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Abstract

Population ageing in Spain is driving a growing demand for long-term care (LTC) services, particularly for individuals with cognitive impairments resulting from neurodegenerative diseases like Alzheimer's. While ageing reflects societal progress, it poses challenges for healthcare and LTC systems. In Spain, around 734,000 to 937,000 people live with dementia, and cognitive impairment affects 18.5% of those aged 65 and older, rising sharply in older age groups.

Informal care provided by families accounts for most of the economic burden of dementia, representing 69% to 81% of total care costs. Spain's LTC system, established by the 2007 Dependency Act, aimed to provide universal access to care services, yet financial constraints, reliance on informal care, and regional disparities have hindered its implementation. Current strategies include promoting home-based care and enhancing the quality of services, but significant gaps remain in specialized support for neurodegenerative diseases.

Key challenges include improving early diagnosis, expanding access to formal care, and supporting informal caregivers through financial aid and training. As Spain's elderly population continues to grow, a more inclusive, sustainable LTC model is essential to address the rising prevalence of cognitive impairment and its associated social and economic impact.

Keywords: Cognitive Impairment, aging, long term care

JEL codes: I18, I38, J14

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1. Introduction

Population ageing is giving rise to noticeable shifts in the needs of populations across several European countries, and this trend is expected to intensify in the coming decades. Although such rise in the needs of the population challenges the sustainability of Welfare States ageing itself is an indicator of success, largely driven by significant increases in life expectancy over the past century. In particular, the last 40 years have seen notable gains in life expectancy for those aged 65 and over. However, while this demographic shift is a testament to advances in healthcare quality and living standards, pension systems still need to adapt to changing ageing of the labor workforce, changes in mobility encompass rising demands on health and long-term care (LTC) systems, which require considerable resources to meet the needs of an older population.

Ageing effects. Age is a predisposing factor rather than a need factor for the demand of care services (de Meijer et al, 2013), and although it is far less important driver of healthcare expenditure (Zweifel et al, 1999; Seshamani and Gray, 2004; Carreras et al, 2018; Costa-Font and Vilaplana, 2020; Breyer and Lorenz, 2021; Zweifel, 2022) when it comes to LTC it is always relevant driver even when accounting for time to death (Karsson and Klohn, 2014; Hashimoto et al, 2010). Therefore, we expect that in the coming decades, the demand for LTC services will grow significantly in Europe (European Commission, 2024). Among the driver of such LTC spending lies the growth of neurodegenerative diseases, especially those that cause cognitive impairment (Oficina de Ciencia y Tecnología, 2023).

The prevalence of dementia and neurodegenerative disorders. While accurately identifying the number of individuals affected by neurodegenerative diseases is challenging—largely due to under-diagnosis—it is estimated that between one and one and a half million people in Spain may

be living with a neurodegenerative condition, the majority of whom experience cognitive impairment. In Spain, the prevalence of dementia is a significant and growing concern, with estimates suggesting that between 734,000 and 937,000 individuals are affected by this condition. Dementia encompasses a range of neurodegenerative diseases that primarily affect cognitive function, leading to impairments in memory, reasoning, and the ability to carry out everyday activities. Alzheimer's disease is the most common form of dementia, but other types, such as vascular dementia and Lewy body dementia, also contribute to the overall impact.

The estimation of those affected is complex, mainly due to under-diagnosis and the fact that many people, especially in the early stages, may not seek medical attention or be diagnosed accurately. This underreporting can be attributed to various factors, including the stigma associated with cognitive decline, the gradual progression of symptoms, and sometimes, the assumption that memory loss is a natural part of ageing. As a result, the true number of individuals living with dementia may be higher than current estimates suggest.

Understanding the scale of the problem and the diverse needs of people with dementia will be crucial in ensuring a more responsive and sustainable care model in the future. Alzheimer's disease alone accounts for 60-80% of cases according to the so-called Comprehensive Plan for Alzheimer's. A recent Spanish study conducted on the population aged 65 and over estimated a prevalence rate of cognitive impairment of 18.5%. Prevalence rates vary depending on gender (women showed higher adjusted rates), education level, marital status and age (the prevalence was 45.3% in people aged 85 and older, Vega Alonso, 2018). In this regard, the Spanish Ministry of Health has developed two strategies in this field, namely the so-called "Strategy on

neurodegenerative disorders”² and the “Comprehensive plan for Alzheimer's and other dementias”³.

The growing prevalence of dementia is placing increasing pressure on healthcare and social support systems, underscoring the urgent need for further adaptation to meet the demands of an ageing population. Among the main challenges it is possible to point out effective diagnosis, early intervention, and access to comprehensive care are essential to managing dementia effectively. However, to address these challenges, further collaboration between medical professionals, caregivers, and policymakers is required to raise awareness, enhance diagnostic tools, and ensure that resources are available for both individuals living with dementia and their families. A broad approach is required and includes the provision of psychological support, social integration, and creating dementia-friendly environments. Such efforts might involve modifying public spaces and homes to better accommodate those with cognitive impairments, as well as training caregivers and healthcare providers in specialized dementia care. By fostering a more inclusive and supportive environment, we can help individuals with dementia maintain a better quality of life and ease the burden on families and communities.

Costs of dementia. Costa of illness studies have estimated large social costs that compare to the costs of professional care (Kosaner et al, 2021; Wimo et al, 2023). A recent study (Gomez Maldonado et al, 2024) estimates that the average annual cost of care for patients with Alzheimer's

² Ministerio de Sanidad, Servicios Sociales e Igualdad. Estrategia en enfermedades neurodegenerativas del Sistema Nacional de Salud. https://www.sanidad.gob.es/organizacion/sns/planCalidadSNS/pdf/Est_Neurodegenerativas_APROBADA_C_INTERTERRITORIAL.pdf (2016)

³ Ministerio de Sanidad, Consumo y Bienestar Social. *Plan integral de Alzheimer y otras demencias. 2019-2023.* https://www.sanidad.gob.es/profesionales/saludPublica/docs/Plan_Integral_Alzheimer_Octubre_2019.pdf (2019).

disease (AD) in 2021 to range from €42,336 to €70,445, with the cost rising as cognitive impairment worsened—doubling from moderate to severe impairment. Among the total cost, healthcare expenses accounted for 5.2% to 8.6%. Formal long-term care (LTC) services, provided by professionals, represented between 7.7% and 12.8% of the overall cost. However, the cost of informal care, typically provided by family members or unpaid caregivers, was significantly higher, ranging from 69.0% to 81.4% of the total cost. These figures illustrate not only the considerable financial burden of dementia on healthcare systems but also the critical role played by informal caregivers. Indeed, the heavy reliance on unpaid care underscores the need for policy measures that support family caregivers, including financial assistance, respite services, and improved training to help them manage the demands of caregiving⁴⁵.

Mar et al. (2011) using data from patients with acquired brain damage (including stroke and traumatic brain injury), found that the cost of non-healthcare services increases significantly as functional impairment becomes more severe. For individuals with mild physical or cognitive impairment, the non-healthcare cost was €16,484, while for those with severe functional impairment, this cost rose to €44,550 (base year 2008). At mild levels of impairment, informal care (typically provided by family members or friends) plays a larger role in the total cost, reflecting the greater reliance on unpaid caregivers. However, as the degree of impairment increases, formal care (provided by professional services) becomes the dominant cost factor. This shift highlights the growing need for structured, professional support as individuals with acquired

⁴ The differences between the total cost figures and the weight of the items are due to the shadow price applied to the valuation of the informal care time (home employee vs. home help service).

