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Working Paper

Asya Bellia
Valeria Bellini
Agar Brugiavini
Raluca Elena Buia
Diego Ciccone
Silvia D'Arrigo
Vincenzo Galasso
Francesco Geremia
Federica Martinelli
Chiara Signorello

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Asya Bellia, Vincenzo Galasso
Bocconi University

Agar Brugiavini, Raluca Elena Buia, Silvia D'Arrigo
Ca' Foscari University of Venice

Valeria Bellini, Diego Ciccone, Francesco Geremia, Federica Martinelli, Chiara Signorello
Generali S.p.A

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We measure frailty/dependence based on an adaptation of the Katz index, which makes use of the number of limitations in the activities of daily living ADL. We propose different models to identify the determinants of the probability of experiencing frailty in later life and introduce a novel concept of "pre-frailty". Our results indicate that lower levels of education, being a woman and residing in Southern Italy are associated with increased likelihood of being pre-frail/frail. Living alone significantly affects dependence as measured by frailty or pre-frailty at older ages. The potential demand for long term care services is compared with the existing coverages, both public and private: a marked and widespread lack of protection emerges for people who are mostly in need, with very high potential costs for individuals, households and society at large.

Keywords
frail, prefrail, long-term care, activities of daily living, SHARE, unmet demand for care

JEL Codes
I13, I14, J38

Address for correspondence:
Agar Brugiavini
Department of Economics
Ca' Foscari University of Venice
Cannaregio 873, Fondamenta S.Giobbe
30121 Venezia - Italy
e-mail: brugiavi@unive.it

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wp.dse@unive.it

Department of Economics
Ca' Foscari University of Venice
Cannaregio 873, Fondamenta San Giobbe
30121 Venice Italy
Fax: ++39 041 2349210

Long term care in Italy: coping with frailty and dependence

A. Bellia[†], V. Bellini[°], A. Brugiavini[*], R. E. Buia[*], D. Ciccone[°], S. D'Arrigo[*], V. Galasso[†], F. Geremia[°], F. Martinelli[°], C. Signorello[°]

9 February 2026

Abstract

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[†]Bocconi University, Milan; [*]Ca' Foscari University of Venice; [°]Generali S.p.A

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Introduction

Population aging is a well-documented and persistent trend in Europe, characterized by increases in life expectancy and sustained declines in fertility rates. This demographic shift is urging policymakers to implement appropriate strategies and public-private synergies aimed at satisfying the care needs of vulnerable older adults meanwhile ensuring the sustainability of the funding mechanism in the long run. The unsolved debate on which finance arrangements and best practices to pursue for long-term care (LTC) is crucial to help growing percentages of vulnerable people, as the population gets older, implementing everyday activities and supporting their independent and active living within society (Karagiannidou and Wittenberg, 2022).

Long-term care is "*a range of services and assistance for people who, as a result of mental and/or physical frailty and/or disability over an extended period of time, depend on help with daily living activities and/or are in need of some permanent nursing care*" (2014 Report by EU Social Protection Committee). Among the European countries, Italy is a compelling case study for examining long-term care needs and provisions at older ages in the optical of a life-cycle dynamics, given its highest life expectancy in Europe and a marked inversion of the population pyramid, largely driven by the baby-boom generation's transition into retirement. According to Eurostat[1], the median age of the Italian population peaked at 48.7 years in 2024, making this country, compared to the estimated European Union (EU) 27 average of 44.7, the oldest within this geographical area. Data from the Italian National Institute of Statistics (ISTAT)[2] show a spectacular fast growth of the old age dependency ratio—defined as the ratio of senior individuals, aged 65 and over, in relation to the working age population (15 to 64). This was 38.4 in the year 2024, versus 37.8 in 2023, the estimate for the year 2025 is 39.0. These statistics are consistent with population projections by OECD, which estimates an increase of the old age dependency ratio from 42.8 in 2025 to 48.1 over a five-year horizon[3]. The demographic imbalance is compounded by persistently low fertility rates: starting in 2010, Italy recorded a total fertility rate of 1.21 children per woman up to the year 2023. This is among the lowest in EU-27, where the estimated average was 1.38. Meanwhile, the fraction of the oldest adults, aged 75 and over, is expected to peak at 13.8 percent by 2030 and then 20.7 percent by 2050, the highest value among the EU-27 (European Commission, 2021 Long-term care report). The reduction in the working age population produces direct implications on the labor force, as the fraction of active individuals in the age range 20-74 is projected to decline by 8.3 percentage points over the period 2022-2070 (European Commission and Economic Policy Committee, 2024 Ageing Report). The negative demographic trends are mirrored by structural economic weaknesses. Over the past decades, Italy has experienced sluggish GDP growth, with a rate of 0.7 per cent in 2024, below the EU-27 average

[1] https://doi.org/10.2908/DEMO_PJANIND. Last accessed: July 27, 2025.
[2] Official statistics by ISTAT are reported on the web platform https://noi-italia.istat.it
[3] https://data-explorer.oecd.org. Last accessed: July 27, 2025.

of one percentage point. Furthermore, total health expenditure as a share of GDP amounted to 8.85 per cent in 2022, falling short of the estimated average of 10.23 among the EU-27, as reported by Eurostat[4].

The decline in functional capacity resulting from ageing and health disorders prompts, within a "silver economy" framework, the development of formal LTC solutions, including insurance services either publicly disciplined or private, to complement the role of social networks in providing informal caring – i.e., family members or, to a lower extent, relatives and friends outside the household. European countries are hence urged to promote healthy and active aging across the population by ensuring "*high-quality, affordable, and accessible*" formal LTC services (Council of the European Union, 2022/C 476/01). Addressing this challenge requires attention to the design of welfare strategies for older adults, especially given that women have traditionally borne—and continue to bear—a disproportionate share of caregiving responsibilities, which are a source of persistent gender inequalities in the domestic sphere and labor market participation (Naldini et al., 2016). In addition, women spend more years in ill-health relative to men and are significantly more likely to need long-term care services in the same age group, conditional to having a higher life expectancy (European Commission, 2021 Long-term care report). Consistently, Italy displays a strong gender imbalance in care provision: 42.8% percent of the women aged 16 years or over providing informal care/assistance in 2016, reported spending more than 20 hours per week for care, compared to 36.6% of men. This percentage increases to 55.0% percent (against 38.7% of men) for the age group 65–74 (Eurostat)[5].

LTC systems in Europe can be categorized into four main types (Joshua, 2017): (i) social insurance models, financed by means of social contributions linked to taxpayers' disposable income - first introduced in the Netherlands in 1968 and later adopted in Germany; (ii) tax-funded social-care systems, aimed at implementing a universal care model, that was adopted in Nordic EU countries; (iii) tax-based LTC programs which are means tested (United Kingdom); and (iv) hybrid systems, which involve a policy mix of different instruments, as observed in France or Italy.

As detailed in the EU Commission's Long-Term Care Report (2021), the Italian public long-term care system remains largely oriented to a cash-for-care scheme in which the main policy measure is the "*indennità di accompagnamento*" (literally, "attendance allowance" or AA, henceforth), a national program managed by the National Institute of Social Security (INPS) and financed through general taxation, which provides financial support to individuals with a severe disability regardless of age or income. Formal public care provisions, either in cash or through home and residential care facilities (healthcare and social care related), are based on a complex structure involving multiple levels of government. Specifically, the largest share is allocated to the AA (43.2

[4] https://doi.org/10.2908/TPS00207. Last accessed: July 27, 2025.
[5] https://doi.org/10.2908/ILC_ATS18.Last accessed: July 27, 2025.

percent in 2023), followed by healthcare-related LTC services (38.8 percent) (Accounting Department of the Treasury, 2024 Report). While regional authorities are responsible for ensuring the provision of minimum levels of healthcare services, local municipalities are tasked with delivering LTC benefits related to social support, either through home-based services (such as assistance with daily living activities and nursing care) or through residential care facilities, including nursing homes (European Commission, ESPN Thematic Report on Challenges in long-term care - Italy, 2018). Hence, the categories of targeted beneficiaries, the eligibility rules and the type of interventions (in cash on in-kind through home care, residential facilities or LTC hospital beds) depend, in a hierarchical and blurry model, on the public strategies of different institutional tiers. In this framework, residential care facilities and home care services are not established on national standards but refer to regulatory criteria set by regions and local municipalities. In addition, the AA benefits come without restrictions on their use and do not allow the provider to have any control over the quality of the assistance. Although these measures may derive from the idea of ensuring a true match with the care preferences of beneficiaries, in practice they appear to incentivize family and community-based support in place of professional homecare services. The resulting institutional arrangement is fragmented and lacks coherence, reinforcing existing local economic disparities and potentially leading to unequal access to LTC services across the country.

On the one hand, Italian public expenditure on long-term care as a share of GDP is in line with the European average and projected to increase, rising from 1.63 percent in 2023 to approximately 2.4 percent by 2070 (General Accounting Department of the Treasury, 2024 Report). On the other hand, the Italian LTC system heavily relies on informal care provided by family members—particularly women—as well as on an underground economy of unskilled care workers, often migrants (Brugiavini et al., 2023). Conversely, the long-term care insurance (LTCI) market represents a marginal portion of private spending on LTC, as it accounts for approximately 1.7% of GDP. This expenditure is predominantly out-of-pocket, with LTC insurance premiums amounting to only 0.2% of total life insurance packages, equivalent to €178 million in 2023[6]. Since access to long-term care often depends on a household's financial capacity—either to afford long-term care insurance or rather to pay out-of-pocket for professional home-care services and nursing facilities or irregular and unskilled caretakers —it tends to reinforce existing socioeconomic inequalities in the coverage of care needs.

Satisfying the increasing demand for assistance of vulnerable individuals posits challenges in terms of equity, efficiency, and sustainability of Italian public healthcare in the long run. The heavy reliance on informal family carers, cash-oriented and multileveled public LTC policies together

[6] Cesari, R. (2024, June 13). Hearing of Prof. R. Cesari – Fact-finding investigation on the balance and outcomes of the extended pension sector, with particular reference to demographic transition, the evolution of professions, and the trends in supplementary welfare. Parliamentary Supervisory Commission on Social Security Institutions, IVASS.

with the limited access to the private insurance market for LTC all contribute to a suboptimal and heterogeneous model of care provision.

This paper aims at providing an exhaustive description of the care needs of older people and existing provisions in Italy. In an oversimplified representation we could think of our work as a description of demand and supply of long-term care and unmet needs. In fact, we do much more than this, as we provide some up-to-date metrics to assess the underlying vulnerability of older people and measure the determinants of observed differences in the population.

To be more precise, in this paper, we analyze the public and private LTC coverage in Italy, relying on high quality microdata from two large-scaled and comparable datasets, namely the Italian subsample of the "Survey of Health, Ageing and Retirement in Europe" (SHARE) and the ISTAT "Multipurpose survey". We first report the prevalence of functional limitations in daily activities or ADLs, which are an evenly used tool both for regulating public expenditure on LTC services and to establish the eligibility conditions to receive LTCI benefits, in relation to chronic diseases and several individual characteristics – namely, gender, age, education, spatial indicators, and relationship status. We investigate the transitioning stages from a healthy functional status to frailty (as proxied by severe dependence) through appropriate empirical modelling. Second, we attempt to assess the potential (un)covered demand for long-term care services, providing a mapping of formal – both public and private- LTC products and informal care. We document how, for vulnerable groups in the population, unmet needs significantly emerge.

We discuss possible policy implications of these stylized facts and propose possible public strategies to cope with unmet needs while managing public costs of ill-health, based on a fully dynamic life-cycle approach. We consider preventive public health interventions potentially lengthening working life perspectives of senior workers and promoting active ageing. In this perspective, we consider public strategies to address the specific needs of individuals lying in the intermediate stage of prefrailty, which represents a transition point where targeted health-supporting actions can be most effective in mitigating an irreversible progression toward more severe dependency. Building on the outlined demand/supply framework, we examine policy solutions based on regulated synergies between public and private actors to ensure the provision of high-quality and inclusive long-term care services. These interventions target vulnerable population groups of low-education and low-income households in their older ages, with a focus on single individuals. Furthermore, the analysis addresses regional disparities within the country, emphasizing the pronounced north-south divide in both the prevalence of health-dependent older adults and the quality and availability of long-term care services.

The paper is organized as follows. In the first section, we report the most widely used definitions of frailty and (in)dependency from the recent medical literature, and we introduce the criteria for the assessment of pre-frailty and frailty in our analysis. The second section presents the data

sources and provides rather detailed descriptive statistics documenting the prevalence of pre-frailty and frailty in Italy, by also relating them with morbidity and disaggregating by key demographic and socioeconomic characteristics of the population. Sections 3 and 4 are devoted to the econometric analysis identifying the predictors of the number of functional limitations, as well as the determinants of pre-frailty and frailty. We also explore transition patterns between different health stages over time. Section 5 describes the coverage of formal and informal care services for non-self-sufficiency, plus the unmet demand for long term care and presents some policy implications. Section 6 attempts some estimates of the costs implied by frailty and Section 7 concludes.

1. Defining and measuring frailty and non-self-sufficiency in old age

Frailty is gaining recognition as a pressing global challenge, reflecting the ability of public health systems to meet the rising demand for care services in an increasingly aging population. Frailty is an age-related clinical condition characterized by "*a decline in functioning across multiple physiological systems, accompanied by an increased vulnerability to stressors*" (Hoogendijk et al., 2019). It is a multifaceted notion that remains the subject of ongoing debate in the medical literature. This complexity is mirrored in the diversity of operational definitions and prognostic tools developed to meet the specific needs of various clinical settings, ultimately resulting in the absence of a single and universally accepted definition (de Vries et al., 2011; Hoogendijk et al., 2019; Lekan et al., 2021).

From a life-course perspective, frailty strictly connects to the broader concept of healthy ageing. The World Health Organization (WHO) in the World Report on Ageing and Health (2015) defines healthy ageing as "*the process of developing and maintaining the functional ability that enables wellbeing in older age*". Functional ability refers to the health-related attributes that enable individuals "*to be and to do what they have reason to value*". It emerges from the interplay between three key components: the **intrinsic capacity** (i.e., the composite of an individual's physical and mental abilities), the environmental characteristics, which refer to the external settings of an individual's life, and the dynamic interaction between the individual and these characteristics. Public health interventions and preventive strategies are needed, on the one hand, to support the intrinsic capacity-enhancing behaviors and to maintain such capacity, also removing barriers to its expression. On the other hand, actions are needed to enable environments that help compensate the declines in such capacity, ultimately through the provision of long-term care services (Beard et al., 2016; WHO, 2015). According to the comprehensive geriatric assessment (CGA)—a clinical diagnostic method used by healthcare professionals and therapists—an exhaustive evaluation of health status in older age requires a multidimensional approach to assess not only functional ability and physiological disorders, but also socio-environmental conditions such as social support,

financial resources, and access to professional care services, all of which contribute to the development of frailty (Pilotto et al., 2020).

From a clinical perspective, frailty reflects a reduced resilience of the homeostatic regulatory systems to external stressors, leading to a progressive impairment of physiological functions with age. This increased vulnerability exposes frail individuals to a higher risk of adverse health outcomes (Varadhan et al., 2008). The medical literature documents that frailty is a significant risk factor for hospitalization and mortality and is associated with the onset of chronic conditions, including age-related neurological disorders such as dementia, Parkinson's disease, stroke, and multiple sclerosis (Chang et al., 2018; Junius-Walker et al., 2018; Yang et al., 2018). In addition, frailty is generally described as a precursor to disability, which is a "*difficulty or dependency in carrying out activities essential to independent living, including essential roles, tasks needed for self-care and living independently in a home, and desired activities important to one's quality of life*" (Fried et al., 2004). However, some studies underline the fact that frailty status does not exactly overlap with disability status, so that they could also coexist in one individual (Dent et al., 2019).

As outlined in the International Classification of Functioning, Disability and Health (ICF) proposed by WHO (2002), non-self-sufficiency maps malfunctioning at different concurrent stages: physiological impairments induce activity limitations, while the external context (personal conditions and environmental factors) moderates the process, either by supporting or restricting individual activities and hence social participation. A more recent conceptualization of the multidimensional frailty model relies on the deterioration of the organic interaction among various health domains organized within a hierarchical structure. Such a multilevel framework begins with underlying biological and pathophysiological mechanisms and culminates in the clinical manifestation of adverse health outcomes (Pilotto et al., 2020).

In this paper, we focus on observable signals of the frailty status. Specifically, we use functional limitations as a proxy for frailty, drawing upon an adapted version of the index of independence in Activities of Daily Living (ADL), originally developed by Katz et al. (1963), to assess the presence or absence of dependence on external support in daily functionalities. As we will demonstrate, the existence of a distinct number of limitations serves as an indicator of a frailty state, signaling a significant impairment in self-sufficiency that compromises an individual's quality of life. The ADLs are relevant instruments to evaluate the quality and effectiveness of public intervention programs for healthy ageing and to investigate the predictive factors and transitional mechanisms behind different health states (Kekäläinen et al., 2023; Marroig et al., 2023; Mouchaers et al., 2023). Moreover, they constitute a key factor to evaluate an individual's deterioration of autonomous life and consequent need for care for targeting public interventions or private insurance products on LTC, where clinical evaluation by medical specialists is a common practice to detect the activation criteria for accessing the care benefits. In other cases, the loss in

functionality is measured by means of self-reported assessments, which are practical instruments in survey collections referring to older aged individuals.

Complementing the conceptualization of frailty is the operationalization of *pre-frailty*, which is more complex due to its subtle nature as a precursor to frailty. Again, we use ADLs as proxies to identify pre-frailty, serving as early clinical manifestations of a partial and emerging state of dependence. The pre-frail state holds particular significance, since frailty follows a dynamic trajectory - which means that it can fluctuate across degrees of severity over time (Hoogendijk et al., 2019)- and, most importantly, retains a certain degree of reversibility. Timely identification of pre-frailty as an intermediate stage leaves space to public health policies for halting or slowing its progression before it culminates in severe functional impairment or end-of-life decline. Understanding the behavioral, socioeconomic, and environmental determinants that influence the transition from pre-frailty to frailty carries critical policy relevance, offering a foundation for targeted preventive interventions aimed at mitigating age-related vulnerability and its societal and public costs.

2. Describing morbidity and frailty among older adults in Italy

2.1 Data and definitions

We use two main micro-data sources, namely the Italian subsample of the Survey on Health Ageing and Retirement in Europe (SHARE) and the Italian Multipurpose Survey on Health (drawn by ISTAT), to present robust empirical evidence on the prevalence of frailty status in the older population as a function of individual socio-demographic characteristics. The two datasets allow, through different methodologies, also to study the transitions toward prefrailty and frailty over age, in a full life-cycle perspective.

SHARE is a multidisciplinary panel study, started in 2004 and still ongoing, with interviews conducted every two years. It is designed to gather relevant and internationally comparable microdata on the living conditions of older citizens aged 50 or more from 28 European countries, including Israel. The declared objective of the SHARE project is to study the effects of health conditions, social arrangements and economic conditions on the well-being of European senior citizens over life course. For our analysis, we make use of the regular waves of the panel, up to the latest data collection of 2021/2022 (wave 9). Notice that a special issue denoted as SHARELIFE, providing retrospective information on respondents' life history, fully covered the third wave (2008-09) and was then administered again in wave 7 (only for those who did not participate previously), while the routinary questionnaire was administered to the remaining sample (18 per cent).

The SHARE sample contains a modified version (Steel et al., 2003) of the ADL index originally proposed by Katz et al. (1963) to measure the state of dependency in performing the following

Table 2.1. ADL limitations: comparison of the items used in SHARE and ISTAT.

	SHARE	ISTAT
1.	Dressing, including putting on shoes and socks	Dressing and undressing
2.	Walking across a room	The longest distance you can walk by yourself without stopping and without getting too tired
3.	Bathing or showering	Bathing or showering
4.	Eating, such as cutting up your food	Eating, including cutting up your food
5.	Getting in or out of bed	Getting in or out of bed
6.	Using the toilet, including getting up or down	Sitting down and getting up from a chair

Note. The answer options for item 2 in ISTAT are: (1) 200 meters or more, (2) more than a few steps but less than 200 meters, and (3) a few steps only.

basic activities: dressing, walking across a room, bathing or showering, eating, getting in or out of bed, and using the toilet. Respondents were asked to indicate whether they experienced any difficulties in each listed item, excluding temporary conditions expected to last less than three months. Since the answers were dichotomous, a positive answer is interpreted as a signal of severe loss of functionality in performing that specific activity. Hence, the score ranges from a value of zero to a value of six, with higher values meaning stronger dependence.

The "Health Conditions and Use of Health Services" module of the Italian Multipurpose Survey on Households is a cross-sectional survey conducted by the Italian National Statistics Institute (ISTAT), providing a picture of the health conditions, prevention strategies for health and use of health-related services within households. Data are publicly available over four records starting in 1994 and then following five-year based intervals for two subsequent releases (1999-2000 and 2004-05), with the latest wave spanning the years 2012-13. We restrict the sample to the two most recent waves, which include interview years also covered in the SHARE releases.

The interviews include a battery of questions aimed at measuring the persistence of permanent difficulties in performing a set of activities in daily living, meaning that the respondent is requested to exclude any temporary (reversible) impairments such as plaster casts or a fever. Differently from to the SHARE's binary answers, respondents in ISTAT self-evaluate their degree of self-sufficiency – in case also with the use of medical aids such as wheelchairs or canes- on a three-point scale scoring. The scale assigns a value one, if the individual can perform the activity by

herself without any difficulty; two, if she/he experiences some difficulties; and three, if she is entirely dependent on the assistance from some other person to perform the activity. In order to

Table 2.2 Descriptive statistics: comparison between the SHARE and the ISTAT (50+) data.

	SHARE	**ISTAT**
Age	68.16	65.96
Women (%)	54.92	55.02
Geographical area		
North-West (%)	21.52	22.90
North-East (%)	17.47	20.57
Center (%)	22.88	18.72
South and Islands (%)	38.14	37.81
Level of education		
Lower secondary or less (%)	70.39	72.24
Upper secondary (%)	19.21	20.41
Post-secondary or tertiary (%)	10.40	7.35
Singles (%)	22.81	17.46
Observations	29,093	81,265

Note. The number of observations in the SHARE dataset is 27,937 units for the geographical area and 28,774 for the level of education.

preserve comparability between data sources, we define a respondent as having an ADL limitation if she reports that encounters at least some difficulties in carrying out the activity.

As shown in Table 2.1, items in ISTAT perfectly mirror those in SHARE, with the only exceptions of items 2 and 6, for which the criterion of similarity between compatible concepts applies. Specifically, a self-evaluated difficulty in "walking across a room" in SHARE (item 2), corresponds in ISTAT to the capacity of walking autonomously without stopping or feeling exhausted for a few steps only. Analogously, the actions associated with the function of toileting are consistent with the effort required for sitting down and getting up from a chair without help.

Table 2.2 shows the descriptive statistics for the two data sources, in which the ISTAT sample is restricted to respondents who are aged 50 or older. Notice that participation in national statistical programs, such as the Multipurpose Survey, is compulsory for all citizens invited to collaborate on the investigation, as regulated by state law, and thus the number of observations in this sample is noticeably greater than in the SHARE's case. Moreover, participants in the SHARE are traced longitudinally over the interview years, while the Multipurpose survey is a repeated cross-sectional data collection. Given these caveats, the ISTAT sample appears, on average, slightly younger and with a lower proportion of highly educated people than the SHARE data.

In this study, we record the **frailty status** and the precursory stage of **pre-frailty** using the number of ADL limitations as an indicator of loss in self-sufficiency and hence of increased vulnerability. As detailed in chapter 4, standard policies adopted by the top ten LTC insurance companies in Italy, which account together for over 95 per cent of the private sector, require the coexistence of at least 3/4 out of 6, 4 out of 5 and 3 out of 4 functional limitations or, alternatively, the assessment of a deterioration in functional capacity scaled on a minimum score of 40/45 out of 60, to qualify for the insurance benefits (IVASS, 2024). To describe accurately the characteristics of vulnerable people in the current care model, we define: (a) frailty as the condition of lacking autonomy in at least four ADL limitations; and (b) prefrailty as a state of mild to moderate impairment due to the presence of at least one but less than four limitations. Such an approach thus confines frailty to only severely impaired individuals.

As a further step, in section 2.3 we provide a comparison between this method and a broader definition, which includes older adults with three ADL limitations in the frail group. This exercise allows us to analyze to which extent the potential demand for assistance, or in other words, the coverage needed of LTC services would increase if the definition of frailty is relaxed to include those people experiencing a moderate functional decline in everyday activities but hardly qualifying for insurance benefits or public care provisions in the current model of assistance. Although moderate constraints do not explicitly involve acute exposure to stressors, nonetheless they cause important levels of dependence on external support for implementing daily tasks and have therefore a significant impact on the quality of life of individuals.

2.2 Morbidity among older Italians: a descriptive overview

In Western countries, the average increase in life expectancy and technological advancements in medical care have led to growing rates of middle-aged and older adults living with multiple coexisting chronic conditions. Such trends are challenging governments to address the expansion of care demands and the greater risk of unplanned hospitalization (Akugizibwe et al., 2020; Dhalwani et al., 2016; Ryan et al., 2015).

The rising utilization and associated costs of primary and secondary care for older adults with chronic diseases also raise concerns about the potential enhancement of social inequalities in access to and quality of the services, particularly in countries with universal healthcare systems, such as Italy. Significant geographical disparities in national healthcare utilization emerged from a study carried out in 2018, covering residents across ten out of twenty Italian regions and representing over 60% of the population aged 50–85. More favorable multimorbidity profiles were observed among both women and men in Northern regions, compared to those residing in Central and Southern areas (Corrao et al., 2020). A previous analysis using SHARE data found that each additional chronic condition reported in the 2006–07 wave was associated with more than a

twofold increase in the likelihood of declaring reduced functional capacity and fair or poor health. Moreover, the effect increased by 14 and 23 percentage points, respectively, over the study period spanning from the baseline year to the 2015 wave (Palladino et al., 2018).

