Cognitive versus Physical Impairment and the Use and Cost of Long-Term Care in Japan*

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Abstract

Japan has the world's oldest population and a universal Long-Term Care Insurance (LTCI) system, yet how care use and costs differ between cognitive and physical impairment remains underexamined. Using the nationally representative Comprehensive Survey of Living Conditions (2016 and 2019 waves; 324,466 adults aged 65 and older), we compare the utilization, intensity, and cost of long-term care across three groups: those with a dementia diagnosis (defined as regularly receiving medical treatment for dementia), those with physical (ADL) limitations but no dementia, and those with neither. A dementia diagnosis is associated with dramatically higher care use—75.3% receive some care, versus 5.3% of the unimpaired reference group. In models adjusting for demographic and socioeconomic characteristics, dementia raises the probability of receiving formal care by 55 percentage points and informal care by 52 percentage points—roughly double the effects of ADL limitations—and, conditional on use, is associated with about 113 additional hours of formal care per month (some 60% more than physical limitations alone). We estimate formal-care costs at 1.07–4.03% of GDP (depending on the valuation method) and co-residing informal-care costs at 0.79% of GDP. Per-capita formal-care costs are substantially higher for those with dementia (about 3.5 versus 2.0 million JPY annually under the self-reported approach), whereas informal-care costs are nearly uniform across impairment types—underscoring the intensive, and largely invisible, contribution of family caregivers. With the dementia and mild-cognitive-impairment population projected to reach roughly 12 million by 2040, these findings point to mounting fiscal and family-care pressures from cognitive impairment in Japan.

Keywords: long-term care; dementia; cognitive impairment; activities of daily living (ADL); care utilization; informal care; Long-Term Care Insurance; population aging; Japan

JEL classification: I11, I18, J14, H51

Introduction

Long-term care for the elderly, particularly those with cognitive impairments, represents one of Japan's most profound social challenges. Families struggle to provide constant supervision, institutional care remains costly, the population requiring care continues to grow rapidly, and care workers are in short supply. As one of the world's most rapidly aging societies, with 29.3% of its population aged 65 and older as of 2024—the highest proportion among 200 countries with populations over 100,000 people (Statistics Bureau of Japan, 2024a)—Japan stands at the forefront of a global demographic transformation. Many countries and regions, including South Korea, Hong Kong, and European nations, are following similar aging trajectories and are projected to reach comparable levels of population aging by 2050 (World Economic Forum, 2023). Understanding Japan's experience in navigating these demographic challenges offers crucial insights for policymakers worldwide.

Scale and economic burden of long-term care: The scale of Japan's long-term care challenge is significant. Among Japan's 36.23 million elderly population aged 65 and above (65+) in 2023, approximately 6.63 million people (18.3%) receive formal long-term care services, substantially exceeding the OECD average of 11.5% (Ministry of Health, Labor and Welfare (MHLW), 2024; Statistics Bureau of Japan, 2024b; OECD, 2023). This high utilization rate reflects Japan's comprehensive Long-Term Care Insurance (LTCI) system introduced in 2000, which provides universal coverage with generous benefits regardless of income level. The system was designed to enable older adults to live in their familiar communities with dignity while alleviating the burden on family caregivers, particularly to address Japan's cultural expectations of filial responsibility, where family members, especially daughters and daughters-in-law, have traditionally provided informal care (Muramatsu & Akiyama, 2011). Since the introduction of LTCI, utilization rates have continued to rise, placing growing pressure on the formal care system.

The economic implications are equally substantial. Formal long-term care expenditure reached 9.6 trillion JPY (88.3 billion USD) in fiscal year 2016 (approximately 1.8% of Japan's GDP), marking a 2.1% increase from the previous year (National Institute of Population and Social Security Research Project, 2018). However, these figures represent only part of the total economic burden. Research by Fu et al. (2023) estimates the value of informal caregiving between 2.9 and 6.6 trillion

JPY (26.6 and 60.6 billion USD) annually in 2016, suggesting that informal care accounts for 23-41% of total long-term care expenditures when combined with formal care costs.[1] The substantial scale of informal care costs, despite the availability of formal services, underscores the continuing importance of family caregiving within Japan's care system and the significant economic burden it places on households.

Special challenges of cognitive impairment care: The economic burden described above is not uniformly distributed across all care needs. Care for those with cognitive impairment presents particularly distinct challenges that exceed those of physical impairment alone, driving much of the higher utilization rates and costs within Japan's long-term care system. Cognitive impairment has emerged as the leading cause of long-term care requirements, accounting for 23.6% of all persons requiring care, surpassing cerebrovascular diseases at 19.0% and fracture/fall at 13.0% (MHLW, 2023a). The specialized needs of individuals with cognitive impairment necessitate distinct care approaches that go beyond traditional physical care services. These individuals often require constant supervision, assistance with communication, and safeguards against wandering behavior. Additionally, they need carefully structured environments with consistent routines, specialized cognitive stimulation programs, and support for maintaining basic daily activities that they might gradually lose the ability to perform independently.

To address these unique needs, Japan has developed dementia-specialized care services. Specialized day care services for dementia (*ninchisho-taiogata-tsusho-kaigo*) maintain smaller group sizes with a maximum of 12 people per day, compared to standard day care services (*tsusho-kaigo*) which typically serve a maximum 18 people per day for small-scale services or a maximum of 26 people per day for large-scale services (MHLW, 2017). These specialized services employ staff with advanced training in dementia care and operate on a community-based model to reduce environmental stress and anxiety (Toguchi, 2024). The services include not only basic physical care but also targeted cognitive support, carefully structured social interactions, and specialized rehabilitation activities designed to maintain cognitive function and promote independence. Staff members receive mandatory specialized training in dementia care management, enabling them to provide appropriate cognitive support and handle dementia-specific challenges effectively

[1] These informal care estimates already incorporate the opportunity cost of caregivers' time, including foregone wages and reduced work hours.

(Toguchi, 2024). Such specialized services are particularly important given that a large portion of elderly individuals with cognitive impairment currently live at home[2], with 63.5% of their primary caregivers being 60 years or older themselves (MHLW, 2023a).

However, these specialized services and enhanced staffing requirements translate into higher costs, creating additional challenges for government financial stability and for families seeking appropriate care. In 2023, standard day care services average 792,609 JPY (7,273 USD)[3] annually per recipient, while dementia-specific day care services cost 1,042,885 JPY (9,568 USD)—a 31.6% premium—and community-based services like dedicated dementia group homes (*ninchisho-taiogata-kyodoseikatsu-kaigo*) cost as high as 2,778,130 JPY (25,488 USD) annually per recipient (MHLW, 2024). While Japan's long-term care insurance system ensures most care is accessible through standardized copayments[4], significant gaps remain in understanding the total economic burden on families with cognitively impaired elderly individuals, particularly for premium private facilities and additional services beyond standard coverage.

Future projections: These challenges are expected to intensify as the scale of cognitive impairment among Japan's elderly population is substantial and rapidly growing. According to 2022 estimates, approximately 4.43 million elderly people are living with dementia, while another 5.59 million have mild cognitive impairment (MCI) (Cabinet Office, 2024). Together, they represent about one in every 3.6 elderly individuals having either dementia or its precursor conditions. Projections indicate this population could reach approximately 12 million (5.84 million with dementia and

[2] According to the MHLW's 2012 report on the breakdown of residential settings for elderly people with dementia, among the 2.8 million people with dementia, 50.0% lived at home, while others were distributed across various institutional settings: 14.6% in special nursing homes, 13.6% in medical institutions, 12.9% in health care facilities, 5.0% in group homes, and 3.6% in designated facilities (MHLW, 2012). While recent precise statistics are not available, current service utilization patterns suggest this home-based predominance likely continues or has increased, as among 6.63 million care recipients, 4.41 million use home-based services compared to 1.34 million in facilities (MHLW, 2024). Though these recent figures include all care needs, not just dementia, the service utilization pattern indicates a continued predominance of home-based care.

[3] Hereinafter, using the 2019 average exchange rate of 109 JPY per USD.

[4] Under Japan's long-term care insurance system, recipients typically pay 10% of the cost of care services, with some higher-income recipients paying 20% or 30% (MHLW, 2023c). For institutional care, users also pay additional charges for room, board, and daily living expenses. For example, a person requiring the highest level of care (level 5) in a multi-bedroom facility would pay approximately 104,200 JPY monthly, including about 26,130 JPY for care services (10% copayment), 27,450 JPY for accommodation, 43,350 JPY for meals, and 10,000 JPY for daily living expenses. Various subsidy programs exist to reduce these burdens for lower-income recipients, including supplementary benefits for room and board costs and caps on monthly payments based on income level.

6.13 million with MCI) by 2040, affecting one in every 3.3 elderly individuals (Cabinet Office, 2024). Additionally, about 36,000 people are estimated to be living with early-onset dementia as of 2022. The risk increases dramatically with age, from approximately 9.55% for men and 11.95% for women in the 75-79 age group to 47.09% for men and 58.88% for women aged 85 and above—an age range that also corresponds with significantly increased long-term care needs (Ninomiya, 2015). Similarly, OECD projections indicate that Japan will have one of the highest dementia prevalence rates globally in 2040, exceeding 30 people per 1,000 population (OECD, 2023). All the statistics suggest the challenges of cognitive impairment care will only intensify in the coming decades.

Policy environment

Japan operates a mandatory public Long-Term Care Insurance (LTCI) system established in 2000 that provides universal coverage for all citizens aged 40 and above. Under this system, eligible individuals receive comprehensive coverage for both institutional and home/community-based care services, with beneficiaries typically paying 10-30% of costs based on income while the remainder is funded through insurance premiums and public funds (Fu et al., 2023).

The LTCI eligibility determination follows a standardized two-stage assessment process. In the first stage, a computer-based assessment evaluates the applicant's functional status across 74 items, including both physical and cognitive dimensions. The second stage involves an expert committee review that considers the initial assessment along with the individual's medical conditions to determine the appropriate care level. Recipients are ultimately categorized into seven levels: two support levels for those with milder needs (Support Levels 1-2) and five care levels for those requiring more intensive assistance (Care Levels 1-5). Each level corresponds to a monthly cap on available services, with higher levels receiving more generous benefits.

For individuals with cognitive impairments, the assessment process is particularly attentive to cognitive function, behavioral symptoms, and social adaptation abilities. The evaluation specifically examines communication skills, comprehension of daily routines, memory function, decision-making capacity, and the presence of behavioral and psychological symptoms of dementia. These cognitive factors are weighted alongside physical limitations in determining the

appropriate care level. This assessment approach ensures that the unique needs of those with cognitive impairments are recognized within the broader LTCI framework, even when physical limitations may be minimal.

Evolution of dementia care policy: Japan's approach to cognitive impairment has evolved significantly, driven by the demographic realities discussed earlier. This evolution is marked by increasingly comprehensive national strategies: the Five-Year Plan for the Promotion of Dementia Measures (Orange Plan) in 2012, the Comprehensive Strategy to Accelerate Dementia Measures (New Orange Plan) in 2015, and the National Framework for Promotion of Dementia Policies in 2019 (Health and Global Policy Institute, 2024). A pivotal development occurred with the enactment of the 2023 Basic Act on Dementia, which introduced a transformative "new perspective on dementia" that recognizes continuing capabilities and meaningful roles for individuals post diagnosis (Cabinet Office, 2024). This legislation has led to improvements in how cognitive care is delivered and supported across the country.

Specialized services for cognitive impairments: While the LTCI system provides equal benefits regardless of whether limitations are physical or cognitive, Japan has developed specialized support structures specifically for those with cognitive impairments (Cabinet Office, 2024). As mentioned earlier, these include dementia-specialized day care services and community-based dementia group homes. These specialized facilities feature purposeful environmental design that reduces confusion and anxiety, smaller staff-to-patient ratios, and caregivers with advanced training in dementia care management.

Beyond these specialized care facilities, Japan's dementia care system emphasizes community integration through a coordinated network of support. Community-based support centers employ dementia care coordinators who help families navigate available services and coordinate care across medical and social support systems. Care managers—typically healthcare professionals or social workers with specialized training—provide post-diagnosis guidance to help individuals and families adapt to changing circumstances while maximizing independence.

Community engagement and support networks: The system particularly prioritizes maintaining *community engagement* for individuals with cognitive impairments through both grassroots

education and dedicated support spaces. A cornerstone of this approach is the Dementia Supporters initiative, launched in 2005 as part of the Ten-Year Project to Promote Dementia-Friendly Communities (MHLW, 2009). This national program trains community members across all age groups and sectors—including local residents, company employees, and notably, elementary, junior high, and high school students—to recognize dementia symptoms and provide appropriate support within their communities. Participants complete training courses that equip them with accurate knowledge and practical skills for assisting individuals with dementia and their families. By May 2009, the program had certified over one million supporters, and this network has continued to expand. The inclusion of young students is particularly significant, fostering early awareness and empathy while building a foundation for long-term cultural change toward dementia-friendly communities where individuals with dementia are understood and supported by informed citizens across all sectors and generations of society. Complementing this community education effort is a nationwide network of dementia cafés (*ninchisho-café*) that provides accessible social spaces where individuals with cognitive impairments can interact with peers and community members in a supported environment (MHLW, 2018). These cafes serve not only as social venues but also as informal information-sharing platforms where caregivers can exchange experiences and coping strategies. Together with specialized medical centers and memory clinics that offer diagnostic services and ongoing treatment support, these community-based initiatives work in coordination to ensure continuity of care across the disease progression (MHLW, 2023b).

Caregiver support: For informal caregivers, the Basic Act recognizes that support for family members is essential alongside support for the person with dementia (Cabinet Office, 2024). It highlights that appropriate support should be provided to family caregivers to enable both the person with dementia and their families to live securely in their communities. This reflects the act's fundamental understanding that supporting family caregivers is crucial for achieving its goal of helping people with cognitive impairments maintain dignity and an independent daily life routine according to their abilities.

The act and associated policies reflect Japan's recognition that supporting individuals with cognitive impairments requires more than just medical intervention—it demands integrated support networks that address both care recipients' and caregivers' needs while maintaining dignity and community connection. Local governments play a crucial role in implementing these

policies, adapting national standards to local contexts while ensuring consistent quality of care across regions (Cabinet Office, 2024).

Data and definitions

Sample: Our primary data source is the Comprehensive Survey of Living Conditions (CSLC), a large-scale nationally representative survey conducted by the MHLW of Japan. The survey has been fielded every three years since 1986, collecting detailed information on health status, household composition, and living arrangements. Each survey wave includes 600,000 to 800,000 randomly selected individuals, making it one of the largest health surveys in Japan.

The CSLC consists of several questionnaire modules. The core health and household questionnaires are administered to the full sample. The income questionnaire is administered to a random 10 percent subsample, while the long-term care questionnaire targets 5,000 to 6,000 individuals with care requirements. Our sample consists of CSLC respondents ages 65+ in the 2016 and 2019 waves. As with other countries' analyses, we avoid later waves due to the pandemic's impact on survey administration.

Strengths and limitations: The CSLC has several unique strengths for studying elderly care arrangements. The survey employs a two-stage screening process that first identifies elderly individuals requiring assistance due to physical or cognitive decline, then collects detailed information about their care arrangements. This approach enables identification of both formal and informal care relationships, including spouses, children, parents, relatives, and formal care providers, regardless of caregiver residence status.

However, the survey design also imposes important analytical constraints. For economic valuation of informal care—which requires detailed demographic and socioeconomic information about informal caregivers—our analysis is restricted to co-residing caregiver-recipient pairs. While the survey can identify all caregiver relationships, detailed caregiver characteristics (age, education, employment status) are only available for family members who can be linked through the household roster. The survey also excludes institutionalized populations, missing elderly individuals in nursing homes where care needs may differ significantly. Finally, the modular

survey design prevents joint analysis of income and long-term care data, as these questionnaires are administered to separate subsamples.

Dementia diagnosis (cognitive impairment): Unlike the HRS and SHARE surveys used in other chapters, which directly assess cognitive abilities through performance tests, the CSLC does not include direct cognitive testing. While Japan has longitudinal aging surveys such as the Japanese Study of Aging and Retirement (JSTAR), these datasets have significant limitations for our analysis. JSTAR covers relatively small, non-nationally representative samples focused on younger cohorts (ages 50-75), with limited coverage of the oldest-old population (85+) where dementia prevalence is highest. This combination results in too few cases of cognitive impairment for reliable statistical analysis. For instance, whereas our CSLC sample identifies over 7,500 individuals with dementia diagnosis across a nationally representative sample of 324,466 elderly adults, JSTAR would yield insufficient cases for the care utilization analyses and cost estimates required for this study.

Given these constraints, our measure of cognitive impairment relies on self-reported (or proxy-reported) regular visits to healthcare providers for dementia treatment from the nationally representative CSLC dataset. Specifically, we use the health questionnaire item "regular outpatient visits for dementia" which asks whether the respondent regularly visits healthcare facilities for

dementia treatment.[5] Respondents (or their proxies)[6] who answer "yes" to this question are classified as having a dementia diagnosis in our analysis, while all others are classified as not having a dementia diagnosis.

This approach has important limitations compared to the direct cognitive testing used in other countries' analyses. Our measure likely identifies a highly selected sample—only individuals with formally diagnosed dementia who are actively receiving medical treatment and are not living in nursing care facilities, potentially underestimating the true prevalence of cognitive impairment in the population. According to Ishihara et al. (2024), approximately 5 million Japanese people were living with cognitive issues in 2015 (approximately 15% of the population 65+), which represents a substantially higher prevalence than the 2.31% prevalence rate identified in our CSLC data (see Figure 1a).