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brain damage experience greater functional decline, further underscoring the financial strain on both families and healthcare systems.

Finally, Vilaplana-Prieto and Oliva-Moreno (2024) estimated the time spent on informal care for individuals with Alzheimer's disease (AD) living at home and its economic value, comparing data from 2021 with that from 2008. Despite the relatively short period between the two years, the study found that the number of people with AD living at home had increased by 43%, with a corresponding rise in the number of individuals receiving informal care. The authors find that while various factors may explain this significant increase, one key reason is the ageing of the Spanish population. Between 2008 and 2021, the population aged 65 and over grew by 24.2%, with the most notable increase occurring in those aged 85 and over, which rose by 74.4%.

The study also provides a monetary valuation of informal care using the Proxy Good method, which estimates the cost of replacing informal caregiving with formal home care services. The results indicate that fully replacing informal care with formal care would exhaust the entire budget of the *Sistema para la Autonomía y Atención a la Dependencia* (Spanish System for Autonomy and Care for Dependency). This highlights the enormous financial pressure that caregiving, particularly informal caregiving, places on families and the public welfare system, as well as the need for sustainable, long-term solutions to support both caregivers and the ageing population.

2. Policy environment

Although as most southern European countries, Spain is among the Western European countries with relatively low formal care provision as the family is still the main provider of long-term care

(OECD, 2005). However, after 2007, the Spanish government implemented a major reform known as the Promotion of Personal Autonomy and Care for Dependent Persons, which came into effect on January 1, 2007. This reform established the System for Autonomy and Care for Dependency (SAAD), with guiding principles that emphasized the universal and public nature of the right to receive benefits, equal access to benefits based on need, and the involvement of all public administrations, alongside the participation of private initiatives in the provision of services. SAAD represented a significant regulatory advancement in the field of social rights, offering a legal framework aimed at improving care for dependent persons.

However, the economic crisis that struck Spain in 2008 and lasted until 2014 significantly hindered the financing and full implementation of the new system. During these early years, the government faced considerable planning challenges and political disputes, which delayed the rollout of services and the promised population coverage. These delays led to long waiting lists, often referred to as the "dependency limbo," where individuals in need of care remained without adequate support for extended periods. In response to these delays, the system increasingly promoted cash benefits associated with informal care, rather than the development of professional, formal care services. As a result, despite the legislative progress made by SAAD, its practical impact was limited in the short term due to financial constraints, political gridlock, and the overwhelming reliance on informal care, which put additional strain on families and caregivers (Peña Longobardo et al, 2016).

Seventeen years after its implementation, the reform of Spain's long-term care (LTC) system has led to significant advancements in the provision of care for individuals with limitations in

autonomy. As of the end of 2024, nearly 1.5 million people are receiving some form of service or cash benefit through the System for Autonomy and Care for Dependency (SAAD). The catalogue of services available under the system includes those designed to prevent dependency and promote personal autonomy, such as telecare, home care, daycare and night centre services, and nursing homes. Each regional authority in Spain is responsible for establishing quality standards and accrediting professional services, ensuring that care is tailored to local needs. SAAD covers funding for a range of care options, including day and night care centres, residential care, and home care assistance.

The financing of SAAD comes from a combination of the Central Government, Regional Governments, and user co-payments. In the initial years following the approval of the SAAD, the financial burden largely fell on regional governments. However, in recent years, the Central Government has increased its financial contribution through substantial budget increases, which have helped to partially address the underfunding that plagued the system in its early years.

While the system has made notable strides in expanding services and improving coverage, challenges remain—particularly in terms of ensuring equitable access to services across all regions and maintaining the sustainability of the funding model. Nonetheless, SAAD represents a significant milestone in Spain's social welfare system, aiming to better support the growing number of individuals with dependency needs as the population continues to age (Jiménez-Martín and Viola, 2022). Therefore, the contribution of public funds may now slightly exceed 1% of GDP.

There is no public information on users' contributions to the SAAD, although a recent study estimated the percentage of co-payments for all benefits at 22% (Codorniu, 2024). Recent changes in the government LTC strategies are trying to promote home care for dependent persons and reinforcing home care, telecare and day centres⁶. Likewise, the criteria for quality and minimum professional staffing of the centres and service providers, both public and private, have also been revised and improved⁷. In both plans, most emphasis is being placed in ensuring that people in need of care reside age in place for as long as possible alongside trying to improve the quality of the services provided, whether at home or in nursing homes.

3. Data and Definitions

Sample: Our primary data source is the Survey of Health Aging and Retirement in Europe (SHARE). We use a pool of waves from 2004 to 2017, especially waves 1 (2004/05), 2 (2006/07), 4 (2010/11), 5 (2012/13), 6 (2014/15) and 7 (2016/17), all pre-COVID period. The SHARE sample consists of respondents aged 50 and older, but we focus on the individuals 65 +.

Cognitive Impairment: Based on Donovan et al. (2023)⁸ we created the cognitive impairment indicator, "SHARE-Cog," which is composed of three subtests/domains: 10-word registration, verbal fluency, and 10-word recall. A score of 6 or lower on this indicator is used as a measure of cognitive impairment.

⁶ Ministerio de Derechos Sociales, Consumo y Agenda 2030. Estrategia estatal para un nuevo modelo de cuidados en la comunidad Un proceso de desinstitucionalización (2024-2030). Junio, 2024.

⁷ Ministerio de Derechos Sociales y Agenda 2030. Acuerdo sobre Criterios comunes de acreditación y calidad de los centros y servicios del Sistema para la Autonomía y Atención a la Dependencia (SAAD) (22/06/2022). <https://www.mdsocialesa2030.gob.es/derechos-sociales/servicios-sociales/acuerdos-criterios-comunes-saad.htm>

⁸ Medical tested based on O'Donovan et al. (2023). Available at: https://www.researchgate.net/publication/374409285_Validation_of_a_Harmonised_Three-Item_Cognitive_Screening_Instrument_for_the_Survey_of_Health_Ageing_and_Retirement_in_Europe_SHARE-Cog

1. 10-Word Registration: In this task, the participant was read a list of 10 words aloud and was asked to immediately recall as many as they could. Prior to reading the list, the instructions were given as follows:

“Now, I am going to read a list of words from my computer screen. We have purposely made the list long so it will be difficult for anyone to recall all the words. Most people recall just a few. Please listen carefully, as the set of words cannot be repeated. When I have finished, I will ask you to recall aloud as many of the words as you can, in any order. Is this clear?” Afterward, the participant had one attempt to recall the words. One of the words in the list was randomly chosen by the computer.

2. Verbal Fluency: For this subtest, the participant was asked to name as many animals as they could within one minute. This test was strictly timed, and once the minute elapsed, no additional time was granted, even if the instructions needed to be repeated. If the participant remained silent for 15 seconds, the following reminder was given:

“I want you to tell me all the animals you can think of.” If the participant appeared to stop early, they were encouraged to continue by being prompted to find more words. Any animal, including different breeds, male and female animals, and infants of species, were accepted, as well as mythical animals. Repetitions, redundancies, and proper nouns were not allowed.

3. 10-Word Recall: This task occurred after the verbal fluency test and a serial-7 subtraction task. Participants were then asked to recall as many words as they could from the 10-word list read to them earlier. The question was framed as:

“A little while ago, the computer read you a list of words, and you repeated the ones you could remember. Please tell me any of the words that you can remember now.”

Together, these three subtests—10-word registration, verbal fluency, and 10-word recall—are used to assess cognitive function, with a score of 6 or below indicating cognitive impairment based on the SHARE-Cog indicator.

