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COGNITIVE AGING AND LONG-TERM CARE IN ITALY

Agar Brugiavini
Ludovico Carrino
Gloria Moroni
Rinaldo Naci
Giacomo Pasini

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Agar Brugiavini, Ludovico Carrino, Gloria Moroni, Rinaldo Naci, and Giacomo Pasini
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ABSTRACT

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Agar Brugiavini
Ca' Foscari University of Venice
Economics Department
brugiavi@unive.it

Ludovico Carrino
University of Trieste
Department of Economics,
Business, Mathematics
and King's College London
ludovico.carrino@units.it

Gloria Moroni
Ca Foscari University of Venice
Economics Department
gloria.moroni@unive.it

Rinaldo Naci
Ca' Foscari University of Venice
rinaldo.naci@unive.it

Giacomo Pasini
Ca' Foscari University of Venice
pasinigi@unive.it

Cognitive Aging and Long-Term Care in Italy

Agar Brugiavini, Ca' Foscari University of Venice and Institute for Fiscal Studies

Ludovico Carrino, University of Trieste and King's College London

Gloria Moroni, Ca' Foscari University of Venice, CESIfo

Rinaldo Naci, Ca' Foscari University of Venice

Giacomo Pasini, Ca' Foscari University of Venice and Netspar

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Abstract

This chapter examines the incidence and economic burden of cognitive impairment among older individuals in Italy within the long-term care (LTC) system. Using SHARE Wave 9 data (2022), cognitive impairment is measured through standardized memory and numeracy tests, classifying 8.6% of individuals aged 65+ as cognitively impaired. Cognitive decline rises sharply with age and is strongly associated with higher care needs, particularly intensive formal care. While both physically and cognitively impaired individuals rely heavily on informal care, cognitively impaired individuals receive substantially more hours of care. Total LTC costs amount to $35.3 billion (1.66% of GDP), with cognitively impaired individuals accounting for the largest share of expenditures. Informal care represents a greater financial burden than formal care across all groups. The findings highlight significant unmet care needs and underscore the urgent necessity of policy reforms and healthy ageing strategies to ensure LTC sustainability.

Introduction

The Italian population is aging rapidly: in 2024 almost a fourth (24.6%) of Italians reached age 65 or over, and this percentage is expected to rise up to 36.8% by 2050. The proportion of individuals

older than 85 was 4.1% in 2024 and this percentage is expected to double to reach 8.4% by 2050 (United Nations, Population division 2023)[1]. This increasing trend in population ageing - partly attributed to advancements in healthcare and better living conditions - creates significant hurdles for the healthcare system, social programs, and the overall economy (Brugiavini et al, 2023). The increasing number of older people will imply higher health expenditures, given the growing incidence of chronic health conditions and cognitive impairments and also more complex medical care. At the same time, the pension systems and social services could face difficulties in guaranteeing financial sustainability, and the labour market could be affected by labour shortages, due to the higher proportion of retired individuals relative to the working population. These considerations suggest that proper estimates of the likely costs of ageing-related health conditions are crucial.

While in the previous volume on Long-Term Care, Brugiavini et al, (2023) focus on the use, cost and availability of Long Term Care (LTC) for older individuals affected by limitations in Activities of Daily Living (ADL), this chapter investigates the incidence of cognitive impairment for older individuals and its costs in terms of formal and informal care. The incidence of cognitive impairment among individuals over 85 is significantly higher than among those aged 65 and older, tripling in the over-85 age group compared to the 65 and older group.[2] Cognitive impairment is a major concern for older adults and their families: it represents a major emotional and physical challenge, and it also generates severe financial consequences. As the cognitive function declines, people often need help with activities of daily living. This care is usually provided by family and friends on an informal basis, which can lead to financial strain, health problems, and emotional distress for the caregivers themselves. When care needs become more extensive, paid assistance is often necessary, provided in nursing homes or at home. These costs can be substantial and are usually paid out-of-pocket. Indeed in the Italian system and in most European countries, public provision of long-term care is fragmented and scarce, and private insurance for long-term services can be expensive and is often unavailable to many older adults.

[1] https://www.weforum.org/agenda/2023/02/world-oldest-populations-asia-health/
[2] In Italy in 2019 dementia and Alzheimer's diseases affected 4.2% of the people aged 65 and older living at home (excluding seniors residing in institutions). However, it reaches 14.7% among those aged 85 and older (ISTAT, 2019).

In Italy, the fraction of older people receiving care either formal or informal is 26.6%, regardless of their health status, and it increases to 53.4% if we focus on individuals with at least 1 ADL. In the Italian chapter of the previous volume, it has been estimated that the cost of care is 2% of the GDP, of which 0.7% and 1.3% represent the cost of formal and informal care respectively. The cost of informal care is almost twice as big as the cost of formal care in Italy and as we have seen in the previous chapter this has consequences also for the younger female labour supply (Brugiavini et al. 2023).

The present chapter is going to complete the set of estimates regarding the costs of poor health at older ages for the Italian case, by including a more detailed analysis of the impact of cognitive decline.

Policy Environment

The Italian public LTC system offers cash benefits and in-kind services. Cash benefits include mostly the Accompany Allowance (IA). In-kind services include home care, semi-residential, and residential care. However, the system is fragmented, with funding, management, and governance responsibilities spread across central, local and regional authorities.[3] Key players in LTC include municipalities, local health authorities (ASL), nursing homes (RSA), and the National Institute of Social Security (INPS). The system is financed through taxes, with a significant portion of LTC costs borne directly by households – for example considering the nursing care services, 35% of the cost is covered out-of pocket by the individual while this share falls to less than 7% for home health care services. These numbers are consistent with the fact that many families in Italy rely on informal caregivers, especially family members themselves, to provide home care. Traditionally, Italian families have played a vital role in caring for older relatives. However, changing family dynamics, such as smaller households and increased geographic mobility, may impact this traditional caregiving model (Brugiavini et al 2023, Tediosi, Gabriele, 2010, Tomassini et al. 2024).

National cash benefit

[3] A thorough review can be found in Brugiavini, Carrino, Orso, and Pasini (2017).

LTC cash benefits are provided at national, regional and municipal level. The main national cash benefit, the "Accompany Allowance" (Indennità di Accompagnamento – IA), is provided by the National Institute of Social Security (Istituto Nazionale per la Previdenza Sociale - INPS).[4] Eligibility for IA requires: (i) Certificate of 100% disability level i.e., being unable to walk without the permanent help of a third party or not being able to carry on the activities of daily living ADL, and being in need of continuous assistance; (ii) Not residing in residential institutions with costs covered by the public administration (Brugiavini et al., 2017). The application for IA is initiated by the patient's General Practitioner and the eligibility is assessed by a health-district level commission of INPS. The cash allowance IA is paid monthly and its usage is at beneficiaries complete discretion. The average monthly cash-benefits in 2021 was €522,10 (INPS, 2021). This aspect has contributed to raise the concerns over the general lack of an established and homogeneous regulation of quality checks in the LTC governance in Italy (European Commission, 2021). Moreover, the regions, provinces, and municipalities also provide various cash benefits to households with non-self-sufficient individuals. However, there is considerable variation in the amount, the nature and the eligibility criteria of these cash benefits across different geographical areas in Italy (Marenzi et al. 2023). While the IA provides crucial help for elderly individuals in need of care and indirectly to their family caregivers, the fragmented nature of cash benefits remains a significant issue for equitable access to LTC in Italy.

In-Kind Benefits

In-Kind Benefits consist of health services and social services. The National Health Service (SSN) and Local Health Units (ASL) manage health services, while social care services are largely handled by municipalities. While health services are free, social care services are means-tested. The main health services are provided both at home, through the Integrated Domiciliary Care (Assistenza Domiciliare Integrata – ADI) and in residential institutions. The social care services provision, including domestic and personal care services are provided both at home through the

[4] IA was introduced in 1980 by Law 18/1980, and aims to support care expenses for people with disability irrespectively of their economic condition (Tediosi, Gabriele, 2010).

Services of Domiciliary Assistance (Servizi di Assistenza Domiciliare – SAD) and in residential institutions.