Specifically, this discrepancy stems from three factors. First, our measure captures only those receiving regular medical care for dementia, missing individuals who remain undiagnosed or who do not regularly seek treatment. In Japan, regular dementia treatment following formal clinical diagnosis (see Appendix A for Japan's standardized diagnostic process) typically involves visits to memory clinics, psychiatric departments, or specialized dementia centers for medication

[5] While the CSLC data does not specify the particular treatments received, dementia treatment in Japan follows a multi-model approach adapted to disease stage and symptoms. Standard treatment includes: (1) Pharmacological—cholinesterase inhibitors (donepezil, galantamine, rivastigmine) for mild-to-moderate Alzheimer's disease, and memantine for moderate-to-severe cases (Nakamura, 2004); medications for behavioral and psychological symptoms of dementia (BPSD) as needed. (2) Non-pharmacological interventions—cognitive stimulation therapy, reminiscence therapy, reality orientation, and validation therapy provided through day care centers and community programs. (3) Clinical monitoring—regular assessments through memory clinics or psychiatric departments, typically involving periodic cognitive function tests, behavioral symptom evaluation, and medication adjustment (Ishihara et al., 2024). (4) Coordinated care—integration among primary care physicians, specialists, long-term care support teams, and community-based services, as outlined in the National Framework for Promotion of Dementia Policies. Treatment intensity and modality vary according to dementia severity, type (Alzheimer's disease, vascular dementia, dementia with Lewy bodies, etc.), and individual circumstances. Formal dementia diagnosis in Japan follows standardized clinical guidelines involving a two-stage process: first, determining whether cognitive decline meets diagnostic criteria for dementia (versus normal aging or mild cognitive impairment); second, identifying the specific dementia etiology based on clinical symptoms and neuroimaging findings (Japanese Society of Neurology, 2017). Appendix A provides the complete diagnostic flowchart adapted from these clinical practice guidelines. This rigorous diagnostic process ensures that our measure captures individuals who have undergone formal medical evaluation and received a clinical diagnosis, rather than those with undiagnosed or unrecognized cognitive impairment.

[6] The CSLC does not identify whether responses were provided by the elderly individuals themselves or by proxy respondents.

management and cognitive monitoring (Nakamura, 2004; Ishihara et al., 2024). However, individuals with stable mild-to-moderate dementia may manage primarily through periodic medication refills rather than regular facility visits. Cultural factors regarding stigma may also influence formal diagnosis rates and treatment-seeking behaviors. Second, the CSLC only covers non-institutionalized populations, excluding elderly individuals in nursing homes or care facilities where dementia prevalence is typically higher. Third, our measure cannot identify individuals who were evaluated but excluded from dementia diagnosis during the clinical assessment process. As shown in Appendix A, the Japanese diagnostic protocol systematically excludes several categories: individuals with age-related memory decline within the normal range, those with mild cognitive impairment (MCI) who do not meet criteria for dementia, and those with cognitive symptoms attributable to other conditions such as drug-induced cognitive impairment, delirium, depression, delusional disorder, or atypical epilepsy. Additionally, the diagnostic process differentiates dementia from reversible conditions such as metabolic or endocrine disorders, infections, normal pressure hydrocephalus, and other treatable medical causes. Our measure therefore captures only those who have completed this multi-stage evaluation and received a confirmed dementia diagnosis, missing both undiagnosed individuals and those whose cognitive symptoms were determined to have non-dementia etiologies.

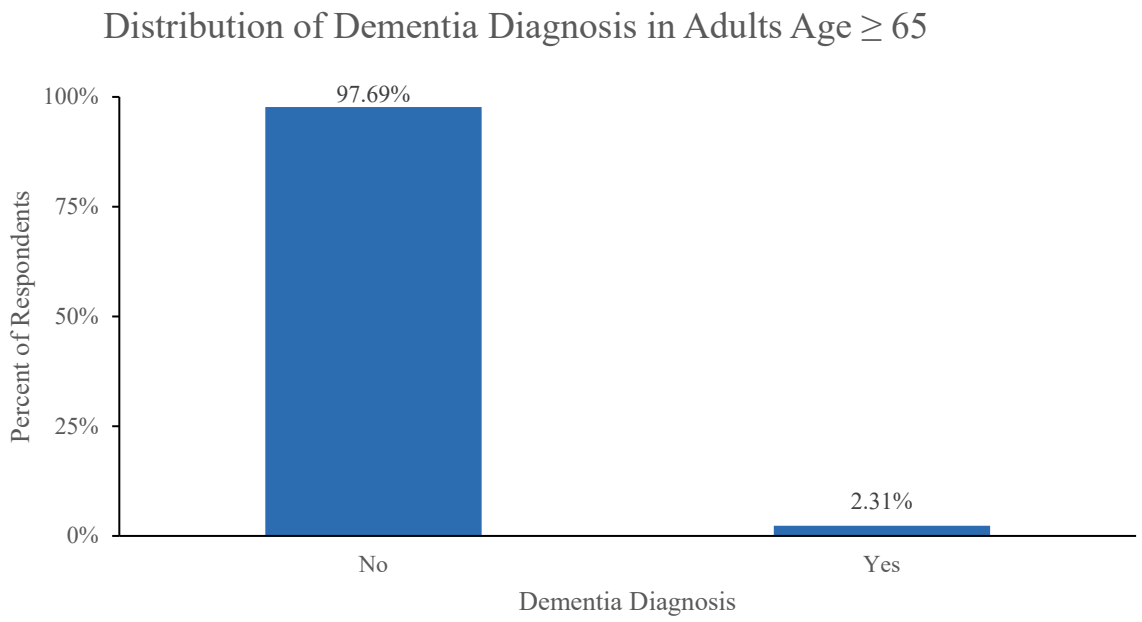

Figure 1a. Prevalence of Dementia Diagnosis Among Japanese Adults Aged 65 and Older
Notes: This figure presents the prevalence of dementia diagnosis among Japanese adults aged 65 and older, using data from the 2016 and 2019 waves of the Comprehensive Survey of Living Conditions (CSLC). For this analysis, dementia

diagnosis is operationally defined as individuals who self-report (or whose proxies report) regularly visiting healthcare facilities for dementia treatment. This measurement approach captures diagnosed cases receiving active medical care and likely underestimate total prevalence of dementia compared to direct clinical assessment methods employed in epidemiological surveys.

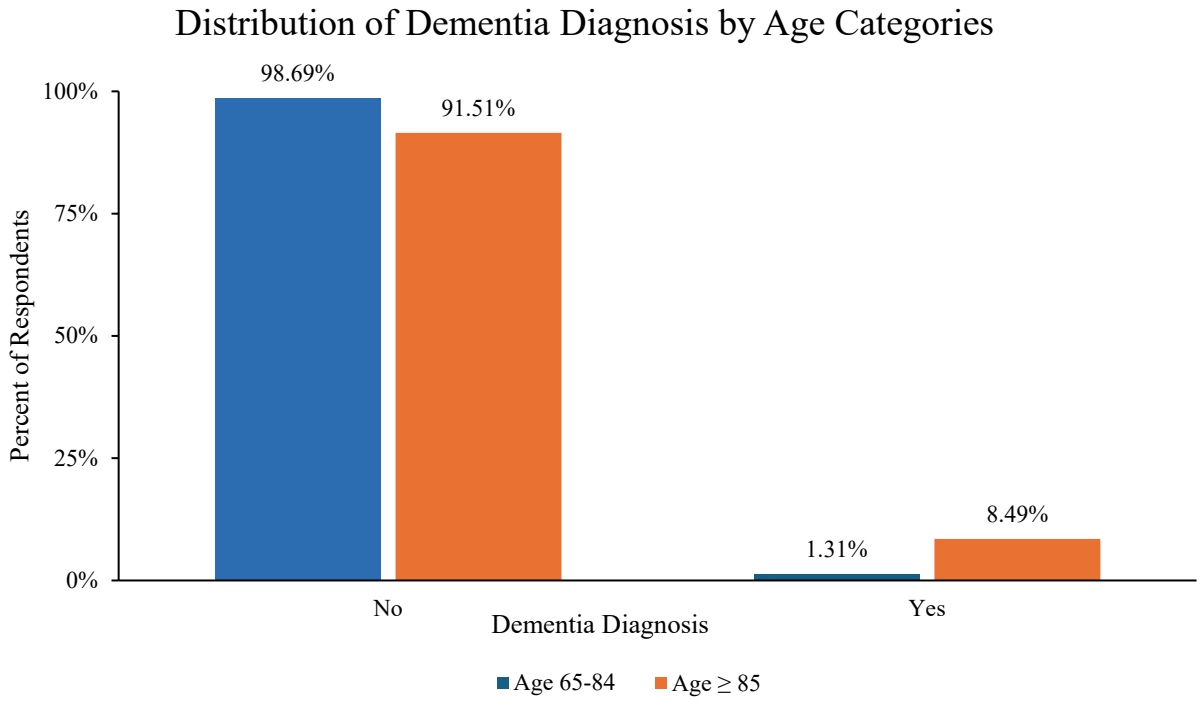

Figure 1b. Age-Stratified Prevalence of Dementia Diagnosis in Japan
Notes: This figure presents a comparative analysis of dementia diagnosis prevalence across two age cohorts: adults aged 65-84 years (blue bars) and those aged 85 years and older (orange bars), using data from the 2016 and 2019 waves of the CSLC. The substantial difference in prevalence rates between these age groups demonstrates the strong age gradient in dementia diagnosis risk (1.31% for ages 65-84 versus 8.49% for ages 85+, representing a more than six-fold increase). As with Figure 1a, dementia diagnosis is operationally defined as individuals who report regularly visiting healthcare facilities for dementia treatment, which primarily captures formally diagnosed cases receiving medical care.

As shown in Figure 1a, using this definition, we find that 2.31% of adults aged 65+ have a dementia diagnosis requiring regular medical treatment. This prevalence is considerably lower than the 8.1% cognitive impairment rate reported in the US, reflecting our measure's focus on individuals making regular visits to healthcare facilities to treat dementia—thus excluding those with mild-to-moderate dementia managed primarily at home—rather than capturing the broader spectrum of cognitive impairment through direct testing. When examining dementia diagnosis by age categories (Figure 1b), we observe a clear age gradient similar to that found in other countries. Among individuals aged 65-84, dementia diagnosis prevalence is 1.31%, while for those 85 and older, it increases substantially to 8.49%. This more than six-fold increase with age aligns with

expected epidemiological patterns of dementia, though the absolute prevalence remains lower than reported in countries using direct cognitive assessment.

Physical limitations: Physical functioning is another key aspect of our analysis. The CSLC asks respondents whether they experience health-related limitations in five domains: (1) daily living activities (dressing, bathing, eating, getting in/out of bed); (2) going outside; (3) work or household chores; (4) exercise or sports activities; and (5) other activities. To align with standard approaches used in other countries, we classify domain (1) as an ADL (Activities of Daily Living) limitation, while domains (2), (3), and (5) are classified as IADL (Instrumental Activities of Daily Living) limitations. We exclude domain (4)—exercise or sports—from our analysis as it represents discretionary rather than essential daily functions. Given that ADL limitations represent more severe functional impairment than IADL limitations, we use a hierarchical approach: individuals with any ADL limitation are classified as having ADL limitations regardless of their IADL status, while those without ADL limitations are categorized based on their number of IADL limitations.[7]

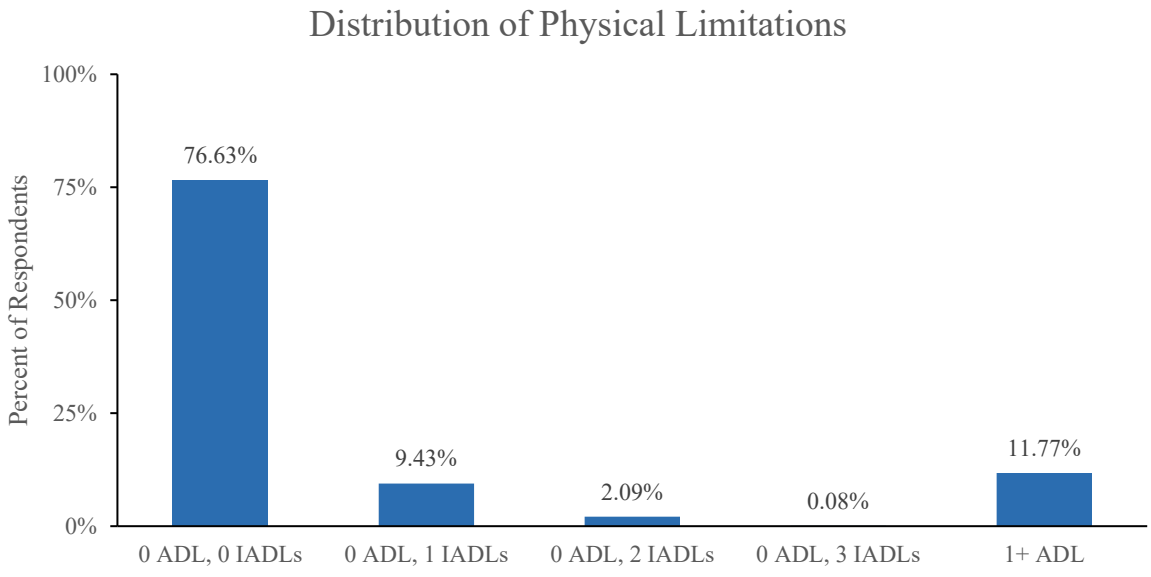

Figure 2a. Distribution of Physical Limitations Among Japanese Adults Aged 65 and Older
Notes: This figure presents the distribution of physical limitations among Japanese adults aged 65 and older, using data from the 2016 and 2019 waves of the CSLC. The CSLC asks respondents whether they experience health-related

[7] While domain 1 aligns closely with traditional ADL definitions, the CSLC's classification differs from standard measures in important ways. Domains 2-5 are more heterogeneous than typical IADLs, and domain 1 is measured as a single binary indicator without distinguishing between difficulty with one versus multiple ADL tasks. These measurement differences limit perfect comparability with other countries' analyses, though our hierarchical classification represents the best available approach given the CSLC's data structure.

limitations in five domains: (1) daily living activities (dressing, bathing, eating, getting in/out of bed); (2) going outside; (3) work or household chores; (4) exercise or sports activities; and (5) other activities. We apply a hierarchical classification system in where domain 1 is treated as an ADL (Activities of Daily Living) limitation, while domains 2, 3, and 5 are classified as IADL (Instrumental Activities of Daily Living) limitations. Domain 4 (exercise or sports) was excluded from the IADL count as it represents discretionary rather than essential daily functions. The categories shown are mutually exclusive, with individuals classified by their most severe limitation level. Those with any ADL limitation are classified as "1+ ADL" regardless of IADL status, while those without ADL limitations are categorized by their number of IADL limitations (0-3). Notably, 76.63% of older adults report no functional limitations, while 11.77% have at least one ADL limitation.

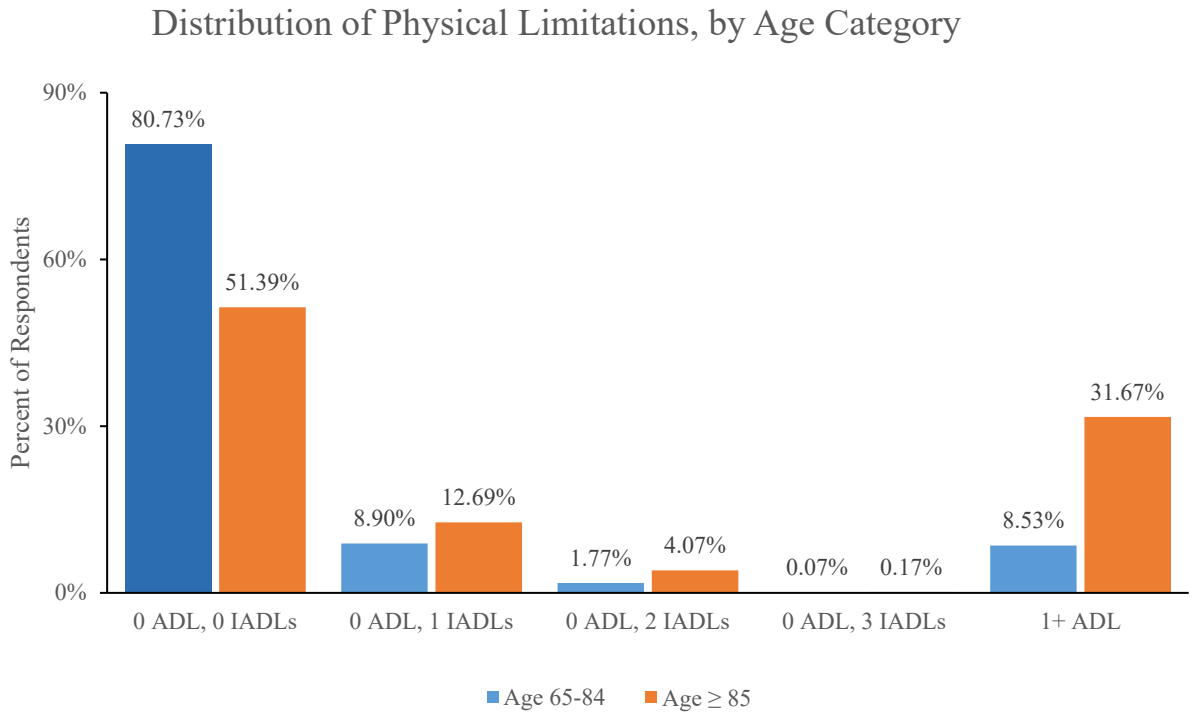

Figure 2b. Age-Stratified Distribution of Physical Limitations in Japan
Notes: This figure presents a comparative analysis of physical limitations across two age cohorts: adults aged 65-84 years (blue bars) and those aged 85 years and older (orange bars), using data from the 2016 and 2019 waves of the CSLC. The CSLC asks respondents whether they experience health-related limitations in five domains: (1) daily living activities (dressing, bathing, eating, getting in/out of bed); (2) going outside; (3) work or household chores; (4) exercise or sports activities; and (5) other activities. We apply a hierarchical classification system in where domain 1 is treated as an ADL limitation, while domains 2, 3, and 5 are classified as IADL limitations. Domain 4 (exercise or sports) was excluded from the IADL count as it represents discretionary rather than essential daily functions. The categories shown are mutually exclusive, with individuals classified by their most severe limitation level. Those with any ADL limitation are classified as "1+ ADL" regardless of IADL status, while those without ADL limitations are categorized by their number of IADL limitations (0-3). The figure reveals a substantial age gradient in functional limitations: while 80.73% of those aged 65-84 report no limitations, this proportion drops to 51.39% among those aged 85+. Correspondingly, ADL limitations increase nearly four-fold from 8.53% in the younger cohort to 31.67% in the oldest-old.