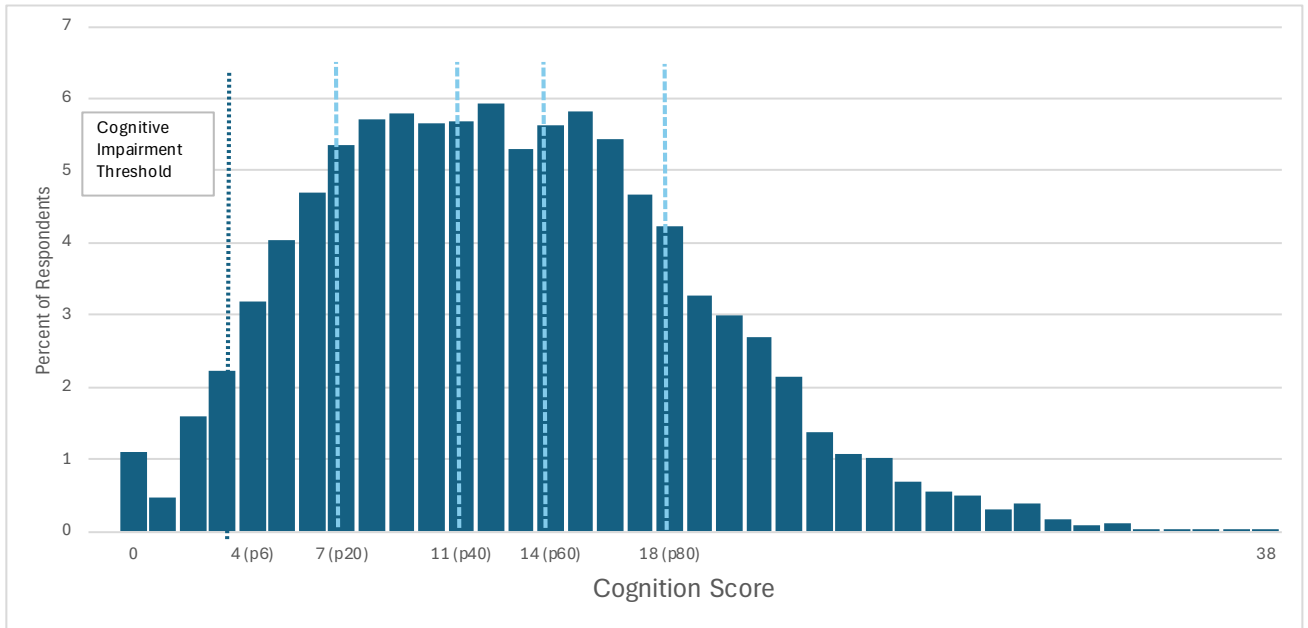
4. Results

4.1 The analysis of Cognitive Score and limitations

Cognitive Scores. The distribution of cognitive scores is shown in **Figure 1a**, where the 6th percentile is used as a threshold for cognitive impairment. For the Spanish population, the 6th percentile corresponds to a score of 4. The dashed lines in the figure represent the quintiles of the distribution. As illustrated, a small percentage of respondents fall into the highest quintiles of the distribution. Furthermore, the second quintile starts at scores ranging from 7 to 10, representing 22.5% of the population aged 65 and over.

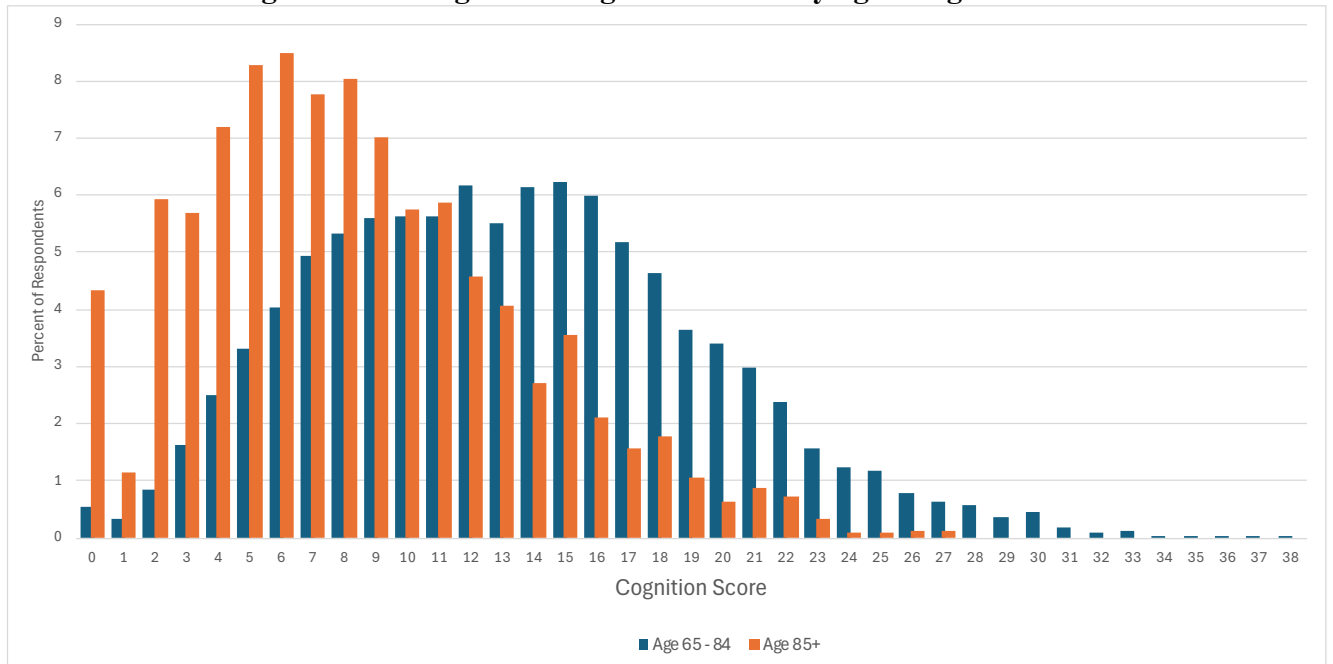
Figure 1b displays the distribution of cognitive scores for two age groups: those aged 65-84 and those 85 years old or older. A clear trend emerges, showing that older age is associated with lower cognitive scores. For the group aged 85 and older, 80% have a cognitive score of 12 or less, while for those aged 65-84, 52% of respondents achieve a score of 12 or less. This suggests a significant decline in cognitive performance as age increases, with the older group (85+) exhibiting notably lower scores on average.

Figure 1a. Histogram of cognition scores (including proxies).



Source: SHARE (waves 1, 2, 4, 5, 6 y 7).