As for the health services, the Integrated Home Care (ADI) aims to help people maintain independence at home, support their recovery, and encourage family involvement. ADI is provided by healthcare companies and offers medical, nursing, and rehabilitative services. Unlike SAD, ADI has been considered an essential level of assistance (LEA) since 2001 and is now integrated with social assistance and family support services. While ADI is mandatory nationwide, specific standards for coverage, care intensity, and quality assessment are still lacking.

As for social services, SAD has a similar goal to help older adults maintain independence in their homes and communities. SAD is provided by qualified professionals who assist with daily living activities (ADLs), such as personal care, home management, and community engagement.[5] However, SAD availability varies significantly across Italy, and it often cannot meet the full demand for LTC services among older individuals.

SAD and ADI services are generally designed for non-self-sufficient individuals, rather than being strictly based on physical or cognitive impairments. Non-self-sufficiency refers to limitations in functional abilities, including physical, mobility, and daily living independence. Eligibility and intensity of these provisions also consider social and economic conditions, family support, and, when relevant, cognitive or psychological issues. While there is no national cognitive standard for home care (SAD), severe impairments are usually considered in the assessments.

Current ADI and SAD models do not always fully meet the needs of non-self-sufficient seniors. SAD typically emphasizes social assistance, focusing on economic difficulties or limited family support, while ADI provides clinical-healthcare services, such as nursing or rehabilitation, without always addressing overall non-self-sufficiency. Effective support requires a multidimensional

[5] SAD specifically includes social and assistance services such as personal care (personal hygiene, dressing, mobilization, walking), small home management interventions (making the bed, cleaning, and general arrangement of the environment), facilitation of maintaining relationships with the community (accompaniment in handling small daily tasks, medical visits, social activities in the community), and activities supporting informal (family) or formal (caregivers) caregivers (Network Non Autosufficienza 2021).

approach, considering the person's condition, vulnerabilities, and life context, often combining multiple interventions to address needs comprehensively (Tidoli, 2021).

As part of the In-Kind Benefits, the services of LTC include also Institutional Care which includes Semi-Residential Care, i.e. day care centres. They are particularly important for individuals with cognitive impairment. The innovative interventions implemented have aimed at strengthening and improving the responsiveness for the specific target related to dementia.[6]

Among the Institutional care, the most important ones are the residential care. The provision of residential care in Italy diversifies into Socio-Health Residential Facilities (Presidi Residenziali Socio Sanitari - RSS) and Socio-Assistance Residential Facilities (Presidi Residenziali Socio-Assistenziali- RSA). They are collectively referred to as socio-assistance and socio-health residential facilities, encompassing all public and private structures providing residential services of a socio-assistance and/or socio-health nature (assisted accommodation with overnight stays) to individuals in need of care.

Finally, the private LTC insurance market is relatively small in Italy. LTC contracts usually offer a deferred life annuity provision for the case of non-self-sufficiency due to injury or illness. "Non self- sufficiency" is defined as the condition by which an individual is no longer able to perform ADL, including washing, dressing, feeding and moving, according to some predefined scale (e.g. 3 limitations out of 6 limitations, etc…). According to Brugiavini et al. (2023) the prevalence of individuals aged 65+ holding a private LTC insurance is estimated to be 4.19%. The insured individuals are more likely to receive formal home help and have higher wealth and income compared to the uninsured individuals.

[6] For instance, Tuscany since 2017 has implemented regulations (specified in Regional Council Resolution No. 1402 dated December 11, 2017, and the Regulation approved by Regional Presidential Decree No. 2/R/2018 outlining requirements for authorizing socio-health facilities) for the innovative "Centro Diurno Alzheimer" project. Currently, there are 26 active centers across the region, providing a total of 301 spaces. The primary aim of the project is to enhance the array of specialized services for individuals with dementia in Day Care Centers (Cda). These centers are conceived as semi-residential socio-health facilities designed for temporary assistance and care, focusing on the intensive treatment of a specific patient group: individuals with a diagnosis of dementia accompanied by significant behavioral disorders that cannot be effectively managed through other care methods. Other regions have promoted initiatives to enhance the capacity of day centers encouraging the stay at home: Liguria has launched the Alzheimer's Day Centers project as a pilot initiative. The organizational model of this project focuses on preventive purposes rather than assistance. The main objective is to facilitate individuals in remaining at home while receiving support from the Day Center (Network Non Autosufficienza 2021) .

Data and Definitions

Sample:

The primary data source for our analysis is the Survey of Health, Ageing and Retirement in Europe (SHARE). This survey investigates the effects of health and socio-economic policies on the life courses of European citizens and is designed to be comparable to the U.S. Health and Retirement Study (HRS) and the English Longitudinal Study of Ageing (ELSA). SHARE collects comprehensive data on demographics, family structure, activities, income, wealth, health, and long-term care needs. Its first wave was conducted in 2004, encompassing 140,000 individuals aged 50 or older from 28 European countries and Israel. Currently, SHARE consists of nine panel waves, along with two telephone-administered waves conducted during 2020-2021, which primarily focused on the impacts of the pandemic.

This analysis is based on respondents aged 65 or older, utilizing data from the most recent SHARE release that is wave 9, corresponding to the interview year 2022. Our baseline data sample comprises 2,804 individual observations.

We focus on the cognitive abilities of the respondents, assessing these through a set of questions included in the survey that are also common in the HRS and ELSA. Specifically, we ask respondents three memory questions: (i) to immediately and delayed recall a list of 10 words, (ii) count backward from 100 by sevens, (iii) and state the date (month, day, year, and day of the week). Using this information, we construct a cognitive score ranging from 0 to 29 for each individual respondent. Following the findings of Crimmins et al. (2011) and Langa et al. (2017), we classify individuals with a score of 6 or lower as "Cognitively Impaired."

Unlike the HRS, SHARE does not record the reasons for which a respondent requires a proxy for an interview. However, the survey permits proxy interviews only in cases where physical and/or cognitive limitations make it too difficult for the respondent to complete the interview. Additionally, some questionnaire modules, such as the cognitive section, are designated as non-proxy sections, meaning they cannot be answered by others. In our analysis, we examined whether there was a relationship between the use of a proxy interview and the age or cognitive score of respondents in the previous year to determine whether to classify respondents with proxy

interviews as cognitively impaired. Out of our 2,804 observations, 129 (4.71 percent) are proxy interviews, which we classify as cognitively impaired.[7] In Figure 1a, the first bar on the left represents this group. Together with other individuals with a cognitive score equal or lower than 6, 8.6% of our sample can be classified as cognitive impaired.

Figure 1a shows the distribution of cognitive score. The dotted line in Figure 1a indicates the cutoff for cognitive impairment (6p), while the dashed lines represent the quintiles of the cognitive score distribution. When calculating these cutoffs, we assume that proxy responses fall into the lowest quintile.

The probability of cognitive impairment significantly increases with age. As shown in Figure 1b, individuals aged 65-84 have notably higher cognitive scores compared to those 85 and older. The median cognitive score for the older group is 10, whereas for the younger group is 16, indicating a large difference. This age-related cognitive decline is evident not only in the score distribution but also in the substantially higher proportion of older individuals requiring proxy interviews. that is 2.71% in the younger group and 15.42% in the older group.

Physical Limitations: Given the importance of the relationship between physical and cognitive impairment (Robertson et al. 2013; De Cock et al. 2018), we also consider measures of physical limitations. The SHARE survey asks about respondents' (or their proxies') difficulties with ADLs, such as dressing, bathing, walking, getting in and out of bed, or using the toilet. Many long-term care insurance policies, both public and private, require individuals to have limitations in at least two of these ADLs to be eligible for benefits. Therefore, we define a physical limitation as having difficulty with two or more ADLs.

Figure 2a illustrates the distribution of ADL limitations in our sample, revealing that 86.51% have no limitations. Figure 2b further breaks this down by age group. Consistent with the pattern observed for cognitive impairments, physical impairments increase with age. However, for both

[7] Proxy interviews are undertaken only in cases of physical and/or cognitive limitations. Although we cannot distinguish between these two, we found a strong correlation between proxy interview and low levels of cognitive impairment in the previous wave. We analyzed the distribution of proxy interviews in wave 7 and 6 based on cognitive scores from the corresponding previous waves 5 and 6 and we found that individuals with a score of less than 6, in the previous wave, were the most likely to have a proxy interview in the subsequent wave.

groups, 65-84 and 85 or older, a large proportion of individuals still have no limitations despite being much smaller in the older group, 90.4% and 65.21% for the younger group and the older group respectively.