Figure 2a displays the distribution of physical limitations in our sample using this hierarchical classification. The majority of Japanese elderly (76.63%) report no limitations in either ADL or IADL domains. Among those without ADL limitations, 9.43% report one IADL limitation, 2.09% report two IADL limitations, and 0.08% report three IADL limitations. Importantly, 11.77% of the

sample reports at least one ADL limitation (limitation in dressing, bathing, eating, or getting in/out of bed), which represents the most physically impaired group in our analysis. Figure 2b presents the distribution by age category, revealing substantial differences between the younger (65-84) and older (85+) groups. While 80.73% of the younger group reports no limitations, this drops to 51.39% among those 85 and older. The proportion with ADL limitations increases markedly with age—only 8.53% of those aged 65-84 report ADL limitations, compared to 31.67% of those 85 and older. This represents nearly a four-fold increase in the most severe physical limitations with advanced age.

Care utilization and outcomes: Our focus is on how care patterns vary with cognitive and physical impairments. In the CSLC, we can identify two primary categories of at-home care: formal care and informal care. Unlike the HRS and SHARE, the CSLC does not capture nursing home residency since the survey covers only non-institutionalized populations.

Informal care is defined as receiving primary assistance or supervision from family members or relatives, specifically when the primary caregiver relationship is coded as spouse, child, child's spouse, parent, other relative, or other family, regardless of whether the caregiver co-resides with the care recipient. Formal care is defined as having received LTCI certification. Since individuals typically apply for certification when they need care services, this measure captures those who are accessing or eligible to access formal care services.

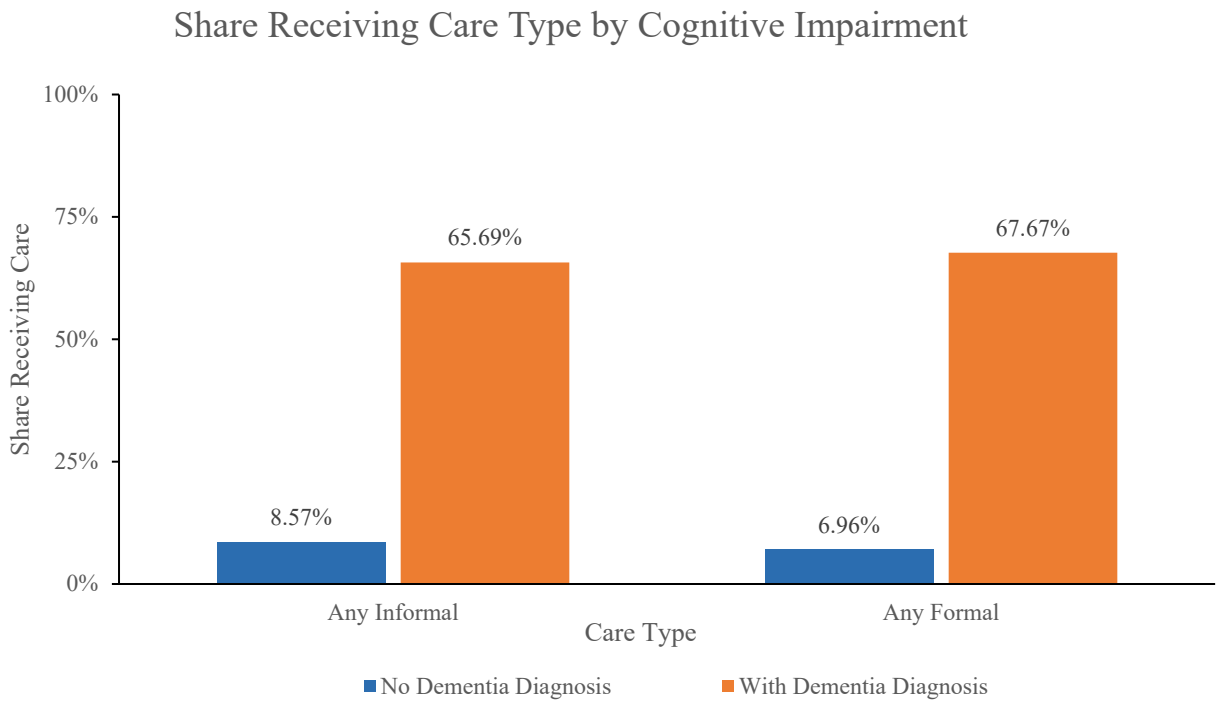

Figure 3. Care Utilization Patterns by Dementia Diagnosis Status in Japan

Notes: This figure presents patterns of care utilization among Japanese adults aged 65 and older by dementia diagnosis status, using data from the 2016 and 2019 waves of the CSLC. Dementia diagnosis is operationally defined as regularly visiting healthcare facilities for dementia treatment (self-reported or proxy-reported). Care utilization is measured using questions from the household questionnaire. Informal care is defined as receiving primary assistance or supervision from family members or relatives, specifically when the primary caregiver relationship is coded as spouse (1), child (2), child's spouse (3), parent (4), other relative (5), or other family (7), regardless of whether the caregiver co-resides with the care recipient. Formal care is defined as having received LTCI certification, which indicates that individuals are accessing or eligible to access formal care services. The figure reveals striking differences in care utilization: those with dementia diagnosis are nearly 8 times more likely to receive informal care (65.69% versus 8.57%) and nearly 10 times more likely to receive formal care (67.67% versus 6.96%) compared to those without dementia diagnosis.

Figure 3 displays the relationship between dementia diagnosis status and care utilization in Japan. The contrast between those with and without dementia diagnosis is notable—among those identified with dementia diagnosis, 66% receive informal care and 68% receive formal care.[8]

[8] Limited official statistics are available regarding the proportion of people with dementia who utilize informal and formal care services in Japan. Available evidence suggests variable utilization rates depending on the definition of formal care and study population. A 2016 community-based survey (n=635) found that 43.9% of dementia patients needed long-term care services (care levels III-V) (Igarashi et al., 2020). When calculated from national aggregated data, approximately 24-28% of people with dementia appear to utilize formal care services, derived from: LTCI recipients with dementia as the primary cause—approximately 1.2-1.3 million, representing 18.1-18.7% of approximately 6.7-7 million total LTCI recipients (MHLW, 2024)—divided by the total dementia population of approximately 4.6-5.0 million (Cabinet Office, 2024). The 66-68% figure reported here likely represents diagnosed individuals already engaged with healthcare systems, as opposed to the broader population of people living with dementia who may not have received a formal diagnosis or may not be accessing

These utilization rates are notably higher than some official statistics would suggest, likely reflecting that our dementia sample captures individuals with formally diagnosed dementia who are actively engaged with healthcare systems, rather than the broader population of people living with dementia who may not have received formal diagnosis or may not be accessing services. By comparison, only 9% of those without dementia diagnosis receive informal care, and 7% receive formal care. This nearly eight-fold difference highlights the substantial care needs associated with diagnosed dementia requiring medical treatment.

Descriptive statistics

This section examines the demographic characteristics, functional status, and care utilization patterns of Japanese elderly adults across three distinct groups: those with no ADL limitations and no dementia diagnosis, those with ADL limitations but no dementia diagnosis, and those with dementia diagnosis (regardless of physical status). This analysis reveals how impairment type relates to socioeconomic characteristics and care arrangements in Japan's aging society, offering insights relevant to other countries facing similar demographic transitions. Throughout this discussion, readers should keep in mind that our dementia diagnosis measure captures only individuals with formally diagnosed dementia who are actively receiving medical treatment—representing approximately 2.31% of adults aged 65+—rather than the broader population with cognitive impairment.

Prevalence and distribution of impairments: Table 1 illustrates the joint distribution of dementia diagnosis and physical limitations in the Japanese elderly population aged 65+. A substantial majority—76.63% of our sample—has neither dementia diagnosis nor any ADL or IADL limitations, indicating generally good functional status among Japanese elderly. An additional 9.43% have some IADL limitations but no ADL limitations and no dementia diagnosis, reflecting a substantial group with mild functional challenges that do not affect basic daily activities.

services. The discrepancy across statistics highlights the need for more comprehensive official statistics on dementia care utilization in Japan.

Table 1. Joint Distribution of Dementia Diagnosis and Physical Limitations Among Japanese Adults Aged 65 and Older

	With Dementia Diagnosis	No Dementia Diagnosis	Total
Count			
0 ADL, 0 IADLs	1,917	246,725	248,642
0 ADL, 1 IADLs	900	29,693	30,593
0 ADL, 2 IADLs	292	6,499	6,791
0 ADL, 3 IADLs	17	248	265
1+ ADL	4,383	33,792	38,175
Total	7,509	316,957	324,466
Percentage			
0 ADL, 0 IADLs	0.59%	76.04%	76.63%
0 ADL, 1 IADLs	0.28%	9.15%	9.43%
0 ADL, 2 IADLs	0.09%	2.00%	2.09%
0 ADL, 3 IADLs	0.01%	0.08%	0.08%
1+ ADL	1.35%	10.41%	11.77%
Total	2.31%	97.69%	100.00%

Notes: This table presents the joint distribution of dementia diagnosis and physical limitations among Japanese adults aged 65 and older, using data from the 2016 and 2019 waves of the CSLC. Dementia diagnosis is operationally defined as regularly visiting healthcare facilities for dementia treatment (self-reported or proxy-reported). The CSLC asks respondents whether they experience health-related limitations in five domains: (1) daily living activities (dressing, bathing, eating, getting in/out of bed); (2) going outside; (3) work or household chores; (4) exercise or sports activities; and (5) other activities. In this analysis, domain 1 is treated as an ADL limitation, while domains 2, 3, and 5 are classified as IADL limitations. Domain 4 (exercise or sports) was excluded from the IADL count. The physical limitation categories use a hierarchical classification system: individuals with any ADL limitation are classified as "1+ ADL" regardless of IADL status, while those without ADL limitations are categorized by their number of IADL limitations (0-3). The table reveals that individuals with dementia diagnosis are disproportionately concentrated in the most severe limitation category: 58.4% (4,383/7,509) of those with dementia have ADL limitations, compared to only 10.7% (33,792/316,957) of those without dementia—representing a more than five-fold difference.

Among those without dementia diagnosis, 10.66% have at least one ADL limitation (33,792 out of 316,957). This distribution differs markedly from the population with dementia diagnosis, where physical limitations are substantially more prevalent. Of the 2.31% of respondents identified with dementia diagnosis, only 25.5% (0.59% of the total sample) have no physical limitations. The remaining 74.5% of those with dementia diagnosis (1.72% of the total sample) have at least one IADL or ADL limitation, with 58.4% (1.35% of the total sample) having at least one ADL limitation.

This pattern suggests a strong relationship between cognitive impairment and physical limitations. However, several important caveats apply to this interpretation. First, the direction of causality cannot be determined—while dementia may cause functional decline, physical limitations may also increase vulnerability to cognitive impairment. Second, our measure of cognitive impairment, based on regular dementia treatment, likely identifies more severe cases. Third, ADL limitation responses may themselves be influenced by cognitive status, as individuals with dementia may require supervision or guidance for tasks that they are physically capable of performing

Table 2a. Demographic and Socioeconomic Characteristics by Physical Limitations and Dementia Diagnosis Status

	0 ADL & No Dementia Diagnosis	1+ ADL & No Dementia Diagnosis		With Dementia Diagnosis		Total	
Age	74.43	80.54	**	84.20	**	75.29	**
	(7.06)	(8.37)		(6.82)		(7.56)	
Male	0.457	0.405	**	0.337	**	0.449	**
Married	0.696	0.538	**	0.486	**	0.675	**
Education							
< High school	0.241	0.365	**	0.433	**	0.259	**
High school	0.400	0.345	**	0.315	**	0.392	**
Vocational school	0.039	0.032	**	0.024	**	0.038	*
Two-year college	0.037	0.024	**	0.018	**	0.035	**
University	0.089	0.064	**	0.044	**	0.086	**
Graduate school	0.005	0.003	**	0.001	**	0.005	
Work for pay	0.318	0.117	**	0.043	**	0.291	**
Receiving pension	0.963	0.971	**	0.982	**	0.965	**
Income per capita (mean)	223.01	193.10	**	163.94	**	218.86	
	(267.55)	(785.75)		(184.03)		(352.13)	
Income per capita (median)	168	132		124.5		163	
Observations	283,165	33,792		7,509		324,466	

Notes: This table presents demographic and socioeconomic characteristics across three groups of Japanese adults aged 65 and older, using data from the 2016 and 2019 waves of the CSLC. Physical limitations are defined using a hierarchical classification system based on five health-related limitation domains from the CSLC: (1) daily living activities (dressing, bathing, eating, getting in/out of bed); (2) going outside; (3) work or household chores; (4) exercise or sports activities; and (5) other activities. Domain 1 is treated as an ADL limitation, while domains 2, 3, and 5 are classified as IADL limitations (domain 4 is excluded). Individuals with any ADL limitation are classified as "1+ ADL," while those without ADL limitations are classified as "0 ADL" regardless of their IADL status (including those with 0, 1, 2, or 3 IADL limitations). Dementia diagnosis is defined as regularly visiting healthcare facilities for dementia treatment (self-reported or proxy-reported). The sample sizes shown (283,165; 33,792; 7,509; total 324,466) represent the full merged household-health questionnaires sample aged 65+. Demographic variables use this full sample, while income statistics are based on a separate income questionnaire administered to approximately 10% of households, resulting in a smaller subsample for income analysis. Income per capita is measured in 10,000 JPY. Male is a binary indicator (1=male, 0=female). Married, work for pay, and receiving pension are also binary indicators. Education variables indicate the highest level of education completed. Standard deviations are in parentheses for continuous variables. Stars correspond to statistical tests comparing each group to the reference group (0 ADL & No Dementia

Diagnosis). *: Significant at the 95% confidence level. **: Significant at the 99% confidence level. The table reveals substantial demographic and socioeconomic disparities across disability and dementia status: those with dementia are markedly older (mean age 84.2 versus 74.4 years), less likely to be male (33.7% versus 45.7%), less educated, and have considerably lower income (median per capita income 124,500 JPY versus 168,000 JPY for the reference group).

Demographic and socioeconomic characteristics: In Table 2a, we examine how the three groups—those with no ADL limitations and no dementia diagnosis, those with 1+ ADL limitations but no dementia diagnosis, and those with dementia diagnosis (regardless of ADL status)—compare across key demographic and socioeconomic measures. Consistent with findings from other countries, those without significant impairments demonstrate advantages across nearly all measures. These patterns highlight how impairment intersects with broader social and economic disadvantages in Japan, with implications for care needs and resource allocation.

Age structure shows steep gradients across impairment groups. The group with no ADL limitations and no dementia diagnosis has a mean age of 74.4 years, compared to 80.5 years for those with ADL limitations but no dementia diagnosis, and 84.2 years for those with dementia diagnosis. This nearly 10-year age gap between the least and most impaired groups aligns with the well-established relationship between advanced age and both physical limitations and dementia risk.

Gender patterns show important disparities. Among those with no ADL limitations and no dementia diagnosis, 45.7% are male, compared to 40.5% in the ADL limitations group and only 33.7% in the dementia diagnosis group. Put differently, females comprise a progressively higher percentage of the more impaired groups. This gender pattern aligns with findings from other countries, where females typically constitute a larger proportion of those with dementia and physical impairments, likely reflecting women's longer life expectancy, gender-specific risk factors, and potentially different patterns of healthcare utilization and diagnosis.

Marital status differences reflect both age and health effects. Marital status shows that those with no ADL limitations and no dementia diagnosis are more likely to be married (69.6%) compared to those with ADL limitations but no dementia diagnosis (53.8%) and those with dementia diagnosis (48.6%). This gradient likely reflects both age differences and the potential impact of health status on marital relationships and widowhood. The lower marriage rates among impaired groups may also have important implications for informal care availability, as spouses often serve as primary caregivers in Japan.

Educational attainment demonstrates a clear inverse relationship with impairment. Among those with dementia diagnosis, 43.3% have less than a high school education, compared to 36.5% of those with ADL limitations but no dementia diagnosis and 24.1% of those with no ADL limitations and no dementia diagnosis. Conversely, higher education levels (university and graduate school) are more prevalent in the least impaired group. These educational differences are consistent with the cognitive reserve hypothesis and may also reflect cohort effects.