Figure 1b. Histogram of cognition scores by age categories

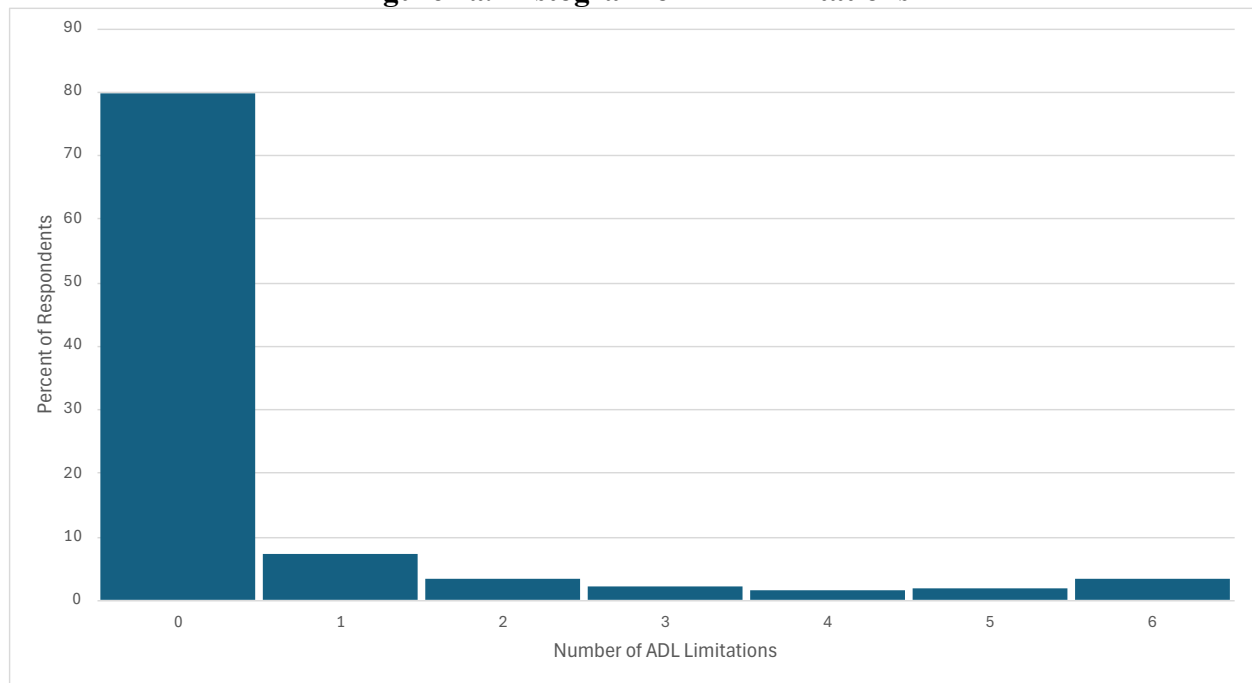


Source: SHARE (waves 1, 2, 4, 5, 6 y 7).

Physical Limitations: The measure of physical limitations in our study is based on difficulties with activities of daily living (ADLs), which include tasks such as dressing, bathing, walking across the room, getting in and out of bed, and toileting. A physical limitation is defined as difficulty in performing two or more ADLs.

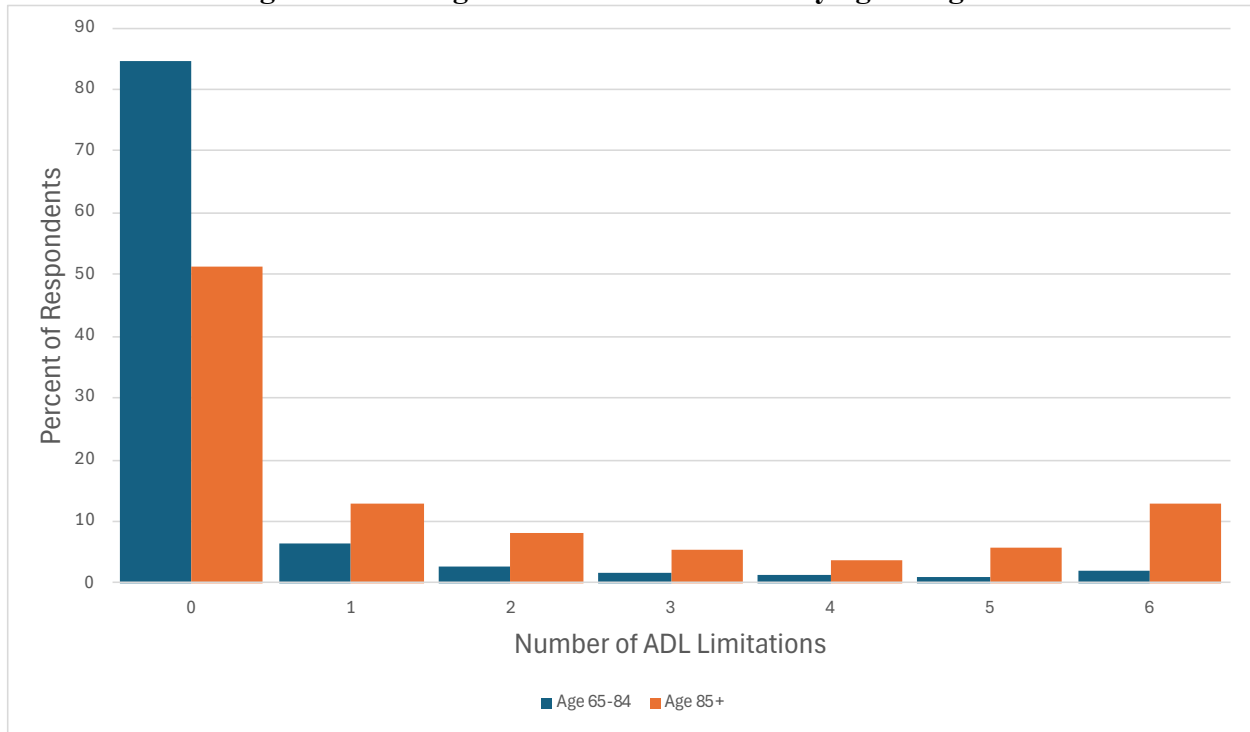
In **Figure 2a**, we present the distribution of ADL limitations in our SHARE sample. **Figure 2b** further breaks down ADL limitations for two distinct age groups: 65-84 and 85+. As shown, the majority of individuals report no physical limitations. However, this proportion decreases with age. For the younger group (65-84), approximately 85% have no physical limitations, while in the older group (85+), only 51% report no limitations.

Figure 2a. Histogram of ADL limitations



Source: SHARE (waves 1, 2, 4, 5, 6 y 7).

Figure 2b. Histogram of ADL limitations by age categories

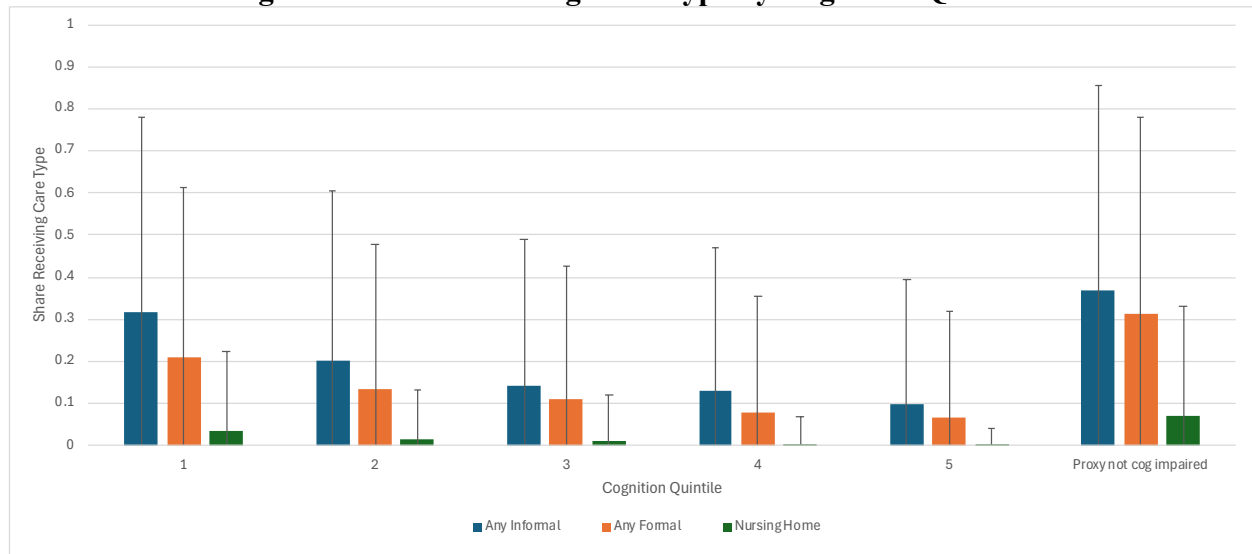


Source: SHARE (waves 1, 2, 4, 5, 6 y 7).