Socioeconomic disparities, in turn, influence the risk of developing multimorbidity, frailty, and disability - each of which contributes to a higher likelihood of a progressive transition toward mortality (Dugravot et al., 2019). Some authors argue that specific combinations of chronic diseases are more strongly associated with the manifestation of disabilities and limitations in activities of daily living, suggesting that multimorbidity influences the severity of functional impairment, and has a greater impact than single conditions examined in isolation (Patel et al., 2022; Quiñones et al., 2016). Moreover, the interaction effect of functional limitations and multiple chronic conditions on hospitalization and mortality is greater than the expected effects assuming additivity (Chamberlain et al., 2019). While multimorbidity is considered as a precursor to the development of functional limitations, the dynamic interaction between these conditions—driven by lifelong biological, care-related, and psychosocial factors—shapes individuals' health trajectories throughout the life course (Calderón-Larrañaga et al., 2019).

For these reasons, it is useful to provide a brief overview of the medical research in this area. It is by now established that chronic conditions are significant predictors of functional decline among middle-aged and older adults (Patel et al., 2022). Several studies show the association between the occurrence of long-term diseases with ageing, such as cardiovascular diseases, diabetes, obesity, arthritis, pulmonary disease, and cancer, and the onset of functional limitations in basic activities of daily living (Bowling et al., 2019; Lin et al., 2016; Millán-Calenti et al., 2010; Sharma et al., 2021). Moreover, multimorbidity, that is the concurrent presence of two or more chronic diseases, is associated with an augmented exposure to functional impairment in later ages (Bleijenberg et al., 2017; Patel et al., 2022; Ryan et al., 2015).

Focusing on Italy, we describe the prevalence (in percentage) of diseases by sociodemographic characteristics among older adults, using information from all the regular waves of the SHARE data. Respondents were asked to state *whether a doctor ever told them that they had or currently have any of a list of conditions*. The question clarified that the reported condition should be doctor-diagnosed and that the interviewed person is assumed to be either currently treated for or affected by that condition. In this overview, we consider major typologies of physical conditions which are indicative of a critical progression toward physiological vulnerability: cancer, cardiovascular (including hearth attack, high blood pressure, and stroke), metabolic bone (arthritis, osteoporosis, and bone fractures), diabetes, neurodegenerative (Parkinson and Alzheimer), and respiratory (chronic lung/asthma).

Figure 2.1. Prevalence of diseases (percent) by gender and age in Italy.

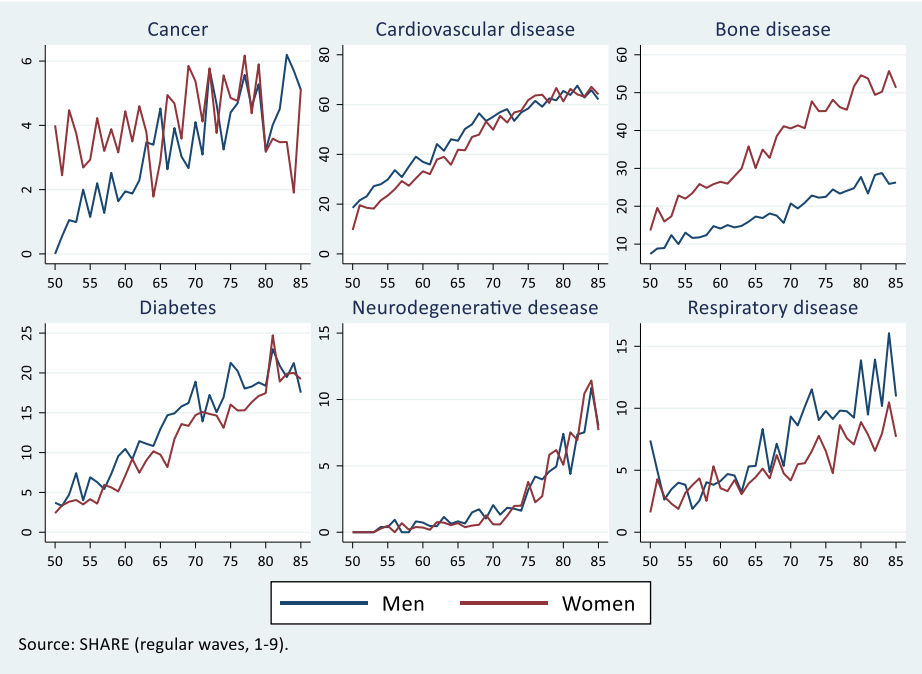


Figure 2.1 shows the prevalence of some selected illnesses over age (50-85), by gender. Strongly divergent trajectories emerge when looking at the bone disease, as women display a greater prevalence at each age and a steeper increase than that observed for men, following a parallel trending pattern in the middle-aged years and peaking at above 50 per cent beyond age 80.

From a clinical standpoint, estrogen deficiency associated with menopause during midlife increases women's exposure to bone loss. This aligns with strong evidence indicating that women are more susceptible to functional decline at older ages compared to men. Women appear more likely to develop cancer earlier in life—between the ages of 50 and 60—compared to men, again possibly due to drastic changes in the estrogen levels. In contrast, women are generally less prone to cardiovascular disease until around age 75, at which point gender differences tend to disappear, with steady increments until 60 percentage points. A similar pattern is observed for diabetes, with women exhibiting lower prevalence rates than men until the oldest age groups. Gender differences in the frequency of respiratory problems emerge at around the age of 70 and above, in which the prevalence is higher for men. By contrast, the prevalence of neurodegenerative diseases displays a similar exponential pattern for both men and women, with consistent increases occurring beyond age 75.

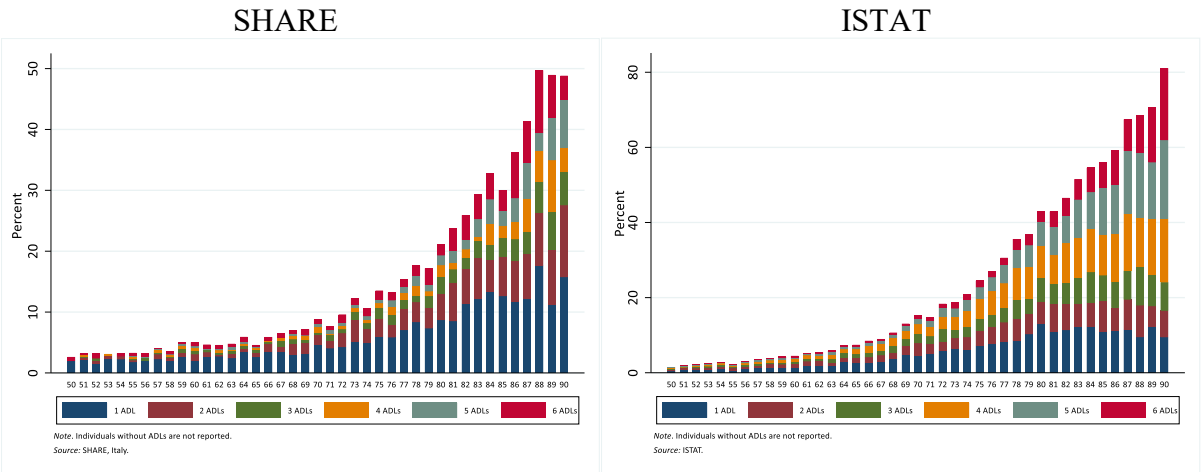
The other important differences are geographical (the North–South gradient) and by education attainments. The prevalence of diseases, reveal higher rates of cardiovascular, bone-related, diabetic conditions and respiratory illnesses in Southern Italy (Figure A2.1 in the Appendix). Cardiovascular disease ranks as the most frequent condition, with values ranging from 45% to 52.6% among men and from 37.5% to 51.3% among women, followed by bone diseases and diabetes. Interestingly, the prevalence of bone diseases and diabetes among women varies significantly across areas of the country.

The prevalence of chronic illnesses increases with age and signals the emergence of neurodegenerative conditions among the oldest age groups. It is important to observe that disease prevalence is positively associated with lower levels of education (Figures A2.2 and A2.3 in the Appendix): as we will later show in this paper, the level of education is a main driver for all health outcomes, but it is also coupled with geographical disparities. Some caution should be taken in drawing conclusions when looking at simple correlations between two variables: for example, educational attainment proxies for socioeconomic status, which in turn is positively linked to life expectancy. But this latter is also related to higher exposure to physical illnesses and mobility limitations: we need a model that explains the mechanisms behind some of these correlations.

2.3 Pre-frailty and frailty among older adults in Italy

As explained in paragraph 2.1 above, we define, for individuals, the frailty/prefrailty based on the number of limitations with the ADLs. To get a first idea of the potential level of (in)dependence in our samples, Figure 2.2 displays the distribution by number of ADL limitations in the SHARE versus the ISTAT data, by age. While at younger ages the prevalence of one or two ADLs is similar in the two samples, as age increases the percentages of individuals with a high number of limitations (4 or more) are larger for the ISTAT data with respect to the SHARE data.

Figure 2.2. Distribution by number of ADL limitations in the SHARE and the ISTAT data.



Possible explanations for these findings relate to the characteristics of the two datasets. First, participation in the SHARE survey is totally voluntary, while participation in the ISTAT survey is, to some extent, compulsory. Second, while the questions regarding the ADLs aim at the same type of activities, the wording in the two surveys differs, which may lead to variation in answers. Finally, the ISTAT sample is larger and may contribute with many individuals to each cell, while the SHARE data exhibit a smaller sample size, especially for the respondents aged 80 and older.

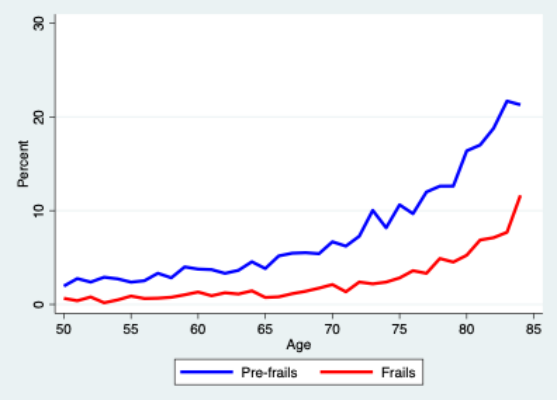
Frailty defined on the basis of 4/6 ADL limitations

In what follows we define the frailty status as the presence of, at least, 4 limitations out of the 6 ADLs considered. We are aware that this is an arbitrary, albeit quite common definition, so we also highlight what are the differences that would emerge, considering instead 3 or more ADL limitations out of 6. In this latter definition a person is in prefrailty if she/he exhibits only 1 or 2 limitations. The analysis looks at "crude ratios", i.e. the prevalence of 4 or more, out of 6, limitations for each age group, as it emerges directly from the data.

Figure 2.3 shows in parallel the percentages of frail and prefrail individuals in SHARE data versus ISTAT data, when employing the 4/6 definition. The prevalence of frail and pre-frail individuals is larger in the ISTAT data, which may be due to several reasons related to the different nature of the samples, as already explained above. The distribution of frailty by gender reveals that up to a given age, such as age 65, males and females exhibit similar prevalences of prefrailty/frailty (see Figure 2.4). After age 65 (or 75), women are on average more exposed to being prefrail (or frail) and the gap increases with age. These results are in line with the medical literature, that recognizes an acceleration in the deterioration of health for women after the end of their fertile years. Important differences by education and geographical differences also emerge, not shown for brevity.

Figure 2.3. Crude ratios: prevalence of prefrail and frail individuals by age - SHARE and ISTAT.

SHARE



ISTAT

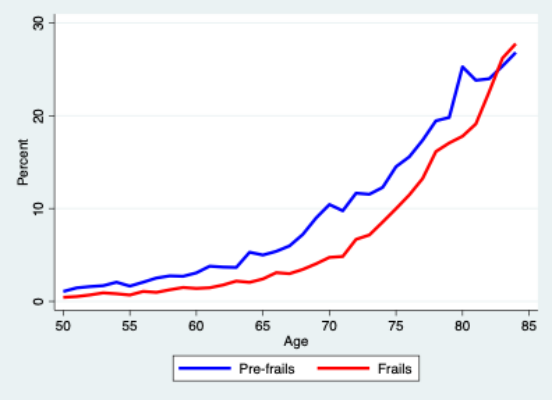
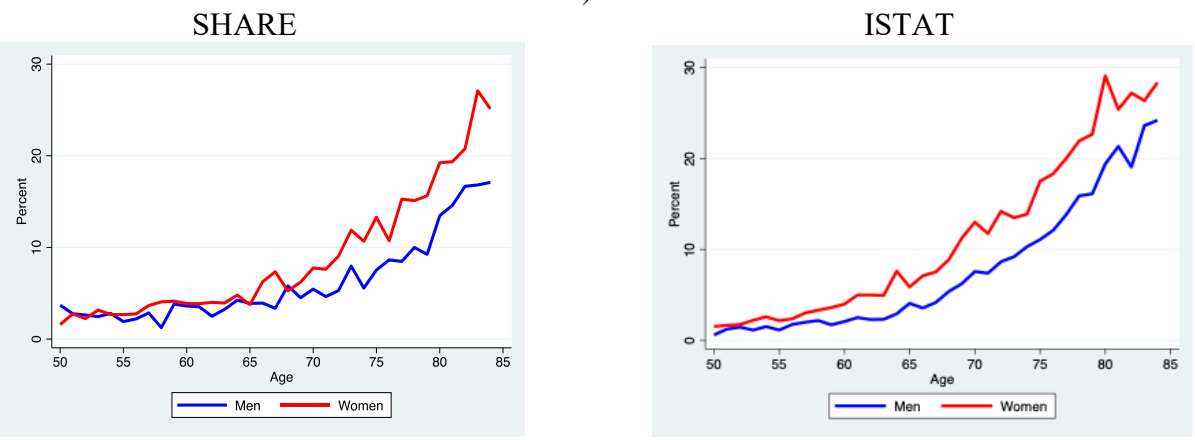
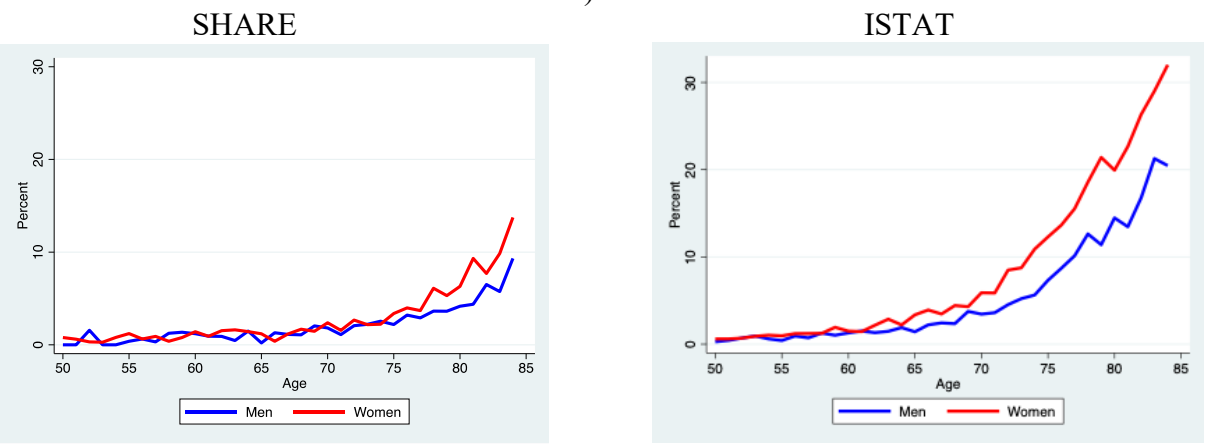


Figure 2.4. Crude ratios: prevalence of prefrailty (a) and frailty (b) by age and gender.

a)



b)



2.4 The role of different eligibility criteria based on the number of limitations

As we argued, the choice of the number of limitations as an eligibility criterion for the frailty status generates different patterns in the prevalence rates: when employing the definition of 4 limitations out of 6, instead of using the 3-out-of-6 criterion, frailty occurs at later ages. This is relevant because the access to given types of long-term care benefits (public or private) requires an evaluation of the level of dependency, which is usually based on the number of limitations in the activities of daily living. Comparing the results based on the two definitions allows us to get a better understanding of the role of the eligibility criteria.

Figure 2.5. Prevalence of non-frails, pre-frails and frails using 4/6 vs 3/6 ADL limitations definitions, SHARE data.

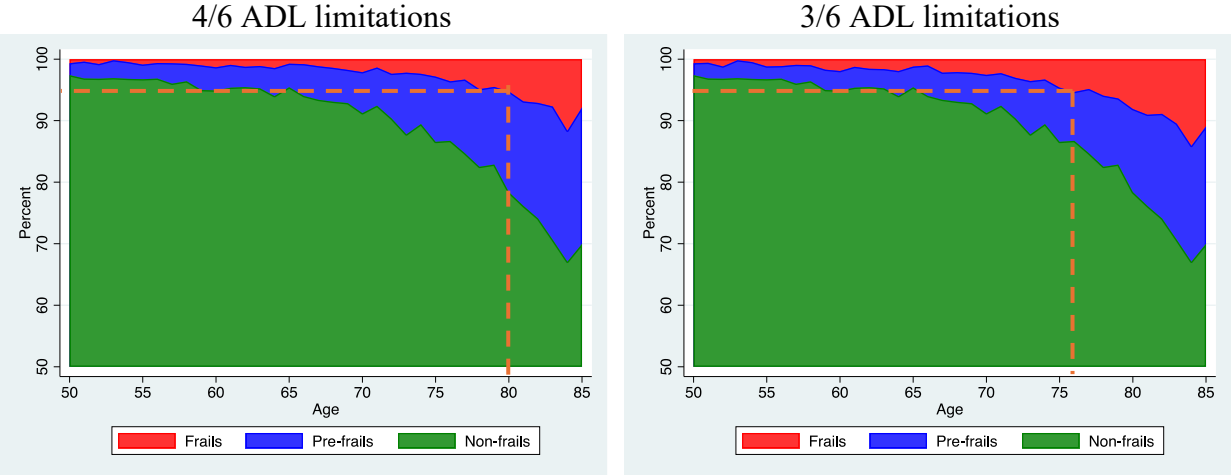
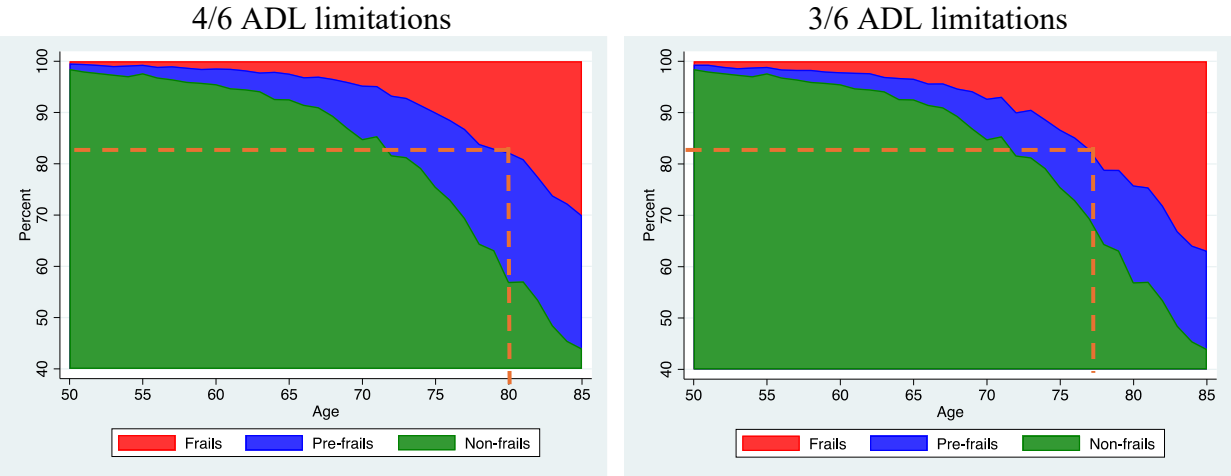


Figure 2.6. Prevalence of non-frails, pre-frails and frails using 4/6 vs 3/6 ADL limitations definitions, ISTAT data.



Figures 2.5 and 2.6 provide an estimate of the change in the percentage of individuals (prevalence) regarded as "frail" between the two approaches, in the SHARE and ISTAT data respectively: we make use of the "difference in years" as a presentation device, traced through a dotted red line. For example, in the SHARE data, a prevalence of 5% of frail people corresponds to an age of 80 if we use the more "stringent" definition of frailty, but it characterizes the individuals aged 76 in a more "inclusive" approach. This evidence is confirmed in the ISTAT data, albeit with different sample sizes. The same figure that characterizes frailty status at age 80 in the tight 4/6 definition, corresponds to an age of 77 in the more inclusive one. This means that a change in the definition,

going from 3/6 to 4/6 limitations, significantly reduces the number of individuals considered to be frail/dependent at a given age.

From a policy perspective it is important to understand how the eligibility rules should be targeted, as people exhibiting 3 limitations cannot be in the same pool as those affected by a moderate functional impairment (having one or two ADL limitations according to the Katz index). Therefore, the concern is that individuals with significant levels of dependency may lack the necessary protection, when less inclusive rules for eligibility apply. At the same time, if proper preventive actions are taken during the "prefrailty" years, it may take longer to move onto the frailty status. Hence, we have identified a **crucial "window of action" between the ages 72 and 85** that is worth investigating further.

For brevity we present further evidence on these measures in the Appendix (Figures A2.4 and A2.5): it worth mentioning that the difference in the prevalence of frailty, generated by the two eligibility criteria ("tight" and "slack"), is wider for the less educated individuals. There is also a geographical gradient: the difference in prevalence is larger in Southern Italy. These results have important policy implications: tightening eligibility conditions for frailty assessment affects, to a larger extent, individuals with lower socioeconomic status, who are also those who need more support.

2.5 (Multi-)Morbidity and dependence/frailty

As outlined in section 2.1 above, the prevalent medical literature documents a strong relationship between multimorbidity and dependence/vulnerability of older adults. Indeed, the mechanism behind the onset of frailty is the occurrence of several morbidities, in some cases even unrelated, but still reinforcing each other as to generate the overall negative impact on well-being. This relationship may seem obvious, as the typical mechanism is that chronic diseases generate limitations in ADLs, but it is possible that the same level of loss of autonomy is generated by one major condition or by several minor conditions occurring in one individual at the same time (Fabbri et al. 2025). To explore the correlation between these two domains among the SHARE respondents, Figure 2.7 provides the composition by the number of chronic illnesses, for each of the three states: not-frail, pre-frail, and frail.

Figure 2.7 shows that pre-frail individuals and frail individuals display a larger number of chronic illnesses than the "not frail" individuals. Indeed, about 80% of frail individuals have 2 or more chronic diseases, with more than 40% having been diagnosed with 4 or more morbidities. About 19% of them report 1 chronic condition and only 1% report having no chronic condition. Given

that the data refer to diagnosed diseases, we should consider these percentages as lower bounds, as some individuals may actually suffer from illnesses that have not been diagnosed.

A useful alternative representation of this relationship is to consider the percentages of individuals in a given frailty status, separately by number of diagnosed chronic conditions and age bands (Figure 2.8). As expected, the relationship between frailty and multimorbidity varies with age. We can observe that almost all people free of chronic illnesses are not frail, up to age 80, while less than 10% of them are prefrail among the oldest age group (80+). Among the youngest individuals in our sample (age group 50-59) about 10% of the individuals diagnosed with 4 or more chronic illnesses are prefrail and only 3% should be considered frail, based on the 4-out-of-6 ADL limitations[7]. Conversely, within the oldest age band (80+) the prevalence of pre-frails and frails is above 50% (about 20% are pre-frail, slightly more than 30% being frail).

Figure 2.7. Number of chronic illnesses by frailty status.

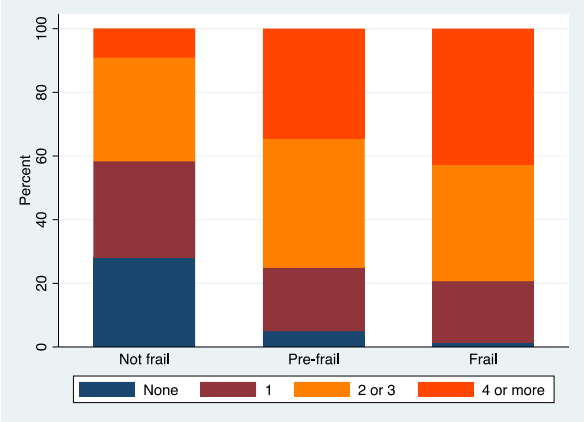
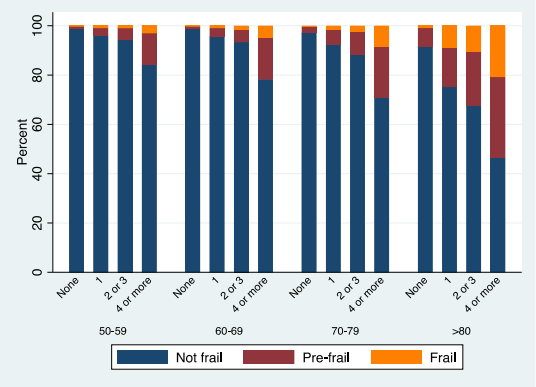


Figure 2.8. Distribution of the frailty status, by age band and number of diagnosed chronic conditions.



[7] The case with 3-out-of-6 is in Figure A2.6 in the Appendix

We also investigate the correlation of the frailty status with the level of multimorbidity by gender and by region of residence (Figure A2.7 and A2.8 in the Appendix). As expected, women and respondents living in Southern Italy display a higher number of chronic conditions associated with higher percentages of frailty/pre-frailty.

3. Empirical analysis: estimating the probability of frailty

Understanding frailty requires a multivariate analysis: resorting to multivariate econometric techniques allows us to make predictions about frailty within and out of the sample. In these models we use the SHARE data as a pooled sample, i.e., treating each wave as an independent cross-section, as to allow for a more direct comparison with the analysis carried out on the ISTAT data, which is cross-sectional data by construction.

The empirical strategy entails three steps: first, we estimate multivariate regressions (OLS) in which the outcome of interest is the number of ADL limitations. Second, we model a probit regression of the probability of being frail, that is, the outcome variable takes the value of 1 if the individual is in a frailty state (i.e., having at least 4 ADL limitations out of 6) and 0 otherwise. Finally, we complement the last specification through an ordered probit (joint) estimation of the probability of being prefrail or frail versus being free-of-limitations.