Although they do not directly affect our classification, we also examine limitations with respect to instrumental activities of daily living or IADLs. These activities include preparing meals, shopping for groceries, making phone calls, taking medication, managing money, leaving the house independently and accessing transportation services, doing personal laundry, using a map and, doing work around the house or garden. In results not reported here, we find similar patterns while using IADLs instead of ADLs, with 81.41 percent of those 65-84 with no IADLs limitations compared to 42.79 percent of those 85 or older.

Care Utilization and Outcomes: We examine how care usage varies based on cognitive and physical impairments and its associated costs. Our outcome measures include the type of long-term care used (if any) and the amount of care provided. We categorize care into two primary types: any formal (i.e. paid) home care and any informal (i.e. unpaid) home care. In addition, we estimate the hours of home care received over the last month for both formal and informal care.[8] On average 11 percent of our sample uses only formal home care, 20 percent uses informal care, with an overall 25.6 percent that receive any type of care. Unfortunately, the SHARE survey does not provide a complete picture for people permanently residing in nursing homes, this is because the original sampling frame did not include such population, so that data about nursing-home residents is collected only if the Respondent moves from her/his original residence to a nursing home. The absence of specific data on nursing home residents in the SHARE dataset means that our estimates of cognitive impairment may be underreported, as they do not capture a significant portion of cognitively impaired individuals living in such facilities. Therefore, our figures should be interpreted with this limitation in mind. However, we can complement our analysis on care-utilization using external

[8]Starting from Wave 7, SHARE collects information on the number of weeks and weekly hours of formal care received. For informal care received from outside the household, however, SHARE only records the frequency of help (daily, weekly, monthly). To estimate informal care hours, we therefore adopt an approach similar to Barczyk and Kredler (2019). Informal care hours received from outside the household are imputed using data from Waves 1 and 2 for individuals who reported receiving such support in Wave 9. Specifically, we estimate hours as a function of the respondent's age, gender, self-reported frequency of help, and the number of ADL and IADL limitations. Informal care received within the household, instead, is estimated using data from the ISTAT Multipurpose Time Use Survey, which provides average care hours by caregivers, differentiated by sex and age group, based on self-reported information collected through a daily diary, covering activities such as household help and personal care.

ancillary evidence on nursing homes provided by Cherubini et al. (2012).[9] Figure 3 shows the share of individuals receiving care by care type and by cognition quintile. Among individuals in the bottom quintile of the cognitive distribution, 41% receive any informal care, while 23% receive any formal care. The proportion of individuals receiving home care, both formal and informal care, is significantly lower for individuals in the top quintile of the cognition distribution, whereby only 10.4% and 7.2% receive any informal and any formal respectively.

Descriptive statistics

Table 1 shows the relationship between cognitive and physical limitations. The majority of the sample (85.51%) exhibits neither cognitive nor physical impairments, while 6.56% of the sample has one or more physical impairments but no cognitive impairments. This group is fairly evenly divided between those with a single physical impairment and those with two or more. Among individuals with cognitive impairments, just over 38.6% have no physical impairments. Nearly half of the cognitively impaired group (51.4%) has two or more ADL limitations. However, the number of ADL limitations in the cognitively impaired group should be interpreted cautiously as reporting an ADL limitation could just indicate some cognitive limitation. The survey questions ask whether the difficulty is "Because of a physical, mental, emotional or memory problem". In some sense then, the individual may be physically able to complete the task but would need help because they had a cognitive limitation (e.g. a person with dementia not being left alone to bathe). We therefore group all cognitively impaired individuals under one heading, regardless of the number of physical limitations.

Table 2a presents a comparison of demographic characteristics and cognitive measures across three groups: non-impaired individuals (Column 1), those with physical impairments, but no cognitive impairment (Column 2), and those with cognitive impairment (Column 3).

The results indicate that non-impaired individuals are significantly younger, more likely to be married, and have higher levels of education than both impaired groups. This age difference, with

[9] Cherubini et al. (2012) present the results from the study U.L.I.S.S.E., a study aimed at describing older patients in hospitals, receiving home care or resident in nursing homes in Italy and in Umbria region. The study focuses on outcome indicators of care delivered in long-term residential facilities for older individuals no longer self-sufficient.

cognitive impairment groups being approximately 9 years older on average, is consistent with the well-documented increase in dementia risk with age (Azad et al 2007). Additionally, the higher educational attainment among non-impaired individuals is in line with the known association between education and cognitive reserve. However, it is important to note that this difference may be partly attributable to the rising educational levels of more recent cohorts.

Non-impaired individuals also exhibit a significant financial advantage compared to both impaired groups. They have higher mean and median income and wealth. These disparities also reflect the fact that individuals with no impairment have higher labor force participation, being younger and healthier, which is likely to imply lower healthcare costs.

Table 2b shows the difference in need and in care-use across the different groups. The cognitively impaired group (Column 3) has a significantly lower average cognition score of 4.35 compared to the other groups. The physically impaired group also has a lower average cognition score (13.02) compared to the non-impaired group (15.81). When considering a more comprehensive cognitive assessment (Expanded score), including an additional numeracy test, based on calculating proportions (e.g., 10% of a given amount), plus a verbal fluency task, with an extra point awarded if the individual lists at least 10 animal names, plus the back counting task, the pattern remains similar. Unsurprisingly, the physically impaired present on average more than 3 ADL limitations, while the cognitively impaired group exhibits a slightly lower number of ADL limitations, although the difference is significantly different from zero.

While our primary focus is on Activities of Daily Living (ADLs), examining Instrumental Activities of Daily Living (IADLs) provides further insights. IADLs, which encompass tasks such as managing finances, taking medication, and using the phone, often require cognitive abilities. As expected, the cognitively impaired group exhibits a higher number of limitations in these areas, compared to those who suffer from physical impairments.

An important finding of our paper emerges looking at the amount of received care: not all individuals that we classify as cognitive or physical impaired are currently receiving care. Approximately only 60-70% of each group is utilizing either formal or informal care services. Unmet care needs for these individuals are particularly high among those with cognitive impairments (41%), but non-negligible for those with physical impairment (29%). The observed

lack of care may reflect measurement error, since limitations are self-reported and the definition of impairment is based on our own assumptions. It is also possible that some individuals classified as physically or cognitively impaired, do not actually have a level of limitation that requires help. But, overall, these gaps are large and significant: we take this as evidence that the true cost of care may be higher than our estimated costs suggest. A second important finding is that we can document the differences across groups in lack of care.

Formal, paid care is significantly less common than informal, unpaid care for both impaired groups, something that can be partly attributed to the lack of data on nursing home in SHARE that would account for formal paid care. While a slightly higher percentage of physically impaired individuals receive formal care (32.7%) compared to cognitively impaired individuals (26.4%), this difference is not statistically significant. In terms of informal (unpaid) care, both groups rely heavily on unpaid caregivers. However, physically impaired individuals are significantly more likely to receive informal care (60.2%) than cognitively impaired individuals (49.3%).

In contrast to the probability of care, the intensity of care is statistically greater for the cognitively impaired group, averaging 102.7 hours of formal home care compared to 53.9 hours for the physically impaired group. The intensity of informal care follows a similar pattern to the probability of care; the physically impaired receive 48.86 hours of informal care, while the cognitively impaired receive 85.97 hours.

Nursing Home: In Italy, nursing homes (Residenze Sanitarie Assistenziali, RSA) accommodate highly frail older people, often characterized by cognitive impairments and functional disabilities. According to ISTAT data from 2023, over 274,000 older adults resided in long-term care facilities, with more than 80% classified as non-self-sufficient.