Labor force participation declines sharply with impairment severity. Labor force participation shows notable differences across groups. Among those with no ADL limitations and no dementia diagnosis, 31.8% work for pay, compared to 11.7% of those with ADL limitations but no dementia diagnosis and only 4.3% of those with dementia diagnosis. While these differences are likely to reflect age disparities, they may also highlight the impact of functional and cognitive limitations on workforce participation.

Pension receipt is nearly universal across all groups but slightly higher in the more impaired groups (97.1% for those with ADL limitations, 98.2% for those with dementia diagnosis, compared to 96.3% for the least impaired group), likely reflecting age differences.

Economic disparities across impairment groups are substantial. Those with no ADL limitations and no dementia diagnosis have a mean annual income of 2.23 million JPY (20,459 USD), approximately 16% higher than those with ADL limitations but no dementia diagnosis (1.93 million JPY, 17,706 USD) and 36% higher than those with dementia diagnosis (1.64 million JPY, 15,046 USD). Median income follows a similar pattern, indicating that these differences exist throughout the income distribution. These income differentials are particularly notable given their potential impact on care access and quality, though it should be noted that income statistics are based on a smaller subsample from the separate income questionnaire administered to approximately 10% of households, rather than the full sample used for other demographic variables. Japan's universal LTCI system aims to minimize financial barriers to care, yet these income disparities may still affect access to premium services and out-of-pocket care expenses.

Table 2b. Care Utilization by Physical Limitations and Dementia Diagnosis Status

	0 ADL & No Dementia Diagnosis	1+ ADL & No Dementia Diagnosis		With Dementia Diagnosis		Total	
Number of IADLs	0.153	0.889	**	0.783	**	0.245	**
	(0.425)	(0.895)		(0.874)		(0.562)	
Any care	0.053	0.506	**	0.753	**	0.131	**
Any informal care	0.044	0.435	**	0.657	**	0.106	**
Any formal care	0.031	0.394	**	0.677	**	0.097	**
Informal care hours per month (conditional on mainly informal care)	61.978	141.825	**	168.876	**	130.229	**
	(126.34)	(183.27)		(189.02)		(178.84)	
Formal care hours per month (conditional on mainly formal care)	44.036	97.064		201.939	**	124.716	**
	(104.01)	(162.07)		(210.76)		(187.20)	
Observations	283,165	33,792		7,509		324,466	

Notes: This table presents care utilization patterns across three groups of Japanese adults aged 65 and older, using data from the 2016 and 2019 waves of the CSLC. Physical limitations are defined using the same hierarchical classification system as Table 2a, based on five health-related limitation domains from the CSLC. Number of IADLs counts limitations in three domains: going outside, work/household chores, and other activities (exercise/sports is excluded). Dementia diagnosis is operationally defined as regularly visiting healthcare facilities for dementia treatment (self-reported or proxy-reported). The sample sizes shown (283,165; 33,792; 7,509; total 324,466) represent the full merged household-health survey sample aged 65+. Care utilization variables use this full sample, while care hours statistics are derived from the LTC questionnaire administered to approximately 6,000 individuals with LTCI certification, representing a separate subsample with no overlap with the income survey. Any care indicates receipt of either informal or formal care. Any informal care indicates assistance from family members or relatives, regardless of co-residence. Any formal care indicates that individuals have received LTCI certification, which indicates eligibility for and likely utilization of formal long-term care services. Care hours are derived from the long-term care survey question about the primary caregiver's daily average care time and converted to monthly hours using the following assumptions: "almost all day" (480 hours/month), "about half a day" (240 hours/month), "about 2-3 hours" (75 hours/month), "help when needed" (15 hours/month), and "other/occasional care" (9.26 hours/month). Informal care hours represent time provided when the primary caregiver is a family member or relative, while formal care hours represent time when the primary caregiver is a professional service provider. Hours reflect the time commitment of the primary caregiver only, not total care hours from all sources. Standard deviations are in parentheses for continuous variables. Stars correspond to statistical tests comparing each group to the reference group (0 ADL & No Dementia Diagnosis). *: Significant at the 95% confidence level. **: Significant at the 99% confidence level. The table demonstrates dramatic differences in care utilization across groups: those with dementia diagnosis receive care at rates 14 times higher than the reference group (75.3% versus 5.3%), with particularly intensive care needs reflected in monthly care hours—168.9 hours for informal care and 201.9 hours for formal care among those with dementia, compared to 62.0 and 44.0 hours respectively in the reference group.

Physical limitations and care utilization: Table 2b examines the differences in physical limitations and care utilization across the three impairment groups. This analysis reveals not only the care burden associated with different impairment types but also potential gaps in care coverage.

IADL limitation patterns vary substantially across groups. The group with 1+ ADL limitations but no dementia diagnosis shows the highest average number of IADL limitations (0.89), followed by those with dementia diagnosis (0.78), and those with no ADL limitations and no dementia diagnosis (0.15). This pattern indicates that having IADL limitations is strongly associated with having ADL limitations or dementia.

Overall care utilization increases dramatically with impairment severity. While only 5.3% of those with no ADL limitations and no dementia diagnosis receive any care, this rises to 50.6% for those with ADL limitations but no dementia diagnosis and 75.3% for those with dementia diagnosis. However, it is crucial to remember that these utilization rates reflect our sample of individuals with formally diagnosed dementia receiving regular medical treatment—a group likely to have more severe impairment and greater healthcare system engagement than the broader population with cognitive impairment.

Care type preferences differ between impairment groups. For those with dementia diagnosis, formal care (67.7%) is slightly more common than informal care (65.7%), suggesting high utilization of Japan's LTCI services among those with diagnosed dementia. In contrast, those with ADL limitations but no dementia diagnosis shows somewhat higher use of informal care (43.5%) compared to formal care (39.4%). The relatively close rates between formal and informal care in both impaired groups suggest complementarity between informal care and formal care in the Japanese context—a pattern that differs from some other countries where care types may be more substitutable.

Care intensity shows substantial differences across groups, particularly for formal care.[9] Among those receiving formal care, individuals with dementia diagnosis receive an average of 201.9 hours per month, nearly twice as high as those with ADL limitations but no dementia diagnosis (97.1 hours) and more than four times higher than those with no ADL limitations and no dementia diagnosis (44.0 hours). This difference highlights the intensive care needs associated with

[9] The reported care hours are derived from a categorical variable rather than continuous measurements. We converted these categorical responses to estimated monthly hours using the following approach: "almost all day" = 480 hours (16 hours/day × 30 days); "half a day" = 240 hours (8 hours/day × 30 days); "about 2-3 hours/day" = 75 hours (2.5 hours/day × 30 days); "about 30 minutes/day" = 15 hours (0.5 hours/day × 30 days); and "less frequent care" = 9.26 hours per month (calculated as the average of moderate and light care divided by 3, representing care once every three days).

cognitive impairment. For informal care, there is also a gradient, with those with dementia diagnosis receiving 168.9 hours per month compared to 141.8 hours for those with ADL limitations but no dementia diagnosis and 62.0 hours for those with no ADL limitations and no dementia diagnosis. It should be noted that these care intensity statistics are derived from a separate long-term care questionnaire administered to approximately 6,000 individuals with LTCI certification, representing a much smaller and more specialized subsample than the full demographic sample used for other variables in this table. The modular survey design means these hours data come from a different group than the income statistics discussed earlier, preventing joint analysis of care intensity and household economic resources.

The descriptive statistics reveal substantial care burdens associated with both physical and cognitive impairments in Japan, with several key patterns emerging. First, cognitive impairment is linked to significantly higher-intensity care requirements than physical limitations alone. Second, while Japan's public LTCI system provides widespread access to formal services, informal family care remains crucial, particularly for those with physical impairments. Third, the data suggest important socioeconomic gradients in impairment prevalence, with lower education and income associated with higher rates of functional and cognitive limitations.

However, an important caveat warrants emphasis. The CSLC does not include individuals living in nursing homes. This limitation is significant since, according to MHLW (2024), in 2023, approximately 23% of certified long-term care recipients with severe care needs live in institutional settings, with even higher rates among those with dementia. The exclusion of institutionalized populations likely leads us to underestimate the full spectrum of care needs, particularly for those with the most severe cognitive impairments.

Evidence of potential unmet care needs emerges across both impairment groups. Among individuals with ADL limitations but no dementia diagnosis—representing those with significant physical impairments—49.4% receive no care services despite their physical limitations. Even among those with dementia diagnosis, 24.7% receive neither formal nor informal care despite their cognitive impairment. These figures likely underestimate true unmet needs, as our informal care measure captures only primary caregivers and our sample excludes institutionalized populations where care needs may be better met. These gaps offer important lessons for other aging societies,

particularly striking given Japan's comprehensive LTCI system, suggesting that even well-developed formal care infrastructure may not fully address care needs. Countries developing their own long-term care systems can learn from both Japan's successes in formal care provision and the persistent challenges in ensuring comprehensive coverage.

Regression analyses

Methodology: To understand how different types of impairments are associated with care utilization in Japan, controlling for demographic and socioeconomic factors, we employ linear probability model regression analysis that differentiates between cognitive and physical impairments. Our models include two key variables of interest: physical impairment (defined as having 1+ ADL limitations without dementia diagnosis) and dementia diagnosis, with individuals having no ADL limitations and no dementia diagnosis serving as the reference group. We control for demographic and socioeconomic factors including age and age squared, gender, marital status, the interaction of gender and marital status, children (both presence and number), educational attainment, and in some specifications, income. While we maintain consistency with other country chapters where possible, our specification is tailored to the Japanese context and data availability.

Our analysis examines both the extensive margin (whether individuals receive care) and the intensive margin (how much care they receive, conditional on receiving care). We analyze different care arrangements separately: any care (formal or informal), any informal care, any formal care, and care intensity for each type. This approach allows us to understand how impairment type relates to different dimensions of care utilization within Japan's universal LTCI system, offering insights into whether the system responds differentially to cognitive versus physical care needs.

It is crucial to keep in mind throughout this analysis that our dementia diagnosis measure captures only individuals with formally diagnosed dementia receiving regular medical treatment. This selective sample likely represents more severe cognitive impairment and greater healthcare engagement than the broader population with cognitive decline. Additionally, our intensive margin analyses rely on the long-term care questionnaire subsample of approximately 6,000 LTCI-certified individuals, which has no overlap with the income survey subsample.

Overall care receipt: the extensive margin

Probability of receiving any care: Table 3 examines the probability of receiving any care using a linear probability model.[10] These estimates reveal how physical impairments and dementia diagnosis associate with overall care receipt, after accounting for age and other demographic factors.

The association between impairments and care receipt is substantial for both types. In the simplest specification (column 1), individuals with dementia diagnosis are 71.4 percentage points more likely to receive care compared to those without impairments, while those with ADL limitations but no dementia diagnosis are 46.8 percentage points more likely to receive care than the non-impaired reference group. This represents a substantial gap of approximately 24.6 percentage points between the two impairment types, with dementia diagnosis showing a particularly strong association with care receipt.

Table 3. Physical Limitations and Dementia Diagnosis Effects on Probability of Receiving Any Care in Japan

	(1)		(2)		(3)		(4)	
1+ ADL & No Dementia Diagnosis	0.468	***	0.386	***	0.384	***	0.364	***
	(0.003)		(0.003)		(0.003)		(0.009)	
With Dementia Diagnosis	0.714	***	0.583	***	0.580	***	0.582	***
	(0.005)		(0.005)		(0.005)		(0.017)	
Age - 65			-0.006	***	-0.006	***	-0.006	***
			(0.000)		(0.000)		(0.001)	
(Age - 65) Squared			0.001	***	0.001	***	0.001	***
			(0.000)		(0.000)		(0.000)	
Male					-0.021	***	-0.005	
					(0.002)		(0.007)	
Married					-0.032	***	-0.031	***
					(0.002)		(0.005)	
Male * Married					0.015	***	0.012	
					(0.003)		(0.008)	
Number of children					0.001		-0.002	
					(0.002)		(0.008)	
Any children					0.009	**	0.015	

[10] Table 3A in the appendix presents an alternative specification that separately identifies individuals with dementia only, ADL limitations only, and those with both conditions, using categorical age groups instead of a quadratic age specification. The results are broadly consistent, with both impairment types showing strong positive associations with care receipt, though the interaction model reveals a negative interaction term for those with both conditions.

					(0.003)		(0.010)	
Less than high school					0.010	***	0.005	
					(0.001)		(0.004)	
Some college					-0.002		-0.002	
					(0.002)		(0.005)	
College or more					-0.003	*	0.000	
					(0.001)		(0.004)	
Income (Inverse Hyperbolic Sine)							-0.010	***
							(0.002)	
Constant	0.054	***	0.015	***	0.043	***	0.093	***
	(0.000)		(0.001)		(0.002)		(0.014)	
N	264,060		263,807		263,807		28,941	
Mean dependent variable	0.12		0.12		0.12		0.11	
R-squared	0.292		0.370		0.372		0.364	

Notes: This table presents linear probability model estimates in which the dependent variable is an indicator for receiving any care (formal or informal). The sample includes Japanese adults aged 65 and older from the 2016 and 2019 waves of the CSLC. Physical limitations are defined using the same hierarchical classification system as previous tables, where individuals with any ADL limitation are classified as "1+ ADL" regardless of IADL status. Dementia diagnosis is operationally defined as regularly visiting healthcare facilities for dementia treatment (self-reported or proxy-reported). The reference group is individuals with no ADL limitations and no dementia diagnosis. Columns 1-3 use the full merged household-health survey sample (N=263,807-264,060), while Column 4 uses the income survey subsample (N=28,941), which represents approximately 10% of households with no overlap with the long-term care survey. Formal care is defined as having LTCI certification, while informal care indicates assistance from family members or relatives regardless of co-residence. Education variables are relative to high school education. Income is measured using inverse hyperbolic sine transformation to accommodate zeros. Robust standard errors are in parentheses. * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

After controlling for age and other demographic factors in the full model without income (column 3), both effects remain substantial but are somewhat attenuated. Dementia diagnosis increases care likelihood by 58.0 percentage points and ADL limitations increase it by 38.4 percentage points relative to those without impairments. The reduction in coefficient size when adding controls indicates that some—but far from all—of the observed care differences reflect the older average age and different demographic profiles of impaired individuals. Even in the income subsample model (column 4), which has a much smaller sample size, the pattern persists with dementia diagnosis associated with a 58.2 percentage point increase and ADL limitations with a 36.4 percentage point increase in care probability.

This persistent difference even after controlling for demographic, socioeconomic, and economic factors indicates that the relationship between dementia diagnosis and care receipt in Japan reflects more than just correlated individual characteristics. The pattern likely reflects both the objective care intensity required for cognitive impairment and structural features of Japan's LTCI system

that may facilitate formal care access for those with diagnosed dementia. The approximately 20-percentage-point difference between dementia diagnosis and ADL limitations remains consistent across specifications, suggesting that dementia diagnosis is associated with substantially higher care utilization than physical impairment alone—a finding with important implications for care system capacity as dementia prevalence grows.

Demographic patterns in care receipt reveal additional insights into Japan's care landscape. Age shows a small negative coefficient (approximately -0.006 per year), though this is offset by the positive quadratic term, suggesting that very advanced age is associated with higher care likelihood once impairment status is controlled. Marriage is associated with slightly lower care receipt (-0.032 percentage points). Having children shows mixed effects: any children slightly increase care probability (+0.009), as does each additional child (+0.001), though the magnitude is small. These patterns underscore the continuing importance of family structure in Japan's care arrangements, even within a universal public insurance system.

Lower education (less than high school) is associated with a higher probability (1.0 percentage point) of receiving care. This may reflect either lower informal care capacity among less educated households, greater care needs, or differences in help-seeking behavior. Income shows a negative relationship (column 4): higher income is associated with slightly lower care probability (-1.0 percentage points per unit increase in inverse hyperbolic sine), though this effect is modest and may reflect that wealthier individuals can delay formal care entry or purchase services outside the LTCI system that we do not capture.

Informal care patterns

Table 4a. Determinants of Receiving Any Informal Care: Extensive Margin

	(1)		(2)		(3)		(4)	
1+ ADL & No Dementia Diagnosis	0.408	***	0.338	***	0.336	***	0.322	***
	(0.003)		(0.003)		(0.003)		(0.009)	
With Dementia Diagnosis	0.633	***	0.520	***	0.515	***	0.550	***
	(0.006)		(0.006)		(0.006)		(0.018)	
Age - 65			-0.006	***	-0.006	***	-0.006	
			(0.000)		(0.000)		(0.001)	
(Age - 65) Squared			0.001	***	0.001	***	0.001	***
			(0.000)		(0.000)		(0.000)	
Male					-0.019	***	-0.011	

					(0.002)		(0.007)	
Married					-0.004	**	-0.014	**
					(0.002)		(0.005)	
Male * Married					0.007	**	0.014	
					(0.003)		(0.008)	
Number of children					-0.005	*	-0.006	
					(0.002)		(0.008)	
Any children					0.044	***	0.041	***
					(0.003)		(0.010)	
Less than high school					0.010	***	0.006	
					(0.001)		(0.004)	
Some college					-0.003	*	-0.005	
					(0.002)		(0.004)	
College or more					-0.002		0.003	
					(0.001)		(0.004)	
Income (Inverse Hyperbolic Sine)							-0.011	***
							(0.002)	
Constant	0.045	***	0.016	***	0.017	***	0.084	***
	(0.000)		(0.001)		(0.002)		(0.014)	
Observations	264,060		263,807		263,807		28,941	
Mean dependent variable	0.1		0.1		0.1		0.1	
R-squared	0.257		0.323		0.327		0.333	

Notes: This table presents linear probability model estimates in which the dependent variable is an indicator for receiving informal care only. The sample includes Japanese adults aged 65 and older from the 2016 and 2019 waves of the CSLC. Physical limitations are defined using the same hierarchical classification system as previous tables, where individuals with any ADL limitation are classified as "1+ ADL" regardless of IADL status. Dementia diagnosis is operationally defined as regularly visiting healthcare facilities for dementia treatment (self-reported or proxy-reported). The reference group is individuals with no ADL limitations and no dementia diagnosis. Columns 1-3 use the full merged household-health survey sample (N=263,807-264,060), while Column 4 uses the income survey subsample (N=28,941), which represents approximately 10% of households with no overlap with the long-term care survey. Informal care indicates assistance from family members or relatives regardless of co-residence, while formal care is defined as having LTCI certification. Education variables are relative to high school education. Income is measured using inverse hyperbolic sine transformation to accommodate zeros. Robust standard errors are in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

Informal care (extensive margin): Table 4a examines the probability of receiving any informal care.[11] Elderly individuals with dementia diagnosis are more likely to receive any informal care than those with ADL limitations but no dementia diagnosis. The probability of receiving any informal care is 51.5 percentage points higher for those with dementia diagnosis compared to the

[11] Table 4a-A in the appendix presents an alternative specification with interaction terms and categorical age groups. The results are consistent with the main specification, showing strong positive associations for both impairment types with informal care receipt.

reference group, while it is 33.6 percentage points higher for those with ADL limitations in the fully adjusted model (column 3).