For the 65-84 age group, around 9% of respondents experience physical limitations, defined as difficulty in two or more ADLs. This proportion rises dramatically in the 85+ age group, where nearly 36% of respondents report difficulties with two or more ADLs. This indicates a substantial increase in the prevalence of physical limitations as individuals age, highlighting the increased challenges faced by the older population in performing essential daily tasks.

Care Utilization and Outcomes: In **Figure 3**, we display the percentage of the 65+ population using any type of long-term care, broken down by cognition quintile. We define three categories of care: any informal care at home, any formal care at home, and being in a nursing home. On average, 21% of the sample utilizes informal care at home, 15.3% use formal care at home, and a smaller fraction, 2.3%, reside in a nursing home.

Figure 3. Share Receiving Care Type by Cognition Quintile



Source: SHARE (waves 1, 2, 4, 5, 6 y 7).

These figures provide insight into the distribution of long-term care usage across different levels of cognitive function. The data suggests that individuals with lower cognitive scores are more likely to use both informal and formal care, with those in the highest cognitive quintiles using these services less frequently.

4.2 The interaction between cognitive score and limitations

Table 1 illustrates the interaction between physical limitations and cognitive impairment. Around 79% of the sample reports no physical limitations, and 62.4% have neither cognitive nor physical impairments. However, nearly 14% of respondents have physical limitations (defined as difficulty with 2 or more ADLs), while only 1.7% experience both cognitive and physical impairments.

Table 1: Joint distribution cognition score and ADL limitations

| Weighted percent | Cognition score 0 - 4 | Cognition Score 5 - 17 | Cognition Score 8+ | Proxy cognitively impaired | Proxy not cognitively impaired | Total |
|------------------|-----------------------|------------------------|--------------------|----------------------------|--------------------------------|---------|
| 0 ADLs | 3.57% | 9.29% | 62.37% | 1.09% | 2.63% | 78.95% |
| 1 ADL | 0.96% | 1.04% | 4.26% | 0.50% | 0.72% | 7.46% |
| 2+ ADL | 1.72% | 1.42% | 3.92% | 3.78% | 2.75% | 13.59% |
| Total | 6.25% | 11.74% | 70.55% | 5.36% | 6.10% | 100.00% |

Source: SHARE (waves 1, 2, 4, 5, 6 y 7).

Table 2a compares these three groups based on sociodemographic characteristics. We distinguish between the no impairment group (0-1 ADLs and cognitive score of 7 or above); physical impairment only group (more than 2 ADLs and cognitive score of 7 or above); and, cognitive impairment group (cognitive score below 6). Key findings include:

- *Age differences:* The non-impaired group is, on average, 7 years younger (74 years old) than the physically impaired group (81 years old) and 9 years younger than the cognitively impaired group (83 years old).
- *Marital status and education:* The non-impaired group is more likely to be married and has significantly higher education levels. For example, they are 7% more likely to have attended college than the physical impairment group and 16% more likely than the cognitive impairment group.
- *Income and wealth:* There are notable differences in income and wealth per capita across the groups. The average income per capita for the non-impaired group is €13,154, compared to €10,282 for the cognitively impaired group. The gap in wealth per capita is even larger. The cognitive impairment group has an average wealth per capita of €113,351, which is €77,657 less than the non-cognitively impaired group.

Table 2a: Joint distribution cognition score and ADL limitations by sociodemographic characteristics

| Means | 0 - 1 ADLs & Score 7+ | 2+ ADLs & Score 7+ | Score 0 - 6 (All ADLs) | Total |
|----------------------------|---------------------------------|----------------------------------|-----------------------------------|---------------------------------|
| Age | 74.394 <i>6.848</i> | 80.938 ** <i>8.045</i> | 82.596 <i>6.940</i> | 75.715 <i>7.535</i> |
| Female (0 or 1) | 0.544 <i>0.498</i> | 0.681 ** <i>0.466</i> | 0.694 ** <i>0.462</i> | 0.570 <i>0.495</i> |
| Married (0 or 1) | 0.650 <i>0.477</i> | 0.463 ** <i>0.499</i> | 0.462 ** <i>0.488</i> | 0.609 <i>0.488</i> |
| Any children (0 or 1) | 0.665 <i>0.472</i> | 0.693 ** <i>0.462</i> | 0.488 ** <i>0.448</i> | 0.670 <i>0.470</i> |
| Number of children | 2.831 <i>1.507</i> | 3.126 ** <i>1.820</i> | 0.448 ** <i>1.670</i> | 2.877 ** <i>1.558</i> |
| < High school (0 or 1) | 0.207 <i>0.405</i> | 0.350 ** <i>0.477</i> | 0.393 ** <i>0.496</i> | 0.240 ** <i>0.427</i> |
| High school (0 or 1) | 0.673 <i>0.469</i> | 0.602 ** <i>0.490</i> | 0.496 ** <i>0.499</i> | 0.654 ** <i>0.476</i> |
| Some college (0 or 1) | 0.051 <i>0.221</i> | 0.019 ** <i>0.138</i> | 0.099 ** <i>0.109</i> | 0.045 <i>0.208</i> |
| College+ (0 or 1) | 0.069 <i>0.253</i> | 0.028 ** <i>0.164</i> | 0.011 ** <i>0.141</i> | 0.061 <i>0.239</i> |
| Work for pay (0 or 1) | 0.019 <i>0.137</i> | 0.000 ** <i>0.000</i> | 0.141 ** <i>0.038</i> | 0.016 <i>0.124</i> |
| Income per capita (mean) | 13,154.55 <i>24,590.47</i> | 11350.27 ** <i>10,080.67</i> | 10282.25 ** <i>13,351.45</i> | 12,813.75 <i>23,569.68</i> |
| Income per capita (median) | 10,538.00 | 9,240.13 | 8,508.56 | 10,227.20 |
| Wealth per capita (mean) | 191,008.60 <i>129,700.70</i> | 160311.1 ** <i>150,993.00</i> | 113351.45 ** <i>165,413.90</i> | 173,561.80 <i>133,053.30</i> |
| Wealth per capita (median) | 141,189.10 | 127,732.23 | 96,120.21 | 116,322.00 |
| N | 12,746 | 1,568 | 1,309 | 15,623 |

Source: SHARE (waves 1, 2, 4, 5, 6 y 7). Notes: Standard errors are in parentheses. Standard errors are clustered at the respondent level. Stars correspond to the null hypothesis that the mean is different from the mean of 0 - 1 ADLs & Score 7+. *: Significant at the 95% confidence level **: Significant at the 99% confidence level

Table 2b examines care needs and care usage across these three groups, with score 4 being the threshold for cognitive impairment in Spain. We categorize the groups as no impairment (0-1 ADLs, score 5 or above); physical impairment only (more than 2 ADLs, score 5 or above); cognitive impairment (score below 5). The key findings include:

- Cognition scores: The average cognition score is significantly lower for the cognitively impaired group (2.69) compared to the physically impaired group (10.69) and the non-impaired group (13.95).
- ADL and IADL limitations: The physically impaired group has a higher number of limitations in both ADLs and IADLs than the cognitively impaired group, with the gap being particularly wide in ADL limitations.
- Care usage: Care usage increases with the level of impairment. 20% of the non-impaired group receives any form of care, 55% of the cognitively impaired group use care, and 73% of the physically impaired group receive some form of care.
- Nursing home use: Use of nursing homes is relatively low across all groups, with 6% of the physically impaired group and 4% of the cognitively impaired group residing in nursing homes. As expected, the group with no impairments has the lowest usage of nursing homes.
- Care hours: The physically impaired group uses more informal care hours (88 hours) compared to the cognitively impaired group (69 hours). Similarly, the physically impaired group also uses more formal home care hours (34 hours) than the cognitively impaired group (29 hours).