Research from the U.L.I.S.S.E. project and the Umbria Region survey (Cherubini et al. 2012), involving 2,215 nursing home residents, found that 50.7% had a dementia diagnosis based on ICD-9 classifications[10], while an additional 14% exhibited cognitive impairment without a formal dementia diagnosis. Cognitive function was assessed using the Minimum Data Set (MDS) Cognitive Performance Scale (CPS), which ranges from 0 to 6 and provides results comparable to

[10] International Classification of Diseases, Ninth Revision (ICD-9) codes.

the Mini-Mental Status Examination (MMSE). A CPS score of 2 or higher corresponds to an MMSE score of 19 or below, while a score of 5 or more indicates severe cognitive impairment.

Residents with a dementia diagnosis were slightly older than those without (median age: 84 vs. 83 years), while the proportion of females was similar across both groups (82–83%). The dementia group exhibited greater disability, with a median ADL score of 23 compared to 11 in residents without dementia, and a higher burden of comorbidities. When comparing residents formally diagnosed with dementia to those classified as cognitively impaired based on a CPS score greater than 2, the latter group had a lower percentage of females and a slightly better cognitive status (median CPS score: 4 vs. 5).

Overall, the findings from Cherubini et al. (2012), which focus on nursing home residents, align with our analysis based on the SHARE respondents.

Regression analyses

To assess the differential impact of cognitive and physical impairments on care utilization, we employ a regression analysis. A multitude of factors, including the severity of need, financial capacity, and the availability of informal caregivers, influence the type of care individuals receive. Our analysis examines the utilization of any care, specific care types (formal home care, informal care), and the intensity of care (hours of formal and informal care received). Our regression models control for a variety of demographic and socioeconomic variables, including physical and cognitive impairments, age, marital status, gender, race, ethnicity, whether the individual has children, the number of children, educational attainment, income and wealth.[11]

Table 3 presents the results of a linear probability model estimating the likelihood of receiving any type of care. The coefficients associated with physical and cognitive impairments mirror the trends observed in the raw means. Individuals with physical impairments exhibit a 51.2 percentage points (pp) higher probability of receiving care compared to those without such impairments. Similarly, individuals with cognitive impairments have a 38.8 pp higher probability compared to those without such impairments. These two coefficients highlight the significant impact of both types of impairments on care utilization. Incorporating age and age squared as control variables slightly

[11] We use the inverse hyperbolic sine of both income and wealth instead of logs because of the existence of zeros and negative values.

weakens the relationship between cognitive impairment and care utilization. Accounting for the full set of control variables, physical impairment increases the probability of receiving any care by 40.5 pp, while cognitive impairment increases it by 23.8 pp.

The third column incorporates a comprehensive set of control variables. Because of the small sample size and the rich set of variables included in the regression, the statistical power is relatively low, and therefore some of the relationships should be taken with caution. Results indicate that female are more likely to receive any care by 10 pp compared to males. Age – despite being not significant – has a sizable relationship with care utilization, whereby a ten-year increase in age is associated with 14.7 pp increase in the likelihood of receiving care. Married individuals are less likely to require care, particularly women. This suggests that marital status may serve as a protective factor. Additionally, the likelihood of care utilization decreases with the presence of any children of 10 pp. Regarding socioeconomic status, educational attainment is negatively associated with care utilization, despite not being significant. On the contrary, income and wealth seem to be positively correlated with the likelihood of receiving care. This association may be attributed to the ability of higher income and wealthier individuals to afford formal care services.

In Tables 4-6, we examine the use of specific types of care in more detail. We look at the extent to which people use formal home care and informal home care as well as the intensity of care received within each category with a specific focus on their determinants.

Table 5a presents the results of a model estimating the likelihood of receiving formal care. Consistent with the descriptive findings in Table 2b, individuals with physical and cognitive impairments exhibit a higher probability of utilizing formal care. However, the magnitude of this effect is slightly larger for physical impairment. Similarly to the previous model, the number of children is associated with a lower probability to receive paid in-home care.

Turning to the intensive margin of formal care utilization (Table 5b), we observe that the main factors significantly predicting the number of hours of care received, conditional on utilizing any formal care, are the types of impairment. The most notable factor is cognitive impairment, which has a substantial impact—more than double that of physical impairment—on the increase in hours of formal care received. Although this contrasts with the pattern observed in the extensive margins

of formal care, the results confirm greater reliance on more qualified caregivers for longer periods in cases of cognitive impairment.

As for informal care, we observe that individuals with physical and cognitive impairments exhibit higher probabilities of receiving care compared to individuals without impairments, of 37.4 pp and 22.8 pp, respectively (Table 4a). The likelihood of receiving informal care also increases with age and is higher for women. However, married individuals are less likely to receive informal care, particularly married women, suggesting that husbands may be less likely to provide care to their spouses. Looking at socio-economic status proxied by education reveals that, conditional on impairment, higher education is negatively associated with the likelihood of receiving unpaid care. Therefore, education is confirmed to be a protective factor.

Turning to the intensity of informal care (Table 4b), we observe a significant disparity in the number of hours received by individuals with cognitive or physical impairments compared to those with no impairments. However, there is no significant difference in the hours of informal care received between the two impaired groups. Even after controlling for other factors, individuals with cognitive impairments receive 43.24 more hours of care per month than non-impaired individuals, while those with physical impairments receive 14.14 more hours. Despite the low statistical power, married individuals, consistent with the pattern observed for the extensive margin, tend to receive fewer hours of informal care.

Costs

In this section we delve deeper into the cost of care both for individuals and society as a whole. Considering the significantly higher demand for care among individuals with cognitive impairments compared to those with physical impairments, understanding these costs and how they vary based on impairment type can help policymakers in anticipating future care needs as the population ages and the relative prevalence of physical and cognitive impairments shifts.

While the cost of formal care can be assessed by multiplying the hours of care received by the average or median hourly rate of a home health aide, valuing informal care is a more complex task. To approximate the value of one hour of an informal caregiver's time we follow the methodology by Gruber and McGarry (2023). This method consists into imputing the hours measured with an

external dataset and multiplying the result by the total number of care hours received by an individual. For the cost of nursing home care, we use the average daily rate of Residenze Sanitarie Assistenziali (RSA) in Italy for each year, multiplied by 365. We detail these procedures below.

For formal home care, the process is straightforward. For each individual in our sample, we multiply the hours of formal home care by the average hourly rate for a home health aide.[12] We sum this product over all the individuals in our sample using the SHARE individual level weights.

Calculating the average cost of a nursing home stay in Italy is particularly challenging due to significant regional disparities, variations in funding structures, and limited data availability. Italy's decentralized healthcare system gives regions autonomy over healthcare and social services, resulting in considerable differences in nursing home costs across the regions. For instance, wealthier northern regions may have higher costs due to higher living standards and better-equipped facilities, while southern regions may offer lower-cost options but with limited availability. Additionally, also the cost-sharing structure between residents and the public health system varies by region. Furthermore, the lack of standardized and comprehensive national data on nursing home costs makes it difficult to aggregate and compare information. In 2019, the average cost of a day's stay in a nursing home in Italy was €112.60. This cost increased to €127.70 for nursing homes specialized in Alzheimer's and dementia care (Pesaresi F. 2016, 2018). To estimate the total annual cost of nursing home care, we multiplied the average daily cost by 365. Additionally, we multiplied the number of dependent older adults by the probability of being diagnosed with dementia in a nursing home to account for the higher average daily cost in specialized facilities.

Estimating the cost of informal care requires more assumptions and imputations. Unfortunately, we cannot adopt the same strategy used for formal care, which involves multiplying hours of care by the hourly cost, because family caregivers do not receive monetary compensation. Consequently, we must approximate the value of their time based on observable characteristics. We begin by imputing a wage rate and a probability of working for each caregiver in our sample

[12] We obtain the average hourly wage for a home health aide from the pay scales of "Colf/Badanti." For our calculation, we focus on the wage level for home aides classified as BS, non-cohabiting assistants for self-sufficient individuals. To this minimum hourly wage, we add the employer's share of social security contributions and any additional contributions required.

based on the available information in our sample using data from the Italian National Statistics Institute (ISTAT).[13] For caregivers who are spouses or children of the respondent, we construct predicted values using their age, gender, marital status, and year. For other caregivers, when it's possible to retrieve their gender, we use it along with the year to construct the predicted values.