This pattern suggests that in Japan, dementia diagnosis triggers both formal LTCI service utilization and sustained informal caregiving, likely reflecting the intensive and multifaceted nature of dementia care. The substantial effect for dementia diagnosis compared to ADL limitations indicates that cognitive impairments generate particularly strong informal care responses from families, even when formal services are potentially also utilized—a pattern consistent with the specialized dementia care services described in our policy section (dementia-specific day care, group homes, etc.) that complement rather than substitute for family involvement.

Age shows a negative relationship with receiving any informal care (coefficient on linear term: -0.006), though the quadratic term indicates this effect diminishes at very advanced ages. Being married shows a small but significant decrease in the likelihood of receiving any informal care (-0.4 percentage points for women), though this effect is attenuated for men (interaction coefficient: +0.7 percentage points), suggesting gender differences in spousal caregiving patterns. Having any children substantially increases the probability of receiving any informal care (4.4 percentage points), highlighting the central role of filial support in Japan's care system, though the effect of additional children is slightly negative (-0.5 percentage points), possibly reflecting coordination challenges or diffusion of responsibility among multiple siblings.

Lower education (less than high school) is associated with a higher probability of receiving any informal care (+1.0 percentage points), which may reflect stronger traditional norms around family caregiving, socioeconomic differences in attitudes toward formal care, or geographic concentration in areas with closer family networks.

In column (4), we include income as an additional control, using the income subsample that represents approximately 10% of households. Higher income is associated with a lower probability of receiving any informal care (-1.1 percentage points), suggesting that wealthier individuals may have better access to comprehensive formal care services that reduce the need for family involvement, or they may utilize paid private care that falls outside the informal care definition. The pattern persists in the income subsample, with dementia diagnosis showing a 55.0 percentage

point effect and ADL limitations showing a 32.2 percentage point effect, confirming that cognitive impairment has a substantially stronger association with receiving any informal care than physical limitations alone, even after accounting for economic resources.

Informal care (intensive margin): Moving from the extensive to the intensive margin of informal care, Table 4b examines how many hours of care individuals receive once they are receiving any informal care.[12] This analysis shifts focus from whether care is received to how intensive that care is—a critical dimension for understanding caregiver burden and the sustainability of family-based care arrangements. This analysis uses the long-term care questionnaire subsample of approximately 6,800 individuals who receive informal care as their primary arrangement, with no overlap with the income survey. Consequently, we cannot include income as a control variable in this intensive margin analysis.

Table 4b. Determinants of Informal Care Hours: Intensive Margin

	(1)		(2)		(3)	
1+ ADL & No Dementia Diagnosis	80.2	***	77.7	***	75.4	***
	(4.1)		(4.1)		(4.1)	
With Dementia Diagnosis	107.0	***	108.0	***	107.0	***
	(5.8)		(5.8)		(5.7)	
Age - 65			-7.7	***	-6.9	***
			(1.2)		(1.2)	
(Age - 65) Squared			0.2	***	0.2	***
			(0.0)		(0.0)	
Male					-7.9	
					(6.9)	
Married					34.3	***
					(5.9)	
Male * Married					29.1	**
					(9.6)	
Any children					-13.3	
					(30.6)	
Less than high school					-4.1	

[12] Table 4b-A in the appendix presents an alternative specification with interaction terms and categorical age groups. Notably, the interaction specification reveals that while dementia alone is associated with modest increases in care hours (23.6 hours/month), individuals with both dementia and ADL limitations receive substantially more intensive care (135.4 hours/month in the fully adjusted model), with a positive and significant interaction term (+35.6 hours) indicating synergistic effects. This contrasts with the extensive margin where interaction terms were negative, suggesting that while families may face constraints in whether they can provide care when multiple needs are present, those who do provide care invest substantially more time when both cognitive and physical impairments coexist.

					(4.4)	
Some college					-10.1	
					(9.2)	
College or more					11.2	
					(10.2)	
Constant	58.7	***	120.0	***	80.0	***
	(2.8)		(11.2)		(12.2)	
Observations	6,792		6,792		6,792	
Mean dependent variable	122.00		122.00		122.00	
R-squared	0.055		0.062		0.081	

Notes: This table presents OLS estimates in which the dependent variable is monthly hours of informal care, conditional on receiving informal care as the primary caregiving arrangement. The sample includes Japanese adults aged 65 and older from the 2016 and 2019 waves of the CLSC who reported having a family member or relative as their primary caregiver. Physical limitations are defined using the same hierarchical classification system as previous tables, where individuals with any ADL limitation are classified as "1+ ADL" regardless of IADL status. Dementia diagnosis is operationally defined as regularly visiting healthcare facilities for dementia treatment (self-reported or proxy-reported). The reference group is individuals with no ADL limitations and no dementia diagnosis. This analysis uses the long-term care questionnaire subsample of approximately 6,000 individuals with LTCI certification, which has no overlap with the income survey. Care hours are derived from survey responses about primary caregiver time commitment and converted to monthly hours using the following assumptions: "almost all day" (480 hours), "about half a day" (240 hours), "about 2-3 hours" (75 hours), "help when needed" (15 hours), and "occasional care" (9.26 hours). Hours represent time provided by the primary informal caregiver only. Education variables are relative to high school education. The variable 'Number of children' is omitted from this model specification, with only the binary 'Any children' indicator included. Income is not available for this subsample. Robust standard errors are in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

Among those receiving informal care, we observe substantial differences in care hours between the two impairment types. Individuals with dementia diagnosis receive significantly more hours of care—approximately 107.0 more hours per month compared to those without impairments. In contrast, individuals with ADL limitations but no dementia diagnosis receive about 80.2 more hours per month. This represents a meaningful difference of nearly 27 hours per month (roughly an additional hour per day) between the two impairment types, with dementia diagnosis associated with more intensive informal caregiving.

This intensive margin finding persists with full demographic controls in column (3), where individuals with dementia diagnosis receive 107.0 additional hours per month while those with ADL limitations receive 75.4 additional hours. The pattern aligns with expectations that cognitive impairments generally create higher caregiving burdens than physical limitations alone, reflecting the comprehensive supervision needs of those with cognitive decline who often require constant attention rather than just assistance with specific tasks. For Japan's aging society, this 32-hour

monthly difference (roughly 1 hour per day) has significant implications for caregiver burden and the sustainability of family-based care as dementia prevalence rises.

Age shows a significant negative relationship with care hours (-6.9 hours per month per additional year of age), possibly reflecting selection effects where those who survive to more advanced ages with physical limitations have different care needs patterns, or indicating that the oldest-old receive relatively less intensive family care—perhaps due to caregiver aging or exhaustion. Gender and marital status play important roles in care intensity, with married individuals receiving 34.3 more hours of informal care per month. The interaction between male and married status is particularly notable, with married men receiving an additional 29.1 hours of care, suggesting that married men may receive more intensive informal care than other groups—likely reflecting the traditional pattern in Japan where wives serve as primary caregivers for their husbands, whereas married women may receive less intensive spousal care or may rely more on adult children.

Educational differences in care hours are not statistically significant, indicating that care intensity may be driven more by functional needs than socioeconomic factors once individuals are already receiving informal care. This contrasts with the extensive margin findings where education did predict care receipt, suggesting that while socioeconomic factors influence whether care is obtained, the intensity of care provided is primarily determined by need rather than resources—at least within the realm of family caregiving.

Formal care patterns

Table 5a. Determinants of Receiving Any Formal Care: Extensive Margin

	(1)		(2)		(3)		(4)	
1+ ADL & No Dementia Diagnosis	0.373	***	0.310	***	0.309	***	0.296	***
	(0.003)		(0.003)		(0.003)		(0.009)	
With Dementia Diagnosis	0.657	***	0.555	***	0.553	***	0.550	***
	(0.006)		(0.006)		(0.006)		(0.019)	
Age - 65			-0.007	***	-0.007	***	-0.006	***
			(0.000)		(0.000)		(0.001)	
(Age - 65) Squared			0.001	***	0.001	***	0.001	***
			(0.000)		(0.000)		(0.000)	
Male					-0.023	***	-0.004	
					(0.002)		(0.006)	
Married					-0.027	***	-0.018	***
					(0.001)		(0.004)	

Male * Married					0.017	***	0.007	
					(0.002)		(0.007)	
Number of children					-0.004		-0.010	
					(0.002)		(0.006)	
Any children					0.004		0.013	
					(0.003)		(0.008)	
Less than high school					0.003	**	0.002	
					(0.001)		(0.003)	
Some college					-0.001		0.002	
					(0.001)		(0.004)	
College or more					-0.002		-0.002	
					(0.001)		(0.003)	
Income (Inverse Hyperbolic Sine)							-0.003	
							(0.002)	
Constant	0.031	***	0.011	***	0.036	***	0.040	***
	0.000		(0.001)		(0.001)		(0.012)	
Observations	264,060		263,807		263,807		28,941	
Mean dependent variable	0.09		0.09		0.09		0.08	
R-squared	0.279		0.343		0.345		0.338	

Notes: This table presents linear probability model estimates in which the dependent variable is an indicator for receiving formal care only. The sample includes Japanese adults aged 65 and older from the 2016 and 2019 waves of the CSLC. Physical limitations are defined using the same hierarchical classification system as previous tables, where individuals with any ADL limitation are classified as "1+ ADL" regardless of IADL status. Dementia diagnosis is operationally defined as regularly visiting healthcare facilities for dementia treatment (self-reported or proxy-reported). The reference group is individuals with no ADL limitations and no dementia diagnosis. Columns 1-3 use the full merged household-health survey sample (N=263,807-264,060), while Column 4 uses the income survey subsample (N=28,941), which represents approximately 10% of households with no overlap with the long-term care survey. Formal care is defined as having LTCI certification, while informal care indicates assistance from family members or relatives regardless of co-residence. Education variables are relative to high school education. Income is measured using inverse hyperbolic sine transformation to accommodate zeros. Robust standard errors are in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

Formal care (extensive margin): For any formal care (Table 5a), the pattern shows that both impairment types substantially increase the likelihood of receiving formal care, with dementia diagnosis showing a dramatically stronger effect.[13] Individuals with dementia diagnosis are 55.3 percentage points more likely to receive any formal care compared to the reference group, while those with ADL limitations but no dementia diagnosis are 30.9 percentage points more likely in the fully adjusted model (column 3). This substantial difference—dementia diagnosis nearly

[13] Table 5a-A in the appendix presents an alternative specification with interaction terms and categorical age groups. The results are broadly consistent, though the interaction specification reveals that dementia alone (36.7 percentage points) and ADL limitations alone (31.7 percentage points) have more similar effects on formal care receipt than suggested by the main specification. The combined effect for those with both conditions is 70.6 percentage points, with a small and statistically insignificant interaction term, suggesting roughly additive effects of the two impairment types on formal care utilization.

doubles the effect size compared to ADL limitations—underscores the critical role of Japan's LTCI system in providing formal services for cognitive impairment, likely reflecting both the complexity of dementia care needs and the specialized services (day care, group homes, respite care) designed specifically for this population.

Age shows a negative relationship with any formal care receipt (coefficient on linear term: -0.007), with the squared term indicating slight non-linear patterns that partially offset this effect at very advanced ages. This negative age effect, once impairment is controlled for, may reflect cohort differences in LTCI awareness or utilization patterns, or survivor bias where the healthiest individuals reach very advanced ages. Marriage shows a strong negative association with any formal care receipt (-2.7 percentage points for women), though this effect is partially offset for married men (interaction effect of +1.7 percentage points). This pattern suggests that married individuals, particularly married women, are somewhat less likely to access formal care services.

The relationship with children reveals minimal effects: having any children shows no significant association with formal care receipt, and the number of children similarly shows no significant relationship. This pattern contrasts sharply with informal care patterns and suggests that filial support primarily manifests through informal caregiving rather than affecting formal care utilization decisions.

Education shows small positive effects for those with less than high school education (+0.3 percentage points), though the magnitude is modest and may reflect geographic or cohort factors rather than causal educational effects.

Column (4) includes income controls using the smaller income subsample. The coefficients for both impairment types remain remarkably stable: dementia diagnosis shows a 55.0 percentage point effect and ADL limitations show a 29.6 percentage point effect, confirming the robustness of these patterns across different population subsamples. Income itself shows no significant relationship with any formal care receipt, which strongly supports the effectiveness of Japan's universal LTCI system where access to formal care services is primarily determined by assessed need rather than ability to pay. This stands in stark contrast to systems with more means-tested or private insurance-based care, where income would be expected to show stronger effects. The lack

of income effects suggests that LTCI successfully removes financial barriers to formal care access, at least for the core services covered by the system.

Formal care (intensive margin): The intensive margin for formal care (Table 5b) reveals substantial differences between impairment types.[14] This analysis shifts to examining care intensity among those receiving formal care, using the long-term care questionnaire subsample, focusing on those who receive formal care, with no overlap with the income survey. Individuals with dementia diagnosis receive approximately 113.0 additional hours of formal care per month compared to the reference group, while those with ADL limitations but no dementia diagnosis receive 71.6 additional hours in the fully adjusted model (column 3). This represents a dementia diagnosis effect that is roughly 60% larger than the ADL limitations effect, indicating that cognitive impairments are associated with substantially more intensive formal service use—roughly 40 more hours per month, or over 1.3 hours more per day.

Table 5b. Determinants of Formal Care Hours: Intensive Margin

	(1)		(2)		(3)	
1+ ADL & No Dementia Diagnosis	77.9	***	75.2	***	71.6	***
	(3.53)		(3.53)		(3.50)	
With Dementia Diagnosis	117.0	***	116.0	***	113.0	***
	(5.26)		(5.25)		(5.23)	
Age - 65			-7.52	***	-7.18	***
			(1.04)		(1.03)	
(Age - 65) Squared			0.212	***	0.233	***
			(0.028)		(0.027)	
Male					-8.24	
					(5.59)	
Married					32.5	***
					(5.09)	
Male * Married					32.3	***
					(8.25)	
Any children					-13.4	
					(27.6)	
Less than high school					-6.12	

[14] Table 5b-A in the appendix presents an alternative specification with interaction terms and categorical age groups. Similar to the informal care intensive margin, the interaction specification reveals that dementia alone is associated with modest increases in formal care hours (30.4 hours/month), while individuals with both dementia and ADL limitations receive substantially more intensive formal care (143.6 hours/month in the fully adjusted model), with a positive and significant interaction term (+40.4 hours). This parallel pattern across both informal and formal care suggests that the combination of cognitive and physical impairments creates synergistic care demands that substantially amplify service intensity in both care sectors.

					(3.80)	
Some college					-18.7	*
					(7.29)	
College or more					3.49	
					(8.74)	
Constant	53.1	***	109	***	81.2	***
	(2.23)		(9.63)		(10.2)	
Observations	8,519		8,519		8,519	
Mean dependent variable	113.71		113.71		113.71	
R-squared	0.066		0.074		0.094	

Notes: This table presents OLS estimates in which the dependent variable is monthly hours of formal care, conditional on receiving formal care as the primary caregiving arrangement. The sample includes Japanese adults aged 65 and older from the 2016 and 2019 waves of the CSLC who reported having a professional caregiver or service provider as their primary caregiver. Physical limitations are defined using the same hierarchical classification system as previous tables, where individuals with any ADL limitation are classified as "1+ ADL" regardless of IADL status. Dementia diagnosis is operationally defined as regularly visiting healthcare facilities for dementia treatment (self-reported or proxy-reported). The reference group is individuals with no ADL limitations and no dementia diagnosis. This analysis uses the long-term care questionnaire, which has no overlap with the income survey. Care hours are derived from survey responses about primary caregiver time commitment and converted to monthly hours using the following assumptions: "almost all day" (480 hours), "about half a day" (240 hours), "about 2-3 hours" (75 hours), "help when needed" (15 hours), and "occasional care" (9.26 hours). Hours represent time provided by the primary formal caregiver only. Education variables are relative to high school education. The variable "Number of children" is omitted from this model specification, with only the binary "Any children" indicator included. Income is not available for this subsample. Robust standard errors are in parentheses. * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

This difference (41.4 additional hours for dementia versus ADL limitations alone) underscores the intensive resource requirements for supporting those with cognitive impairments through formal services, likely reflecting the need for constant supervision and specialized dementia care approaches described in our policy section. Notably, this proportional difference (58% higher for dementia) is somewhat larger than what we observed for informal care intensity (42% higher for dementia), suggesting that the formal care system may be particularly responsive to the specialized needs of dementia patients, possibly through more structured service packages designed for cognitive impairment.