These findings suggest that while cognitive and physical impairments both lead to increased care needs, physical impairments are associated with higher levels of care usage, especially in terms of informal care and formal home care. The cognitively impaired group, while also in need of care, shows a lower level of formal care use and nursing home residency, possibly reflecting differences in the type of care required for cognitive versus physical limitations.

Table 2b: Care needs and care usage across cognition score and ADL limitations

| Means | 0 - 1 ADLs & Score 5+ | 2+ ADLs & Score 5+ | Score 0 - 4 (All ADLs) | Total |
|--|---------------------------|------------------------------|------------------------------|------------------------------|
| Limited score (out of 29) | 13.945 <i>5.743</i> | 10.698 ** <i>4.449</i> | 2.695 ** <i>1.354</i> | 12.671 ** <i>6.262</i> |
| Number of ADLs | 0.076 <i>0.266</i> | 3.864 ** <i>1.575</i> | 1.735 ** <i>2.211</i> | 0.578 ** <i>1.435</i> |
| Number of IADLs | 0.399 <i>1.036</i> | 4.744 ** <i>2.768</i> | 3.190 ** <i>3.020</i> | 1.051 ** <i>2.104</i> |
| Any care (0 or 1) | 0.188 <i>0.391</i> | 0.731 ** <i>0.443</i> | 0.557 ** <i>0.497</i> | 0.271 ** <i>0.444</i> |
| Any Unpaid care (0 or 1) | 0.125 <i>0.330</i> | 0.527 ** <i>0.499</i> | 0.395 ** <i>0.489</i> | 0.185 ** <i>0.389</i> |
| Any Paid care (0 or 1) | 0.082 <i>0.274</i> | 0.359 ** <i>0.480</i> | 0.281 ** <i>0.450</i> | 0.125 ** <i>0.331</i> |
| Any Nursing home (0 or 1) | 0.006 <i>0.077</i> | 0.060 <i>0.238</i> | 0.045 ** <i>0.207</i> | 0.014 ** <i>0.120</i> |
| Unpaid care hours per month (conditional on unpaid care) | 43.138 <i>5.883</i> | 88.301 ** <i>18.746</i> | 69.103 ** <i>25.573</i> | 60.023 ** <i>24.884</i> |
| Paid care hours per month (conditional on paid care) | 17.796 <i>3.555</i> | 34.660 ** <i>7.296</i> | 29.884 ** <i>9.944</i> | 24.711 ** <i>9.896</i> |
| NH LOS days per year (conditional on nursing home stay) | 157.013 <i>142.062</i> | 265.743 ** <i>141.077</i> | 199.572 ** <i>159.178</i> | 224.904 ** <i>150.801</i> |
| N | 12,746 | 1,568 | 1,309 | 15,623 |

Source: SHARE (waves 1, 2, 4, 5, 6 y 7). Notes: Standard errors are in parentheses. Standard errors are clustered at the respondent level. Stars correspond to the null hypothesis that the mean is different from the mean of 0 - 1 ADLs & Score 7+. *: Significant at the 95% confidence level **: Significant at the 99% confidence level.

4.3 Examining Long-Term Care Use and Determinants

We begin by exploring the use of any care, followed by more specific types of care: formal home care, informal home care, and residence in a nursing home. To assess the factors associated with more intensive care, we also examine the number of hours of formal care received in the past month (conditional on receiving any formal care) and the number of hours of informal care received in the past month (conditional on receiving any informal care).

The regressions control for several variables, including whether the respondent has physical or cognitive impairment, age and age squared, marital status, gender, the interaction between marital status and gender, whether the respondent has children and the number of children, schooling level, and income and wealth.

Table 3 examines the probability of receiving any care using a linear probability model. Column 1 (no controls) shows that the likelihood of receiving care is higher among those with physical impairments. However, after controlling for age and age squared in Column 2, the probability of receiving care decreases for both groups, but the relative difference between those with physical impairments and those without remains unchanged. In Column 3, after adding additional covariates, the results show that being married decreases the probability of receiving care by 10%, while married women are significantly more likely to receive care, with a 7% higher probability compared to their male counterparts. The level of schooling also plays a significant role in care use. Individuals with less than high school education are 4.3% less likely to receive care, while those with some college are 3.2% less likely compared to those with higher education. We now examine in more detail the use of formal home care, informal home care, and nursing home care, analyzing both the extensive margin (probability of using care) and intensive margin (number of hours of care received).

In **Tables 4a and 4b**, we focus on the use of formal home care. The probability of receiving formal care increases with both physical and cognitive impairments across all specifications. However, the probability decreases in absolute values as more covariates are added to the regression model. Married women are more likely to receive formal care, highlighting the importance of gender and marital status in care receipt. The level of schooling negatively affects the likelihood of receiving formal care. Lower education levels (e.g., less than high school) are associated with a higher probability of receiving formal care, which may reflect less availability of informal care or greater dependence. Conditional on receiving formal care, both cognitive impairment and physical impairment are strongly associated with receiving more care, with the effect being particularly strong for those with physical impairments. Finally, age shows a u-shaped pattern.

Table 3: Probability of receiving any care

| | (1) | (2) | (6) |
|----------------------------------|-----------------------|-----------------------|------------------------|
| | Any personal care | Any personal care | Any personal care |
| | R1 | R2 | R3 |
| | b/se | b/se | b/se |
| 2+ ADLs and Score 7+ | 0.552*** █ (0.011) | 0.461*** █ (0.012) | 0.454*** █ (0.012) |
| Score 0 - 6 | 0.346*** █ (0.013) | 0.244*** █ (0.013) | 0.212*** █ (0.013) |
| Age - 65 | | -0.016* █ (0.008) | -0.015* █ (0.009) |
| (Age - 65) Squared | | 0.000*** █ (0.000) | 0.000*** █ (0.000) |
| Female | | | -0.014 █ (0.015) |
| Married | | | -0.104*** █ (0.014) |
| Female * Married | | | 0.070*** █ (0.017) |
| Number of children | | | 0.003 █ (0.003) |
| Any children | | | 0.015 █ (0.011) |
| Income (Inverse Hyperbolic Sine) | | | -0.000 █ (0.000) |
| Wealth (Inverse Hyperbolic Sine) | | | -0.000 █ (0.000) |
| Less than high school | | | -0.043*** █ (0.008) |
| Some college | | | -0.028 █ (0.017) |
| College or more | | | -0.032** █ (0.016) |
| Constant | 0.176*** █ (0.004) | 0.325 █ (0.316) | 0.429 █ (0.330) |
| N | 13,396,000 | 13,396,000 | 12,311,000 |
| F | 1,428,401 | 925,859 | 253,296 |
| p | 0.000 | 0.000 | 0.000 |
| r2 | 0.176 | 0.217 | 0.224 |

Source: SHARE (waves 1, 2, 4, 5, 6 y 7). Notes: Standard errors in parentheses. Standard errors are clustered at the respondent level="* p<0.05, ** p<0.01, *** p<0.001". Proxies who are identified as cognitively impaired are placed into groups "Score 0 - 6 Only" and "2+ ADLs and Score 0 - 6", depending on the number of ADL limitations.