3.1 Predicting the number of ADL limitations through a multivariate econometric model (cross sectional analysis)

We estimate the determinants of the number of ADL limitations based on individual characteristics, by considering the sample to individuals aged 50–90 in the SHARE sample and aged 30–90 in the ISTAT. Estimates carried out on the ISTAT data allow us to capture the effect of early signals of future limitations at ages below 50 (say age 40), which are not feasible in the SHARE survey.

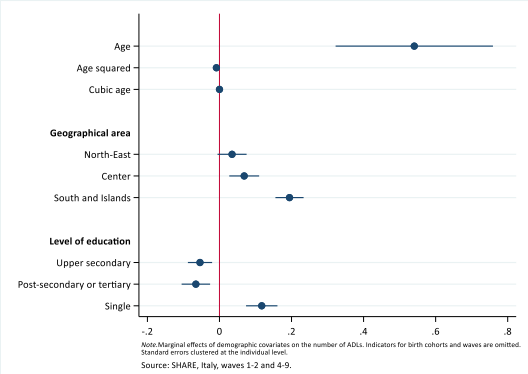
Figure 3.1 shows the marginal effects of the different explanatory variables on the number of limitations. For example, “Age” has a positive and significant effect, i.e. older people have on average a higher number of limitations, and the effect is statistically significant. In both datasets, marked geographical disparities emerge, underscoring the persistent North–South divide in disability risk: individuals residing in Central areas, and particularly in Southern Italy, exhibit a higher predicted number of ADL limitations compared to those living in the North-West. In addition, individuals with upper secondary or post-secondary/tertiary education exhibit significantly lower levels of functional limitations compared to those holding only a lower secondary qualification or less, reinforcing the evidence that socioeconomic status is a key

determinant in the exposure to vulnerability. Similar results emerge for individuals who are single rather than living in a couple: the predicted number of ADL limitations increases by approximately 0.11 to 0.12, confirming the protective role of informal support within the household in mitigating functional impairment.

These associations appear more marked for women (Figure 3.2): in the SHARE data, being single a woman is associated with an increase of 0.05 in the expected number of ADL limitations, if compared to single men, while in the ISTAT data the corresponding difference is 0.02.

Figure 3.1. OLS estimates of the number of ADL limitations - SHARE versus ISTAT data.

SHARE



ISTAT

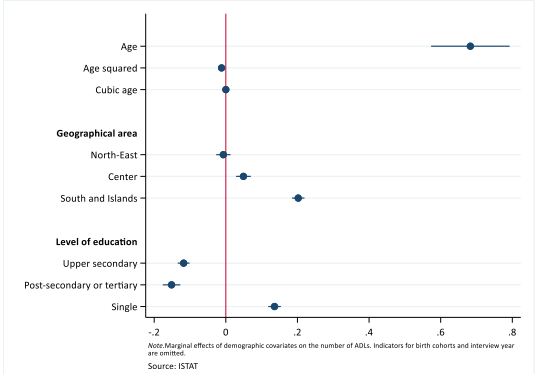
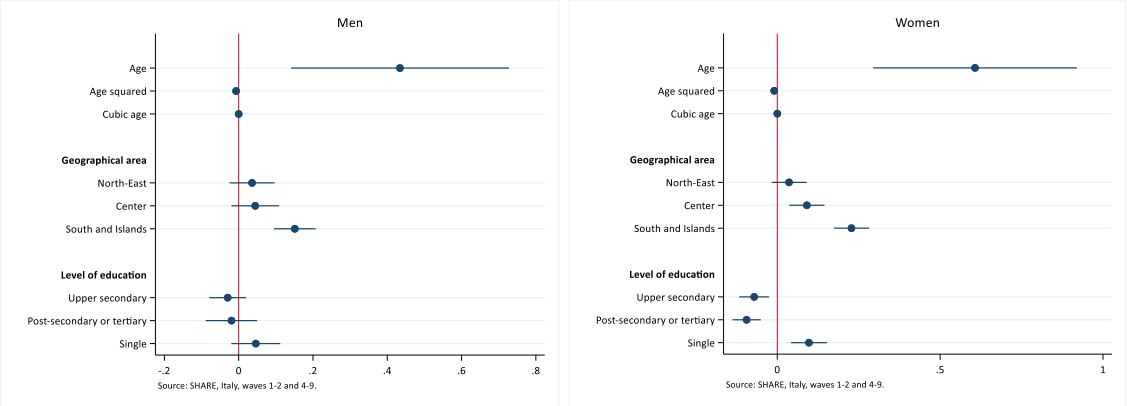
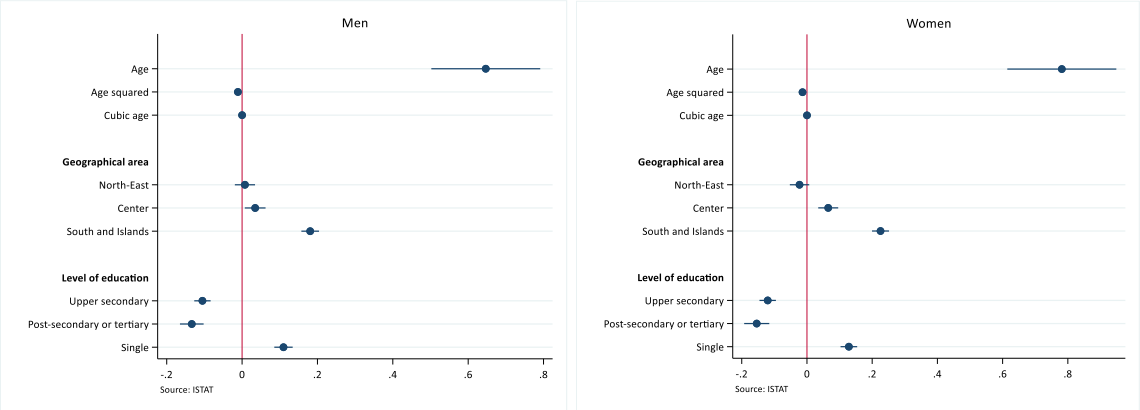


Figure 3.2. OLS estimates of the number of ADL limitations by gender - SHARE and ISTAT data.

a) SHARE



b) ISTAT



3.2 Predicting frailty and prefrailty statuses

3.2.1 Estimating the frailty status (ADL>=4/6)

We estimate the prevalence of being frail by employing a set of probit regressions, in which the outcome is a binary variable taking a value of 1 if an individual exhibits four or more limitations in the ADLs. In this section we restrict the analysis to predicting the frailty status only.

The probit model is specified as follows:

$$Prob(Frailty = 1) = \alpha + \beta_1 Age + \beta_2 Age^2 + \beta_3 Age^3 + \gamma Female + \delta Geographical\_area + \theta Education + \mu Birth\_cohort + \eta Single + \varepsilon$$

The equation includes as covariates, age, gender, geographical area (with North-West as the baseline category), educational attainment (with the lowest level as the baseline), indicators of birth cohort, and an indicator of being single. We ran separate regressions for men and women by assuming that the pathway from good to bad health condition diverges based on gender, since women show higher levels of functional dependency in older ages than men. These specifications allow us to further compute the predicted prevalence of frailty by age also out-of-the-sample, for younger ages.

Table 3.1 displays the average marginal effects of the main explanatory variables on the probability of being frail. For comparability, we report the results of the estimations performed on a subsample of individuals aged 50-90 both in the SHARE and in the ISTAT data, while Table A3.1 in the Appendix displays the average marginal effects of regressions carried out on the ISTAT sample for all individuals, including those aged 30-90.

Results are coherent across samples. Age is positively and significantly associated with the probability of strong functional limitations and being a woman increases the likelihood of being frail. Individuals living in the North-East of Italy are not significantly different from those in the North-West, while residents in the Central and Southern regions exhibit significantly larger likelihoods of being frail, with the magnitude of the effect being more than double in the South. Being more educated reduces the probability of displaying severe impairments, for both genders, the size of the effect is slightly larger for women with post-secondary or tertiary education.

Table 3.1. Average marginal effects on the probability of being frail (individuals aged 50-90).

	SHARE, individuals aged 50-90				**ISTAT, individuals aged 50-90**		
VARIABLES	**Full sample**	**Men**	**Women**		**Full sample**	**Men**	**Women**
Age	0.00573***	0.00404***	0.00714***		0.00433***	0.00397***	0.00470***
	(0.000994)	(0.00130)	(0.00146)		(0.000479)	(0.000643)	(0.000716)
Female	0.00603**				0.0107***		
	(0.00272)				(0.00135)		
Geographical area							
North-East	0.00703**	0.00489	0.00916**		-0.00125	0.000426	-0.00319
	(0.00336)	(0.00486)	(0.00446)		(0.00171)	(0.00233)	(0.00250)
Center	0.0127***	0.00863*	0.0168***		0.00804***	0.00469*	0.0118***
	(0.00337)	(0.00505)	(0.00440)		(0.00188)	(0.00247)	(0.00286)
South and Islands	0.0250***	0.0188***	0.0300***		0.0281***	0.0252***	0.0316***
	(0.00316)	(0.00446)	(0.00425)		(0.00174)	(0.00233)	(0.00260)
Level of education							
High school	-0.00712**	-0.00186	-0.0129***		-0.0197***	-0.0196***	-0.0196***
	(0.00352)	(0.00498)	(0.00477)		(0.00161)	(0.00211)	(0.00249)
Post-secondary and tertiary	-0.00702	0.000898	-0.0158***		-0.0237***	-0.0222***	-0.0254***
	(0.00476)	(0.00733)	(0.00533)		(0.00217)	(0.00274)	(0.00345)
Single	0.00755***	0.00287	0.00872**		0.0186***	0.0194***	0.0176***
	(0.00285)	(0.00442)	(0.00388)		(0.00167)	(0.00242)	(0.00238)
Cohort controls	✓	✓	✓		✓	✓	✓
Wave controls	✓	✓	✓		✓	✓	✓
Observations	27,061	12,286	14,775		80,304	42,219	38,085

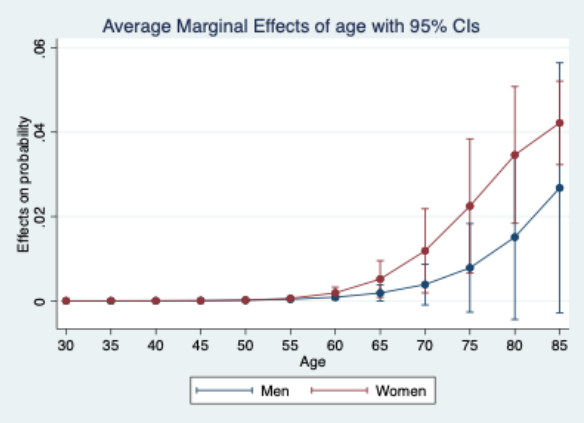
Note. Indicators for North-West and lowest level of education (i.e., lower secondary or less) are omitted.

Being single is associated with a significantly larger likelihood of being frail and, based on the results from the ISTAT sample, the correlation is stronger and larger in size for men. Figure 3.2 displays the average marginal effects of age on the probability of being frail throughout the life-course (as from age 30) in the two subsamples: both graphs support the idea that there is an

acceleration in the transition to frailty for women starting around the age of 65, and the gap is increasing as the individuals get older. Predictions are presented in Figure 3.3[8].

Figure 3.2. Average marginal effects of age on the probability of being frail.

SHARE



ISTAT

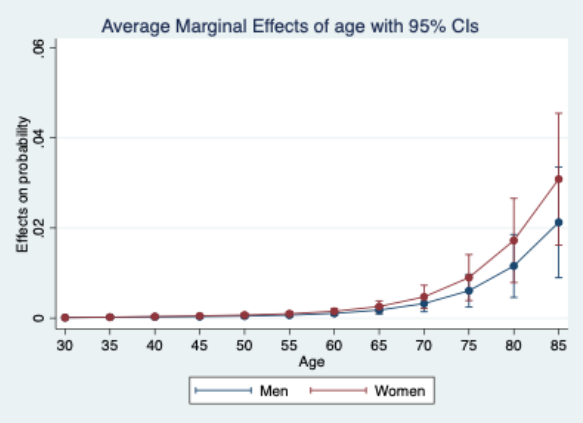
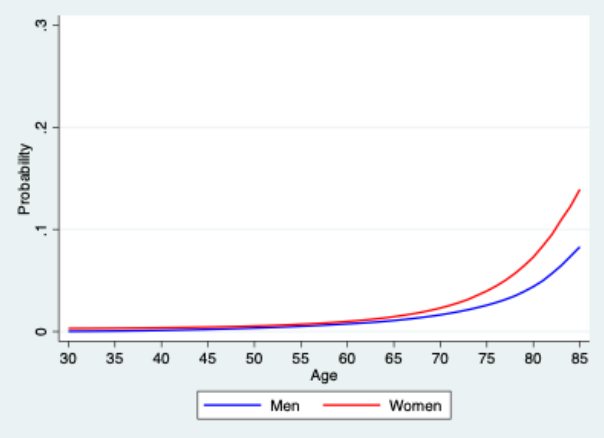
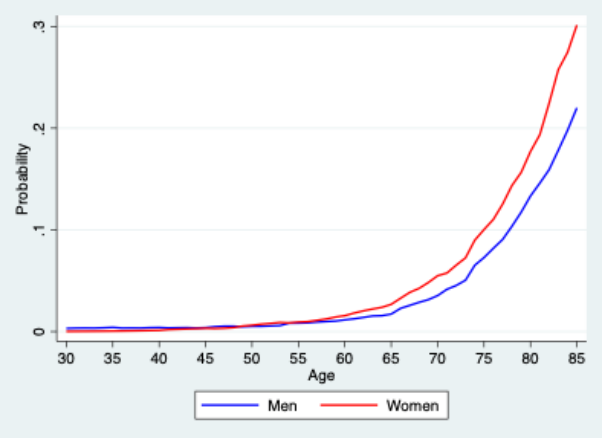


Figure 3.3. Predicted probabilities of being frail over the life course.

SHARE



ISTAT



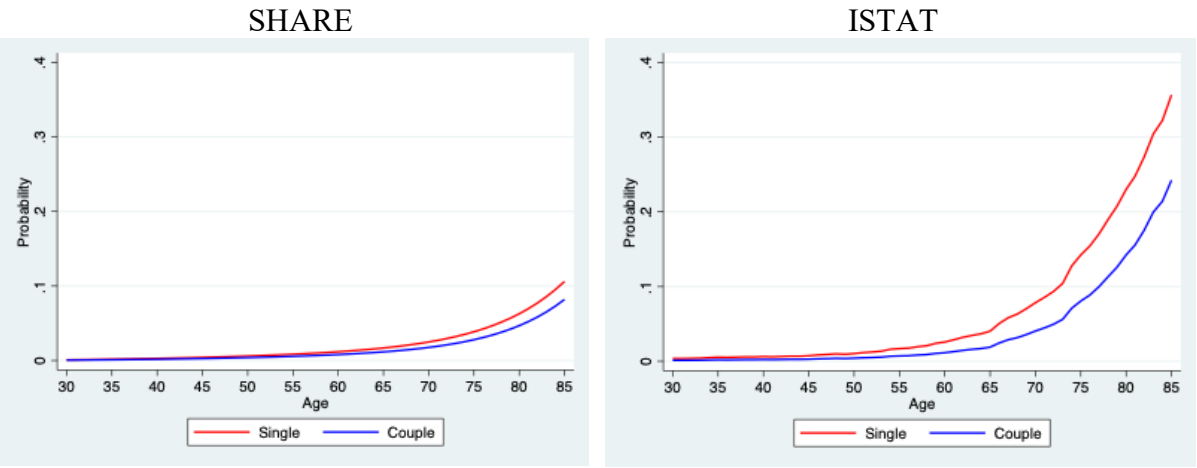
[8] Although the SHARE dataset collects information on individuals aged 50 and older, we can still project the probabilities outside the sample ages (30 to 49). This exercise is obviously bound to have a larger error than in the case of the ISTAT data. However, the bulk of the prefrail and frail people is located at ages beyond 40 or even beyond 50, so that the error would not affect the relevant age-bands.

These results are obtained through estimates based on the sub-sample aged 50-90 in both surveys, Table A3.1 in the Appendix shows the regressions on the ISTAT sample aged 30-90: results are confirmed[9].

3.2.2 Evidence from statistical counterfactuals

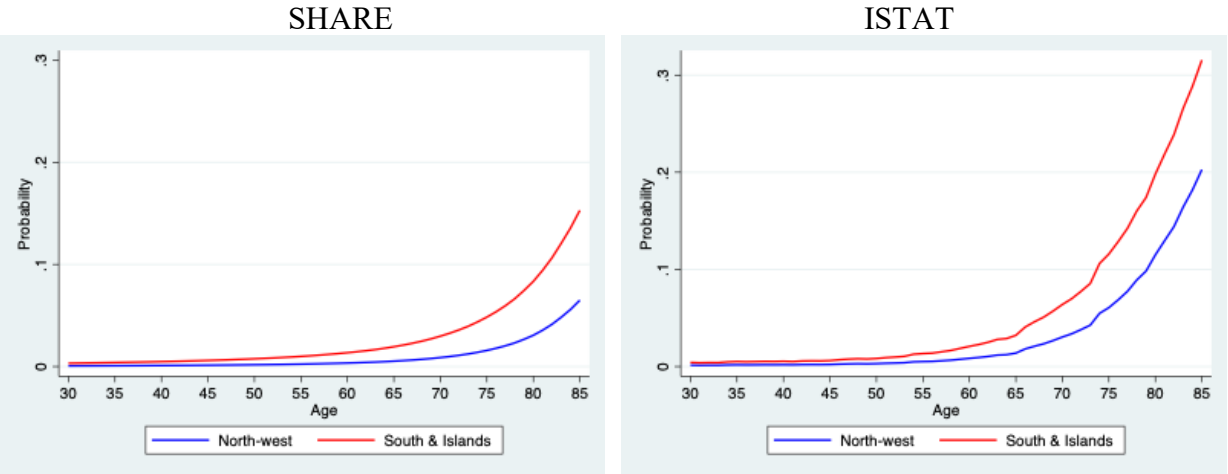
In this section we show the results of statistical counterfactuals which quantify the differences for specific groups in the population. Figure 3.4 displays the predicted probability of being frail, at any given age between age 30 to age 85, if all the individuals in our sample were single versus the situation in which all individuals were living in a couple. The former group displays significantly larger probabilities of being frail in old age. The gap appears already at age 60 and it deepens gradually as individuals age. We repeat a similar exercise by comparing, geographically, the two extreme cases: North-west and South and Islands (see Figure 3.5).

Figure 3.4. Counterfactuals: probabilities of frailty, singles vs. coupled individuals.



[9] Estimation results using the more "inclusive" frailty definition (3 out of 6 ADL limitations) are available upon request. The estimates are coherent with the ones using the "stringent" definition and with the frailty patterns documented in paragraph 2.4.

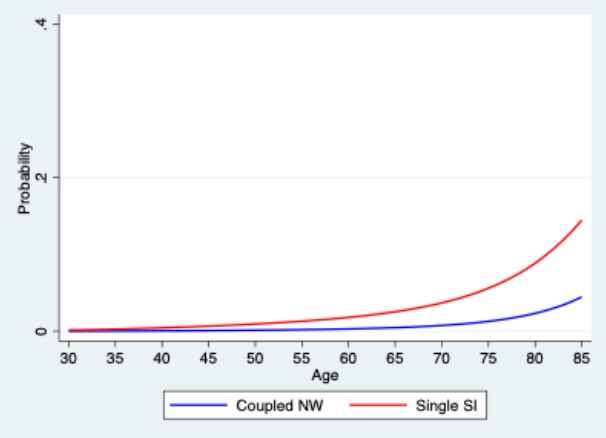
Figure 3.5. Counterfactuals: probabilities of frailty, North-West vs. South and Islands.



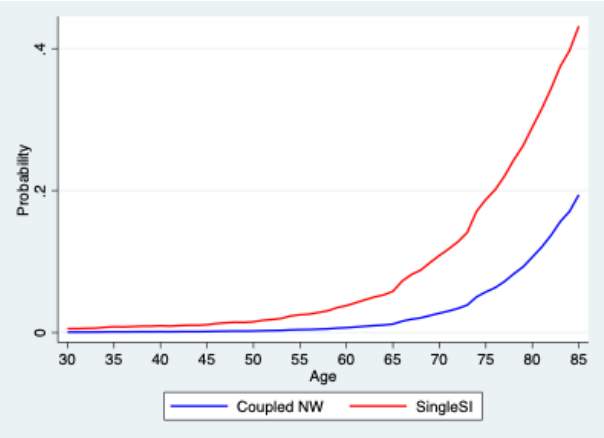
Individuals from North-Western Italy exhibit very low frailty likelihoods up to the age of 65. Moreover, when the distinguishing feature is the region of residence (everything else being identical), we can note that the people residing in the North-West display significantly lower probabilities of severe impairment with respect to those living in the South and Islands. This discrepancy appears already at younger ages and increases throughout life. Finally, we combine two opposite situations: a coupled individual living in the North-West regions versus a single individual living in South (Figure 3.6). The discrepancy between the two groups is striking: a single individual living in the South exhibits a 0.1 higher probability of being frail (0.23 higher based on ISTAT data) with respect to the coupled-individual residing in the North-West, already before the age of 50 and almost surely by the age of 85.

Figure 3.6. Counterfactuals: frailty probabilities for coupled individuals from the North-West vs. single individuals from the South and Islands.

SHARE



ISTAT



3.3 The role of different eligibility criteria based on the number of limitations

3.3.1 Estimates obtained with an ordered probit methodology

In the previous models we produced econometric estimates by considering a binary variable, which classifies individuals who display at least 4 limitations, as frail (the indicator takes value = 1). However, in the pool of people who are not frail (the zeros), those who exhibit 1 to 3 limitations are characterized by different degrees of moderate impairment and are different from the individuals in good health, who are completely autonomous. Therefore, it is important to distinguish between three categories, hence providing a more complete picture of disability and frailty over the life course. For this, we jointly estimate the probability of being in a prefrailty or frailty status, by employing a set of **ordered probit specifications**. We exploit the natural ordering of the health status, where the indicator variable takes mutually exclusive values: 0 = good health, 1= prefrail or 2= frail. For brevity we report the results of such estimates in the Appendix Table A3.2,, the estimates are valuable per se, but we rather focus on the use the parameter estimates of these ordered probits for their predictions.

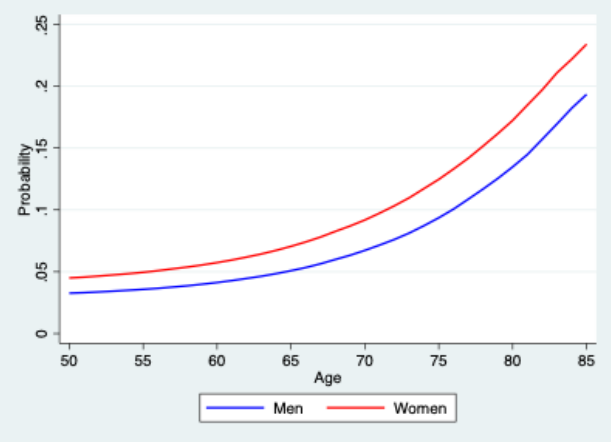
One of the goals of the present contribution is to assess the need for assistance and care for people who are non-self-sufficient, with a focus on the ***unmet demand for care.*** As we already pointed out in Section 2, the potential coverage changes significantly when switching from a more stringent to a more inclusive criterion for access to care schemes. We will briefly analyze this point also in the light of our estimations, by comparing the differences in the predicted prevalence of frailty when employing the more "inclusive" definition (3 limitations in the ADLs) versus the tighter one

(4/6 ADLs). These comparisons are based on the ordered probit methodology that we just introduced.

From Figures 3.7 and 3.8 it emerges that, when using the stricter definition of frailty, the probability of being classified/evaluated as being frail at older ages (75-85) is smaller by about 0.025-0.035 than in the case of the more inclusive (3 out of 6)-criterion, it increases in a similar measure the probability of being prefrail. For our objectives this is relevant, as the prefrail individuals do not benefit from formal LTC coverage, while they represent people with relatively serious impairments and in need of assistance.

Figure 3.7. Predicted probability of being prefrail.

4/6 ADLs



3/6 ADLs

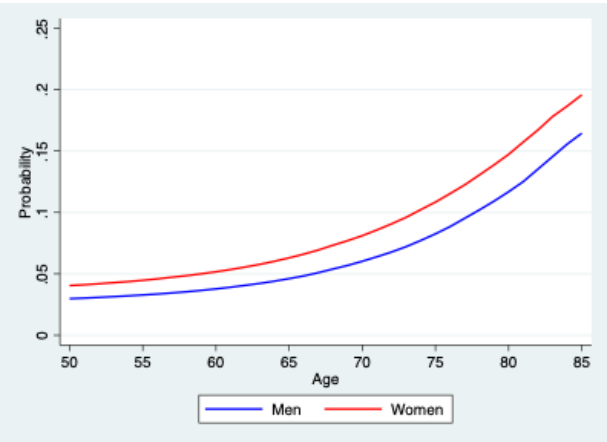
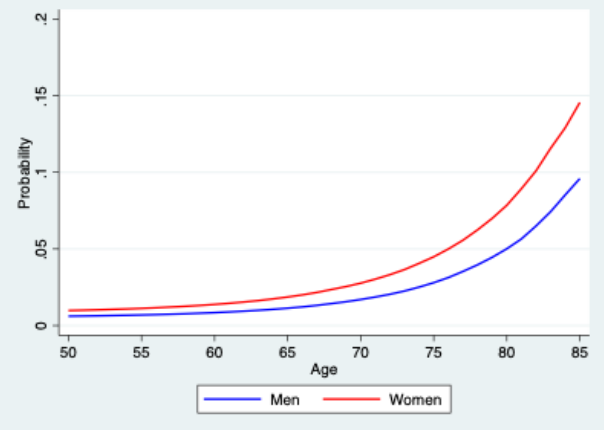
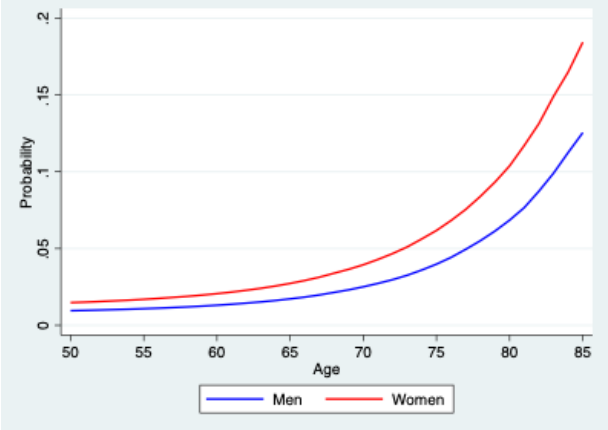


Figure 3.8. Predicted probability of being frail.