Age shows a negative relationship with formal care hours (-7.2 hours per additional year of age beyond 65), similar to the pattern observed for informal care (-6.9 hours). This consistent age pattern across care types may reflect selection effects where only those with particular characteristics continue to receive intensive care at very advanced ages, survivor bias where healthier individuals reach very advanced ages, or cohort differences in care arrangements and service utilization patterns.

Marriage shows a strong positive association with formal care hours for both men and women, though the effect is particularly pronounced for married men. Being married is associated with 32.5 additional hours per month for women, while married men receive an additional 64.8 hours per month (32.5 + 32.3 interaction effect). This pattern contrasts with the extensive margin where marriage reduced formal care receipt, suggesting complex interactions between marital status and care arrangements.

Having children shows no significant relationship with formal care hours, suggesting that family structure primarily affects whether formal care is received rather than how intensively it is used once initiated—consistent with formal care provision responding primarily to assessed functional needs rather than family availability.

Education shows some variation in formal care hours, with those having some college education receiving 18.7 fewer hours per month compared to high school graduates. However, this pattern is not consistent across all education levels. The isolated effect for some college may reflect cohort-specific factors or differential service utilization patterns, but the overall educational gradient in formal care intensity appears weaker than might be expected, suggesting relatively equitable service provision across educational groups within Japan's universal LTCI system.

Synthesis of regression findings

These regression analyses reveal several key patterns in how Japan's care system responds to different types of impairment. First, cognitive impairment (as measured by dementia diagnosis requiring treatment) is associated with substantially higher care receipt and intensity than physical impairment alone. At the extensive margin, dementia diagnosis shows larger effects than ADL limitations for both informal and formal care receipt. At the intensive margin, dementia diagnosis is associated with roughly 40-60% more care hours than ADL limitations alone, for both formal and informal care.

Second, the care system shows important similarities in response patterns across impairment types: both dementia diagnosis and ADL limitations substantially increase the probability of receiving any care (whether informal or formal), with dementia showing consistently larger effects. The substantial effects for dementia diagnosis across both informal and formal care indicate that

cognitive impairment powerfully triggers comprehensive care responses involving both family and professional caregivers.

Third, demographic factors—particularly gender, marital status, and family structure—shape care arrangements in ways that reflect Japan's cultural context, with married men receiving more intensive informal care but formal care showing less gender differentiation. These patterns underscore the continuing importance of family caregiving even within a universal public insurance system.

Fourth, socioeconomic factors show relatively modest relationships with care patterns, consistent with Japan's universal LTCI coverage. Education shows small positive effects on the probability of receiving any informal care but no consistent effects on care intensity. Income shows small negative effects on receiving any informal care but no significant relationship with formal care receipt, suggesting that LTCI successfully removes financial barriers to accessing formal services. However, these modest socioeconomic patterns raise questions about potential disparities in care navigation, supplementary service use, or care quality that deserve further investigation.

Finally, the persistent and substantial differences between cognitive and physical impairment across multiple regression specifications—even after extensive demographic and socioeconomic controls—indicate that these patterns reflect more than just correlated individual characteristics. They likely reflect both the objective differences in care needs (dementia requiring more intensive supervision and behavioral management) and the successful functioning of Japan's care system in providing appropriate responses to different impairment types. The consistency of dementia effects across both informal and formal care suggests that families and the LTCI system work in tandem to address cognitive impairment, rather than substituting for one another. For policymakers in other aging societies, Japan's experience suggests that care systems must be designed with adequate capacity for the particularly intensive, multi-faceted care required by those with dementia, recognizing that cognitive impairment generates substantial demands on both family caregivers and formal service systems simultaneously.

Costs

This section estimates the national economic burden of long-term care for elderly individuals aged 65+ in Japan, providing both aggregate costs and per capita figures across different impairment types. Our analysis estimates the costs of formal long-term care for elderly individuals aged 65+ in Japan, segmented by impairment type. We calculated costs across three distinct groups: individuals with no ADL limitations and no dementia diagnosis, individuals with 1+ ADL limitations but no dementia diagnosis, and individuals with dementia diagnosis regardless of their physical limitation status. By documenting both the scale of care costs and how they vary by impairment type, this analysis offers insights for other aging societies regarding fiscal sustainability, resource allocation, and the economic case for prevention and early intervention programs.

Table 7. Economic Burden of Formal and Informal Care by Physical Limitations and Dementia Diagnosis Status - 2019

	0 ADL & No Dementia Diagnosis	1+ ADLs & No Dementia Diagnosis	With Dementia Diagnosis	Total
Panel A: Formal Care – Self-Report Monthly Costs Approach				
Observations	1,743	2,485	943	5,171
Population (millions)	1.10	1.52	0.51	3.13
National total (Billions JPY)	1,120	3,060	1,799	5,979
National total (Billions USD)	10	28	17	55
Per capita (JPY)	1,021,632	2,010,695	3,527,159	1,911,158
Per capita (USD)	9,372	18,445	32,356	17,532
Percent of GDP	0.20%	0.55%	0.32%	1.07%
Panel B: Formal Care – Care Hours-Based Approach				
Observations	1,743	2,485	943	5,171
Population (millions)	1.10	1.52	0.51	3.13
National total (Billions JPY)	3,716	12,955	5,826	22,497
National total (Billions USD)	34	119	53	206
Per capita (JPY)	3,387,774	8,513,283	11,423,851	7,190,893
Per capita (USD)	31,078	78,097	104,797	65,966
Percent of GDP	0.67%	2.32%	1.04%	4.03%
Panel C: Informal Care – Demographic Stratification Approach				
Observations	4,310	5,574	1,880	11,764
Population (millions)	0.95	1.18	0.38	2.51
National total (Billions JPY)	1,615	2,131	655	4,401
National total (Billions USD)	15	20	6	40

Per capita (JPY)	1,704,422	1,804,266	1,736,525	1,756,319
Per capita (USD)	15,636	16,551	15,930	16,112
Percent of GDP	0.29%	0.38%	0.12%	0.79%

Notes: This table presents estimates of the economic costs of formal and informal care across three groups of Japanese adults aged 65 and older, based on data from the 2019 wave of the CSLC. Physical limitations are defined using the hierarchical classification system from previous tables, where individuals with any ADL limitation are classified as "1+ ADLs" regardless of IADL status. Dementia diagnosis is operationally defined as regularly visiting healthcare facilities for dementia treatment (self-reported or proxy-reported). Panel A: Formal Care – Self-Report Monthly Costs Approach estimates total system costs based on respondents' self-reported monthly out-of-pocket expenses for formal care services. Since these represent copayments under Japan's LTCI system where users typically pay 10% of total costs (with 20-30% copayment rates for higher-income individuals), we use the 10% copayment rate to estimate total costs. Total annual cost = (self-reported monthly cost ÷ 0.1) × 12 months, scaled using survey weights. Panel B: Formal Care – Care Hours-Based Approach estimates costs by converting reported care hours to monetary values using 5,670 JPY per hour, the MHLW standardized rate for intensive physical care services lasting 1-1.5 hours. Care hours are derived from categorical daily care intensity responses, converted to annual totals scaled with survey weights. Panel C: Informal Care – Demographic Stratification Approach estimates costs only for co-residing informal caregivers, as demographic information necessary for wage imputation is available only for household members. Care hours from the long-term care questionnaire are stratified by caregiver demographics (region, age, education, gender, marital status) and imputed to all co-residing caregivers with matching characteristics. Hours are valued at 1,111 JPY per hour (mean wage in Japan's home health care services industry). Sample sizes differ across panels due to data availability. Panels A and B use the long-term care questionnaire subsample (approximately 6,000 individuals with LTCI certification). Panel C requires linkage between care recipients and co-residing caregivers through household identifiers. Population estimates use survey weights to scale to national levels. GDP percentages use Japan's 2019 nominal GDP of 558 trillion JPY. Exchange rate: 109 JPY per USD (2019 average). The estimates reveal substantial economic burden: formal care costs range from 1.07% to 4.03% of GDP depending on measurement approach, while informal care costs represent 0.79% of GDP. Those with dementia diagnosis incur particularly high costs—approximately 15 million JPY per capita annually in formal care (Panel A)—reflecting the intensive care needs documented in earlier tables. These estimates should be interpreted with several important limitations in mind. These analyses exclude institutionalized populations, where care needs and costs may differ substantially from community-dwelling elderly. For informal care, the analysis captures only co-residing caregivers, thereby missing substantial contributions from non-resident family members such as adult children living separately and significantly underestimating the total informal care burden. Regarding formal care measurement, self-reported costs may contain measurement error from recall bias or misunderstanding of care expense definitions, while the standardized hourly rates in the hours-based approach may not adequately capture heterogeneity in service types, quality, or regional price variations. Furthermore, the formal care cost analyses in Panels A and B include only individuals with LTCI certification, potentially excluding those who purchase care services privately without seeking certification.

Formal care costs (two complementary approaches): We employed two approaches to estimate formal care costs; each method captures different aspects of the economic burden and provides a validity check on our estimates. The first approach utilizes respondents' self-reported monthly out-of-pocket expenses for formal care services. Since these represent copayments under Japan's LTCI, where users typically pay 10% of total service costs (with higher rates of 20-30% for higher-income individuals), we adjusted for the standard 10% copayment assumption to estimate total costs. The calculation follows: total annual cost equals self-reported cost divided by 0.1, multiplied by 12 months and scaled using survey weights. The second approach converts reported formal care hours into monetary values using a standardized hourly rate of 5,670 JPY (52 USD) derived from

the MHLW fee schedule (MHLW, 2023d). The MHLW establishes standardized at-home care rates for various levels of care, including physical care and lifestyle support. For our analysis, we used the highest tier of physical care cost of 5,670 JPY per hour for intensive physical care services lasting between one hour and one and a half hours. Care hours were obtained from survey responses about daily care intensity, converted to monthly totals, then annualized and scaled to the national level using survey weights.

Comparing results across approaches: As shown in Table 7, the two approaches yield notably different cost estimates, with the hours-based valuation producing estimates approximately 3.8 times higher than the self-reported cost method. Self-reported costs (Panel A) show total national formal care costs of 6.0 trillion JPY (55 billion USD), representing 1.07% of GDP. Per capita costs vary substantially by impairment type, with individuals with dementia diagnosis requiring 3.5 million JPY (32,356 USD) annually, compared to 2.0 million JPY (18,445 USD) for those with ADL limitations but no dementia diagnosis and 1.0 million JPY (9,372 USD) for those without significant impairments.

Hours-based valuation (Panel B) yields substantially higher estimates of 22.5 trillion JPY (206 billion USD) nationally, representing 4.03% of GDP. Per capita costs follow a similar pattern across impairment groups as the self-reported cost approach, with individuals with dementia diagnosis requiring 11.4 million JPY (104,797 USD), those with ADL limitations requiring 8.5 million JPY (78,097 USD), and those without significant impairments requiring 3.4 million JPY (31,078 USD).

Why the approaches differ: The substantial difference in aggregate estimates—with hours-based costs being 3.8 times higher than self-reported costs—reflects fundamental differences in what each approach captures and potential measurement issues in both methods.

The self-reported cost approach has several potential sources of underestimation. First, respondents may underreport their actual expenses due to recall error, particularly if costs are paid by other family members or through complex insurance arrangements. Second, some individuals may report only their out-of-pocket copayments without understanding the full-service costs, despite survey instructions. Third, the approach relies on accurate self-reports from individuals or

proxies who may have cognitive impairments themselves. These factors likely contribute to the lower estimates, particularly among those with more complex care arrangements.

The hours-based approach, while offering the advantage of objective standardized pricing, has a critical limitation: the survey questions about care receipt do not clearly distinguish between formal LTCI-covered services and informal family care. Respondents reporting "care hours" may include substantial informal care time alongside formal services, leading to overestimation when all reported hours are valued at formal care rates. This conflation is particularly problematic for individuals with dementia or substantial ADL limitations, who typically receive mixed formal-informal care arrangements. The three-fold higher estimates from this approach likely reflect this measurement issue rather than capturing additional legitimate formal care costs.

Pattern consistency across methods: Despite the magnitude differences, both approaches consistently demonstrate that dementia diagnosis is associated with substantially higher formal care costs compared to physical impairments alone. The self-reported cost approach shows individuals with dementia diagnosis requiring 75% higher per capita expenditures than those with ADL limitations (3.5 million vs 2.0 million JPY), while the hours-based approach shows a 34% difference (11.4 million vs 8.5 million JPY). This consistent pattern across methodologies strengthens confidence that the cost premium for dementia diagnosis reflects real differences in care intensity rather than measurement artifact, though the magnitude of the differential varies by method. The pattern highlights the disproportionate economic burden of dementia diagnosis within Japan's long-term care system and underscores the challenges that the growing prevalence of dementia will pose for fiscal sustainability.

Informal care costs (the hidden economic burden): For informal care costs, our method required imputation to value caregivers' care time. Due to data constraints in the survey design, we can only identify and analyze co-residing informal caregivers, as the CSLC only collects demographic information for household members, making it impossible to obtain the caregiver characteristics necessary for our demographic stratification approach when caregivers live outside the household. This limitation means our informal care cost estimates represent a lower bound, excluding potentially substantial care provided by non-resident adult children and other relatives.

Methodology: Our approach involved a two-stage process to estimate the economic value of informal care. First, we identified co-residing informal caregivers using household member identifiers, which links care recipients to their primary caregivers within the same household. This identification process captured caregivers' demographic characteristics including age, education level, gender, and marital status from the household questionnaire.

Second, we developed a demographic stratification approach to impute care hours across all co-residing caregivers. We collected actual care hour data from caregivers who provided responses in the long-term care questionnaire,[15] converting categorical daily care intensity responses into annual hour estimates (5,760 hours for "almost all day," 2,880 hours for "about half a day," 900 hours for "2-3 hours daily," and 180 hours for "as needed assistance"). These caregivers were then grouped into demographic cells based on eight geographic regions (Hokkaido, Tohoku, Kanto, Chubu, Kinki/Kansai, Chugoku, Shikoku, and Kyushu/Okinawa), three age categories (under 50, 50-64, 65+), three education levels (below high school/other, high school/some college, college or higher), gender (male, female), and four marital status (single, married, divorced, widowed). Within each demographic cell, we calculated mean annual care hours, which were then imputed back to all co-residing informal caregivers with matching demographic characteristics. This stratification approach assumes that caregivers with similar demographic profiles provide similar amounts of care—an assumption that enables national-level cost estimation but necessarily smooths over individual variation in caregiving intensity, family dynamics, and care recipient needs.

We valued informal care hours at 1,111 JPY per hour, representing the mean hourly wage in Japan's home health care services industry (Fu et al., 2023). This standardized rate provides a conservative estimate of informal care value, as it assumes family caregivers could be replaced by

[15] Table A6 in the appendix summarizes the care hours by gender and caregiver-recipient types. Female caregivers generally provide more care hours than male caregivers across all relationship types, with parents (particularly mothers averaging 241 hours) and female spouses (176 hours) bearing the highest care burden, while male children provide the least among family caregivers (96 hours). Non-family helpers provide substantial care hours (159 hours on average), exceeding most family members except spouses and parents. The large standard deviations across all categories indicate considerable variation in care intensity within each caregiver type.

professional care workers at market wages—a "replacement cost" approach commonly used in care valuation studies. The total cost was scaled to national levels using survey weights.

Findings: Using this demographic stratification approach, our analysis estimates total national informal care costs at 4.4 trillion JPY (40 billion USD) annually, representing 0.79% of GDP. Per capita costs show remarkable consistency across impairment groups: individuals with dementia diagnosis require 1.74 million JPY (15,930 USD), those with ADL limitations require 1.80 million JPY (16,551 USD), and those without significant impairments require 1.70 million JPY (15,636 USD) annually.

This uniformity in per capita costs across impairment types—in sharp contrast to the large differences observed for formal care—merits careful interpretation. The similarity in per capita costs across groups suggests that co-residing family caregivers provide intensive support regardless of specific care needs, potentially reflecting cultural expectations of family care responsibilities in Japan. However, this finding should be interpreted cautiously, as our analysis captures only co-residing caregivers and excludes non-co-residing family members who may provide substantial care, particularly for individuals with less severe impairments. The pattern may also reflect our imputation methodology, which stratifies by demographic characteristics rather than care recipient needs, potentially smoothing out real differences in care intensity across impairment types.

Comparing formal and informal care burdens: The informal care cost of 0.79% of GDP, while substantial, now appears comparable to the corrected formal care self-reported costs of 1.07% of GDP, though modest compared to the hours-based estimate of 4.03% of GDP. However, these comparisons require careful interpretation for several reasons. First, our informal care estimate captures only co-residing caregivers, missing potentially substantial contributions from non-resident family members—meaning the true informal care burden is significantly higher. Second, our measure captures only care time, not the opportunity costs of employment reductions, career interruptions, or complete workforce exit that many caregivers experience. Third, the relatively uniform informal care costs across impairment types suggest that co-residing families respond to the presence of any significant care need rather than scaling their response to the severity or type

of impairment—a pattern that may reflect cultural norms but could also indicate that families are providing near-maximum care effort regardless of need, raising sustainability concerns.