After estimating the caregiver's potential wage and likelihood of employment, we calculate the value of foregone earnings by multiplying the hours of care estimated using the imputed wage rate and the imputed probability of employment. This approach accounts for the income lost due to caregiving responsibilities. Finally, to take into account the value of foregone leisure time, we multiply the hours of care by the probability of non-employment and the minimum hourly wage of Badanti, defined by National Collective Labour Agreements (CCNL).[14]

Table 7 presents the total and per capita costs of long-term care. In terms of total costs, we estimate a $35.29 billion expenditure or $2,539 per elderly individual equivalent to 1.66% of the GDP. When examining the costs by impairment category (no impairment, physical impairment, and cognitive impairment), we observe that the cost of care for the cognitively impaired group is significantly higher, amounting to $14.59 (0.69% of GDP) billion compared to $7.65 (0.36% of GDP) billion for the physically impaired group. On a per capita basis, this difference disappear with costs of $14,160 for the physically impaired and $12,157 for those with cognitive impairments. The convergency of this measurement is mainly driven by the high cost of nursing care that is similar between the two impairment groups.[15]

Additionally, when analyzing the breakdown by care type, a notable pattern emerges in the Italian context: the cost of informal care consistently exceeds that of formal care, irrespective of impairment type. For individuals with physical impairments, the cost of informal care is $1.68 billion, translating to a per capita cost of $3,120. Similarly, for those with cognitive impairments, the cost of informal care amounts to $5.51 billion, equating to a per capita cost of $4,594. This significant financial burden, often sustained over many years, can have a substantial negative impact on the caregiver's well-being.

[13] See https://www.istat.it/en/ for details regarding the ISTAT.
[14] For our calculation, we focus on the wage level for home aides classified as BS, non-cohabiting assistants for self-sufficient individuals (Lavoratore Domestico 2022).
[15] Results are reported in Euros, but we can provide figures in Dollars 2018 upon request.

At the end of 2022, the number of residents in nursing homes aged over 65 was 274,000, of which 223,000 were not self-sufficient (ISTAT 2023). Given that the incidence of dementia cases in nursing homes is 50.7%, we used this proportion to differentiate between individuals who are not self-sufficient due to physical impairment and those with cognitive impairment. We estimated a total cost for nursing homes of $12.67 billion.

Conclusion

The significant and growing cost of caring for individuals with cognitive impairments exceeds the financial capacity of most families to provide either informal or formal care. Assuming a proportional increase in costs, the projected number of cognitively impaired elderly individuals in need of care will double (Alzheimer Europe, 2019), causing the cost to rise from €33.22 billion to over €66.44 billion, with a substantial portion of this burden falling on informal caregivers.

To alleviate the growing burden of long-term care, we must prioritize healthy aging. Medical advancements can delay decline, reducing the need for extensive care. However, even with these breakthroughs, we must explore additional strategies, such as technological innovations and policy reforms, to support both caregivers and the older individuals. In this context, it is essential to continue collecting, maintaining, and systematically monitoring data from multiple sources—both administrative and survey-based. High-quality, comprehensive data provide a clearer understanding of population ageing, enable meaningful cross-country comparisons, and help identify trends and gaps in service provision. Reliable data also offer a stronger evidence base for policy-making, ensuring that decisions are informed, targeted, and effective in addressing the real needs of older individuals.

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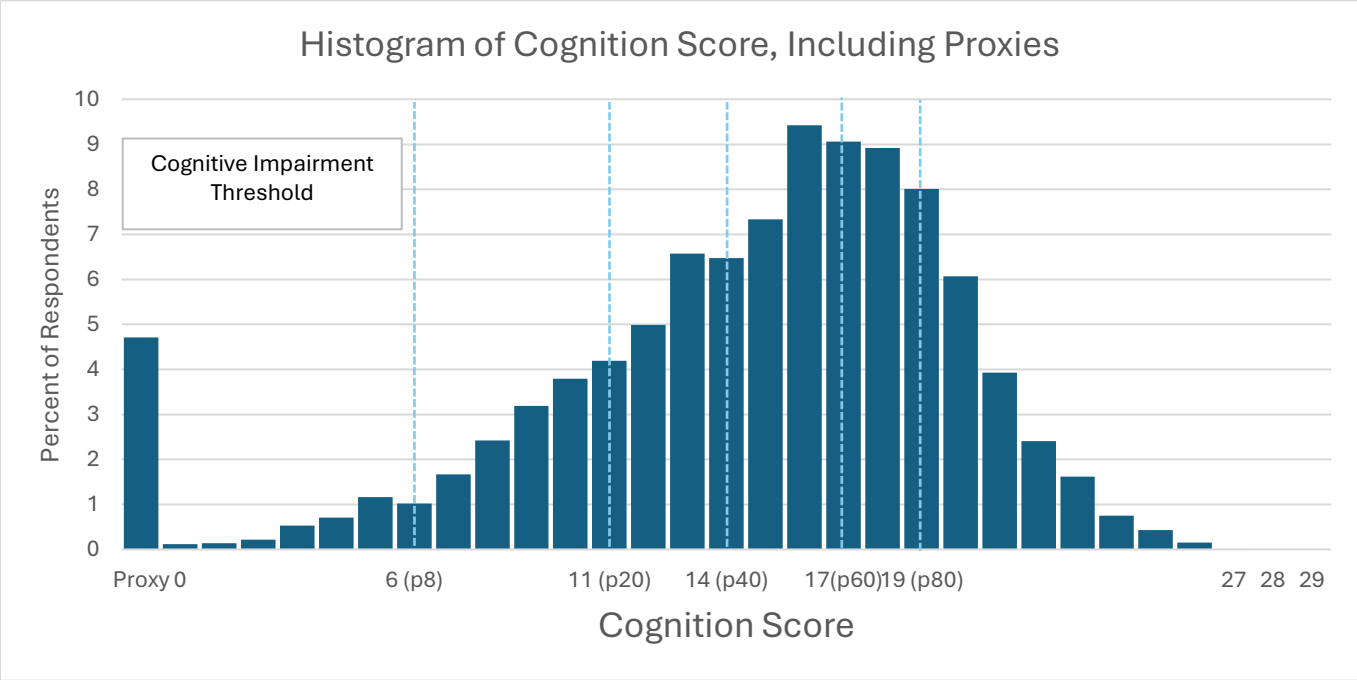
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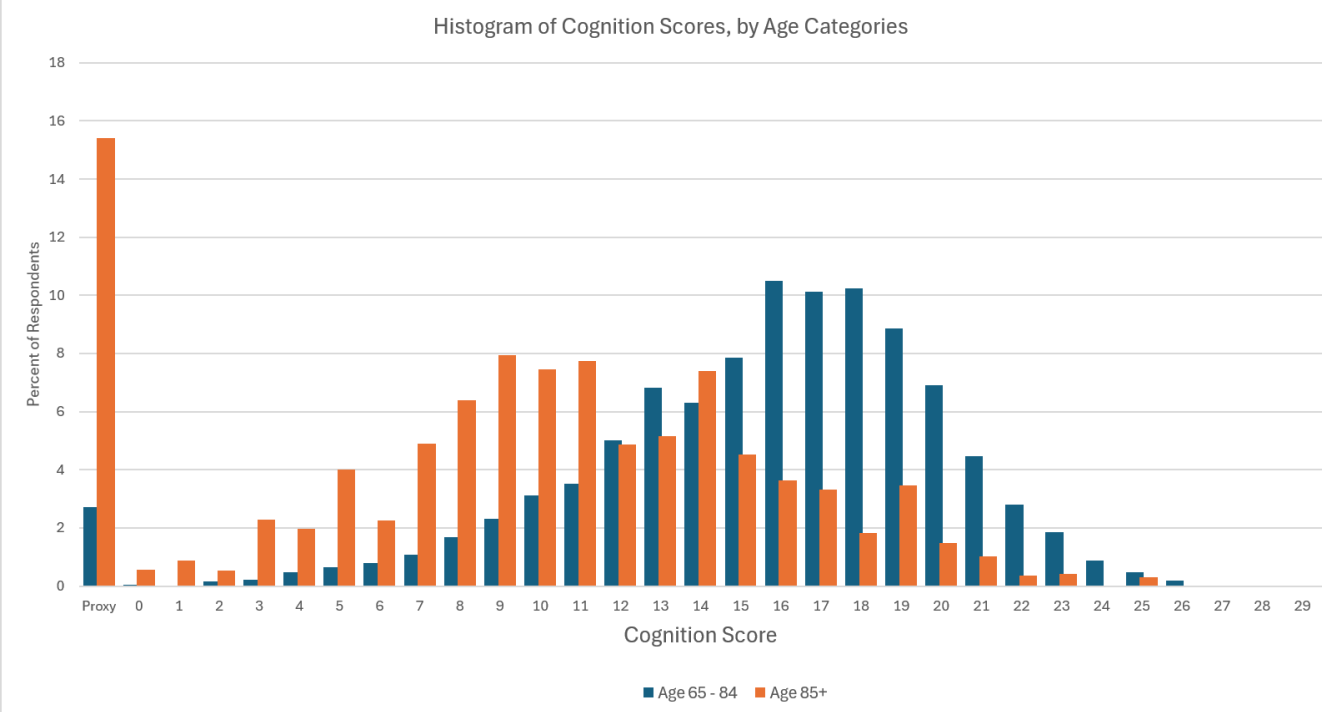
United Nations, Population division (2023), World Population Ageing 2023: Ten Key messages