4/6 ADLs



3/6 ADLs



3.4 Inequalities and inequities in the transition to frailty: storylines based on differences in years in poor health or in healthy life years

Our econometric methodology allows us to consider different scenarios that we call ***"storylines"***, i.e., specific cases that may represent groups of the population, for example distinguishing by gender or geographical location. In each case we use the predicted probabilities (i.e., the result of the econometric model estimates above) and we fix one characteristic of interest at the time. These elaborations make use of estimates and analysis based on SHARE data only.

Setting to 5% the probability of frailty (prefrailty) as a reference for illustrative purposes, we can infer the differences in age. Figure 3.9 shows that, for women with low education, a 5% likelihood of being prefrail appears at earlier ages than men: age 60 versus age 65. A 5% likelihood of being frail is predicted at age 76 for women with low education, versus age 80 for men in low education. In terms of educational differences: men with "high education" (post-secondary and tertiary education) display a 5% probability of being prefrail around 7-8 years later than men in low education (around age 72), and of being severely impaired around age 83. Overall, assuming that the transition from good health to frailty goes through the prefrailty status, we can infer that men with low levels of schooling display: (i) significantly shorter periods of good health (on average about 7 years with no ADL limitations), (ii) longer periods of prefrailty and (iii) earlier transition to severe impairment (frailty, defined as at least 4 limitations in the ADL). The discrepancies are even more marked for women: highly educated women exhibit a 5% likelihood of being prefrail around the age of 71, that is 11 years after such probability occurs for the low schooling subsample.

Figure 3.9. Predicted probability of prefrailty and frailty by level of education**,** men (left) vs women (right).

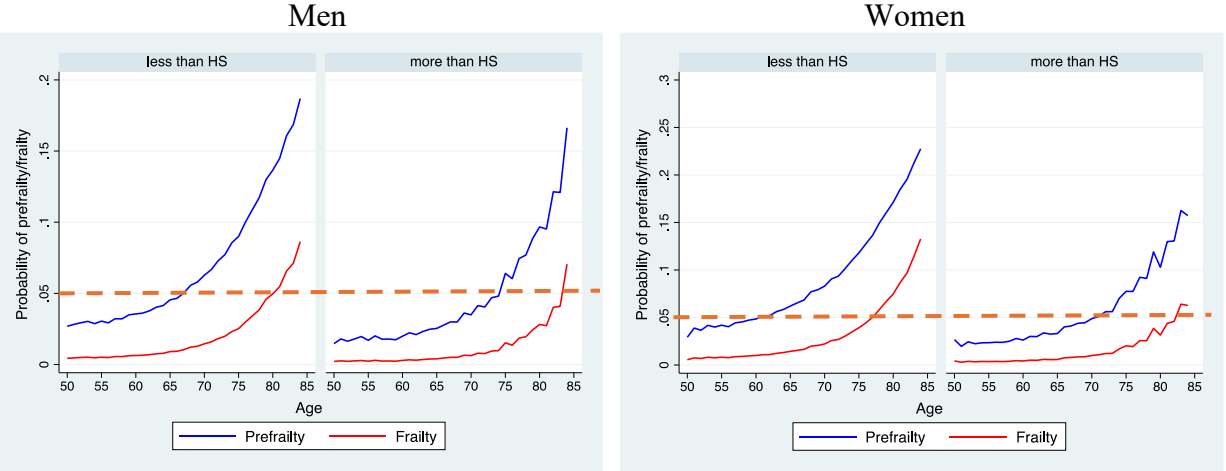
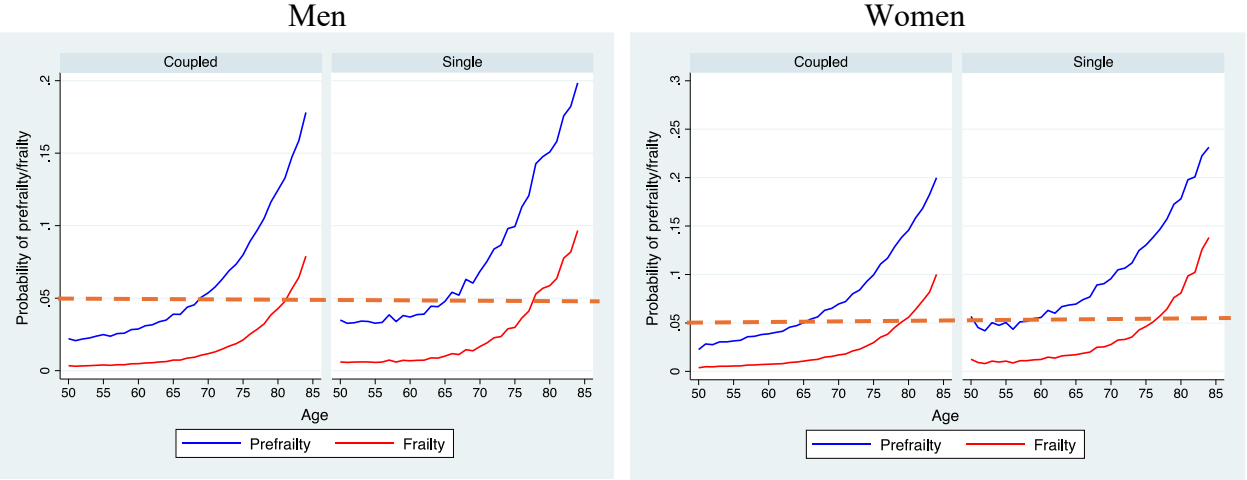


Figure 3.10 compares respondents living in a couple *versus* living alone[10]. This is a very relevant comparison in studying ageing as it provides striking differences which would suggest some targeted interventions. Fixing again the probability at 5%, we show that single men have a 5% likelihood of prefrailty at age 65, that is about 3 years earlier than those living in a couple, while such difference is much larger for women, about 10 years, (from age 55 for women living alone to 65 for those in a couple). As for frailty, singles of both genders exhibit a 5% likelihood of severe impairment around the age of 76, which occurs about five years later (age 81) for coupled women/men.

Figure 3.10. Predicted probability of prefrailty and frailty by marital status, men (left) vs women (right).



3.4.1 Healthy life years

A popular measure in this literature is the number of years in bad health: it provides a simple and comparable metric, between individuals or between groups of the population. It is also a synthetic measure of the potential need for assistance in old age. This metric can also be adopted to provide "storylines" of the type we have proposed above; however, it has some shortcomings when survey data are used. In fact, we cannot observe complete life histories (until death) for all the respondents, we rather observe "right-truncated" histories. On the other hand, if we follow people over the life-course until very old ages, we induce a selection bias due to the "survivors". Hence, we consider a more intuitive, and more rigorous, alternative indicator, that is, **healthy life years: the number of years in good health** between the ages 65-85. We measure the time spell in which the individual does not exhibit any limitation[11].

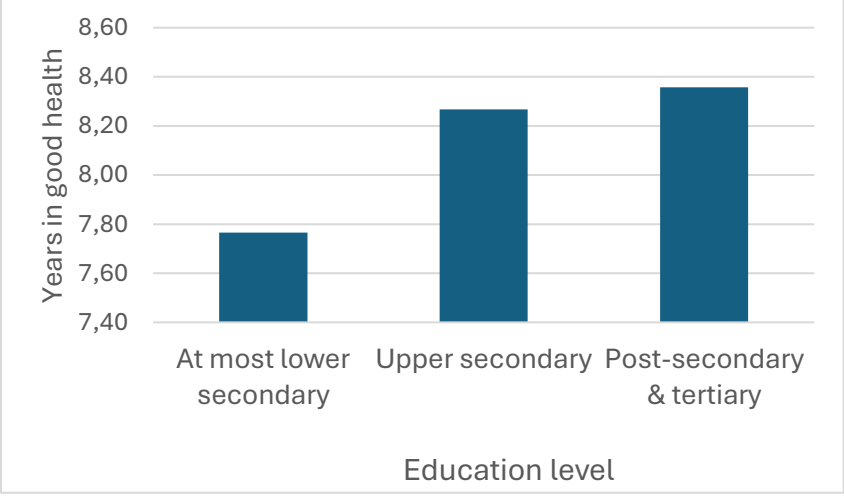
[10] Figures A3.1 to A3.3 in the Appendix shows the case of different areas of the country and of various educational levels.

[11] For instance, Fabbri et al. (2025) report that longer health expectancy, here operationalized as years of life free of chronic diseases, is associated with faster disease accumulation and higher survival rates.

In practice, we measure the difference between the age at first onset of one (anyone) limitation and the age 65. We make use of the probabilities of being prefrail/frail that we estimated through our model, together with the survival probabilities up to age 85, elicited from the ISTAT data to provide a proper metric[12]. As usual, the emphasis is not so much on the estimated levels of healthy life years, as sample measures may be subject to some measurement error and sample variability, but on documenting the difference between different groups in the population.

Our calculations indicate that an individual who reaches the age of 65 in good health would benefit on average of about **7.93** years in good health up to the age of 85. Men display slightly higher values, but not significantly different, if compared to women (8.09 versus 7.79). It should be noted that these findings are very close to the ones reported in national statistics: the average for the population as reported by ISTAT varies between 7.2 years and 11.9 years, depending on the specific years and the cohorts being considered[13]. As expected, there is heterogeneity in various domains, for example by education attainments (Figure 3.11). The gap in the average number of years in good health is about 0.6 years between the most educated and the least educated individuals and as large as 0.5 years, between the individuals with a high-school degree and those who completed at most the lower-secondary education. As already discussed, this is extremely important from a policy perspective, as people with lower schooling are those characterized by lower earnings, and therefore, with higher difficulty in facing the high costs of LTC[14].

Figure 3.11. Years in good health between ages 65-85, by education level.



[12] The formula is $(1 - P_{nh}) * Ps_{85} * 20$, where P_{nh} is the probability of a transition from the healthy state to a frail or prefrail state, drawn from our estimates, while Ps_{85} is the probability of surviving to age 85. The maximum spell of healthy years is 20, for ages between 65 and 85.
[13] EUROSTAT, several years.
[14] Figure A3.4. in the Appendix shows variation across areas in the country

3.5 Transitions towards frailty: transitions from being "healthy" to being in pre-frailty and from the pre-frailty to the frailty status

As we previously explained, evaluating frailty could be done by looking at stock measures (the people who exhibit limitations at a specific point in time/age). The equivalent relative measure is **prevalence,** i.e. the number of frail people at a given age, divided by the total number of people of the same age. In order to complete the analysis, one could look at flows, i.e. transitions from one state to the other. In statistical terms this is a measure of **incidence**: how many **new** frailty cases at age *"a",* given the existing stock of non-frail people at age *"a-1"*. In relative terms this is the hazard of frailty.

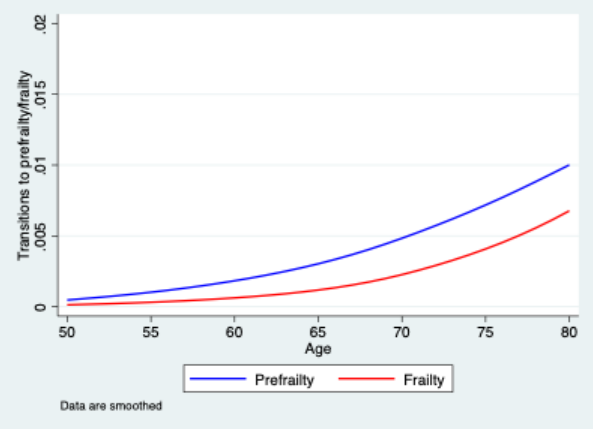
Given the nature of our microdata, assessing the transitions from one status to another, we initially make use of a simple method based on the difference in stocks, rather than looking at individual transitions and then aggregating them. We calculate the difference between the probability of an individual being in a state *s* at age *a,* and the probability of the individual being in the same state at age *a-1*, or in other terms, the difference between the predicted prevalence of a status *s* at age *a* and the predicted prevalence of the same status *s* at age *a-1*:

$$T_a^s = Pr_a^s - Pr_{a-1}^s$$

where *a* is the age and *s* the status we refer to, $s \in \{prefrail, frail\}$.

Figure 3.12. Transitions towards pre-frailty or frailty, in SHARE (left) vs. ISTAT (right) data.

SHARE



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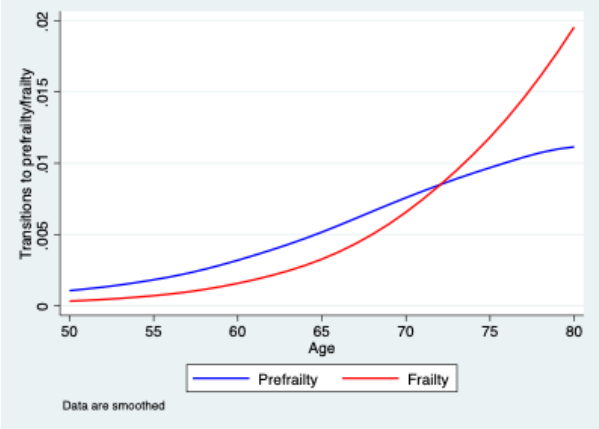
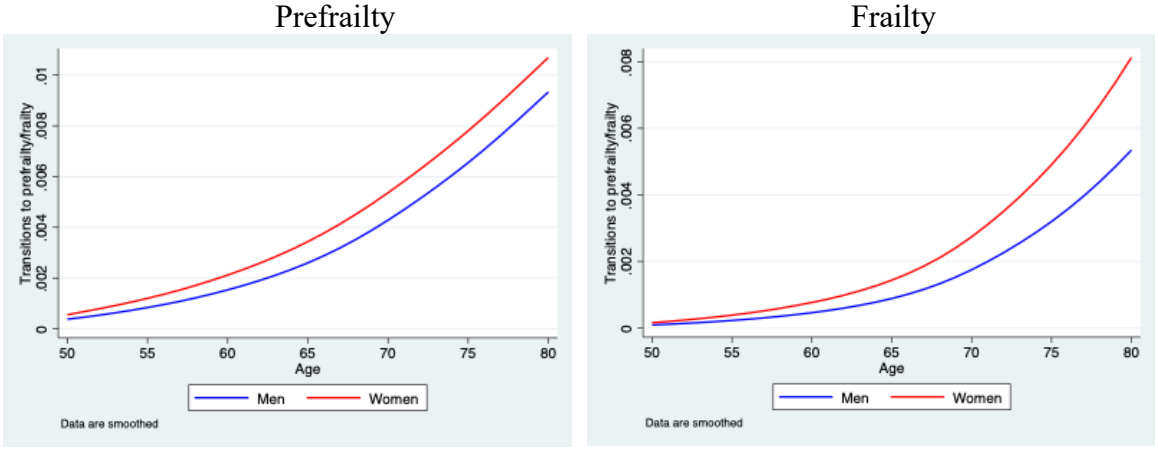
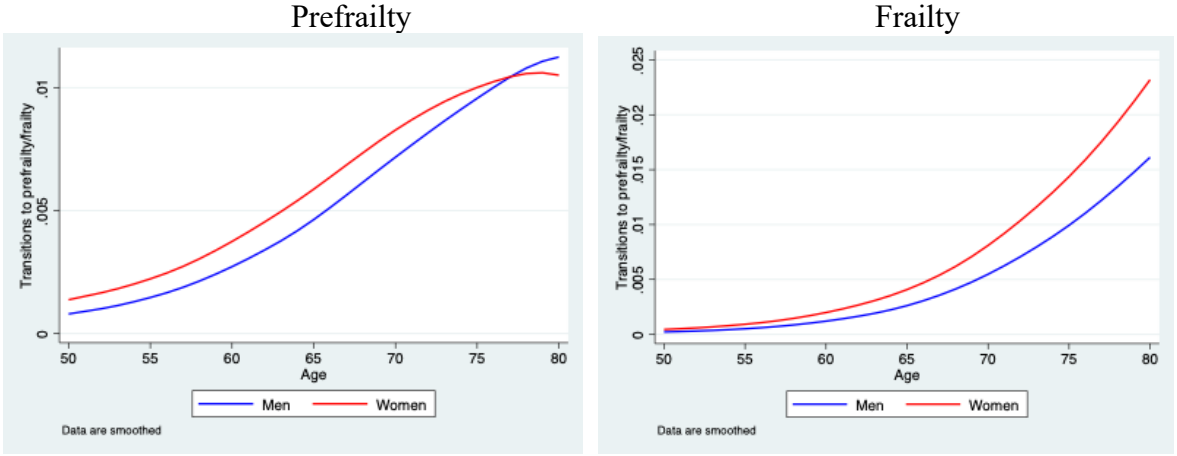


Figure 3.13. Transitions to prefrailty or frailty by gender, in SHARE and ISTAT data.

a) SHARE data



b) ISTAT data



Figures 3.12 and 3.13 show the "new entries" into a frailty (prefrailty) state, at any given age, in relation to the stock of people not prefrail or frail of the previous period. The results for the transitions towards prefrailty are similar for the two dataset SHARE and ISTAT, but based on the ISTAT data we see an acceleration of the process at earlier ages (50-65) and a slowdown after the age of 70. When looking at the transitions to frailty we find higher divergence in the results: data from the multipurpose ISTAT survey document larger shares of new entries into frailty, especially after age 65. Disaggregating by gender, both datasets highlight an acceleration of the entry into frailty for women particularly marked after age 65.

While these results are extremely useful to understand the dynamics, they should be taken with caution. Firstly, because the small sample sizes do not guarantee that the estimates are sufficiently precise and, secondly, because they are sensitive to the chosen model specification for the regression model.

3.6 The role of the main drivers of frailty: from demographics to health deterioration

Evolution of limitations in performing the activities of daily living

In order to design sound interventions that postpone and reduce the period in bad health, it is important to understand how limitations evolve along the life-course. Data from the SHARE survey document that the first limitations that appear are mainly linked to mobility issues. Indeed, among the individuals displaying one ADL, almost half of them experience difficulties in dressing while about 37% have troubles with bathing, with slight variations between men and women and among macro regions (Figures 3.14 and 3.15, below).

Figure 3.14. Prevalence of types of ADL among individuals exhibiting one limitation.

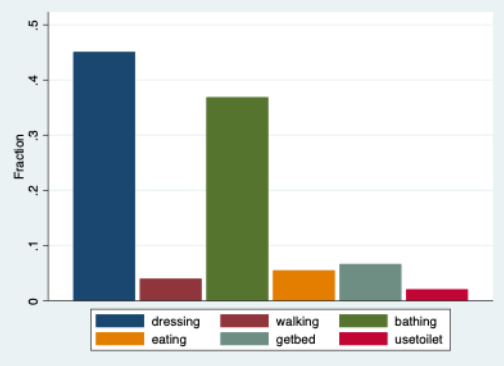
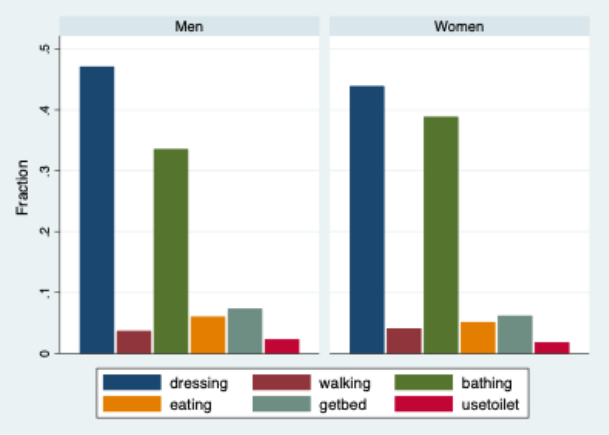
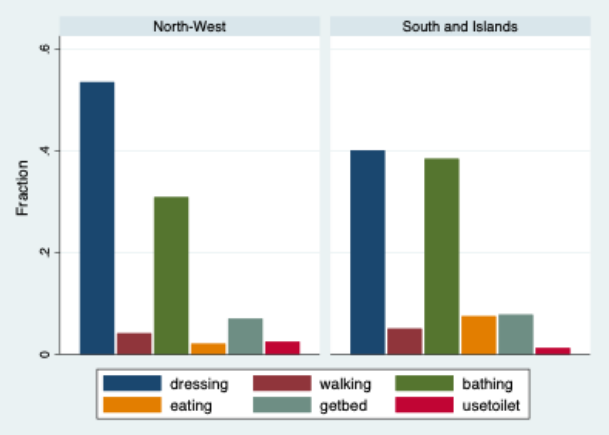


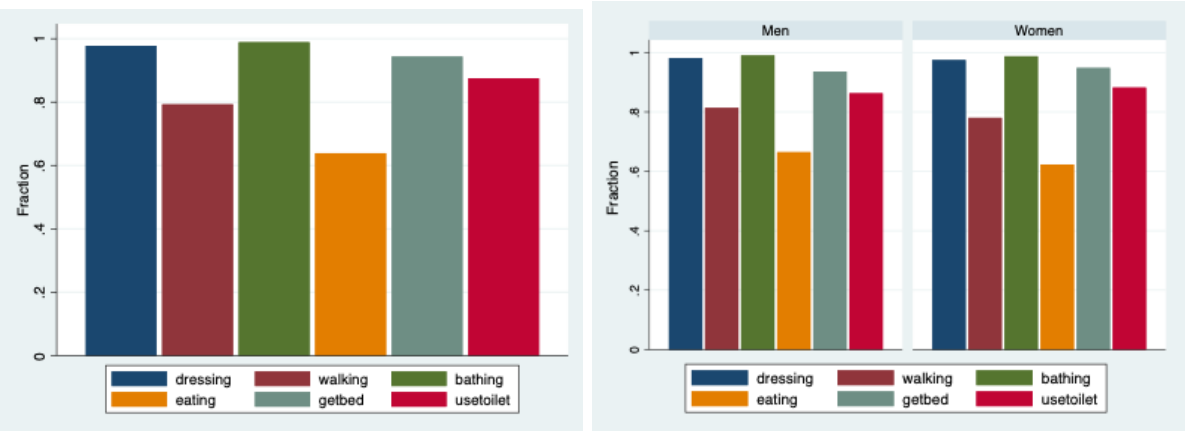
Figure 3.15. Prevalence of type of ADL among individuals exhibiting one limitation, by gender and by geographical area.





Before going deeper into this issue, it is useful to draw some comparisons with external data. Figure 3.16 provides further evidence on this point by focusing on the sub-sample of respondents who are frail according to the criterion 4 out of 6 limitations.

Figure 3.16. Prevalence of ADLs in frail individuals: all (left panel), by gender (right panel)



This evidence, based on self-reported information in randomly selected representative survey data, can be compared with evidence from the insurance industry[15]. In order to carry out such comparison we have to consider "similar" individuals, in particular in the case of data coming from the insurance industry, the prevalence of the various ADLs is recorded for insured individuals, who have claimed benefits and have been assessed eligible for receiving long-term care benefits. It is worth stressing that there is added value in this comparison, given that there is no clear evidence in Italy on the size and nature of "need of care" in the population. Although the ADL-items considered in the SHARE survey and by insurance companies do not overlap completely, there is high consistency in the information provided by the two sources. Individuals classified as frail in the SHARE data, exhibit a prevalence of almost 100% in the presence of the item "difficulties with dressing and bathing", about 80% in "mobility" and 90% in "using the toilet". Data from insurance companies show the same prevalence of limitations for the first two items and about 10% higher for mobility and personal hygiene. The evidence is consistent between the two sources also when considering the prevalence of ADLs separately by gender: men display slightly larger difficulties with walking/mobility and eating. These results encourage us to believe that the survey data provide valuable estimates of the frailty/non-self-sufficiency status.

The relevant question is how the types of limitations relate to the transition from a prefrailty to a frailty status. To this end, we go back to the more general cases (SHARE data) and plot the prevalence of the various ADLs for the individuals exhibiting 3 versus those experiencing 4 limitations, i.e. we assume that people with 3 limitations are "prefrail" while those with 4

[15] Figures displaying the information from the insurance industry are available upon request.

limitations are “frail” (Figure 3.17). The shares of individuals with difficulties in dressing and bathing are already high among those with 3 ADLs, so it is hard to gauge the difference with the case of 4 limitations. In this sense, it is interesting to look at the change (right panel), which is dominated by an increase in the difficulties with using the toilet and getting in and out of bed. The differences between genders mainly regard difficulties in getting in and out of bed and walking, which increase more for men, and using the toilet, which rises more for women (Figure 3.18).

Figure 3.17. Prevalence (left panel) and variations (right panel) in the type of ADL between 3 to 4 limitations in ADL.