Nevertheless, even with these limitations, the estimated 0.79% of GDP in co-residing informal care represents a significant "shadow economy" that supports the formal care system and enables many elderly individuals to remain in community settings rather than requiring institutional care. For context, this informal care contribution equals roughly 74% of the formal care expenditure using the self-reported approach or 20% using the hours-based approach, indicating that family caregiving remains a critical component of Japan's care system despite comprehensive public insurance coverage. Given that the hours-based approach likely overestimates formal care by including informal care hours, while the self-reported approach may underestimate due to reporting errors, informal caregiving likely represents an even larger share of the true total care burden than these figures suggest.

Methodological limitations and interpretation caveats: Several limitations warrant careful consideration when interpreting these cost estimates, as they affect both the absolute magnitudes and the comparative patterns across impairment types.

First, the formal care cost analyses in Panels A and B include only individuals with LTCI certification, potentially excluding those who purchase care services privately without seeking certification —though this group is likely small given the comprehensive coverage and relatively low copayments under LTCI. The self-reported cost approach may contain measurement error from recall bias or misunderstanding of care expense definitions, particularly among those with minimal care needs where the three-fold difference between cost approaches suggests data quality concerns. The hours-based calculations assume uniform service costs across different types and intensities of care, when specialized dementia care services command higher rates, home care in rural areas may cost more due to travel time, and service quality variations exist across providers.

Second, the use of a single standardized wage rate (1,111 JPY per hour) across all types of informal care presents several limitations. While our approach assumes a uniform opportunity cost for all caregivers' time as a conservative simplification, this may not reflect the actual economic value of time for working caregivers, who may earn substantially different hourly wages based on their

occupation, skills, and experience. By applying a uniform rate, we may systematically undervalue the time of high-earning caregivers while potentially overvaluing the opportunity cost for those with lower market wages.

Additionally, this flat rate approach fails to account for the heterogeneity in caregiving tasks themselves, which range from basic assistance with daily activities to complex medical care requiring specialized skills. The standardized rate represents an average across all home health care services, regardless of the actual complexity or skill requirements of the caregiving being provided. Moreover, our approach does not capture the non-time costs of caregiving—the physical and emotional toll, stress, health impacts on caregivers, and reduced quality of life—which represent real economic losses that exceed simple wage replacement calculations.

Third, the restriction to co-residing caregivers likely underestimates total informal care costs, as elderly individuals may receive support from adult children or other relatives living separately. This limitation may be particularly pronounced for individuals with minimal impairments, who might rely more heavily on periodic assistance from non-co-residing family members rather than intensive daily care from household members. Our demographic stratification approach assumes that caregivers with similar characteristics provide similar amounts of care, which may not capture individual variations in caregiving capacity, motivation, family dynamics, or care recipient needs.

Fourth, these analyses exclude institutionalized populations, where care needs and costs may differ substantially from community-dwelling elderly. According to MHLW (2024), approximately 23% of certified long-term care recipients with severe care needs live in institutional settings, with even higher rates among those with dementia. By excluding this population, we likely underestimate the total formal care costs, particularly for individuals with severe dementia who are more likely to require institutional care. The exclusion also means our findings reflect care arrangements for the less severely impaired subset of each impairment category who remain in the community.

Despite these limitations, several robust patterns emerge that have implications for policy. The 27-34% cost premium for dementia diagnosis compared to physical impairment—consistent across both measurement approaches—indicates substantial additional resource requirements for cognitive care. The 0.79% of GDP in informal care from co-residing caregivers alone—likely a

significant underestimate of total informal care—demonstrates the major economic contribution of family caregiving. And the overall formal care burden of 1-4% of GDP reflects Japan's comprehensive public commitment to long-term care, offering a benchmark for other aging societies considering universal care insurance systems.

Conclusion

This study examines the economic burden of long-term care for elderly individuals with cognitive impairments in Japan, revealing important differences in how formal and informal care systems respond to different types of impairments. Our analysis focuses on a measure capturing only 2.31% of adults aged 65 and older—those with formally diagnosed dementia who are receiving regular medical treatment. This selective sample represents individuals with more severe cognitive impairment and greater healthcare engagement than the broader population with cognitive decline.

For formal care, our revised estimates reveal more modest but still substantial cost differentials by impairment type. Using the self-reported cost method, individuals with dementia diagnosis require 3.5 million JPY (32,356 USD) annually compared to 2.0 million JPY (18,445 USD) for those with ADL limitations—a 75% premium. However, this comparison requires careful interpretation, as our interaction model analysis (Appendix Tables 3A-5A) reveals that dementia alone and ADL limitations alone have more similar effects on care utilization than these aggregate figures suggest. The large dementia coefficient in our main specification primarily reflects individuals with both cognitive and physical impairments, who face the highest care costs. These differences reflect the specialized services and intensive supervision requirements embedded within Japan's LTCI system, including dementia-specific day care with smaller group sizes and specially trained staff (MHLW, 2017; Toguchi, 2024).

In contrast, informal care provided by co-residing family members shows remarkably uniform costs across impairment types: 1.74 million JPY annually for those with dementia diagnosis, 1.80 million JPY for those with ADL limitations, and 1.70 million JPY for those without significant impairments. This pattern suggests that co-residing caregivers provide intensive support regardless of specific care needs, potentially reflecting both cultural expectations around family care responsibilities (Muramatsu & Akiyama, 2011) and the constraints families face in scaling their

response to varying levels of need. However, the interaction models reveal important heterogeneity at the intensive margin: among those receiving care, individuals with both dementia and ADL limitations receive substantially more hours of both formal and informal care, with positive interaction effects indicating synergistic demands when both impairment types coexist.

The fiscal implications for Japan's aging society are substantial. With the population experiencing dementia or mild cognitive impairment projected to reach approximately 12 million by 2040 (Cabinet Office, 2024), sustaining current formal care provision will place significant pressure on the LTCI system. The formal care costs of 1.07% of GDP (self-reported method) represent a more modest but still considerable fiscal burden. However, as the interaction models reveal, the true challenge lies in the growing population with combined cognitive and physical impairments, who require disproportionately intensive care from both formal and informal systems. When scaled across a population where one in 3.3 elderly individuals will have cognitive impairment, this represents a formidable fiscal challenge requiring difficult policy choices about benefit levels, eligibility criteria, and financing mechanisms.

Our informal care cost estimate—4.4 trillion JPY annually (0.79% of GDP) for co-residing caregivers alone—reveals a substantial economic contribution that is now comparable to formal care costs and enables community-based care. However, this estimate excludes non-co-residing caregivers and thus understates the true burden on families. The relatively uniform per capita costs across impairment types, combined with the positive interaction effects at the intensive margin, suggest that while co-residing families provide intensive baseline support regardless of impairment type, those caring for individuals with combined impairments face substantially amplified burdens. This raises questions about whether current family caregiving patterns optimally address differential needs and suggests potential value in targeted support programs that help caregivers understand and respond more effectively to varying care requirements, particularly for those managing both cognitive and physical impairments.

Japan's evolving policy framework reflects growing recognition of these distinct challenges. The progression from the Orange Plan (2012) through the 2023 Basic Act on Dementia demonstrates increasingly comprehensive attention to both care recipients' and caregivers' needs. The Act's emphasis on providing "appropriate support to family caregivers to enable both the person with

dementia and their families to live securely in their communities" (Cabinet Office, 2024) aligns with our finding that informal care plays a critical role across impairment types, though with substantially intensified demands when multiple impairments coexist. The patterns revealed by our interaction models—where combined impairments create synergistic rather than merely additive care demands—point to opportunities for interventions that enhance family caregivers' capacity to manage complex, multifaceted care needs.

While our findings validate aspects of Japan's specialized formal care approach, they also highlight concerning fiscal trajectories. The cost differentials for dementia care demonstrate appropriate recognition of specialized needs. However, the positive interaction effects at the intensive margin—where individuals with both cognitive and physical impairments require substantially more care than either condition alone would predict—underscore the importance of prevention initiatives and efficiency improvements as populations with combined impairments increase. The challenge for policymakers lies in maintaining quality and accessibility while controlling costs—a balance that becomes increasingly difficult as the care-dependent population grows relative to the working-age population, particularly as the proportion with combined impairments rises.

Several critical limitations warrant consideration. Our dementia measure captures only those receiving regular medical treatment, excluding undiagnosed cases and those not seeking care. The CSLC's exclusion of institutionalized populations, where approximately 23% of severe care recipients reside (MHLW, 2024), means we underestimate total care costs. Additionally, our informal care analysis is restricted to co-residing caregivers, missing potentially substantial contributions from non-resident family members—a limitation that may be particularly pronounced for individuals with less severe impairments who might rely more heavily on periodic assistance rather than intensive daily care from household members. Furthermore, measurement challenges in both our formal care approaches—with self-reported costs likely underestimating due to reporting errors and hours-based approaches likely overestimating by conflating formal and informal care—suggest that true formal care costs likely fall between our estimates of 1.07% and 4.03% of GDP.

These data constraints—particularly the exclusion of institutionalized populations, the inability to track non-resident caregivers, the lack of direct cognitive assessment tools, and the modular survey design preventing linkage between income, health, and care data—highlight critical gaps in Japan's research infrastructure for studying long-term care. Future research would benefit from surveys that include institutional populations, comprehensive tracking of all informal care providers, incorporation of validated cognitive screening tools in national surveys, and integrated data collection allowing joint analysis of health, care, and economic variables. Such enhancements would enable broader cognitive impairment measures to determine whether our findings extend beyond the diagnosed population, longitudinal analyses to examine how cost patterns evolve with disease progression, and better understanding of how care demands scale when multiple impairments coexist—all particularly important for evidence-based policy development in rapidly aging societies.

As the world's most rapidly aging society, Japan's experience provides valuable lessons for nations facing similar demographic transitions. Three key insights emerge from our analysis. First, the differential responses of formal and informal care systems to cognitive versus physical impairments—and particularly the synergistic effects when both coexist—highlight the importance of comprehensive approaches that recognize both the specialized needs of dementia care and the amplified demands of combined impairments. Second, even universal public insurance systems like Japan's LTCI may not fully address care needs, as evidenced by the substantial unmet needs we document—suggesting that insurance coverage alone is insufficient without adequate service supply and family support. Third, the contrast between formal care's ability to differentiate by need and informal care's baseline uniformity, combined with the intensification observed when multiple impairments coexist, suggests that policies supporting family caregivers should include both financial assistance and education about how to tailor care to different conditions, with particular attention to those managing combined cognitive and physical impairments.

For other aging societies, Japan's experience demonstrates both opportunities and challenges. The development of specialized dementia services shows that care systems can respond to unique cognitive care needs, though at significant cost. The continued reliance on family caregiving despite comprehensive formal coverage underscores the importance of policies that support rather

than replace informal care. Most fundamentally, Japan's experience suggests that sustainable long-term care systems require integrated approaches addressing both formal service provision and family caregiver support, combined with realistic assessments of fiscal capacity and willingness to make difficult trade-offs between benefit generosity, eligibility breadth, and cost control. The finding that combined impairments create disproportionate care demands in both formal and informal sectors emphasizes the critical importance of prevention strategies and early intervention programs that may delay or prevent the accumulation of multiple impairments—potentially offering the most cost-effective approach to managing the economic burden of population aging.

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Appendix A: Diagnostic flowchart for dementia (adapted from the Japanese Society of Neurology, 2017)

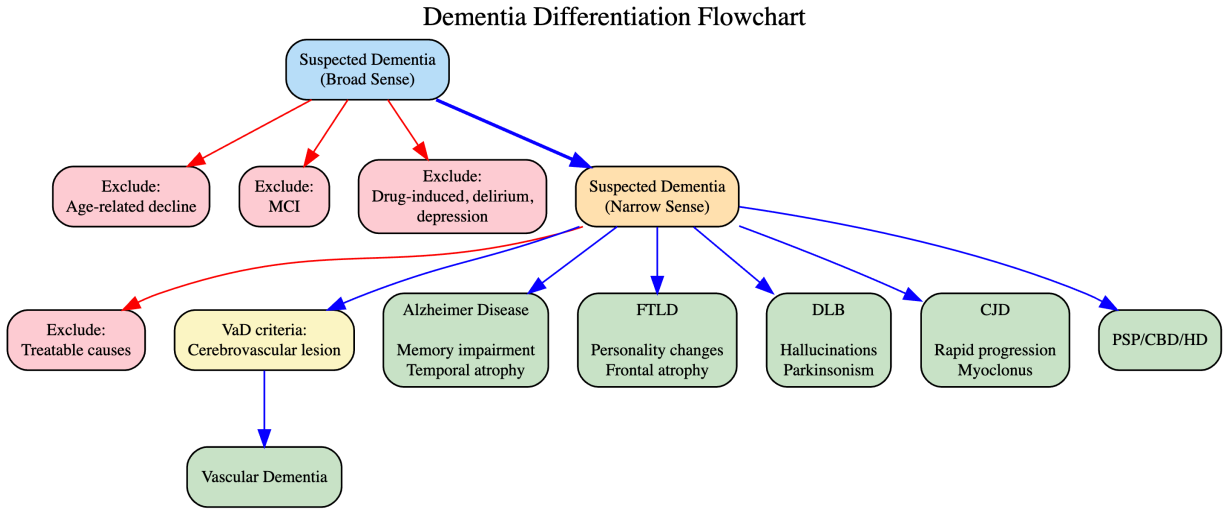

Figure A1. Diagnostic flowchart for dementia

Note: This flowchart illustrates the standardized two-stage diagnostic process used in Japanese clinical practice, adapted from the Japanese Society of Neurology's Clinical Practice Guidelines for Dementia 2017. The first stage differentiates dementia from normal age-related cognitive decline and mild cognitive impairment (MCI). The second stage identifies the specific dementia etiology (Alzheimer's disease, vascular dementia, dementia with Lewy bodies, etc.) through clinical symptoms, neuroimaging, and laboratory findings. This rigorous process explains why our measure of "regular dementia treatment" captures individuals with formal clinical diagnoses who are actively engaged in medical care, rather than the broader population with cognitive impairment including undiagnosed or unrecognized cases.

Source: Japanese Society of Neurology. (2017). Dementia Disease Clinical Practice Guidelines 2017. Chapter 2, p.37. https://www.neurology-jp.org/guidelinem/degl/degl_2017_02.pdf (Accessed October 11, 2025)

Figure A1 summarizes the standard diagnostic process for dementia as described in the Clinical Practice Guidelines for Dementia 2017 (Japanese Society of Neurology). The diagnostic pathway proceeds in two stages.

In the first stage, clinicians determine whether the observed cognitive decline meets the diagnostic threshold for dementia rather than representing normal age-related memory decline or mild cognitive impairment (MCI). Diagnostic criteria and definitions of dementia are provided by several international standards: the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10); the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5); and the National Institute on Aging–Alzheimer's Association (NIA–AA) workgroup criteria. Even if a person does not meet the criteria for dementia, cognitive decline due to underlying impairment may indicate mild cognitive impairment (MCI).

In the second stage, clinicians identify the underlying cause. This involves differentiating vascular dementia (VaD) from degenerative dementias and other secondary causes. Neuroimaging such as CT or MRI is essential to detect cerebrovascular lesions and to exclude reversible or treatable conditions—such as metabolic or endocrine disorders, infections, alcohol-related dementia, normal pressure hydrocephalus, chronic subdural hematoma, or brain tumors.

If vascular dementia is excluded, further differentiation among degenerative dementias is guided by clinical presentation and imaging findings:

- Alzheimer's disease (AD): episodic memory impairment, confabulation, delusions of theft, and marked medial temporal lobe atrophy.
- Frontotemporal lobar degeneration (FTLD): focal atrophy in the frontal and/or temporal lobes, personality change, socially inappropriate behavior, and relatively mild memory impairment.
- Dementia with Lewy bodies (DLB): fluctuating cognition, visual hallucinations, and parkinsonian symptoms.
- Creutzfeldt–Jakob disease (CJD): rapid progression, myoclonus, periodic synchronous discharges (PSD) on EEG, and cortical hyperintensity on diffusion-weighted imaging (DWI).
- Other neurodegenerative diseases such as progressive supranuclear palsy (PSP), corticobasal degeneration (CBD), and Huntington's disease (HD) are also considered in the differential diagnosis.