Figure 1a



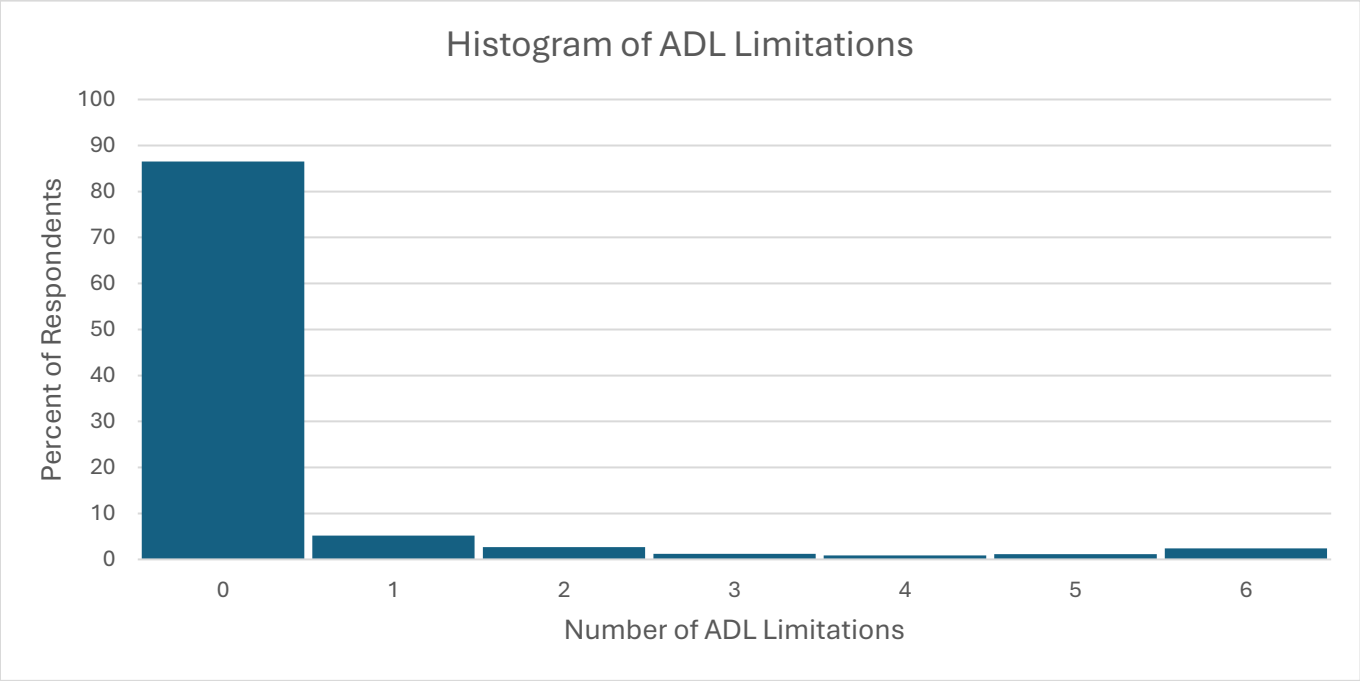
Source: Italian population aged 65 and over, data from SHARE wave 9. Individual calibrated weights are used for all population estimate calculations.

Figure 1b



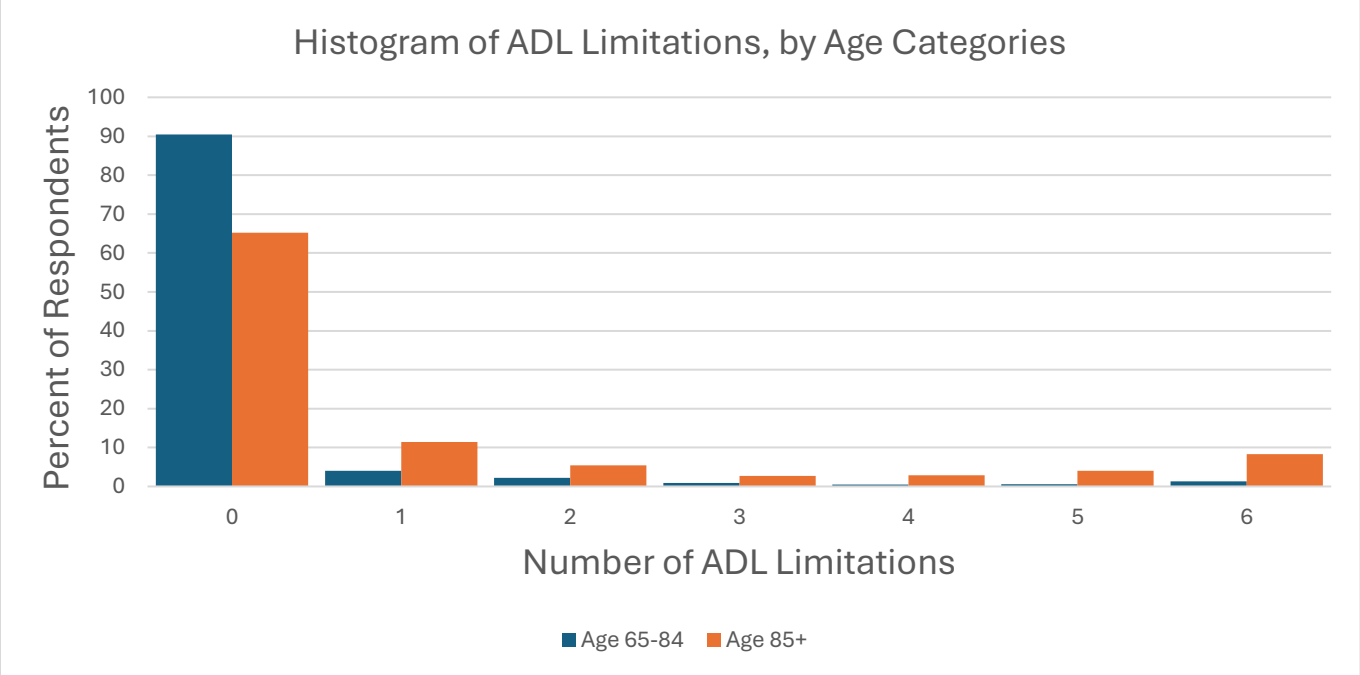
Source: Italian population aged 65 and over, data from SHARE wave 9. Individual calibrated weights are used for all population estimate calculations.