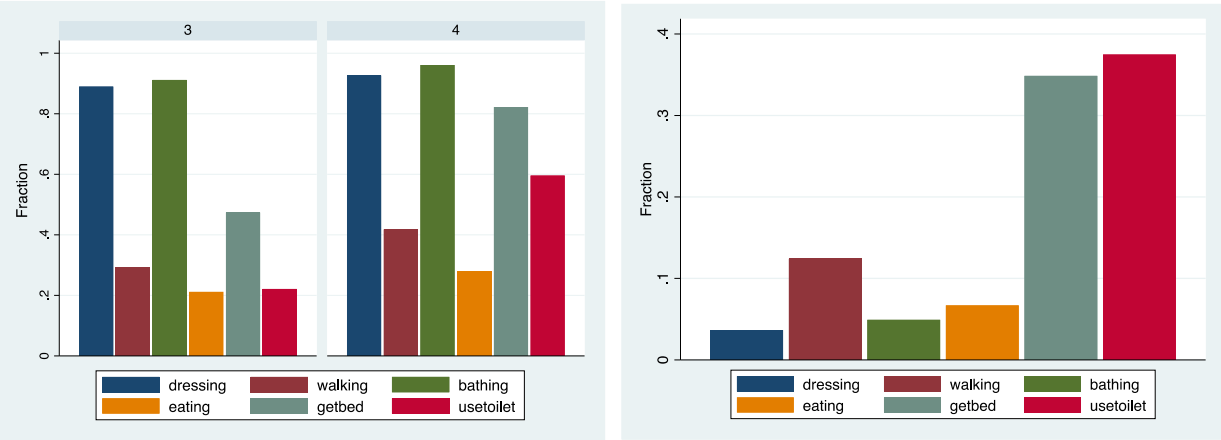
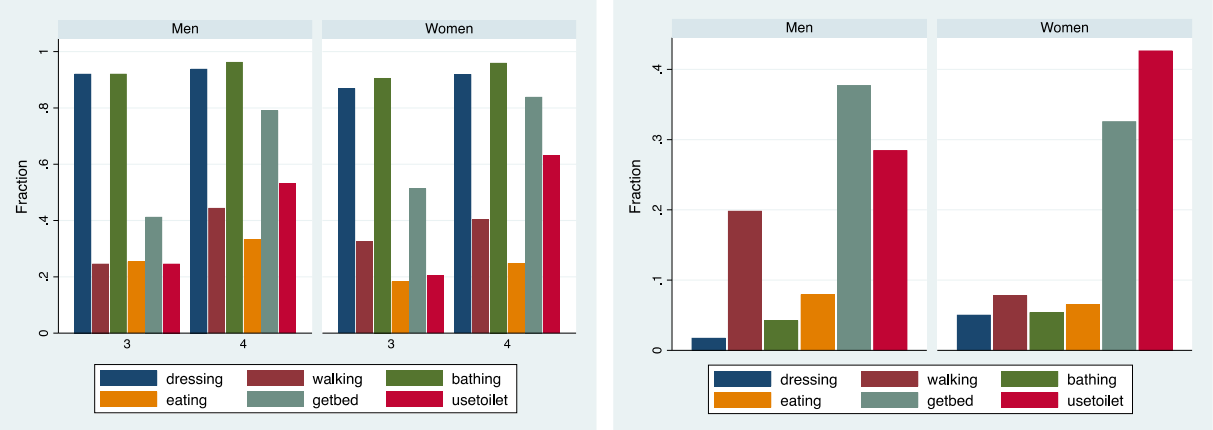


Figure 3.18. Prevalence (left panel) and variations (right panel) in the type of ADL between 3 to 4 limitations with the ADL, by gender.



This is compelling evidence on which type of help should be provided when older people are still at the “prefrailty” status, in order to prevent the transition to the frailty status.

4. Support, assistance and care for non-self-sufficiency

4.1 Public support measures

4.1.1. The Italian LTC system: an overview

Public spending on long-term care (LTC) in Italy is similar to the average spending observed across Europe. However, Italy relies mostly on a national cash benefit known as *"Indennità di Accompagnamento" (IA)*, which accounts for a significant portion of total benefits, rather than on direct care provisions. People are entitled to IA if they are deemed "invalid". The concept of invalidity is somewhat broad, encompassing individuals who are (i) blind, (ii) physically or mentally disabled, (iii) unable to walk without ongoing assistance, or (iv) require permanent help with Activities of Daily Living (ADL). The assessment process is conducted by a commission at the health district level within the National Social Insurance Agency (INPS), initiated by the patient's general practitioner. In 2021, the monthly benefit amount was €522.10. This cash allowance is flexible in its use, as recipients are free to decide how to spend it, with no strict post-distribution monitoring.

The extent of publicly funded home and residential care services is limited, with substantial disparities between regions and municipalities in terms of the availability of formal care and the criteria for accessing these services. Italy's National Statistical Office classifies LTC into four groups: inpatient long- term care, day long- term care, outpatient long- term care, and home- based long- term care. Public funding covers 63.28 percent of the costs for care provided in nursing homes. However, if similar care is provided at home, 92.77 percent of the total cost is covered by public funds. In 2004, the public expenditure on LTC amounted to 1.5 percent of GDP. During the financial crisis, it jumped significantly, reaching 2 percent of GDP in 2020.

Formal care includes assistance with personal care (e.g., toileting, personal grooming, getting dressed), and with housework, as well as public provision of ready-made meals, and help with other daily activities (e.g. taking medications). In Italy, there are two primary professional profiles of care workers who can operate in both nursing homes and home-care settings: the social-assistance operator (Operatore Socio Assistenziale, OSA) and the medical-assistance operator (Operatore Socio Sanitario, OSS). The OSA is an officially recognized auxiliary healthcare worker trained to directly assist individuals with daily activities, support their autonomy, promote their psychological and physical well-being, and help prevent social isolation and exclusion. In contrast, the OSS possesses health-related training that enables them to assist nursing staff in clinical settings, such as operating theaters, emergency rooms, and nursing homes. The less skilled role of the "badante" (caregiver) requires no formal training or very limited qualifications.

Most regions in Italy offer targeted care programs aimed at ensuring a minimum standard of support for basic needs—either in-kind or cash benefits—covering both home care and, to a lesser extent, residential care. These regional programs are funded nationally through the National Fund for the Loss of Autonomy (FNNA), established in 2006 by Law 296/2006, as well as through additional regional funds known as the Regional Fund for the Loss of Autonomy (FRNA).

Programs financed by FNNA or FRNA serve two main groups: (i) individuals with *disabilità gravissima* (severe disability) and (ii) those with *disabilità grave* (moderate to severe disability). The first group includes those eligible for the IA benefit and who also have at least one additional severe condition, such as being minimally conscious, in intensive care, heavily affected by dementia, or experiencing extreme physical impairment. The definition of severe disability, which qualifies individuals for public long-term care (LTC) support, is determined at the regional level.

Eligibility for public LTC significantly influences care receipt, beyond what health limitations alone would predict. In other words, eligibility criteria serve as a key factor shaping care utilization because they define the population that can access and potentially benefit from LTC services. The "potential coverage" of LTC policies is the proportion of the population aged 65 and over that meets the specific eligibility criteria for LTC benefits within a given country. Depending on how "need-for-care" is defined, the share of older Europeans who could access LTC varies considerably (Brugiavini et al., 2023 and 2025).

On March 31, 2023, Law No. 33, titled "*Deleghe al Governo in materia di politiche in favore delle persone anziane"* (Delegations to the Government regarding policies supporting older adults), became effective. The main elements of the LTC reform are structured around four central pillars. The first involves establishing a new governance framework for LTC services, aiming to address the needs of older adults in later life in a more comprehensive and tailored manner. To achieve this, the "National System for the Older Population with LTC Needs" *("Sistema nazionale per la popolazione anziana non autosufficiente": SNAA*) was created, tasked with planning and overseeing all health, social, and welfare initiatives implemented by the State, regions, and local authorities, including financial benefits provided by the National Social Insurance Agency (INPS). The second pillar focuses on developing an updated home care model designed to promote aging in place by enhancing public home healthcare services and integrating social and health support measures. The third pillar introduces a new residential care model that combines health and social activities. The fourth pillar involves reforming the IA, whose amount will vary depending on individual care needs. Moreover, beneficiaries will be able to choose whether they want to receive the IA in cash or in kind. Additionally, the reform will establish a multidimensional assessment system for evaluating individuals' conditions, with the "Single Point of Access" (Punto Unico di Accesso: PUA) serving as the sole gateway to the care network (Santini et al., 2025).

4.1.2 Existing Evidence on the provision of public LTC

Data on the recipients of LTC benefits, either public or private, are not easily accessible, therefore we will employ self-reported data from the SHARE survey[16] to document the relevant distributions. We are particularly interested in understanding who are the recipients of benefits/care and ultimately compare these results with the need for care that we obtained in the previous sections of this paper. In order to provide a general overview of public provisions, we present in Figure 4.1 (and 4.2) a simple statistic: the fraction of individuals receiving benefits for disability (DI) or non-self-sufficiency (LTC). It should be clarified that in our data the "disability benefit - DI" category includes both "invalidity" and "disability": the former is related to a limited working capacity and reduced ability to carry out and independent life, at any age and it is more likely to be a permanent condition. The latter is more strictly related to the labor market position of the individual and benefits may be subject to a periodic test, to check if the eligibility conditions persist, so that the benefit could be temporary. By and large, for the age groups under investigation a higher number of DI benefits are indeed disability benefits and not invalidity benefits. Furthermore, it is important to stress that the eligibility assessment process for DI benefits, carried out by specifically appointed committees at a regional level, is often different from the one for invalidity benefits, and surely different from the one designed for LTC benefits: it takes into account several dimensions, besides the health limitations through limitations in ADL (e.g. cognitive decay or working capacity, etc.). It is important to recall that, thanks to the use of national representative surveys (SHARE and ISTAT) we are looking at the entire population, not just people who have been selected from specific health registers or similar sources. As a result, we can observe people who are "in need of care", based on our notion of frailty, and yet do not receive benefits, or at the other extreme, people who do receive benefits and are not in need of care. Among those classified as "non frail" and "prefrail" by our definition, a non-negligible number do receive disability benefits, and in some cases also LTC public benefits. Figure 4.1 also shows that prefrail and non-frail individuals qualify more often for disability than people in the other groups: this is not just an "age effect", but it is also related to the nature of the DI benefits, that are very often awarded to people with partial reduced capacity (i.e. a few limitations in ADL). In fact. DI benefits are regarded in several European countries as a "pathway to retirement", i.e. an alternative exit route to early retirement.

[16] For this descriptive evidence we only use the data from waves 6 (2015) to wave 9 (2022) because previous waves do not allow to distinguish between disability, LTC benefits and some other forms of assistance.

Figure 4.1. Recipients of public benefits, by frailty status.

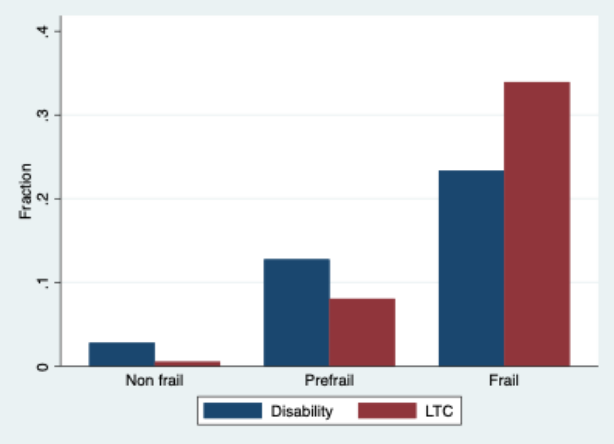
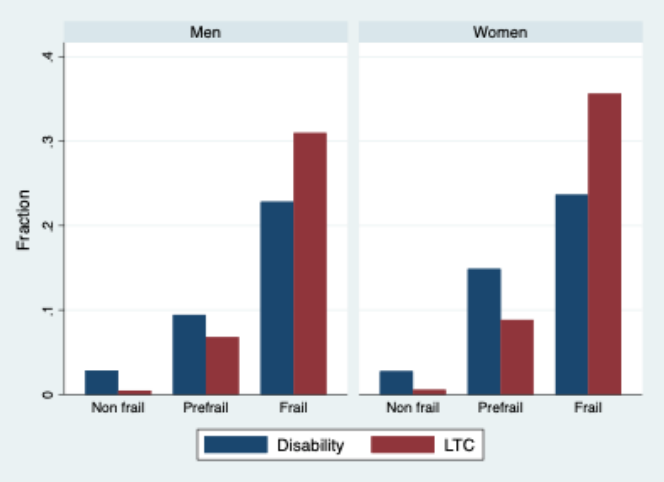


Figure 4.2. Recipients of public benefits, by gender and frailty status.



Other considerations emerge: among those who would be classified as "frail" (because they experience difficulties in more than four of the day-to-day activities) there are still significant shares not receiving LTC benefits. This may be because individuals reporting difficulties could experience different degrees of non-autonomy, which we cannot take into account in our classification based mostly on the presence of limitations. However, these individuals deserve special attention as some of them may represent vulnerable individuals who are precisely those presenting "unmet demand" for long term care assistance.

If we analyze the benefit recipients separately by gender, we note that the percentage of women who qualify both for disability and LTC are larger among prefrail and frail females. This may suggest that in the case of women it is more likely to qualify for benefits, possibly because there

is more overlapping between the self-reported limitations in ADL and the assessment by Regional Committees.

Figure 4.3 below shows a higher frequency of public benefit recipients is present in Southern Italy with respect to the North-West, both for the prefrail and frail individuals. An interesting finding, previously unknown in this literature, is provided in Figure 4.4, when plotting the benefit recipients by 10-years age groups. It emerges that higher and statistically significant fractions of individuals aged 50-59 or 60-69 receive disability benefits, compared with the other age groups (70-79). The same pattern emerges when distinguishing by frailty status. A possible interpretation is the following: since eligibility for disability benefits depends on the reduction in working capacity, such a pattern may indicate that as requirements for old-age retirement tightened (due to recent pension reforms), workers in poor health may need to go into disability as a pathway to retirement.

Figure 4.3. Recipients of public benefits, by NUTS-1 region and frailty status.

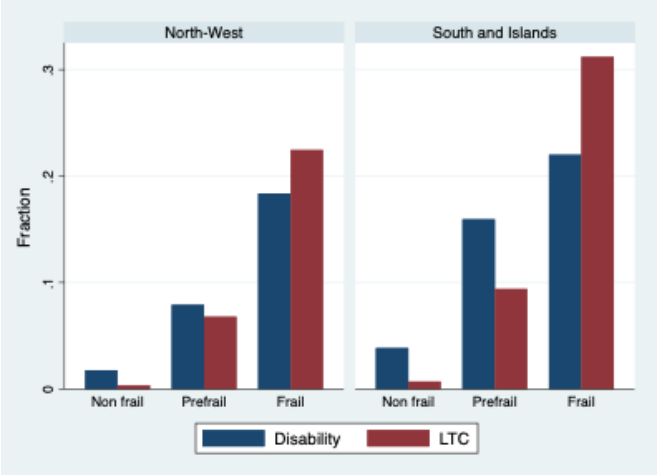
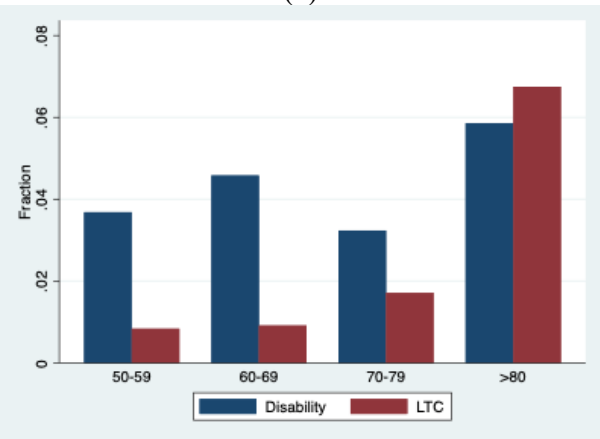


Figure 4.4. Fraction receiving public benefits by age group - overall (a) - and by frailty status (b).

(a)



(b)

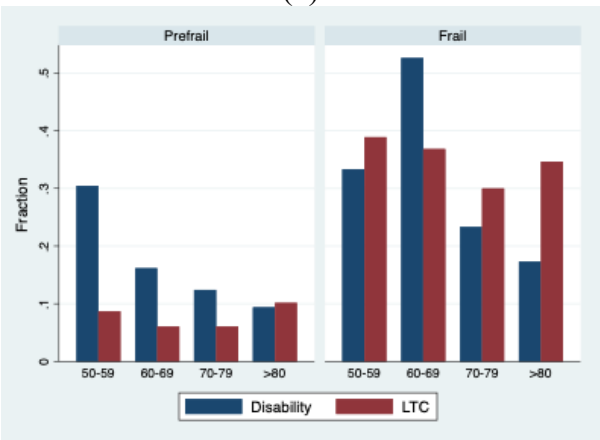
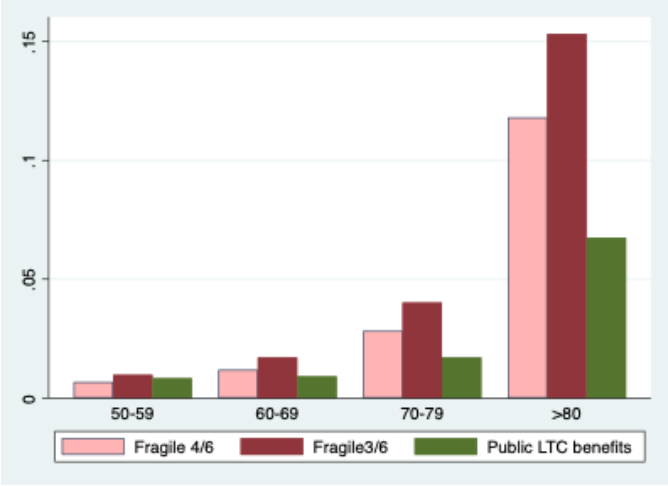


Figure 4.5. Prevalence of frail individuals according to two different criteria of frailty and individuals receiving public LTC benefits, by age group.



One objective of this paper is to document the "unmet" demand for care. We have a very effective instrument to do this by comparing the (estimated) potential demand for care by frail and prefrail people and the (estimated) public benefits. In what follows we focus on LTC benefits, for the reason we reported, as they cover the risk of non-self-sufficiency. Figure 4.5 displays the fractions of individuals evaluated as frail based on the more stringent definition (4 limitations out of 6 ADLs) and on the more "inclusive" (3/6 ADLs) definition, together with the shares of individuals receiving public LTC benefits, by age group. It emerges that in Italy the fractions of individuals covered by public LTC benefits are smaller than those classified as frail. The difference is an estimate of the potential unmet demand for care/assistance and is particularly large for the older age group, which is also more needy.

Figure 4.6. Share of frail individuals receiving/not receiving public LTC benefits, by age group.

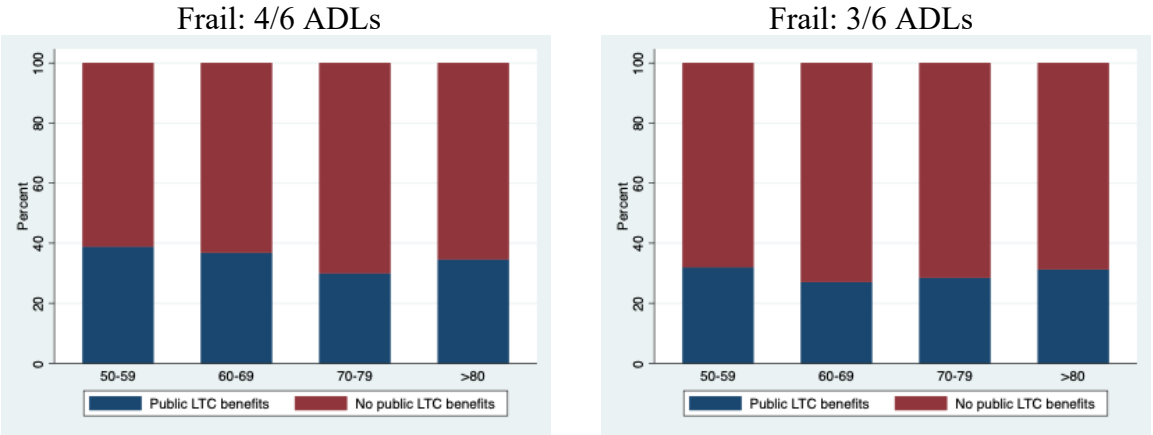


Figure 4.6 displays in a more immediate fashion this message: it shows the percentage distribution of individuals that report 4/6 ADL limitations (left) and 3/6 (right) between those who receive or do not receive public LTC benefits. It emerges that the shares of severely impaired individuals lacking public coverage is slightly larger in the older age groups (70-79 and 80+) reaching more than 60% of the persons with 3 or 4 ADLs. Such percentages are particularly high, calling for a potential re-evaluation of the eligibility criteria for the public LTC benefits.

Even if we are aware that DI benefits cover a different set of risks and have very different eligibility criteria, we present a more complete picture by documenting the shares of frail individuals that receive/do not receive disability benefits. The percentages of severely impaired individuals that receive disability benefits are higher in the 60-69 age group; this is further evidence that individuals in poor health use disability as a pathway towards retirement.

Finally, taking these figures with some care, we combine LTC and disability benefits in order to get an estimate of how many frail individuals lack any form of public coverage related to poor health. Figure 4.8 documents that in the older age groups (70-79 and 80+) more than 50% of the individuals do not receive any form of public benefits (neither LTC nor disability), suggesting that the unmet demand for LTC is significantly high.

Figure 4.7. Share of frail individuals receiving public disability benefits, by age group.

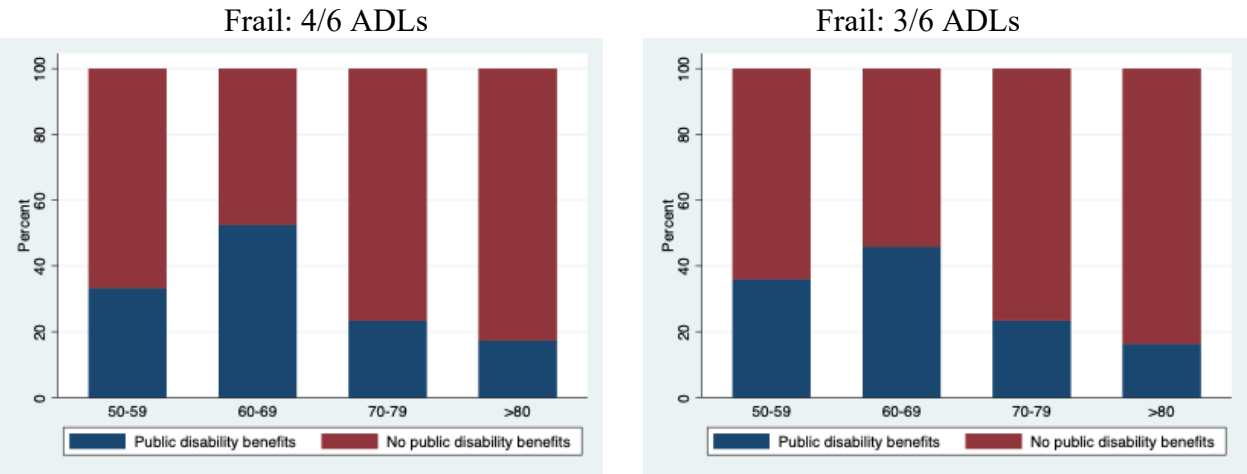
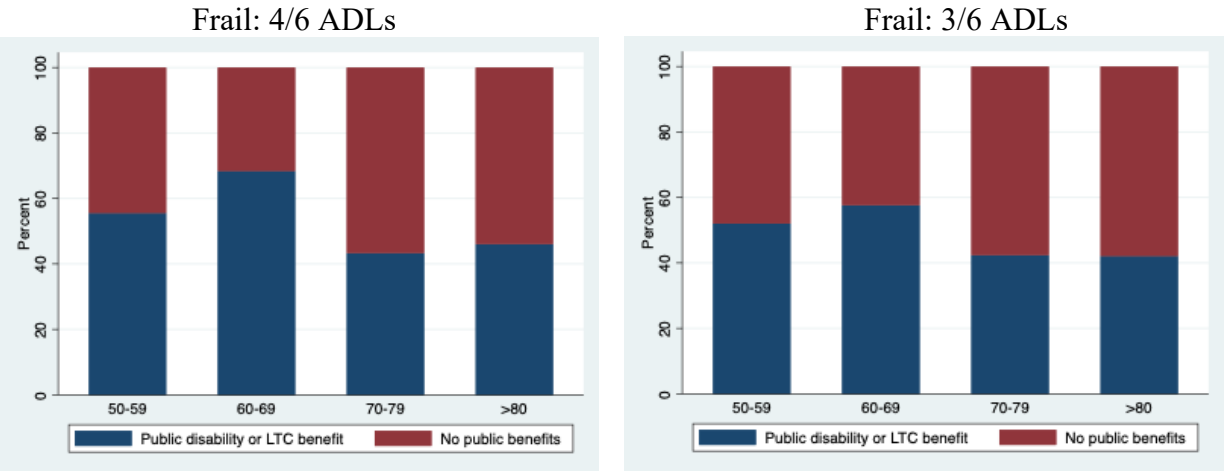


Figure 4.8. Share of frail individuals receiving public benefits (disability and/or LTC), by age group.



4.2 Private insurance

4.2.1 Main insurance products for assistance and for non-self-sufficiency: the risks covered

A long-term care policy is an insurance contract, either individual or collective (group-based), that covers against the risk of losing self-sufficiency. The coverage typically lasts for the lifetime of the insured (i.e., from the onset of the health condition until death) or a fixed term specified in the contract. In Italy, the private market for long-term care (LTC) insurance remains rather marginal compared to the public system, which primarily relies, as outlined in the Introduction, on cash transfers to support vulnerable older adults and individuals with severe disabilities. The 2024 report by the Italian Institute for the Supervision of Insurance (IVASS) provides an overview of the main characteristics of the LTC insurance market. The companion allowance, that is the main public long-term care policy, accounted for 0.7% of GDP (15 billions euros) at the end of 2023 and assisted approximately 2 million beneficiaries. In contrast, the total value of LTC insurance products for life coverage—which provide a lifelong annuity in the event of loss of self-sufficiency—reached 323 million euros in 2024, reflecting a 16.7% year-over-year increase.

The ten leading companies who generated the highest volume of premium collection (€1.063 billion) over the years 2017-2024 cover more than 95 percent of the LTC insurance market: 75.7 percent of the generated premiums refer to individual polices (around 400,000 insured), 20.8 percent correspond to group or collective contracts (covering approximately 3.7 million insured individuals), and the residual 3.6 percent to funds managed by social security and assistance institutions (covering about 750,000 insured holders). Notably, single-premium policies account for less than 1 percent of total collected premiums, as periodic payment plans represent the predominant method of premium contribution. In addition, 74.3 percent of the total premiums collected correspond to long-life contracts, 14.9 percent to contracts with a predetermined expiration date, and the remaining 10.8 percent to (predominantly) annual contracts with automatic renewal. LTCI polices for non self-sufficiency vary across providers in several key aspects, including: age requirements of potential subscribers, evaluation criteria for assessing functional impairment, entity of the insurance premium, minimum insurance period, and insurance benefits.