Table 3A. Physical Limitations and Dementia Diagnosis Effects on Probability of Receiving Any Care in Japan

	(1)		(2)		(3)		(4)	
With Dementia	0.505	***	0.421	***	0.417	***	0.412	***
	(0.010)		(0.009)		(0.009)		(0.030)	
1+ ADL	0.468	***	0.397	***	0.394	***	0.374	***
	(0.003)		(0.003)		(0.003)		(0.009)	
With Dementia * 1+ADL	-0.113	***	-0.093	***	-0.092	***	-0.058	
	(0.011)		(0.011)		(0.011)		(0.034)	
Age 75 ~ 84			0.055	***	0.045	***	0.045	***
			(0.001)		(0.001)		(0.003)	
Age 85 ~ 94			0.236	***	0.213	***	0.201	***
			(0.002)		(0.003)		(0.008)	
Age 95 ~ 104			0.478	***	0.440	***	0.477	***
			(0.008)		(0.008)		(0.025)	
Age 105 ~			0.460	***	0.411	***	-0.434	***
			(0.088)		(0.087)		(0.011)	
Male					-0.025	***	-0.009	
					(0.002)		(0.007)	
Married					-0.039	***	-0.040	***
					(0.002)		(0.005)	
Male * Married					0.018	***	0.018	*
					(0.003)		(0.008)	
Number of children					-0.002		-0.004	
					(0.002)		(0.008)	
Any children					0.016	***	0.020	
					(0.003)		(0.010)	
Less than high school					0.013	***	0.008	*
					(0.001)		(0.004)	
Some college					-0.002		-0.001	
					(0.002)		(0.005)	
College or more					-0.003	*	0.001	
					(0.001)		(0.004)	
Income (Inverse Hyperbolic Sine)							-0.012	***
							(0.002)	
Constant	0.054	***	0.009	***	0.039	***	0.098	***
	(0.000)		(0.000)		(0.002)		(0.014)	
Observations	264,060		263,807		263,807		28,941	
Mean dependent variable	0.12		0.12		0.12		0.11	
R-squared	0.299		0.364		0.368		0.362	

Notes: This table presents linear probability model estimates in which the dependent variable is an indicator for receiving any care (formal or informal). The sample includes Japanese adults aged 65 and older from the 2016 and 2019 waves of the CSLC. Physical limitations are defined using the same hierarchical classification system as previous tables, where individuals with any ADL limitation are classified as "1+ ADL" regardless of IADL status. Dementia diagnosis is operationally defined as regularly visiting healthcare facilities for dementia treatment (self-reported or proxy-reported). The reference group is individuals with no ADL limitations and no dementia diagnosis. Columns 1-

3 use the full merged household-health survey sample (N=263,807-264,060), while Column 4 uses the income survey subsample (N=28,941), which represents approximately 10% of households with no overlap with the long-term care survey. Age is modeled using categorical dummies for 75-84, 85-94, 95-104, and 105+ years, with those under 75 as the reference group. Formal care is defined as having LTCI certification, while informal care indicates assistance from family members or relatives regardless of co-residence. Education variables are relative to high school education. Income is measured using inverse hyperbolic sine transformation to accommodate zeros. Robust standard errors are in parentheses. * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Key findings: The results demonstrate that both physical limitations and dementia diagnosis are powerful predictors of care receipt. In the simplest specification (Column 1), individuals with dementia only show a 50.5 percentage point increase in care probability, while those with ADL limitations only show a 46.8 percentage point increase, relative to those with neither condition. The interaction term is negative and significant (-11.3 percentage points), indicating that individuals with both conditions receive less additional care than the sum of individual effects would predict. The combined effect for those with both dementia and ADL limitations is 86.0 percentage points (50.5 + 46.8 - 11.3). In the fully adjusted model (Column 3), the dementia-only effect is 41.7 percentage points, the ADL-only effect is 39.4 percentage points, and the interaction remains negative (-9.2 percentage points), yielding a combined effect of 71.9 percentage points for those with both conditions. These effects remain robust to controlling for demographic, socioeconomic, and family structure variables. The negative interaction may reflect ceiling effects in care utilization or limitations in the care system's capacity to fully address combined cognitive and physical needs. The negative Age 105~ coefficient in column (4) may reflect sample selection: column (4) draws from the income survey subsample which excludes LTCI respondents, so surviving 105+ year-olds in this subgroup can be disproportionately healthy non-LTCI users; conditional on income, this selection reverses the positive age gradient observed in columns (1)–(3). The Age 105~ estimate in column (4) should be interpreted with caution given the very small cell size for this age group.

Table 4a-A. Determinants of Receiving Any Informal Care: Extensive Margin

	(1)		(2)		(3)		(4)	
With Dementia	0.452	***	0.381	***	0.375	***	0.394	***
	(0.010)		(0.010)		(0.010)		(0.030)	
1+ ADL	0.408	***	0.348	***	0.345	***	0.330	***
	(0.003)		(0.003)		(0.003)		(0.009)	
With Dementia * 1+ADL	-0.102	***	-0.086	***	-0.085	***	-0.040	
	(0.012)		(0.012)		(0.012)		(0.036)	
Age 75 ~ 84			0.045	***	0.037	***	0.038	***
			(0.001)		(0.001)		(0.003)	
Age 85 ~ 94			0.201	***	0.180	***	0.176	***
			(0.002)		(0.002)		(0.007)	
Age 95 ~ 104			0.429	***	0.394	***	0.435	***
			(0.009)		(0.009)		(0.026)	
Age 105 ~			0.401	***	0.354	***	-0.395	***
			(0.094)		(0.093)		(0.010)	
Male					-0.021	***	-0.015	*
					(0.002)		(0.007)	
Married					-0.011	***	-0.022	***
					(0.002)		(0.004)	
Male * Married					0.010	***	0.019	*
					(0.003)		(0.008)	
Number of children					-0.008	**	-0.008	
					(0.002)		(0.008)	
Any children					0.050	***	0.046	***
					(0.003)		(0.010)	
Less than high school					0.013	***	0.009	*
					(0.001)		(0.004)	
Some college					-0.003	*	-0.004	
					(0.002)		(0.004)	
College or more					-0.002		0.004	
					(0.001)		(0.004)	
Income (Inverse Hyperbolic Sine)							-0.013	***
							(0.002)	
Constant	0.045	***	0.008	***	0.011	***	0.086	***
	(0.000)		(0.000)		(0.001)		(0.013)	
Observations	264,060		263,807		263,807		28,941	
Mean dependent variable	0.1		0.1		0.1		0.1	
R-squared	0.263		0.318		0.323		0.331	

Notes: This table presents linear probability model estimates in which the dependent variable is an indicator for receiving informal care only. The sample includes Japanese adults aged 65 and older from the 2016 and 2019 waves of the CSLC. Physical limitations are defined using the same hierarchical classification system as previous tables, where individuals with any ADL limitation are classified as "1+ ADL" regardless of IADL status. Dementia diagnosis is operationally defined as regularly visiting healthcare facilities for dementia treatment (self-reported or proxy-reported). The reference group is individuals with no ADL limitations and no dementia diagnosis. Columns 1-3 use the full merged household-health survey sample (N=263,807-264,060), while Column 4 uses the income survey subsample (N=28,941), which represents approximately 10% of households with no overlap with the long-term care

survey. Age is modeled using categorical dummies for 75-84, 85-94, 95-104, and 105+ years, with those under 75 as the reference group. Informal care indicates assistance from family members or relatives regardless of co-residence, while formal care is defined as having LTCI certification. Education variables are relative to high school education. Income is measured using inverse hyperbolic sine transformation to accommodate zeros. Robust standard errors are in parentheses. * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Key findings: The interaction specification reveals that individuals with dementia only show a 37.5 percentage point increase in informal care probability in the fully adjusted model (Column 3), while those with ADL limitations only show a 34.5 percentage point increase. The interaction term is negative and significant (-8.5 percentage points), yielding a combined effect of 63.5 percentage points for those with both conditions. This pattern is consistent with the main specification and suggests that while both impairment types strongly predict informal care receipt, the combined effect is less than additive, possibly reflecting capacity constraints among family caregivers or competing demands when addressing multiple care needs simultaneously. The negative Age 105~ coefficient in column (4) may reflect sample selection: column (4) draws from the income survey subsample which excludes LTCI respondents, so surviving 105+ year-olds in this subgroup can be disproportionately healthy non-LTCI users; conditional on income, this selection reverses the positive age gradient observed in columns (1)–(3). The Age 105~ estimate in column (4) should be interpreted with caution given the very small cell size for this age group.

Table 4b-A. Determinants of Informal Care Hours: Intensive Margin

	(1)		(2)		(3)	
With Dementia	23.9	**	26.2	**	23.6	**
	(8.0)		(8.0)		(8.0)	
1+ ADL	80.2	***	78.5	***	76.2	***
	(4.1)		(4.1)		(4.1)	
With Dementia * 1+ADL	31.7	**	31.7	**	35.6	***
	(10.5)		(10.5)		(10.4)	
Age 75 ~ 84			-19.6	*	-11.5	
			(7.9)		(7.9)	
Age 85 ~ 94			-28.3	***	-5.9	
			(7.6)		(7.9)	
Age 95 ~ 104			11.3		43.3	***
			(10.6)		(11.0)	
Age 105 ~			-9.63		28.1	
			(93.0)		(92.7)	
Male					-8.1	
					(6.9)	
Married					31.5	***
					(5.79)	
Male * Married					29.1	**
					(9.6)	
Any children					-16.5	
					(30.8)	
Less than high school					-4.6	
					(4.3)	
Some college					-10.9	
					(9.1)	
College or more					12.6	
					(10.0)	
Constant	58.7	***	78.8	***	47.5	***
	(2.8)		(7.4)		(8.4)	
Observations	6792		6792		6792	
Mean dependent variable	122		122		122	
R-squared	0.071		0.08		0.094	

Notes: This table presents OLS regression estimates in which the dependent variable is monthly hours of informal care received. The sample is restricted to individuals receiving informal care as their primary care arrangement from the long-term care questionnaire subsample (N≈6,792), with no overlap with the income survey. Physical limitations are defined using the same hierarchical classification system as previous tables. Dementia diagnosis is operationally defined as regularly visiting healthcare facilities for dementia treatment. The reference group is individuals with no ADL limitations and no dementia diagnosis who receive some informal care. Age is modeled using categorical dummies for 75-84, 85-94, 95-104, and 105+ years, with those under 75 as the reference group. Education variables are relative to high school education. Robust standard errors are in parentheses. * p<0.05, ** p<0.01, *** p<0.001.
Key findings: The interaction specification reveals important heterogeneity in care intensity. In the fully adjusted model (Column 3), individuals with ADL limitations alone receive 76.2 additional hours per month, while those with dementia alone receive 23.6 additional hours. Critically, the interaction term is positive and significant (+35.6 hours), indicating synergistic effects: individuals with both conditions receive approximately 135.4 hours per month (76.2 + 23.6 + 35.6). This positive interaction contrasts with the negative interactions observed at the extensive margin,

suggesting that while families may face constraints in initiating care when multiple impairments are present, those who do provide care invest substantially more time when both cognitive and physical limitations coexist. This likely reflects that physical care tasks become significantly more time-intensive when combined with cognitive impairment, requiring both hands-on assistance and behavioral management.

Table 5a-A. Determinants of Receiving Any Formal Care: Extensive Margin

	(1)		(2)		(3)		(4)	
With Dementia	0.432	***	0.369	***	0.367	***	0.340	***
	(0.010)		(0.010)		(0.009)		(0.030)	
1+ ADL	0.373	***	0.319	***	0.317	***	0.304	***
	(0.003)		(0.003)		(0.003)		(0.009)	
With Dementia * 1+ADL	0.008		0.022		0.022		0.076	*
	(0.012)		(0.012)		(0.012)		(0.036)	
Age 75 ~ 84			0.036	***	0.030	***	0.029	***
			(0.001)		(0.001)		(0.003)	
Age 85 ~ 94			0.178	***	0.162	***	0.147	***
			(0.002)		(0.002)		(0.007)	
Age 95 ~ 104			0.404	***	0.378	***	0.371	***
			(0.009)		(0.009)		(0.027)	
Age 105 ~			0.422	***	0.388	***	-0.327	***
			(0.094)		(0.094)		(0.010)	
Male					-0.025	***	-0.007	
					(0.002)		(0.006)	
Married					-0.033	***	-0.025	***
					(0.001)		(0.004)	
Male * Married					0.020	***	0.012	
					(0.002)		(0.007)	
Number of children					-0.006	**	-0.012	*
					(0.002)		(0.006)	
Any children					0.010	***	0.017	*
					(0.003)		(0.008)	
Less than high school					0.006	***	0.004	
					(0.001)		(0.003)	
Some college					-0.001		0.003	
					(0.001)		(0.004)	
College or more					-0.002		-0.001	
					(0.001)		(0.003)	
Income (Inverse Hyperbolic Sine)							-0.004	*
							(0.002)	
Constant	0.031	***	0.000		0.028	***	0.038	**
	(0.000)		(0.000)		(0.001)		(0.012)	
Observations	264,060		263,807		263,807		28,941	
Mean dependent variable	0.09		0.09		0.09		0.08	
R-squared	0.289		0.342		0.345		0.343	

Notes: This table presents linear probability model estimates in which the dependent variable is an indicator for receiving any formal care (defined as having LTCI certification). The sample includes Japanese adults aged 65 and older from the 2016 and 2019 waves of the CSLC. Physical limitations are defined using the same hierarchical classification system as previous tables, where individuals with any ADL limitation are classified as "1+ ADL" regardless of IADL status. Dementia diagnosis is operationally defined as regularly visiting healthcare facilities for dementia treatment (self-reported or proxy-reported). The reference group is individuals with no ADL limitations and no dementia diagnosis. Columns 1-3 use the full merged household-health survey sample (N=263,807-264,060), while Column 4 uses the income survey subsample (N=28,941), which represents approximately 10% of households with

no overlap with the long-term care survey. Age is modeled using categorical dummies for 75-84, 85-94, 95-104, and 105+ years, with those under 75 as the reference group. Education variables are relative to high school education. Income is measured using inverse hyperbolic sine transformation to accommodate zeros. Robust standard errors are in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

Key findings: The interaction specification reveals that dementia alone and ADL limitations alone have relatively similar effects on formal care receipt in the fully adjusted model (Column 3): 36.7 and 31.7 percentage points respectively. The interaction term is small and statistically insignificant (2.2 percentage points), indicating roughly additive effects when both conditions are present, with a combined effect of 70.6 percentage points. This contrasts with the main specification where the dementia coefficient (55.3 percentage points) likely captures many individuals with both conditions. The pattern suggests that Japan's LTCI system responds to both cognitive and physical care needs with formal services, with roughly proportional increases in utilization when both types of impairments coexist. The small interaction effect at the extensive margin for formal care contrasts with the larger interactions observed for informal care, suggesting different response patterns in formal versus informal care systems when multiple impairments are present. The negative Age 105~ coefficient in column (4) may reflect sample selection: column (4) draws from the income survey subsample which excludes LTCI respondents, so surviving 105+ year-olds in this subgroup can be disproportionately healthy non-LTCI users; conditional on income, this selection reverses the positive age gradient observed in columns (1)–(3). The Age 105~ estimate in column (4) should be interpreted with caution given the very small cell size for this age group.

Table 5b-A. Determinants of Formal Care Hours: Intensive Margin

	(1)		(2)		(3)	
With Dementia	32.0	***	34.2	***	30.4	***
	(7.4)		(7.4)		(7.4)	
1+ ADL	77.9	***	76.3	***	72.8	***
	(3.5)		(3.5)		(3.5)	
With Dementia * 1+ADL	36.6	***	35.7	***	40.4	***
	(9.8)		(9.7)		(9.7)	
Age 75 ~ 84			-15.6	*	-10.3	
			(6.6)		(6.6)	
Age 85 ~ 94			-21.3	***	-4.6	
			(6.4)		(6.5)	
Age 95 ~ 104			23.0	*	48.7	***
			(9.5)		(9.6)	
Age 105 ~			75.0		106.0	
			(85.1)		(84.6)	
Male					-8.1	
					(5.6)	
Married					29.8	***
					(5.0)	
Male * Married					32.3	***
					(8.2)	
Any children					-16.8	
					(27.9)	
Less than high school					-6.9	
					(3.8)	
Some college					-19.0	**
					(7.2)	
College or more					4.4	
					(8.6)	
Constant	53.1	***	67.7	***	45.6	***
	(2.2)		(6.1)		(6.8)	
Observations	8,519		8,519		8,519	
Mean dependent variable	113.7		114.0		113.7	
R-squared	0.08		0.09		0.11	

Notes: This table presents OLS regression estimates in which the dependent variable is monthly hours of formal care received. The sample is restricted to individuals receiving formal care (defined as having LTCI certification) from the long-term care questionnaire subsample (N=8,519), with no overlap with the income survey. Physical limitations are defined using the same hierarchical classification system as previous tables. Dementia diagnosis is operationally defined as regularly visiting healthcare facilities for dementia treatment. The reference group is individuals with no ADL limitations and no dementia diagnosis who receive some formal care. Age is modeled using categorical dummies for 75-84, 85-94, 95-104, and 105+ years, with those under 75 as the reference group. Education variables are relative to high school education. Robust standard errors are in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

Key findings: The interaction specification reveals synergistic effects parallel to those observed for informal care intensity. In the fully adjusted model (Column 3), individuals with ADL limitations alone receive 72.8 additional hours per month, while those with dementia alone receive 30.4 additional hours. The interaction term is positive and significant (+40.4 hours), indicating that individuals with both conditions receive approximately 143.6 hours per

month (72.8 + 30.4 + 40.4). This positive interaction mirrors the pattern observed for informal care (+35.6 hours), suggesting that combined cognitive and physical impairments create synergistic demands that amplify service intensity across both care sectors. The consistency of positive interactions at the intensive margin (for both formal and informal care) alongside negative or null interactions at the extensive margin indicates that while families may face constraints in initiating care arrangements when multiple impairments are present, established care systems respond to combined impairments with substantially intensified service provision. This has important implications for projecting future care costs and caregiver burden as populations age and the prevalence of combined impairments increases.

Table A6 Mean Care Hours by Caregiver Type and Gender

Caregiver Type	N	Mean	SD
Spouse (male)	1,044	145.10	188.47
Spouse (female)	2,015	176.47	205.09
Child (male)	1,730	95.90	150.14
Child (female)	2,177	127.55	174.08
Spouse of child (male)	39	129.65	170.93
Spouse of child (female)	1,548	104.91	157.64
Parent (male)	6	189.04	227.13
Parent (female)	56	241.36	223.59
Other relatives (male)	89	146.50	189.36
Other relatives (female)	248	129.84	175.34
Non-family member/Helper	1,325	159.28	205.68
Volunteer/Neighbor	77	114.23	186.69