Figure 2a



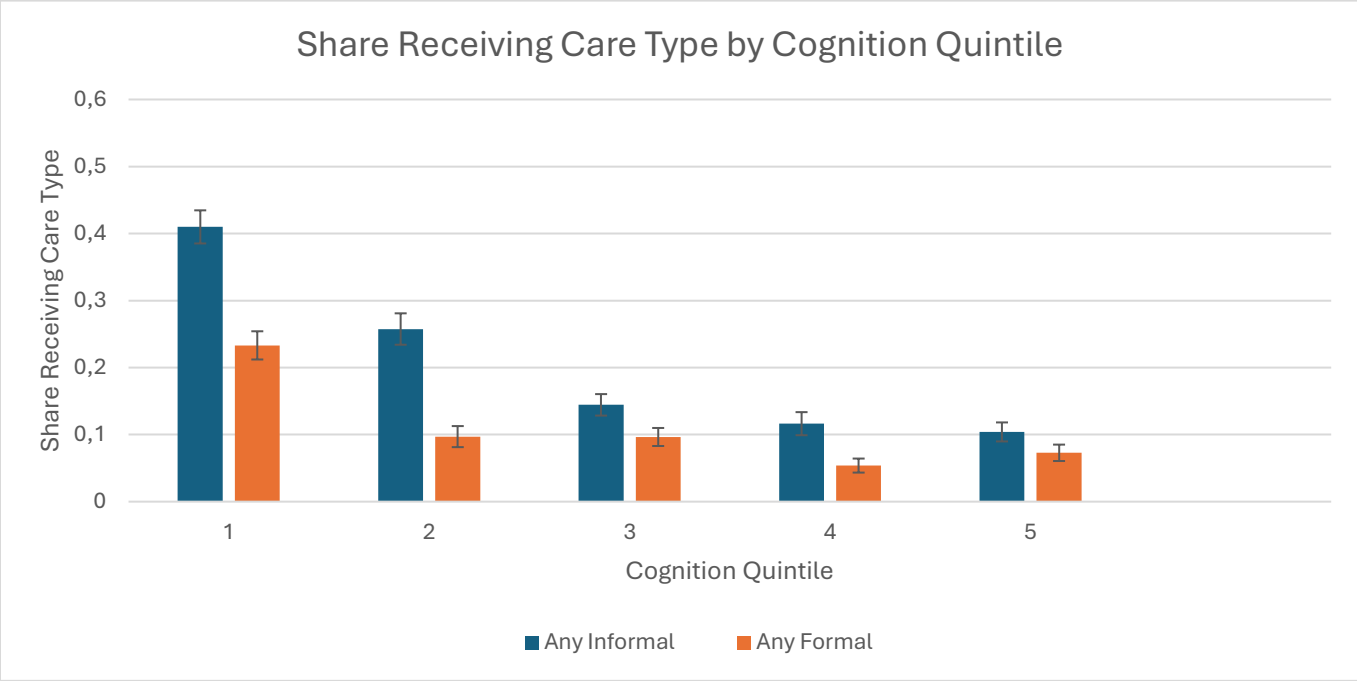
Source: Italian population aged 65 and over, data from SHARE wave 9. Individual calibrated weights are used for all population estimate calculations.

Figure 2b



Source: Italian population aged 65 and over, data from SHARE wave 9. Individual calibrated weights are used for all population estimate calculations.

Figure 3



Source: Italian population aged 65 and over, data from SHARE wave 9. Individual calibrated weights are used for all population estimate calculations.

Table 1: Joint Distribution of Cognition Score and ADL Limitations

Limitations	Cognition score 0 - 6	Cognition Score 7 - 12	Cognition Score 13+	Proxy assumed cognitively impaired	Total
0 ADLs	2.34%	16.66%	66.53%	0.98%	86.51%
1 ADL	0.36%	1.78%	2.54%	0.51%	5.18%
2+ ADL	1.20%	1.80%	2.08%	3.22%	8.30%
Total	3.89%	20.25%	71.15%	4.71%	100.00%

Source: Italian population aged 65 and over, data from SHARE wave 9. Individual calibrated weights are used for all population estimate calculations.

Table 2a: Means of selected variables

Variable	0 - 1 ADLs & Score 7+	2+ ADLs & Score 7+	Score 0 - 6 (All ADLs)	Total
Age	75.40	81.61	83.97	76.38
	(0.188)	(0.856)	(0.545)	(0.187)
Female (0 or 1)	0.563	0.606	0.622	0.570
	(0.0118)	(0.0512)	(0.0345)	(0.0110)
Married (0 or 1)	0.664	0.547	0.501	0.645
	(0.0121)	(0.0548)	(0.0369)	(0.0113)
Any children (0 or 1)	0.882	0.863	0.916	0.884
	(0.00882)	(0.0406)	(0.0207)	(0.00808)
Number of children	1.876	1.831	2.224	1.904
	(0.0293)	(0.121)	(0.106)	(0.0277)
Primary education or none	0.408	0.548	0.789	0.447
	(0.0117)	(0.0532)	(0.0295)	(0.0111)
Lower secondary education	0.282	0.199	0.115	0.265
	(0.0110)	(0.0409)	(0.0223)	(0.0100)
Upper secondary education	0.201	0.165	0.0677	0.188
	(0.00973)	(0.0416)	(0.0182)	(0.00884)
University or higher	0.108	0.0880	0.0283	0.101
	(0.00807)	(0.0289)	(0.0132)	(0.00726)
Work for pay (0 or 1)	0.0874	0.0263	0.0291	0.0800
	(0.00771)	(0.0161)	(0.0123)	(0.00688)
Income per capita (mean)	10,408	10,334	9,511	10,328
	(162.8)	(802.1)	(465.4)	(151.2)
Income per capita (median)	10,053	8,640	9,000	9,784
Wealth per capita (mean)	118,197	100,203	82,252	114,406
	(2,315)	(10,273)	(5,635)	(2,135)
Wealth per capita (median)	96250	70041	67000	93178
Observations	2,465	108	213	2,804

Source: Italian population aged 65 and over, data from SHARE wave 9. Individual calibrated weights are used for all population estimate calculations.
Note: Standard errors in parentheses are clustered at the individual level

Table 2b: Means of Care Use Measures

Variable	0 - 1 ADLs & Score 7+	2+ ADLs & Score 7+	Score 0 - 6 (All ADLs)	Total
Limited score (out of 29)	15.81	13.02	4.350	15.23
	(0.0937)	(0.410)	(0.160)	(0.102)
Expanded score (out of 35)	19.73	16.38	6.242	19.08
	(0.111)	(0.519)	(0.205)	(0.121)
Number of ADLs	0.0494	3.337	2.374	0.377
	(0.00491)	(0.159)	(0.180)	(0.0257)
Number of IADLs	0.383	4.515	4.807	0.924
	(0.0263)	(0.302)	(0.258)	(0.0459)
Any care (0 or 1)	0.202	0.714	0.590	0.256
	(0.00962)	(0.0494)	(0.0362)	(0.00968)
Any Unpaid care (0 or 1)	0.153	0.602	0.493	0.200
	(0.00869)	(0.0529)	(0.0369)	(0.00891)
Any Paid care (0 or 1)	0.0855	0.327	0.264	0.110
	(0.00661)	(0.0505)	(0.0321)	(0.00684)
Unpaid care hours per month (conditional on unpaid care)	36.46	48.86	85.97	48.09
	(5.722)	(13.40)	(16.45)	(5.458)
Paid care hours per month (conditional on paid care)	28.19	53.87	102.7	46.89
	(4.520)	(20.29)	(25.70)	(6.931)
Observations	2,465	108	231	2,804

Source: Italian population aged 65 and over, data from SHARE wave 9. Individual calibrated weights are used for all population estimate calculations.
Note: Standard errors in parentheses are clustered at the individual level.

Table 3: Regression Analysis for Any Care Use

	Any Personal Care	Any Personal Care	Any Personal Care
Constant	0.202***	0.815	0.967
	(0.00963)	(0.913)	(0.919)
2+ ADLs and Score 7+	0.512***	0.404***	0.405***
	(0.0501)	(0.0565)	(0.0573)
Score 0 - 6	0.388***	0.239***	0.238***
	(0.0374)	(0.0413)	(0.0412)
Age - 65		0.00996	0.0147
		(0.0242)	(0.0242)
(Age - 65) Squared		4.65e-05	6.94e-06
		(0.000160)	(0.000160)
Female			0.0996**
			(0.0396)
Married			-0.0316
			(0.0352)
Female * Married			-0.00875
			(0.0435)
Number of children			0.00207
			(0.00965)
Any children			-0.0916**
			(0.0374)
Income (Inverse Hyperbolic Sine)			0.00337
			(0.00327)
Wealth (Inverse Hyperbolic Sine)			0.00461
			(0.00478)
Lower secondary education			-0.0277
			(0.0216)
Upper secondary education			-0.0263
			(0.0243)
University or higher			-0.0234
			(0.0282)
Observations	2804	2804	2804
Mean dependent variable	0.255	0.255	0.255
R-squared	0.107	0.186	0.207

Source: Italian population aged 65 and over, data from SHARE wave 9. Individual calibrated weights are used for all population estimate calculations.
Notes: Standard errors in parentheses and clustered at the respondent level. Income and Wealth are measured as the inverse hyperbolic sine *significant at the 90% confidence level. **significant at the 95% confidence level. ***significant at the 99% confidence level.