Table 4.1. Individual LTCI products offered by the six leading providers in Italy.

	Generali Italia	Allianz	Axa	Reale Mutua	Unipol	Zurich
Entry age						
Minimum	30	30	18	18	18	18
Maximum	75(*)	75	70	70	70	70
Eligibility						
Scale	40/60 points, including partial autonomy	Unable to independently perform 4/6 ADLs	Unable to independently perform 3/4 ADLs	45/60 points, including partial autonomy	Unable to independently perform 4/6 ADLs, the condition is irreversible	Unable to independently perform 3/4 ADLs
Dementia	No	No	Yes, claim eligibility regardless of the level of autonomy	Yes, included in the score regardless of the level of autonomy	No	Yes, non-self-sufficiency includes mental disorders of organic origin (e.g. Alzheimer) and Parkinson, impairing cognitive abilities

Note. Contractual terms last accessed on May 26, 2025.
(*) 70 in the case of an annual premium.

Table 4.1 presents the entry age requirements and eligibility criteria for life coverage under individual LTCI products offered by the six leading insurance providers in the Italian market. Regarding the entry period, providers generally require specific age limits for application: the minimum age spans from 18 to 30 years and the maximum from 70 to 75. Looking at the LTC insurance polices offered by the 10 leading companies - including individual and collective contracts, and contracts in which insurance holders can be either natural or legal personals - the age range can be more restrictive, with a minimum of 40 years and a maximum of 60 (IVASS, 2024). Therefore, insurance policies do not allow older adults, that reasonably are in the retirement phase, to apply for an insurance product to protect against non self-sufficiency, although in a healthy condition. On the other hand, young adults could be less prone to subscribe to LTCI contracts, if they do not prioritize protecting against the risk of functional impairment in the long run and thus argue that the opportunity-cost of paying for this type of products is not convenient at the earlier stages of their working life. Consequently, the age burden can suboptimally restrict the adoption of LTCI products (Bailo et al., 2024). In addition, since having a good health status is a prerequisite for contract subscription, most companies constrain the acceptance to the appraisal of the applicant's clinical condition, thrhough specific medical exams, in case the entry age exceeds a certain threshold (60 years or more) or for higher annual benefits.

Insurance companies require a certain degree of functional dependency in performing activities of daily living (ADLs) to qualify for LTCI benefits. ADL limitations typically involve the need for external assistance with basic tasks such as dressing and undressing, standing up or sitting down, moving within a room, drinking and eating, and maintaining continence. LTC claims are subject to a medical assessment aimed at evaluating not only whether the threshold criteria for non-self-sufficiency are met, but also the expected permanence in bad health condition of the insured. Medical professionals consider several factors in clinical appraisal: the pathological condition, the severity of health deterioration, and its impact on the insured's autonomous life and ability to perform specific activities of daily living.

The evaluation criteria for benefit eligibility vary across providers. Most products adopt a dichotomous scale based on the presence or absence of limitations. Under these models, claim eligibility is recognized when the insured is unable to independently perform either 3 out of 4 or 4 out of 6 ADLs. Other insurance schemes recognize eligibility for LTC benefits upon reaching a minimum score—typically 40 or 45 out of 60— and thus allow the inclusion of partial losses of autonomy into the medical assessment. The first eligibility system is more stringent and depends crucially on the approach adopted by medical consultants, who may either decline or recognize the functional limitation in case of partial impairment in performing daily tasks. Instead, the score-based method constrains medical consultants to follow the standardized criteria of an evaluation grid that includes the assignment, for each listed item, of an intermediate score to detailed scenarios - e.g., the applicant can dress or undress without external help only the upper part of her body. In addition, some insurers consider the presence of severe cognitive impairments, including clinically diagnosed degenerative conditions such as Parkinson's or Alzheimer's disease, either as a sufficient criterion for benefit eligibility or as a contributing factor in the overall scoring process.

The insurance policy generally covers the lifespan, that is it guarantees a protection against the risk of losing self-sufficiency for the entire duration of the insured's life, and the LTC pension benefits are erogated accordingly. Most operators require a one-year "waiting period" since the activation of the contractual terms, that is LTC benefits are not disbursed if the loss of self-sufficiency occurs within one-year from contract subscription, in which case premiums are fully refunded. Further exclusion restrictions apply when the state of functional dependency arises from high-risk jobs or sport activities – e.g., working on oil rigs or skydiving- not declared when the insured signed the contract and for which the company does not provide risk coverage.
Companies offer different payment solutions of the premiums to take out the insurance polices: (i) a fixed term payment option set out in the contract (typically between 5 and 25 years), (ii) a one-shot payment, or (iii) lifetime premium payments. Each option thus implies different contract-related costs for the policyholder. In addition, providers typically allow the insured to suspend premium payments while still guaranteeing risk-coverage against non-self-sufficiency, but with reduced LTC pension benefits, conditional on having paid a minimum number of premiums (e.g.,

3, 5 or 10). Companies offer different levels of risk coverage: typically, the minimum annual LTC pension varies from a minimum of €6,000 (or €500 per month) to a maximum of €60,000 (or €5,000 per month). In other cases, companies offer a lump-sum payment to be issued once the event occurs. The insured amounts can be either fixed or adjustable, i.e., linked to the performance of a separately managed account. In the period 2018-2024, the average annual insured benefits for LTC insurance policies ranged from €9,500 to €13,500, while the average annual premium at the time of contract subscription varied between €41 and €109 (IVASS, 2024).

Additionally, the LTC policy can include further options that make the contractual offer more targeted at the needs of the insured person, for instance: coverage for premiums paid in case of death under an age threshold, coverage for severe illnesses, the possibility of redeeming part of the premiums paid under a certain age limit, and access to healthcare services (such as specialist visits and medical exams in affiliated clinics, a dedicated call center service for booking specialist visits, etc.).

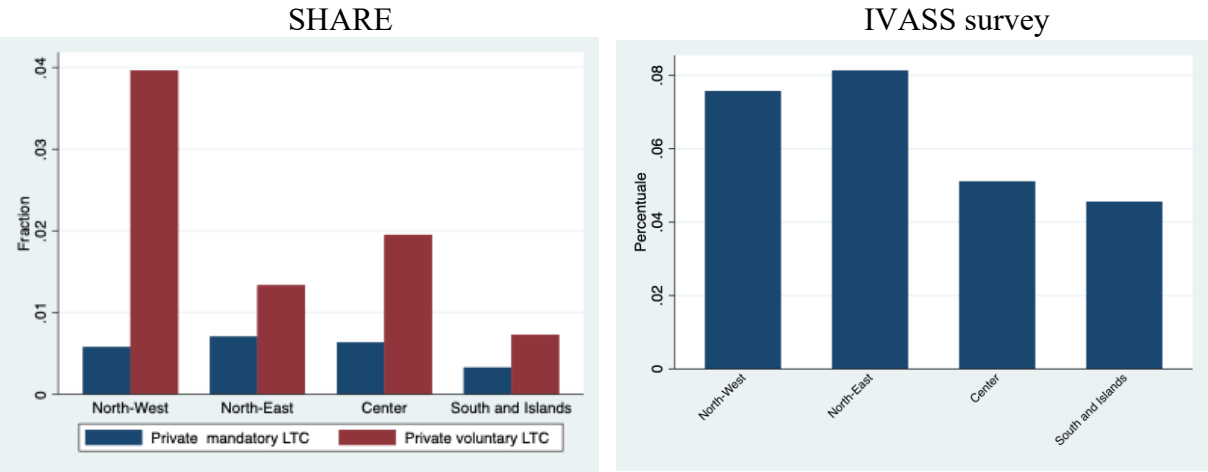
4.2.2 Ownership of private insurance among older Italians

The evidence on the ownership of private insurance for the non-self-sufficiency in Italy is rather scanty. In order to understand whether and how individuals protect themselves against the risks related to ageing we employ data from several surveys that allow us to characterize to some extent the insurance behavior of Italians.

Evidence on private LTC insurance in Italy

According to the 2024 IVASS Report, the number of long-term care (LTC) insurance holders in Italy totals approximately 5 million, of which 2.3 million are women. The average age at the time of policy subscription is 47.6 years for men and 44.9 years for women. In addition, the average age in which the condition of non-self-sufficiency occurs is 64.5 years for men and 62.5 years for women, and the average duration of LTC benefits is of 17.5 months. In 88.3% of cases, the end of the non self-sufficiency period is due to death. In the period 2017-2024, the main triggering event that caused a loss in the insured's functional capacity was the onset of health diseases (69.2%), followed by neurological diseases (26.3%), and accidents (4.5%).

Figure 4.9. Private LTC insurance ownership, by macro area.

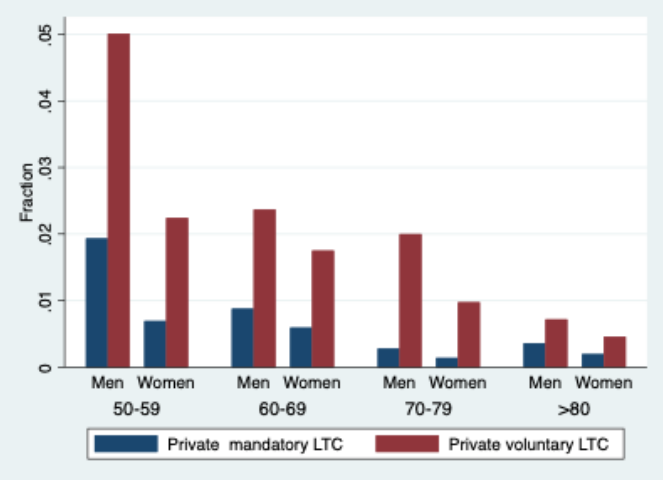


Very few data collections provide specific information on the ownership of private LTC insurance in Italy. In this analysis, we rely on two data sources: the SHARE survey and the Survey on the Italians' Knowledge and Insurance Behavior, conducted in 2021 by IVASS. The SHARE survey reports data on the prevalence of private LTC insurance policies, distinguishing between voluntary and mandatory forms of coverage. In the latter case, companies subscribe to a supplementary health assistance fund that covers additional medical and long-term care expenses of the employees.

Figure 4.9 shows the percentage of individuals holding an LTC insurance policy by geographical area, from the two data sources. The graph on the right (IVASS) indicates a concentration of products in the northern regions, with a peak value of .08 in the North-East area, while the southern regions register the smallest share – that is more than .04 percentage points lower in comparison. The SHARE data reported on the left-sided graph confirms the North-South discrepancy in distribution, but the highest percentage is found in the North-West, where the share of voluntary policies is predominant. Notice that the SHARE data refer to a target sample of individuals aged 50 or older, while the IVASS survey is designed to be representative of the entire adult population of insured individuals in Italy.

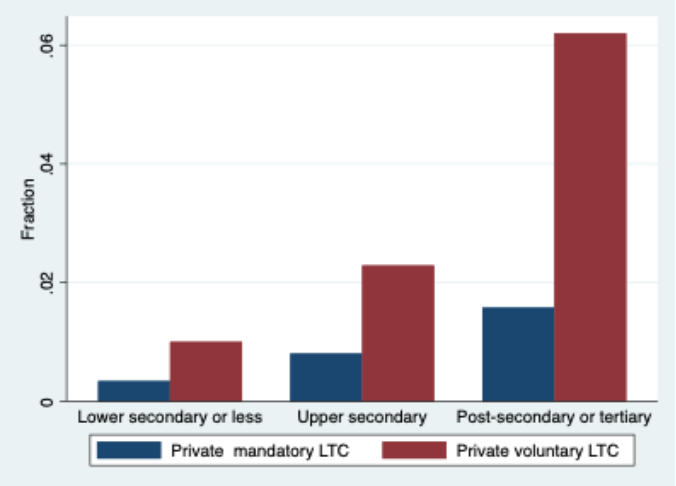
Focusing on the 50+ sample from SHARE, men represent the majority of private LTC insurance holders across all ten-year age groups (Figure 4.10). The highest concentration is observed in the 50–59 age range, followed by a progressive decline in older groups—an expected pattern given the underwriting criteria of LTC insurance policies, which impose restrictions based on health condition and age limits for individual subscriptions. Noticeably, the fraction of insured men holding a voluntary policy sharply reduces after the first decade (by almost .03 percentage points), while the reported differences between genders become less pronounced.

Figure 4.10. Private LTC insurance ownership, by gender and age group.



Finally, the percentage frequency of insurance holders increases with the level of education attainment (Figure 4.11). The most pronounced difference is observed for voluntary policies: the share of policyholders exceeds 6% among individuals with post-secondary or tertiary education, drops by approximately 4 percentage points among those with an upper secondary qualification, and falls to around 1% for individuals with the lowest level of education. This pattern can reasonably be attributed to greater awareness of long-term care risks and better economic resources typically associated with higher levels of education.

Figure 4.11. Private insurance ownership by level of schooling.



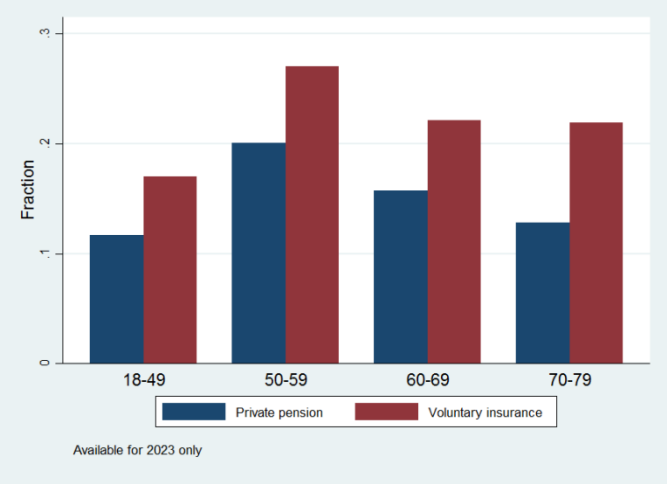
Additional evidence from the Survey on Households, Income and Wealth (SHIW)

While SHIW does not provide specific information on products designed for non-self-sufficiency it helps us understanding the attitude of Italian adults towards insurance in general and the relationship between their behavior and the level of financial literacy.

The Survey on Households, Income and Wealth (SHIW) is administered by the Bank of Italy annualy to Italians aged 18 to 79. Data for 2023 include information on the socioeconomic status of respondents, what financial products they hold (if any), and their financial literacy. Financial literacy is a combination of financial awareness, knowledge, skills, attitudes and behaviors necessary to make sound financial decisions and ultimately achieve individual financial well-being (OECD, 2023)[17]. Questions included in SHIW can be used to build an indicator of financial literacy (OECD, 2022)[18], scoring between 0 and 21[19].

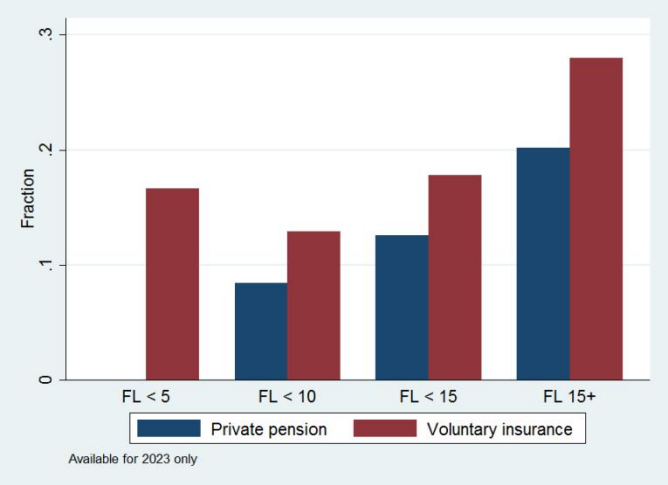
As can be seen in Figure 4.12, the percentage of people holding private pension and voluntary insurance is U-shaped in age, so that it is highest among people aged 50-59, then it gradually decreases. In particular, 20% of people in their 50s hold a private pension, compared to around 12% of people under 50 or in their 70s. Almost 16% of people aged 60-69 hold a private pension. Where voluntary insurance is concerned, the percentage of people holding it jumps from 17% among people under 50 to 27% among those in their 50s. It decreases to 22% among individuals aged 60+.

Figure 4.12. Insurance Products ownership by age.



[17] OECD (2023), "OECD/INFE 2023 International Survey of Adult Financial Literacy", *OECD Business and Finance Policy Papers*, No. 39, OECD Publishing, Paris, https://doi.org/10.1787/56003a32-en
[18] OECD (2022), *OECD/INFE Toolkit for Measuring Financial Literacy and Financial Inclusion 2022*, OECD Publishing, Paris, https://doi.org/10.1787/cbc4114f-en.
[19] I build the financial literacy indicator following Bank of Italy documentation, cfr. https://www.bancaditalia.it/statistiche/tematiche/indagini-famiglie-imprese/alfabetizzazione/Descrizione-delle-variabili-2020.pdf

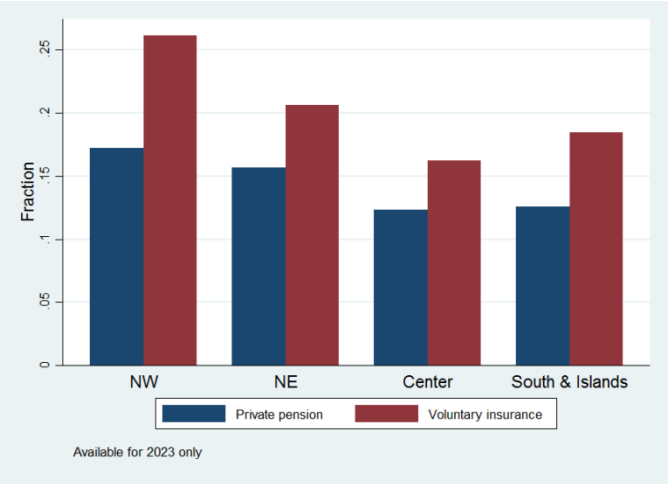
Figure 4.13. Insurance Products ownership by level of financial literacy.



As can be seen in Figure 4.13, the proportion of Italians holding private pensions and/or voluntary insurance is increases with financial literacy. No Italian with a financial literacy lower than 5 hold private pensions, compared to 20% of those whose financial literacy is 15 or higher. As regards voluntary insurance, only 17% of Italians with a financial literacy lower than 5 hold one, compared to 28% of those whose financial literacy is 15+.

As shown in Figure 4.14, the percentage of Italians holding private pensions is highest in Northern Italy, particularly in North-Western Italy, and lowest in Southern Italy (which includes Sicily and Sardinia). In particular, 13% of the respondents living in Southern Italy hold a private pension, compared to 17% of those living in North-Western Italy. Where voluntary insurance is

Figure 4.14. Insurance Products ownership by NUTS-1.



concerned, there is more of difference by NUTS-1, with 26% of people in North-Western Italy holding a voluntary insurance, compared to 20% in North-Eastern Italy, 18% in Central Italy, and 16% in Southern Italy.

5. Addressing the demand for assistance. Can public-private partnerships provide potential solutions to unmet demand?

5.1 Care and benefit recipients

In an ageing society, the increasing number of older adults poses multifaceted demands on welfare systems, conceived not only to encourage healthy lifestyles and prevent chronic illness, but also to address the broader objective of sustaining and improving quality of life throughout later years. This mandate is particularly salient for socially and economically vulnerable groups, such as women and individuals with low socioeconomic status, who often face higher risks of disability and limited financial resources for healthcare utilization.

In order to provide a picture of the Italian landscape it is important to recall a few definitions.

(i) Formal care is provided for pay, usually by professionals or by dedicated workers, this can be provided at home (private homecare) or in dedicated premises and facilities
(ii) Informal care is care provided by relatives and friends, not for pay
(iii) Personal care requires taking care of the person in need on activities of daily living and on medications etc…
(iv) Other care is care provided for house chores, financial and administrative tasks etc..

Within this context, it becomes essential for public interventions to align with the actual care preferences and needs of older citizens. Home-based long-term care (LTC) services may represent a more person-centered and cost-effective strategy, that allows older adults to age in place while preserving as much as possible their autonomy and social integration and valuing the psychological well-being that familiar home environments can provide. By contrast, institutional facilities often entail high operating costs, which can be prohibitive when public subsidies are absent or insufficient. Reportedly, between 2011 and 2021 the proportion of LTC recipients among OECD countries who received care at home slightly increased from 67% to 69% (OECD, 2023). Despite this trend, LTC systems continue to rely evenly on informal care - that is, provided by family members, relatives, friends or other unpaid caregivers-, filling gaps where public funding or formal services are insufficient or access to formal care provision is burdened by economic status.

As we documented, public expenditures for LTC in Italy are mainly allocated to cash benefits, which do not impose restrictions based on their use, hence reinforcing the major role of informal caregivers and (often) low-skilled paid aid providers. In addition, the proportion of individuals living alone in Italy is projected to rise by approximately 13 percent between 2024 and 2050,

increasing from 9.7 million to 11 million. This growth is expected to be more pronounced among women - an increase of about 18 percent (from 5.3 million to 6.2 million)- than among men, whose numbers are projected to rise by roughly 8 percent (from 4.5 million to 4.8 million). In 2024, 47 percent of individuals living alone were aged 65 years or older (4.6 million), and the number is anticipated to reach 6.5 million by 2050 (ISTAT, 2024).

This section examines the usage of home-based professional (formal) and informal care, drawing on the pooled data from the SHARE survey. Regarding formal homecare, respondents reported any professional or paid services received in the last twelve months, grouped into the following categories: personal care (e.g. getting in and out of bed, dressing, bathing and showering), domestic tasks (e.g. cleaning, ironing, cooking), meals-on-wheels (i.e. ready-made meals provided by a municipality or a private provider), and other activities (e.g. filling a drug dispenser). Informal care, provided by individuals either within the household or outside it (i.e., family members, friends, or neighbors), encompasses help with personal care, practical household help (e.g. with home repairs, gardening, transportation, shopping, household chores), and help with paperwork (such as filling out forms, settling financial or legal matters). While the survey records both within and outside household support for personal care, information on the other categories is restricted to individuals outside the household.

Professional (formal homecare) care and informal care

Regarding professional home care, the most commonly received support consists of help with domestic tasks, followed by personal care. The latter is increasing with the transition to frailty status and displays a larger positive variation in the North-West and the Center (Figures 5.1 and 5.2, below).

The prevalence of professional services for personal care, domestic tasks, and to a less extent other activities, is greater among women than men (Figure 5.3). One noteworthy feature is that the percentage of prefrail women requiring help for domestic tasks is similar in magnitude to the percentage of frail men receiving the same type of support, while men receive proportionally more help with meals on wheels in each health condition. The SHARE survey also provides information on the individuals receiving **informal care,** allowing us to distinguish between three types of help: personal care, household support and paperwork help. While for the first one the survey collects information both on the support received from persons inside and outside the household, for the other two types of care only help coming from outside the household is revealed.

Figure 5.1. Fraction of individuals receiving professional care, by type of service and NUTS-1 region.

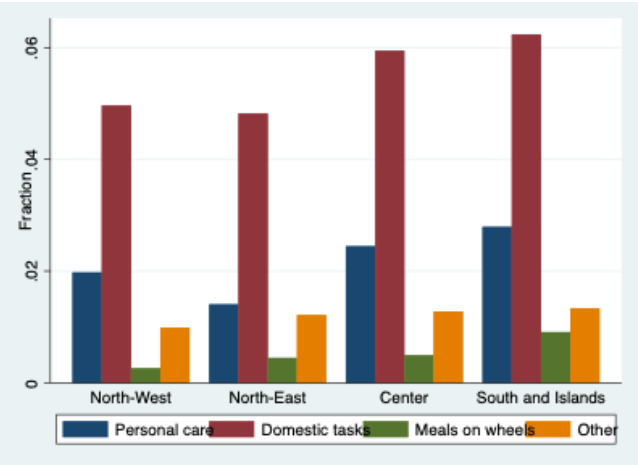


Figure 5.2. Fraction of individuals receiving professional (formal homecare) care by type of service, NUTS-1 region, and frailty status.

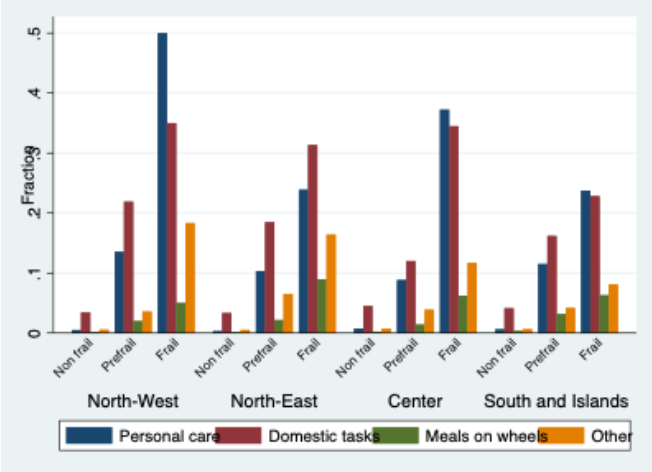


Figure 5.3. Fraction of individuals receiving professional care by type of service, gender, and frailty status.

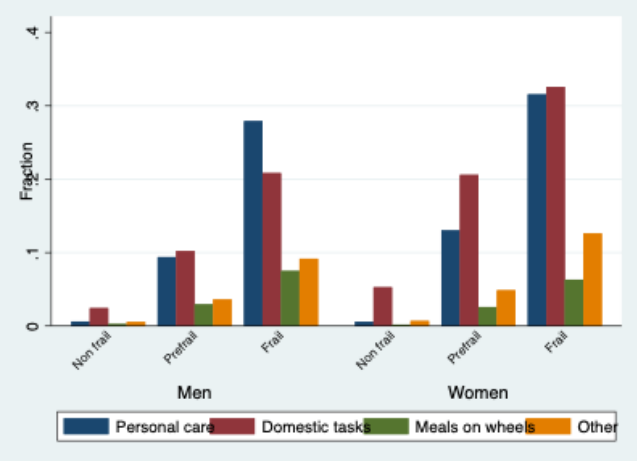


Figure 5.4 shows important differences between individuals in a relationship and singles: the latter, who cannot benefit from the informal support of family members living in the household, receive more frequently formal services for personal care, domestic tasks, and other professional services than individuals living in a couple.