Table 4a and 4b: Use of formal care on the extensive and intensive margin

| | Extensive Margin: <i>Paid care only</i> | | | Intensive Margin: <i>Hours paid care conditional on receiving any paid care</i> | | |
|----------------------------------|---|------------------------|------------------------|---|----------------------|----------------------|
| | (1) | (2) | (6) | (1) | (2) | (6) |
| | Paid In-Home Care ONLY | Paid In-Home Care ONLY | Paid In-Home Care ONLY | Formal Care Hours | Formal Care Hours | Formal Care Hours |
| | R1 | R2 | R3 | R4 | R5 | R6 |
| | b/se | b/se | b/se | b/se | b/se | b/se |
| 2+ ADLs and Score 7+ | 0.292*** (0.009) | 0.221*** (0.009) | 0.222*** (0.010) | 17.250*** (0.355) | 15.646*** (0.307) | 15.675*** (0.323) |
| Score 0 - 6 | 0.189*** (0.010) | 0.109*** (0.010) | 0.101*** (0.011) | 11.377*** (0.426) | 9.172*** (0.372) | 9.378*** (0.398) |
| Age - 65 | | -0.030*** (0.007) | -0.025*** (0.007) | | -0.489 (0.306) | -0.465 (0.321) |
| (Age - 65) Squared | | 0.000*** (0.000) | 0.000*** (0.000) | | 0.006*** (0.002) | 0.006*** (0.002) |
| Female | | | 0.031** (0.012) | | | 0.310 (0.548) |
| Married | | | -0.032*** (0.012) | | | 0.636 (0.571) |
| Female * Married | | | 0.020 (0.014) | | | -0.353 (0.664) |
| Number of children | | | -0.004* (0.002) | | | 0.155 (0.101) |
| Any children | | | 0.006 (0.009) | | | -0.227 (0.412) |
| Income (Inverse Hyperbolic Sine) | | | -0.000 (0.000) | | | -0.000 (0.000) |
| Wealth (Inverse Hyperbolic Sine) | | | 0.000** (0.000) | | | -0.000 (0.000) |
| Less than high school | | | -0.004 (0.006) | | | 0.120 (0.298) |
| Some college | | | 0.037*** (0.014) | | | -0.606 (0.737) |
| College or more | | | 0.049*** (0.013) | | | 0.594 (0.617) |
| Constant | 0.082*** (0.003) | 0.882*** (0.253) | 0.705*** (0.264) | 17.957*** (0.215) | 19109*** (0.279) | 17560*** (0.320) |
| N | 15,623 | 15,623 | 15,623 | 1,921 | 1,921 | 1,921 |
| F | 637,240 | 499,336 | 140,831 | 1,258,981 | 1,042,629 | 276,529 |
| p | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| r2 | 0.087 | 0.130 | 0.138 | 0.596 | 0.710 | 0.715 |

Source: SHARE (waves 1, 2, 4, 5, 6 y 7) and EDAD (2020). Notes: Standard errors in parentheses. Standard errors are clustered at the respondent level="* p<0.05, ** p<0.01, *** p<0.001". Proxies who are identified as cognitively impaired are placed into groups "Score 0 - 6 Only" and "2+ ADLs and Score 0 - 6", depending on the number of ADL limitations.

Table 5 examines the use of informal home care. We find that the probability of receiving informal care is similarly higher for those with physical or cognitive impairments, but once again, the probability decreases as more covariates are added. The intensity of informal care (measured in hours) is also significantly higher for both physically impaired and cognitively impaired individuals compared to those with no impairments. The intensity of care is particularly high for individuals with physical impairments, reinforcing the importance of informal care for this group. Married women also show a higher probability of receiving informal care, and the level of schooling again negatively affects care receipt, suggesting that individuals with lower educational attainment are more reliant on informal care.

Finally, **Table 6** examines the probability of **nursing home use**. This analysis uses a smaller sample of **SHARE data**, so caution is needed when interpreting the results. Those with physical limitations are about 2% more likely to use nursing home care compared to those with cognitive impairment, who have a probability of 0.9%. This suggests that physical limitations might be a stronger determinant of nursing home use, although the relatively low probabilities for both groups indicate that nursing home care is not common in this sample.

Table 5a and 5b: Use of informal care on the extensive and intensive margin

| | Extensive Margin: <i>Paid care only</i> | | | Intensive Margin: <i>Hours paid care conditional on receiving any paid care</i> | | |
|----------------------------------|---|--------------------------|--------------------------|---|------------------------|------------------------|
| | (1) | (2) | (6) | (1) | (2) | (6) |
| | Unpaid In-Home Care ONLY | Unpaid In-Home Care ONLY | Unpaid In-Home Care ONLY | Unpaid Care Hours | Unpaid Care Hours | Unpaid Care Hours |
| | R1 | R2 | R3 | R4 | R5 | R6 |
| | b/se | b/se | b/se | b/se | b/se | b/se |
| 2+ ADLs and Score 7+ | 0.414*** █ (0.0103) | 0.371*** █ (0.0107) | 0.364*** █ (0.0112) | 45.289*** █ (1.44) | 44.483*** █ (1.45) | 44.186*** █ (1.56) |
| Score 0 - 6 | 0.255*** █ (0.0113) | 0.206*** █ (0.0118) | 0.178*** █ (0.0123) | 30.037*** █ (1.74) | 29.135*** █ (1.77) | 29.255*** █ (1.91) |
| Age - 65 | | 0.004 █ (0.0075) | -0.002 █ (0.0078) | | -2.816* █ (1.54) | -2.718* █ (1.63) |
| (Age - 65) Squared | | 0.000 █ (0.0000) | 0.000 █ (0.0001) | | 0.019** █ (0.01) | 0.019* █ (0.01) |
| Female | | | -0.021 █ (0.0141) | | | 1,880 █ (2.93) |
| Married | | | -0.055*** █ (0.0132) | | | 3,911 █ (3.06) |
| Female * Married | | | 0.046*** █ (0.0160) | | | -0.837 █ (3.44) |
| Number of children | | | 0.007*** █ (0.0025) | | | 0.626 █ (0.46) |
| Any children | | | 0.015 █ (0.0098) | | | -3,239 █ (1.99) |
| Income (Inverse Hyperbolic Sine) | | | -0.000 █ (0.0000) | | | -0.000 █ (0.00) |
| Wealth (Inverse Hyperbolic Sine) | | | -0.000*** █ (0.0000) | | | -0.000 █ (0.00) |
| Less than high school | | | -0.047*** █ (0.0073) | | | 1,456 █ (1.43) |
| Some college | | | -0.056*** █ (0.0159) | | | 1,237 █ (3.92) |
| College or more | | | -0.076*** █ (0.0147) | | | 0.613 █ (3.37) |
| Constant | 0.118*** █ (0.0035) | -0.265 █ (0.2905) | 0.081 █ (0.3024) | 45.376*** █ (1.02) | 147.723** █ (62.28) | 139.062** █ (66.21) |
| N | 15,623 | 15,623 | 15,623 | 2,436 | 2,436 | 2,436 |
| F | 977,602 | 544,163 | 152,475 | 503,248 | 259,026 | 69,396 |
| p | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| r2 | 0.127 | 0.140 | 0.148 | 0.584 | 0.591 | 0.604 |

Source: SHARE (waves 1, 2, 4, 5, 6 y 7) and EDAD (2020). Notes: Standard errors in parentheses. Standard errors are clustered at the respondent level="* p<0.05, ** p<0.01, *** p<0.001". Proxies who are identified as cognitively impaired are placed into groups "Score 0 - 6 Only" and "2+ ADLs and Score 0 - 6", depending on the number of ADL limitations.