Table 4a: Regression Analysis for Use of Any Unpaid Care

	Any Unpaid Care	Any Unpaid Care	Any Unpaid Care
Constant	0.153***	-1.122	-1.071
	(0.00869)	(0.843)	(0.845)
2+ ADLs and Score 7+	0.449***	0.373***	0.374***
	(0.0534)	(0.0569)	(0.0577)
Score 0 - 6	0.339***	0.236***	0.228***
	(0.0379)	(0.0412)	(0.0412)
Age - 65		0.0213	0.0207
		(0.0224)	(0.0224)
(Age - 65) Squared		-5.75e-05	-6.46e-05
		(0.000148)	(0.000148)
Female			0.0755**
			(0.0366)
Married			-0.00877
			(0.0324)
Female * Married			-0.0163
			(0.0407)
Number of children			0.00753
			(0.00929)
Any children			-0.0737**
			(0.0347)
Income (Inverse Hyperbolic Sine)			0.00466
			(0.00299)
Wealth (Inverse Hyperbolic Sine)			0.00304
			(0.00421)
Lower secondary education			-0.0364*
			(0.0206)
Upper secondary education			-0.0494**
			(0.0223)
University or higher			-0.0655***
			(0.0253)
Observations	2,804	2,804	2,804
Mean dependent variable	0.2	0.2	0.2
R-squared	0.097	0.146	0.161

Source: Italian population aged 65 and over, data from SHARE wave 9. Individual calibrated weights are used for all population estimate calculations.
Notes: Standard errors in parentheses and clustered at the respondent level. Income and Wealth are measured as the inverse hyperbolic sine *significant at the 90% confidence level. **significant at the 95% confidence level. ***significant at the 99% confidence level.

Table 4b: Regression Analysis of Use of Informal Care Hours

	Informal Care Hours	Informal Care Hours	Informal Care Hours
Constant	36.46***	316.5	496.4
	(5.731)	(725.8)	(787.7)
2+ ADLs and Score 7+	12.40	12.58	14.14
	(14.51)	(14.57)	(14.55)
Score 0 - 6	49.51***	45.95**	43.24**
	(17.39)	(19.79)	(19.97)
Age - 65		-7.529	-11.70
		(18.14)	(19.72)
(Age - 65) Squared		0.0500	0.0760
		(0.113)	(0.123)
Female			-36.63
			(26.17)
Married			-23.62
			(27.97)
Female * Married			42.90
			(31.14)
Number of children			7.234
			(4.818)
Any children			-6.480
			(17.18)
Income (Inverse Hyperbolic Sine)			-1.103
			(3.038)
Wealth (Inverse Hyperbolic Sine)			1.390
			(1.240)
Lower secondary education			-8.940
			(14.71)
Upper secondary education			-7.937
			(17.47)
University or higher			-3.856
			(22.85)
Observations	492	492	492
Mean dependent variable	48.1	48.1	48.1
R-squared	0.030	0.031	0.048

Source: Italian population aged 65 and over, data from SHARE wave 9. Individual calibrated weights are used for all population estimate calculations.
Notes: Standard errors in parentheses and clustered at the respondent level. Income and Wealth are measured as the inverse hyperbolic sine *significant at the 90% confidence level. **significant at the 95% confidence level. ***significant at the 99% confidence level.

Table 5a: Probability of Any Paid Care

	Any Paid Care	Any Paid Care	Any Paid Care
Constant	0.0855***	0.326	0.00170
	(0.00661)	(0.698)	(0.713)
2+ ADLs and Score 7+	0.242***	0.184***	0.184***
	(0.0507)	(0.0512)	(0.0516)
Score 0 - 6	0.178***	0.0962***	0.105***
	(0.0327)	(0.0342)	(0.0346)
Age - 65		-0.0147	-0.00607
		(0.0186)	(0.0189)
(Age - 65) Squared		0.000152	9.68e-05
		(0.000123)	(0.000125)
Female			0.0412
			(0.0318)
Married			-0.0389
			(0.0278)
Female * Married			0.0160
			(0.0343)
Number of children			-0.0173***
			(0.00650)
Any children			0.00180
			(0.0292)
Income (Inverse Hyperbolic Sine)			-0.00186
			(0.00259)
Wealth (Inverse Hyperbolic Sine)			0.00181
			(0.00394)
Less than high school			0.00945
			(0.0167)
Some college			0.0262
			(0.0188)
College or more			0.0247
			(0.0216)
Observations	2,804	2,804	2,804
Mean dependent variable	0.11	0.11	0.11
R-squared	0.045	0.086	0.103

Source: Italian population aged 65 and over, data from SHARE wave 9. Individual calibrated weights are used for all population estimate calculations.
Notes: Standard errors in parentheses and clustered at the respondent level. Income and Wealth are measured as the inverse hyperbolic sine *significant at the 90% confidence level. **significant at the 95% confidence level. ***significant at the 99% confidence level.

Table 5b: Regression Analysis of Number of Hours of Formal Care

	Formal Care Hours	Formal Care Hours	Formal Care Hours
Constant	28.19***	416.2	217.5
	(4.532)	(624.1)	(602.2)
2+ ADLs and Score 7+	25.68	20.60	26.99
	(20.60)	(22.47)	(21.83)
Score 0 - 6	74.50***	61.40***	76.43***
	(26.03)	(23.07)	(22.43)
Age - 65		-11.97	-8.745
		(16.20)	(15.61)
(Age - 65) Squared		0.0881	0.0727
		(0.104)	(0.0996)
Female			-44.00**
			(19.86)
Married			-57.63***
			(20.72)
Female * Married			64.33***
			(23.63)
Number of children			8.590
			(8.757)
Any children			-9.710
			(18.71)
Income (Inverse Hyperbolic Sine)			1.544
			(1.710)
Wealth (Inverse Hyperbolic Sine)			3.184**
			(1.520)
Less than high school			23.53*
			(13.77)
Some college			57.77***
			(19.57)
College or more			21.02
			(13.88)
Observations	283	283	283
Mean dependent variable	46.9	46.9	46.9
R-squared	0.090	0.118	0.194

Source: Italian population aged 65 and over, data from SHARE wave 9. Individual calibrated weights are used for all population estimate calculations.
Notes: Standard errors in parentheses and clustered at the respondent level. Income and Wealth are measured as the inverse hyperbolic sine *significant at the 90% confidence level. **significant at the 95% confidence level. ***significant at the 99% confidence level.

Table 7: Aggregate and Per Capita Cost of Care

	Spending	Not impaired	Physically impaired only	Cognitively Impaired	Total
Formal Care	National total (Billions $)	3.10	1.08	3.53	7.71
	Per capita ($)	255	1995	2942	555
	Per user of care ($)	2,985	6,100	11,142	5,043
Informal Care	National total (Billions $)	7.71	1.68	5.51	14.91
	Per capita ($)	634	3120	4594	1073
	Per user of care ($)	4,144	5,183	9,319	5,363
Nursing Home	National total (Billions $)	2.24	4.88	5.55	12.67
	Per capita/Per user of care ($)	43,911	44,426	49,047	46,237
All Care	National total (Billions $)	13.05	7.65	14.59	35.29
	Per capita ($)	1,073	14,160	12,157	2,539
	Percent of GDP	0.61%	0.36%	0.69%	1.66%
	Population (millions)	12.16	0.54	1.20	13.90
	Observations	2,465	108	231	2,804

Source: Italian population aged 65 and over, data from SHARE wave 9. Individual calibrated weights are used for all population estimate calculations.
Notes: Italy's GDP in 2022 was 2,129 billion $ using 2018 prices (GDP from ISTAT)