Figure 5.4. Fraction of individuals receiving professional care by type of service, type of family and frailty status.

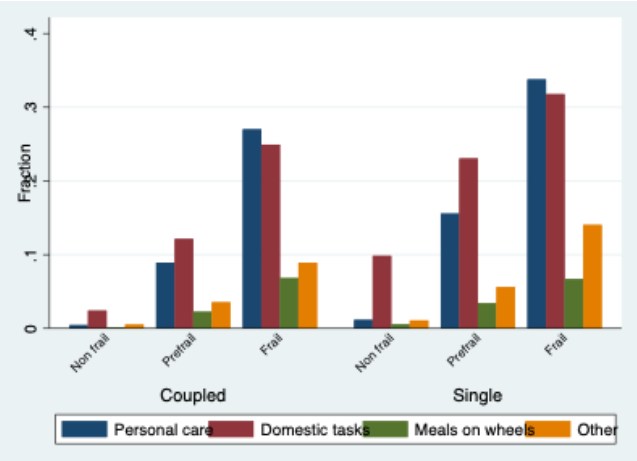
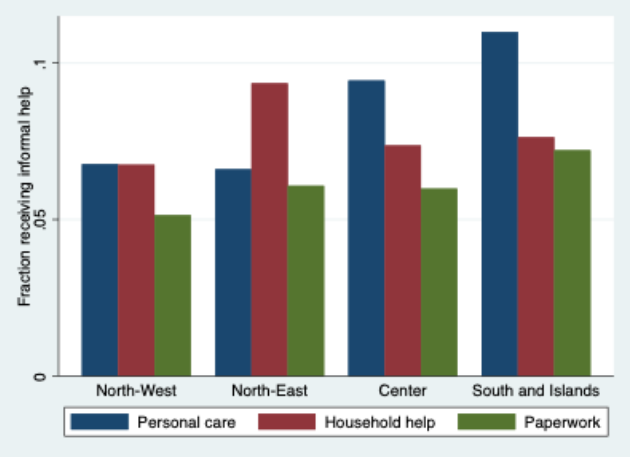


Figure 5.5. Recipients of informal care by NUTS-1 region.



The data document that informal support is more prevalent in Southern Italy, especially in the domains of personal care and, to less extent, administrative assistance (paperwork), while household-related help is more frequently reported in the North-East (Figure 5.5).

However, for our purposes it is crucial to understand how support is related to frailty. Figure 5.6 highlights that for the frail category the largest shares of individuals receiving informal help are in the Center Italy, followed by South. But in interpreting these figures we should take into account that household help and support with paperwork are not revealed when they are provided within the households and this may underestimate these two categories especially in the Southern Italy, where enlarged families in which adult children live together with parents are more common. When analyzing informal care by gender we note that both prefrail and frail women receive less informal support in the form of personal care, but it is interesting and important to remember that they seem to compensate it by getting more professional help (see Figure 5.7 below).

Figure 5.6. Recipients of informal care by macro area and frailty status.

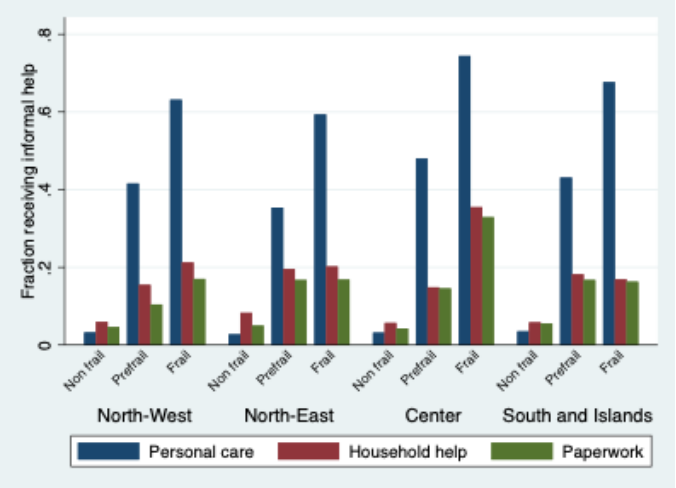


Figure 5.7. Recipients of informal care by gender and frailty status.

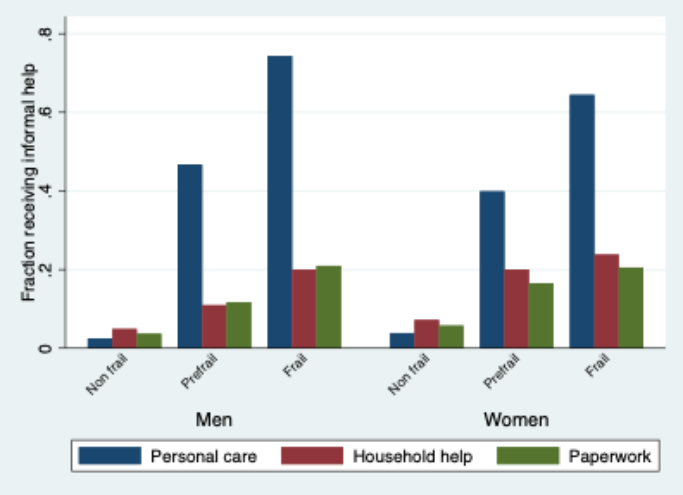
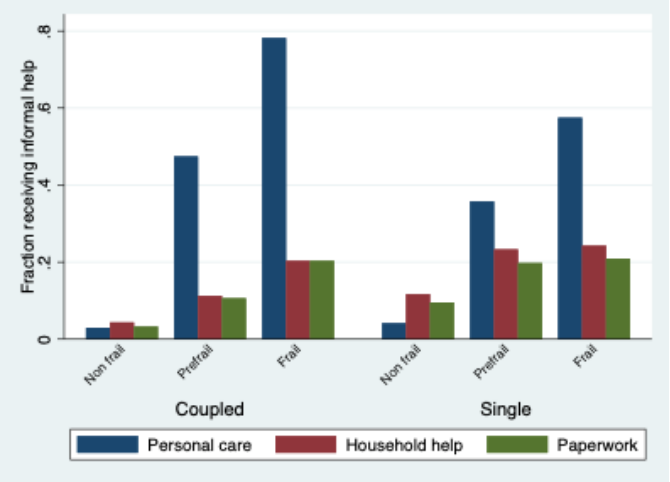


Figure 5.8. Fraction of individuals receiving informal care by frailty status and type of family.



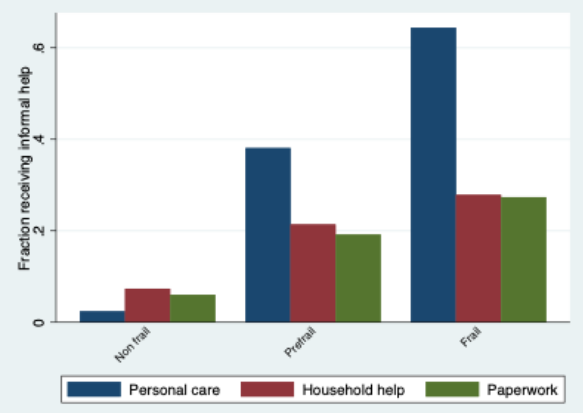
Another interesting issue is related to the type of care available/received by single and coupled individuals. Individuals living in a couple receive more informal personal care while the singles compensate with increased professional care (Figure 5.8).

5.2 Assessing the unmet demand for care

Obtaining an estimation of the unsatisfied demand for LTC is not an easy task due to the lack of detailed information in national data: in Section 4 above we have shown that there is an important "gap in care" based on the SHARE sample. Using once again the SHARE data we can go further and ask how many individuals do not receive any type of public benefits for LTC but rely on informal help or buy formal home care/assistance out-of-pocket. Given that both types of aid may be received also in absence of non-self-sufficiency, we also distinguish the individuals based on their frailty status. From figures 5.9 to 5.13 it emerges that more than 60% of the individuals assessed as frail according to our definition and who don't receive any type of public benefits receive informal assistance for personal care and about 27% for household tasks. The percentage of informal help recipients is rather high also among the prefrail individuals: almost 40% are provided with personal care and about 20% other types of assistance. It is interesting to note that most of the assistance needed with personal care is provided informally, while among the professional services requested the domestic tasks display the larger percentages (5.12).

Figure 5.9. Fraction of individuals not having public benefits receiving informal (left) or private professional care (right).

Informal help



Professional help

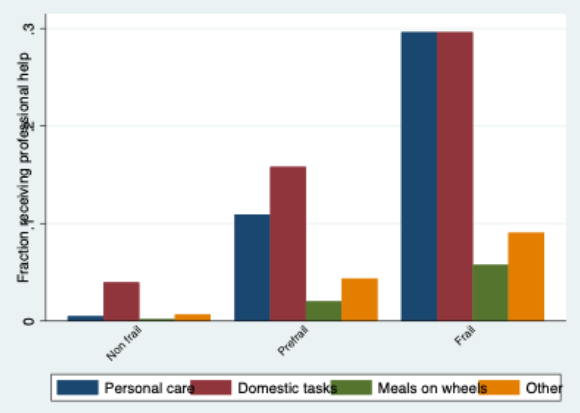
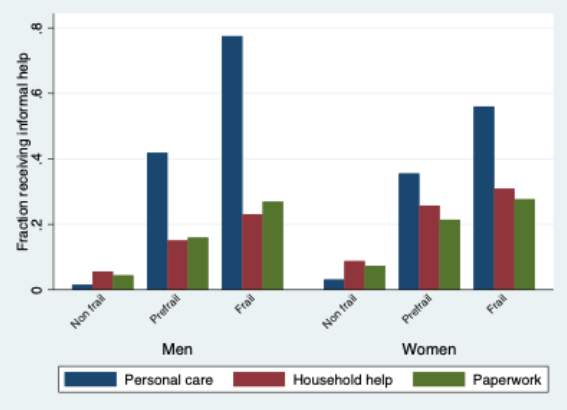


Figure 5.10. Fraction of individuals not having public benefits and receiving informal care (left) or professional care (right), by gender.

Informal help



Professional help

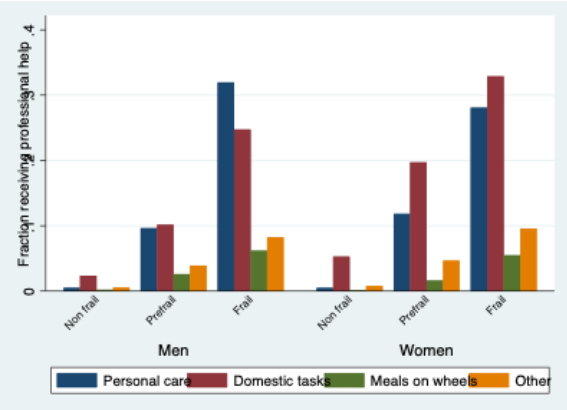
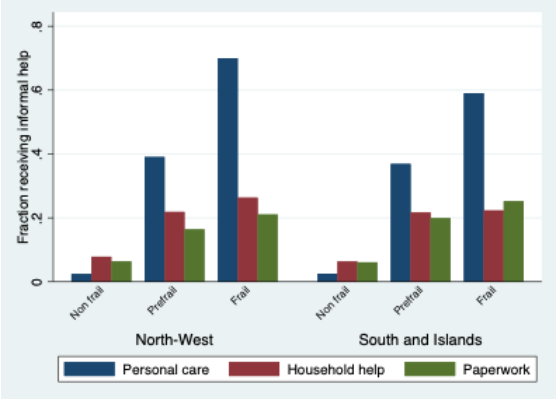


Figure 5.11. Fraction of individuals not having public benefits and receiving informal care (left) and professional care (right), by macro area of residence.

Informal help



Professional help

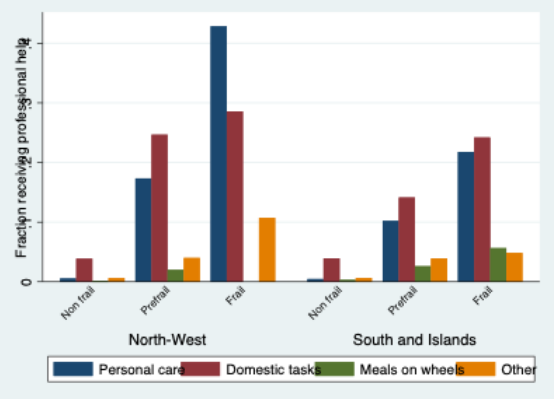
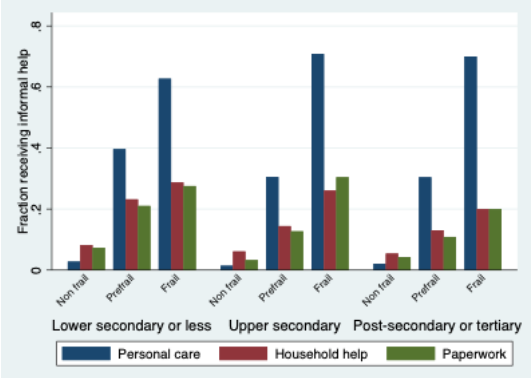


Figure 5.12. Fraction of individuals not having public benefits and receiving informal care (left) or professional care (right), by level of education.

Informal help



Professional help

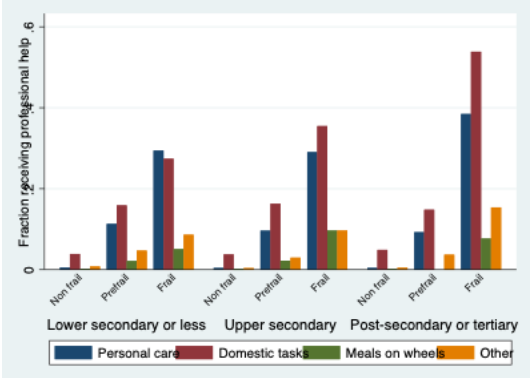
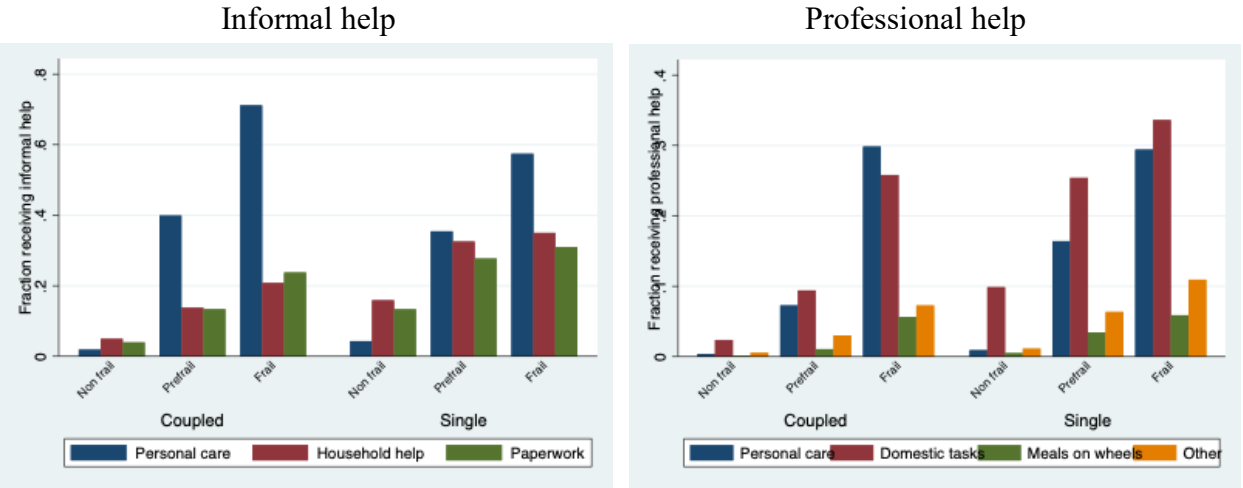


Figure 5.13. Fraction of individuals not having public benefits and receiving informal care (left) or professional care (right), by marital status.



The challenge of the demand for LTC

Economic research increasingly contributes to the public debate on which welfare models and instruments, due to public budget constraints and potential efficiency gains, may better cover the demand for LTC services in Italy, promoting evidence-based policy making. Possible solutions include the development of management protocols aimed at integrating private LTC insurance products into public strategies for addressing care needs related to the loss of autonomy in later years. However, the empirical evidence on the self-perceived quality and efficacy of formal LTC system among older adults, and which types of care needs they would be most interested in protecting against the risk of non-self-sufficiency, remains scarce.

Several research programs are trying to tackle this issue. Some evidence has been obtained by insurance companies who carried out a targeted survey for people engaged in caring activities for disabled, older adults or frail family members, either living together or not[20]. The data indicate that the benefit that are preferred are "access to high-quality affiliated healthcare facilities" and "support or guidance in case of non-self-sufficiency". The first preference points to a potential demand for insurance products that provide immediate access to high-quality medical care, either as a complement to or a substitute for public health services. The second preference may depend on multiple factors: (i) uncertainty about which LTC services are available and what are the access

[20] Source: SWG Survey for Generali Italia, June-July 2025.

requirements, due to the complexity and fragmentation of the Italian LTC system; (ii) limited awareness of the economic costs or absence of a financial planning to make informed decisions; and (iii) respondents may want to receive a customized assistance about the care services that are best suitable to meet their needs or those of the potential recipients. This evidence also suggests that caregivers rely predominantly on the National Health Service or a mixture of public and private providers, when the care recipient requires medical visits, diagnostic tests, or medical care. This study also finds that many caregivers report difficulty in providing help stemming from the high costs of care services (financial burdens).

The data presented in this section underscore the complexity of Italy's home-based LTC framework, marked by pronounced regional disparities and differences across population groups. Our descriptive evidence indicates, as noted in recent literature (Tomassini et al., 2024), that collecting detailed information on (i) the characteristics of formal and informal caregivers in relation to the care recipients' level of autonomy in activities of daily living, and (ii) the intra-family dynamics of care, particularly intergenerational support and exchange, is essential for designing good public policies. This is especially relevant in Italy, where intergenerational co-residence remains among the highest in Europe.

These insights call for the development of a long-term care system tailored to the specific needs of older adults and oriented toward economically inclusive policies that encourage their active participation in the community. Such an approach would provide the foundation for effective synergies between public interventions and the private insurance sector, ultimately promoting a more equitable and sustainable framework for addressing the challenges of population ageing.

6. Assessing the costs of frailty or prefrailty

A crucial question is to assess the costs for an individual (household) to become frail or prefrail. While there are several potential costs, including the emotional distress people experience in such circumstances, we focus only on costs which translate into monetary expenditures. We have discussed how different welfare and insurance arrangements may cover the whole or part of the necessary care, but it is useful to understand the way such costs emerge and evolve in different circumstances, even if completely covered by public benefits or provisions.

We want to be cautious that our estimates, being based on inferences drawn from samples, may be subject to some degree of measurement error. However, as we will discuss below, we obtain very promising matching figures drawn from other sources, which suggests that they are rather robust estimates. In order to rely on larger samples, as to show differences across groups of the population, we confine this part of the paper to ISTAT data only.

A first, important theoretical distinction is between actual estimated costs, that a person in frailty (prefrailty) status incurs, and estimated expected costs. The former estimates are obtained by looking at individuals in the sample, who are classified as frail (prefrail) on the basis of the observed limitations in ADL. In other words, these estimates refer to **the subsample of those who are already in the status of frail (prefrail),** for whom we observe or impute care expenditures.

We start describing the *"necessary expected coverage"*, which is based on the probabilities of being prefrail/frail at any given age, between the ages 50 to 85, as predicted by our econometric models. In order to get monetary values, we make use of the average number of hours of formal and informal care and the mean hourly cost of care, as obtained by Brugiavini et al. (2025).

The graphs in Figures 6.1 a) and b) below associate, to every age *a larger than 50*, the average cost of formal/informal care in the prefrailty/frailty status, weighted by the corresponding likelihood of being in such a status, at that given age[21]. We observe that, while at younger ages the expected costs of care for prefrailty are higher than those of frailty (due to the larger likelihood of this less serious impairment status), after age 77, the expected expenditure in care due to frailty increases sharply and, by the age of 85, it is almost twice as much the amount related to prefrailty. As for estimated expected costs, these are evaluated based on the population at large, i.e. individuals who may in the future transit in the status of frailty (prefrailty). Hence these expected costs are obtained as a mathematical expectation, i.e. as the product of monetary costs by the probability of being frail (prefrail) at a given age. One could think of these estimates as the *"necessary expected coverage"*.

[21] The probabilities of being prefrail/frail are estimated using data from the ISTAT Multipurpose survey. Similar elaborations using the SHARE data are presented in the Appendix. The expected necessary coverage can be interpreted as a contingency fund, or better as a premium payment to an insurance company, for an annuity covering the risk of prefrailty/frailty in every year of life starting at a given age and stopping at age 85. In such latter case the future total "*loss"* which is covered depends on age, but according to our estimates is about € 90000.

Figure 6.1. Necessary expected coverage. Estimated expected individual costs of formal (left) and informal care (right), by age.

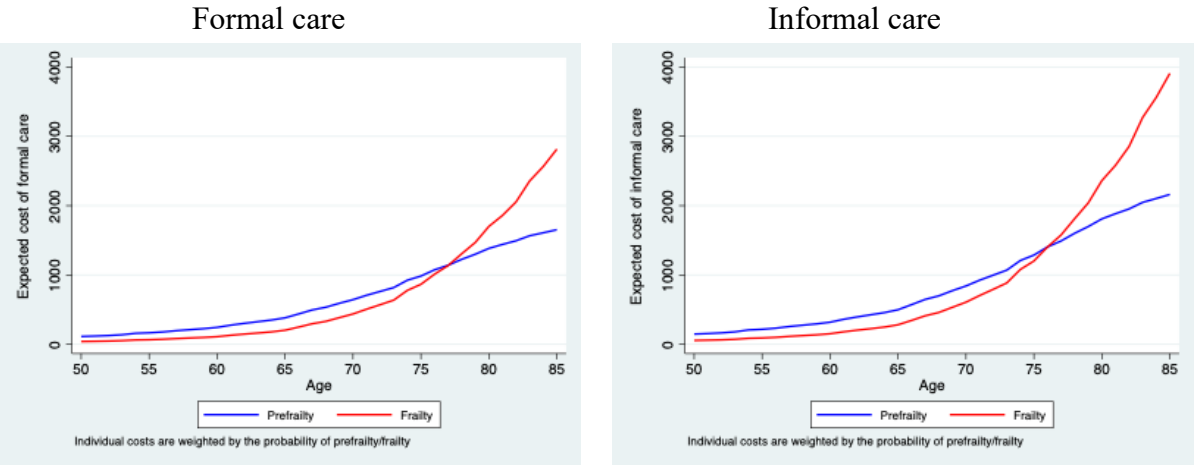
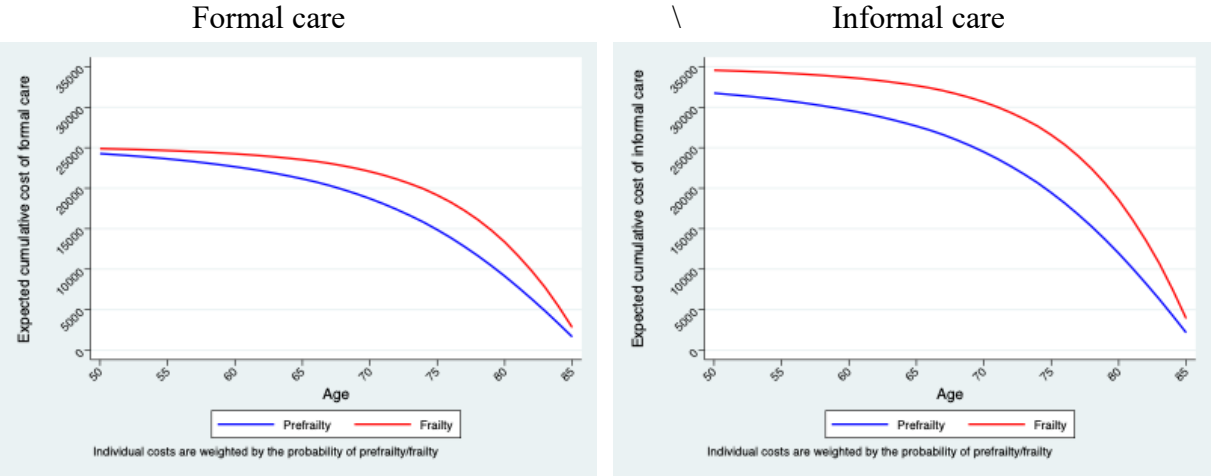


Figure 6.2. *Cumulative necessary expected coverage*. Cumulative individual expected costs of formal/informal care, by age.



It is also important to highlight that the expected costs of informal care are significantly larger than the ones of formal care, for both the prefrailty and frailty cases.

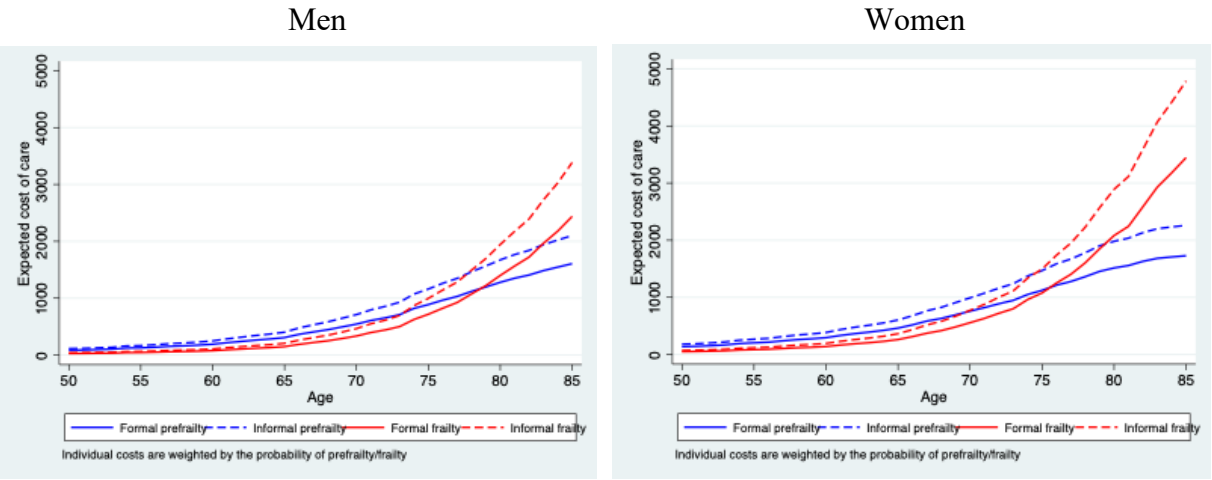
A useful estimate, that conveys information about the size of the burden that people would suffer from the loss of autonomy, is *"the cumulative necessary expected coverage",* i.e. the overall amount that an individual looking from age 50 and currently in good health, can expect to spend for formal/informal help during her/his life if getting sick at a given age. Figure 6.2 displays the *cumulative necessary expected coverage* for formal and informal care related to prefrailty and

frailty from age 50 to 85[22]. For example, at age 70, for someone who did not get limitations until age 69, given the predicted probability of becoming frail (prefrail), the sum of the expected future costs until age 85 is about € 23,000, as people age the probability of getting sick increases, but the number of years decreases, which explains the concave shape of the curves. One can also create mixed profiles such that the individual considers first the coverage for prefrailty (say from age 70 to age 75) and the coverage for frailty.