Table 6: Use of nursing home on the extensive margin

| | (1) | (2) | (6) |
|----------------------------------|------------------------------------|------------------------------------|------------------------------------|
| | Reside in Nursing Home >= 100 days | Reside in Nursing Home >= 100 days | Reside in Nursing Home >= 100 days |
| | R1 | R2 | R3 |
| | b/se | b/se | b/se |
| 2+ ADLs and Score 7+ | 0.025*** █ (0.002) | 0.021*** █ (0.002) | 0.018*** █ (0.002) |
| Score 0 - 6 | 0.013*** █ (0.002) | 0.009*** █ (0.002) | 0.009*** █ (0.003) |
| Age - 65 | | -0.003 █ (0.002) | -0.003 █ (0.002) |
| (Age - 65) Squared | | 0.000** █ (0.000) | 0.000* █ (0.000) |
| Female | | | 0.007** █ (0.003) |
| Married | | | 0.002 █ (0.003) |
| Female * Married | | | -0.007** █ (0.003) |
| Number of children | | | 0.001* █ (0.001) |
| Any children | | | -0.004** █ (0.002) |
| Income (Inverse Hyperbolic Sine) | | | 0.000 █ (0.000) |
| Wealth (Inverse Hyperbolic Sine) | | | 0.000 █ (0.000) |
| Less than high school | | | -0.000 █ (0.002) |
| Some college | | | -0.002 █ (0.003) |
| College or more | | | -0.001 █ (0.003) |
| Constant | 0.002*** █ (0.001) | 0.080 █ (0.060) | 0.086 █ (0.064) |
| N | 15,623 | 15,623 | 15,623 |
| F | 79,295 | 49,002 | 13,176 |
| p | 0.000 | 0.000 | 0.000 |
| r2 | 0.212 | 0.214 | 0.215 |

Source: SHARE (waves 1, 2, 4, 5, 6 y 7). Notes: Standard errors in parentheses. Standard errors are clustered at the respondent level="* p<0.05, ** p<0.01, *** p<0.001". Proxies who are identified as cognitively impaired are placed into groups "Score 0 - 6 Only" and "2+ ADLs and Score 0 - 6", depending on the number of ADL limitations.

4.4 Costs Estimation

In **Table 7**, we analyze the cost of care on both individual and aggregate level. The way to proceed for calculating is the same as in Costa-Font et al (2023). Focusing first on the total costs, we estimate a total cost of long-term care of 21,204 million euros or 65,208 euros per elderly person. If we see the different categories of impairment, the total cost for the physically impaired group (7,863 million euros) is much bigger than for the cognitively impaired group (3,704 million euros). On a per capita basis there is a huge difference in the cost of care for both groups, 95,087 euros for the physically impaired and 35,193 euros for those with cognitive impairments. Moreover, if we look at type of care, the major cost is for informal care representing 11,643 million euros and then the nursing home with a total cost of 7,321 million euros.

Table 7: Total cost of long-term care by cognitive score and ADL limitations

| | | 0 - 1 ADLs & Score 5+ | 2+ ADLs & Score 5+ | Score 0 - 4 (All ADLs) | Total |
|---------------|-----------------------------|--------------------------|--------------------|------------------------|------------------|
| | N | 869 | 114 | 101 | 1084 |
| | Population (millions) | 2.84 | 0.36 | 0.13 | 3.33 |
| Formal Care | National total (Million €)) | 1,199.41 | 609.59 | 431.00 | 2,240.00 |
| | Per capita (€) | 13,656 | 6,866 | 2,348 | 6,219 |
| Informal Care | National total (Million €)) | 6,388.85 | 3,134.17 | 2,119.98 | 11,643.00 |
| | Per capita (€) | 5,591 | 2,811 | 3,639 | 4,099 |
| Nursing Home | National total (Million €)) | 2,047.94 | 4,119.82 | 1,153.24 | 7,321.00 |
| | Per capita (€) | 44,858 | 85,409 | 29,206 | 54,890 |
| Total Cost | National total (Million €)) | 9,636.19 | 7,863.59 | 3,704.22 | 21,204.00 |
| | Per capita (E) | 64,104 | 95,087 | 35,193 | 65,208 |

Source: SHARE wave 7. Notes: in euros 2019. See Costa-Font et al. (2023) for clarifications of the calculations.

5. Conclusions

Spain is one of the countries with the highest life expectancy in the world, particularly for women, ranking in the top five globally. The proportion of the elderly population is large and steadily increasing. In fact, the percentage of Spaniards over the age of 65 is expected to rise from 19.9% today to 23.8% by 2030 and 30.3% by 2060. Notably, by 2060, over 27% of the population aged 65 and above is projected to be 85 years or older, an increase of 10 percentage points from 2021.

Since 2007, Spain has implemented a formal, universal, tax-funded Long-Term Care (LTC) system, regulated regionally within a framework law known as the Ley de Dependencia (Dependency Act, Act 39/2006, December 14, 2006). According to data from the European Observatory on Health Systems and Policies (EOHSP), approximately 12% of the population aged 65 and older currently receives LTC services. Among those receiving care, 17.8% have some form of mental health issues. However, specialized services for mental health conditions, especially neurodegenerative diseases, remain insufficient.

The prevalence of cognitive impairment in Spain for individuals aged 65 and older stands at 18.5% (with a 95% confidence interval of 17.3% to 19.7%). Women present significantly higher adjusted rates of cognitive impairment compared to men. The prevalence increases substantially in older age groups, with 45.3% of individuals aged 85 and above affected by cognitive impairment.

Several factors contribute to the risk of cognitive impairment, including level of education and type of cohabitation. Educational attainment is particularly significant, with lower levels of

education linked to higher rates of cognitive decline. Similarly, living arrangements, such as living alone versus living with family, can influence the onset and progression of cognitive impairment. As the population ages, the prevalence of dementia is also expected to rise dramatically. It is estimated that the global number of people living with dementia will nearly triple by 2050, with Spain seeing an 83% increase, resulting in over 1.5 million cases of dementia by mid-century.

Despite the growing prevalence of dementia and cognitive impairment, Spain currently lacks a comprehensive European plan to tackle these diseases. The Spanish Strategy on Neurodegenerative Diseases, which was established in 2016, remains the key national initiative. Additionally, there was a Comprehensive Plan for Alzheimer's and Other Dementias projected for the period 2019-2023, although this plan's long-term effectiveness is yet to be fully assessed.

Several studies conducted in recent years have examined the economic impact of Alzheimer's disease. The findings consistently highlight the high economic burden of the disease, with a significant portion of the costs arising from informal care provided by family members or other unpaid caregivers. These informal care costs often exceed the expenses associated with formal medical and care services, underlining the critical role that caregivers play in managing the disease. Given the rising prevalence of dementia and the increasing economic burden, there is a growing need for a more specialized, comprehensive approach to addressing neurodegenerative diseases in Spain, particularly to support the informal caregivers who shoulder much of the care responsibility.

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