Once again, the level of the costs has a limited value, as it could be affected by measurement error, even though our "cross validation" with other estimates suggest that the numbers are correct. What is instead very valuable is to carry out comparisons of costs across different cases, as the money metric is a very effective way to convey the importance of such differences.

As expected, there is heterogeneity by gender, with females displaying significantly larger costs of care, a discrepancy that increases with age (Figure 6.3). The gap is particularly high for the

Figure 6.3. Expected costs of informal/formal care by age, men (left), women (right).



frailty costs after the age of 70. Up to the age of 85, the difference between men and women reaches 10000 euros in expected terms (that is weighted by the probability of being frail).

Further graphical evidence illustrates the expected costs of care and the cumulative necessary expected coverage, differentiated by macro-area (Figures 6.5 and 6.6) and by distinguishing between couples and single individuals (Figures 6.7 and 6.8).

[22] Note that such figures are conditional on the fact/assume that that the individual lives up to the age of 85.

Figure 6.4. *Cumulative necessary expected coverage*. Cumulative expected costs of informal/formal help by age, men (left), women (right).

Men Women

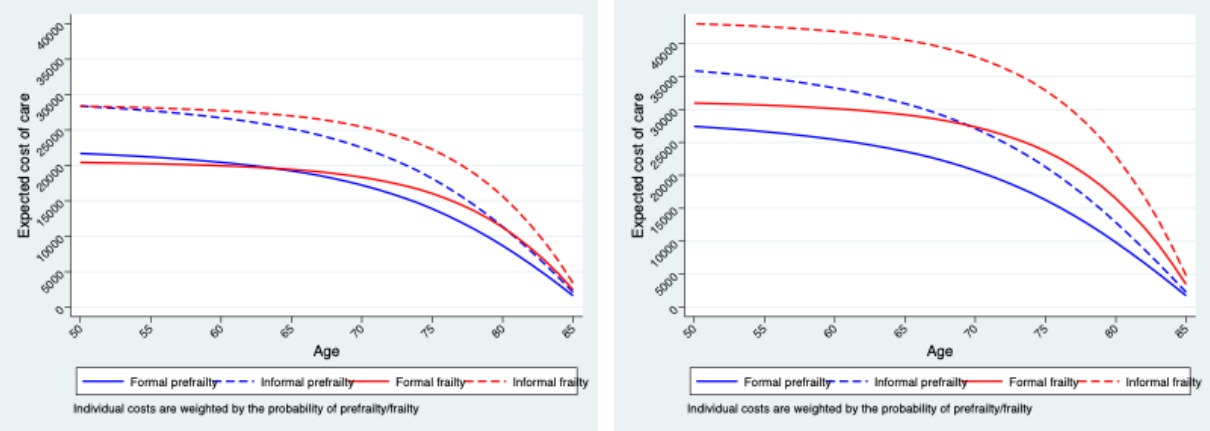


Figure 6.5. Expected costs of formal care, by age and macro-area.

Annual Cumulative

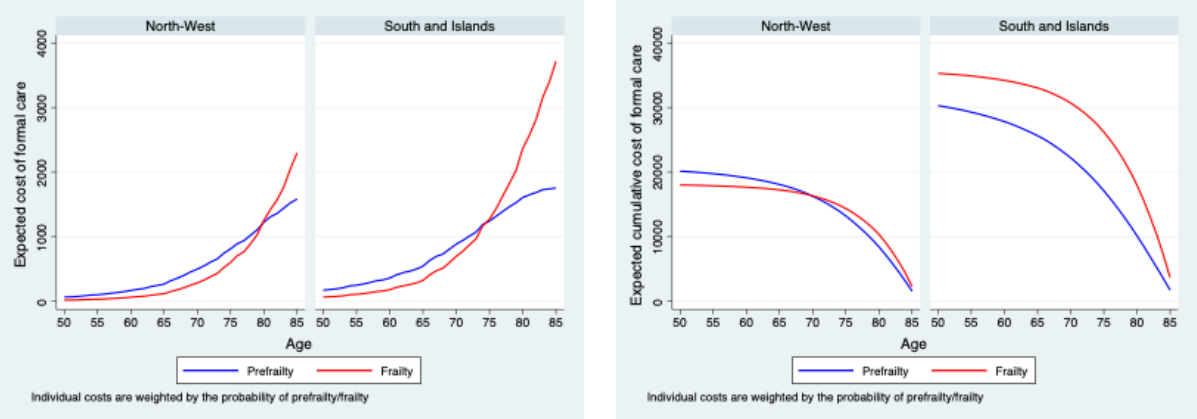


Figure 6.6. *Necessary expected coverage*. Expected costs of informal care, by age and macro-area.

Annual Cumulative

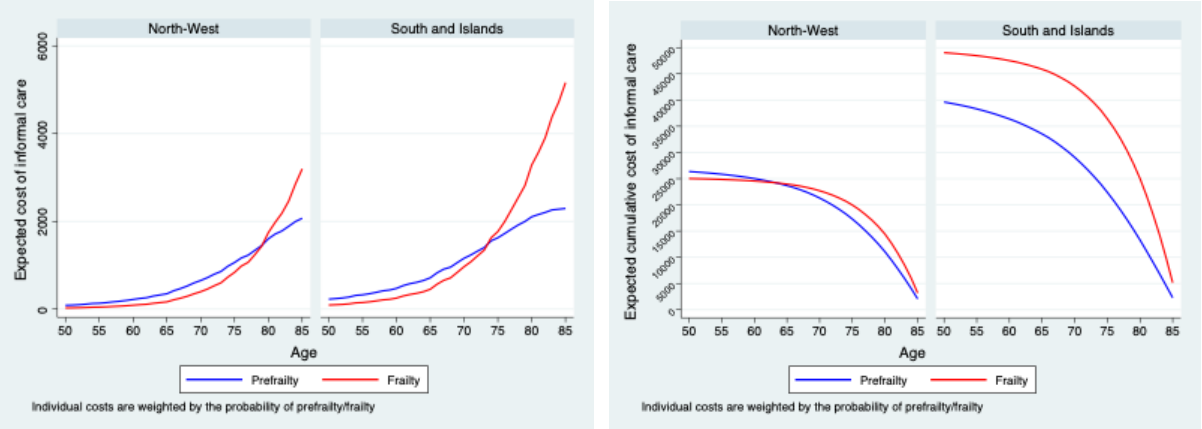


Figure 6.7. *Necessary expected coverage* Expected annual (left) and cumulative (right) costs of formal help by age, coupled vs single.

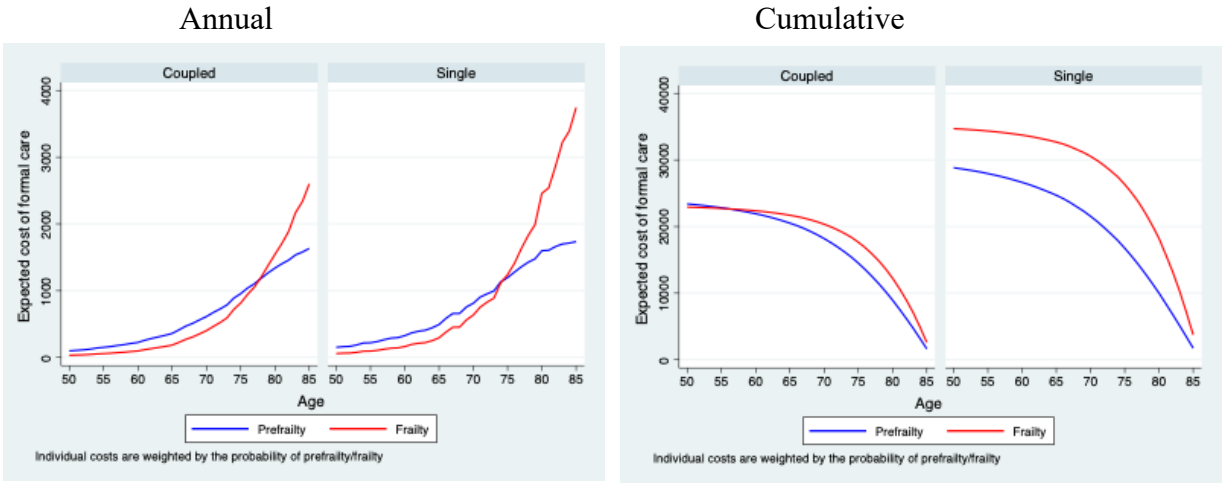
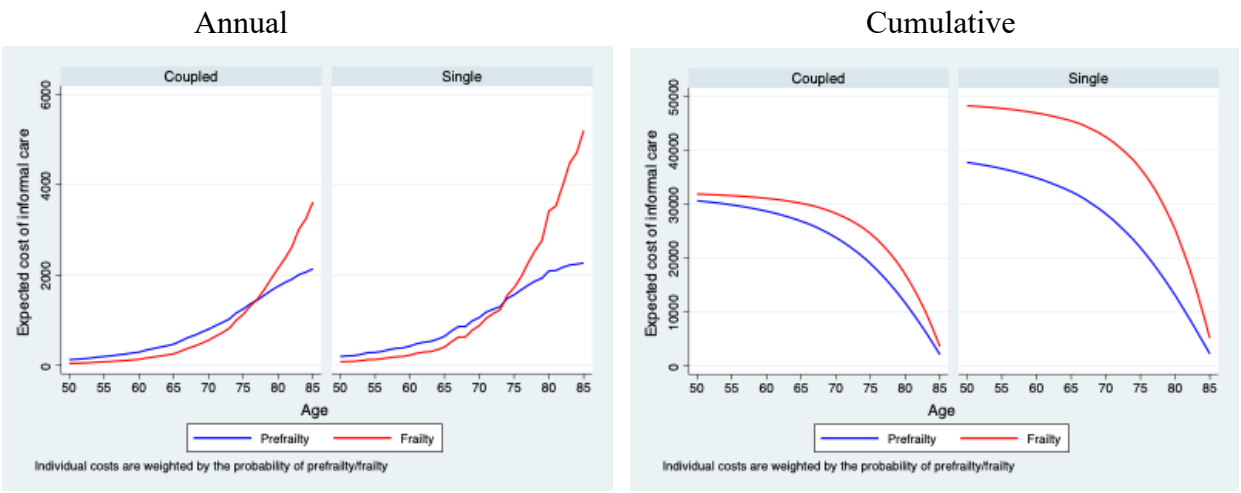


Figure 6.8. *Necessary expected coverage* Expected annual (left) and cumulative (right) costs of informal help by age, coupled (left) vs single (right).



7. Conclusions

Italy is witnessing an increasing demand for assistance and care by vulnerable individuals, posing challenges in terms of equity, efficiency, and sustainability of the Italian public healthcare system. Currently there exists a heavy reliance on informal family care, cash-oriented and multileveled public LTC policies, showing a very heterogeneous pattern of care provision arrangements.

In this paper we provide an exhaustive description of the care needs of older people and existing provisions in Italy, i.e. a description of demand and supply of long-term care and unmet needs, plus some novel evidence on the metrics useful to measure the underlying vulnerability of older people and measure the determinants of observed differences in the population.
The approach is "evidence based", i.e. it relies on statistical descriptive evidence, inferences and prediction models, so that we can support our analysis with robust facts. It is also a life-course approach, in that we consider the dynamics of the main objects of the analysis (e.g. frailty) over time/ages: this is the correct way to understand the main determinants of the status of vulnerability and to tease out the "trigger points", or crucial ages when the health of people deteriorates.
Our work is based on high quality microdata, from two large-scaled and comparable datasets, namely the Italian subsample of the "Survey of Health, Ageing and Retirement in Europe" (SHARE) and the ISTAT "Multipurpose survey". The former is a random sample of the Italian population aged 50 and over between 2004 and 2024 (longitudinal), while the latter is a cross-sectional random sample that we have at disposable for two waves (in 2004-05 and in 2012-13) for all ages.

We first look "**at the demand side**" and report the prevalence of functional limitations in daily activities or ADLs, which are widely used tools, both for regulating public expenditure on LTC services and to establish the eligibility conditions to receive LTCI benefits, in relation to chronic diseases and several individual characteristics – namely, gender, age, education, spatial indicators, and family status.
By following a well-established literature, we define a "frail" individual as someone who exhibits 4 out of 6 limitations in the activities of daily living – ADL, any 4 limitations out of 6, (the "strict" definition). A prefrail individual has between 1 and 3 limitations: once an individual is prefrail he would either stay prefrail or (most likely) transit at some future age into frailty.
In both samples the number of limitations increases with age, the prevalence of prefrailty ranges from about 5% at age 65 to about 25% at age 85. The prevalence of frailty increases substantially at age 75 (around 5%) to reach again almost 25% at age 85.
But what matters most is that these averages conceal the fact that women exhibit twice as much prevalence than men, at all ages, both for prefrailty and frailty.

Since the definition of a "frail individual" could be controversial, we have adopted an alternative definition (the "slack" definition) which makes use of 3 out of 6 limitations. One could argue that

this is more inclusive, as more people would qualify and would qualify earlier for benefits under such criterion. At the same time there would be an obvious change in the number/prevalence of prefrail people. This evidence is more easily explained using as "metric" the ages at which one becomes frail (prefrail): a prevalence of 5% of frails corresponds to an age of 80, if we use the more "stringent" definition of frailty, but it corresponds to age 76 in a more "inclusive" perspective. This means that a change in the definition from 3/6 ADL limitations, moving to 4/6, significantly reduces the number of individuals considered to be frail/dependent at a given age, **but it implies four more years in the prefrailty status.**

From a policy perspective it is important to understand how the eligibility rules should be targeted, as people exhibiting 3 limitations cannot be in the same pool as those affected by moderate functional impairment. Therefore, the concern is that individuals with significant levels of dependency may lack the necessary protection, when more stringent rules for eligibility apply. At the same time, if proper preventive actions are taken during the "prefrailty" years, it may take longer to move onto the frailty status. In other words, we have identified a **crucial "window of action" between the ages 72 and 85** where timely prevention may delay the onset of frailty.

Besides the descriptive evidence we carry out econometric estimates on the SHARE and ISTAT data to generate predictions on the probability of being frail (prefrail) and the probability of becoming frail. As for the former, we perform first probit estimates by specifying a model that explains the probability of being frail as a function of age, gender, geographical area of residence, education, birth-cohort and marital status. The results confirm that such a probability is higher at higher ages, for women (versus men), lower educated people living the South of Italy and being single. A more complete model is estimated through an ordered probit methodology, whereby we jointly obtain the probability of being frail, as opposed to being in good health or prefrail, and the probability of being prefrail as opposed to being in good health. We use these estimates to generate "counterfactuals", i.e. hypothetical cases where all characteristics are fixed, but one. Our model allows us to come up with "story lines", i.e. identifying specific cases that are of interest for policy analysis. **A striking result is that an individual who is single in the South has three times as much probability of being frail at age 75 than someone of the same age living in a couple in the North-West (13% versus 4%). The difference is even larger at older ages.**

The storylines are also used to illustrate the results of transitions from one state to another (say from good health to frailty). In this part of the paper, besides estimating transition probabilities, we adopt a very effective metric "**the healthy life years",** i.e. the number of years as from age 65 in which individuals have no limitations. Our calculations indicate that an individual who reaches, in good health, age 65, would benefit on average of about **7.93** years in good health up to the age of 85. The figure varies by gender, with men displaying slightly higher values, but not significantly different, if compared to women (8.09 versus 7.79). It should be noted that these figures are very close to the one reported from national statistics: the average for the population varies between 7.2 years and 11.9 years, depending on the specific years and the cohorts being considered. As

expected, there is heterogeneity in the population: **for example, the gap in the average number of years in good health is about 0.6 years between the most educated and the least educated individuals.** This is extremely important from a policy perspective, as the people with lower schooling levels are also characterized by lower earnings, and therefore, with higher difficulty in facing the high costs of LTC.

A deeper analysis of the causes of frailty points to specific limitations: we are the first to show on population-based surveys, coupled with evidence from the insurance industry, what are the most common limitations in ADL. For people who exhibit at least one limitation, these are dressing and bathing (washing); for people who are definitely frail (4 limitations), also getting in and out of bed and going to the toilet are frequent limitations. While there seems to be little difference across genders in general, the more acute limitations (getting out of bed and using the toilet) seem to prevail for frail women vis-à-vis frail men. Interesting enough, this sample evidence is corroborated by what found for the insurance industry, where people who are insured and already qualify for LTC show the same patterns of dependency.

Hence, an important point is that prefrailty is a crucial transitional stage from good health status to severe functional impairment, yet it remains insufficiently acknowledged as a priority for preventive intervention. Addressing this stage through targeted public strategies offers a cost-effective means of enhancing the efficiency and fiscal sustainability of long-term care (LTC) systems in the long run, as population ages. Public policies should aim at deferring the onset of autonomy loss and slowing the progression toward very serious and irreversible functional impairment. Service-oriented, community-based LTC programs should be favored over cash transfers, which frequently lack robust monitoring mechanisms and may inadvertently reinforce dependence on informal or low-skilled care.

Our findings underscore persisting structural inequalities in the current model of LTC provision for the more vulnerable categories in the population: (i) women, who are traditionally charged with the responsibility of providing informal care, but more recurrently receive professional help for personal care and domestic tasks; (ii) less educated people, who are more likely to face problems in affording the costs of formal care services and private LTC insurance products due to budget constraints; and (iii) single persons, who cannot receive informal support from family members within the household and hence need more external home care support than individuals living in a couple. Following the recommendations of Tomassini et al. (2024), LTC provision should be calibrated to the functional status of older adults and informed by systematic feedback from beneficiaries and their familial caregivers regarding the quality of the LTC services provided and their specific needs.

Policy priorities should therefore include (a) the establishment of comprehensive monitoring systems capable of capturing the evolving needs and preferences of prefrail (other than frail) individuals, and (b) the expansion of preventive medical health assistance and individualized home-based services focused on personal and domestic support, particularly including those with

three functional limitations who experience severe burdens in their life quality. Moreover, public–private synergies—such as the integration of public support mechanisms to facilitate access to private LTC insurance products—could guarantee broader access to high-quality care and further enhance system responsiveness. Investments in frailty prevention should be regarded not merely as social expenditure but as economically far-sighted measures that reduce future healthcare and LTC costs while generating positive externalities for vulnerable populations and their caregivers. By fostering longer, healthier lives, such policies may advance both social welfare and fiscal capacity, reinforcing the economic sustainability of ageing societies.

The second part of the paper looks at the **"supply side".** In general terms, public long-term care accounts for 0.7% of GDP (IVASS). Based on the SHARE data we show that the prevalence of individuals receiving public LTC provisions or disability benefits is higher for those that we classify as frail people. While this seems a reasonable result, we also find that such prevalence is much higher in Southern regions, where the number of prefrail individuals having benefits is almost as large as the number of frail people in Northern regions, which cannot be explained by health conditions. A first consideration is that, on the one hand, there is a very substantial unmet demand for care, but also, in some regions people receive benefits even in cases of moderate impairment. Furthermore, these benefits do not seem to contribute to better health outcomes later in life (they are not as protective) as, in the same regions, frailty is much higher than elsewhere.

Private LTC insurance is not very common in Italy, the ten leading companies who generated the highest volume of premium collection over the years 2017-2024 cover more than 95 percent of the LTC insurance market, many of the contracts are group or collective contracts. Evidence from Share and from a survey carried out by IVASS show that a large majority of such policies are found in Nortnern Italy, possibly related to occupational contracts. An overwhelming majority is held by men as opposed to women, and younger more educated people.

Important evidence that we can draw from the SHARE data is the importance of formal care (paid homecare) versus informal care (by family members and friends). Formal care, particularly personal care, is used by frail people (about 30%) but also prefrail people (20% of prefrail women and 10% of prefrail men). Formal care is used more often by single people.
These results couple with evidence about informal care: both prefrail and frail women receive less informal support in the form of personal care. The general message is that women are more likely to be also caregivers, so that frail or prefrail men make use of informal care, while frail or prefrail women have to resort to professional (formal care) especially if single.

Finally, we present an exercise that estimates the costs of frailty. These estimates have to be taken with care, as they are possibly affected by measurement error: the message we want to convey is, once again, **the difference that emerge across groups of the population**. We define a *"necessary expected coverage"*, which is based on the probabilities of being prefrail/frail at any given age,

between the ages 50 to 85, as predicted by our econometric models by the average cost of formal/informal care in the prefrailty/frailty status. We observe that, while at younger ages the expected costs of care for prefrailty are higher than those of frailty (due to the larger likelihood of this less serious impairment status), after age 77, the expected expenditure in care due to frailty increases sharply and, by the age of 85, it is almost twice as much the amount related to prefrailty. In order to get a monetary value that is comparable across cases we compute the *cumulative necessary expected coverage* for formal and informal care related to prefrailty and frailty from age 50 to 85. This counts the future LTC expenditures from a given age to age 85, by the probability of becoming frail at that specific age. For example, at age 70, for someone who did not get limitations until age 69, given the predicted probability of becoming frail (prefrail), the sum of the expected future costs until age 85 is about € 23000, as people age the probability of getting sick increases, but the number of years decreases. Once again what matters is the differences we can document: women have a larger cumulative necessary expected cost, with a gap which is very high after age 70, approximately equal to €10000.

We investigate the transitioning stages from a healthy functional status to frailty (as proxied by severe dependence) through appropriate empirical modelling. Second, we attempt to assess the potential (un)covered demand for long-term care services, providing a mapping of formal – both public and private- LTC products and informal care. We document how, for vulnerable groups in the population, unmet needs significantly emerge.

We discuss possible policy implications of these stylized facts and propose possible public strategies to cope with unmet needs while managing public costs of ill-health, based on a fully dynamic life-cycle approach. We consider preventive public health interventions potentially lengthening working life perspectives of senior workers and promoting active ageing. In this perspective, we consider public strategies to address the specific needs of individuals lying in the intermediate stage of prefrailty, which represents a transition point where targeted health-supporting actions can be most effective in mitigating an irreversible progression toward more severe dependency. Building on the outlined demand/supply framework, we examine policy solutions based on regulated synergies between public and private actors to ensure the provision of high-quality and inclusive long-term care services. These interventions target vulnerable population groups of low-education and low-income households in their older ages, with a focus on single individuals. Furthermore, the analysis addresses regional disparities within the country, emphasizing the pronounced north-south divide in both the prevalence of health-dependent older adults and the quality and availability of long-term care services.

Overall, our work provides some novel and interesting insight into the need for care and the coverage. We have shown that the prefrail status is very relevant because it is an age window (between ages 72 and 85) where the manifestation of impairments provides a signal of future fragility: preventive actions can be taken at that stage, while, at the same time, protection for the

future can be effectively designed and built. We have shown that the most common limitations in ADL at first onset are “dressing” and “bathing”: once again these early signals, normally associated with specific morbidities that we illustrate, should be use as a trigger point.

A second very relevant result, which is obtained thanks to the use of the SHARE and ISTAT surveys, i.e. population wide surveys, is that we can unpack the groups in the population which are more vulnerable. Gender differences are well known (women tend to survive longer but suffer from several limitation early on in old age), we show that even more important are characteristics such as living alone. We build “storylines” by which it emerges that the most vulnerable groups in the population are the lower educated people, living alone, in the South and most likely women. This can be expressed in the difference in healthy life years.

Form the “supply side” we have shown how the public and private sector provide coverage (and the type of coverage) and finally we have attempted estimates of the potential expected costs to an individual of the risk of becoming frail.

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Appendix

Figure A2.1 Prevalence of diseases (percent) by geographical area and gender in Italy.

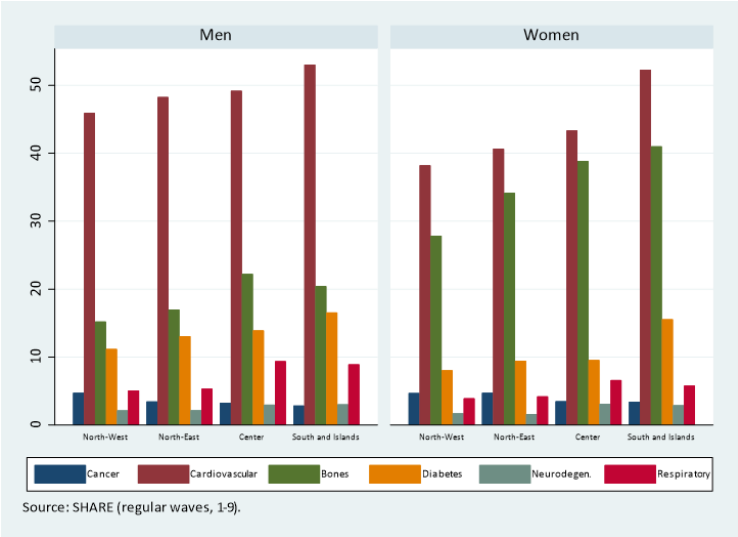


Figure A2.2. Prevalence of diseases (percent) by geographical area and age group in Italy.

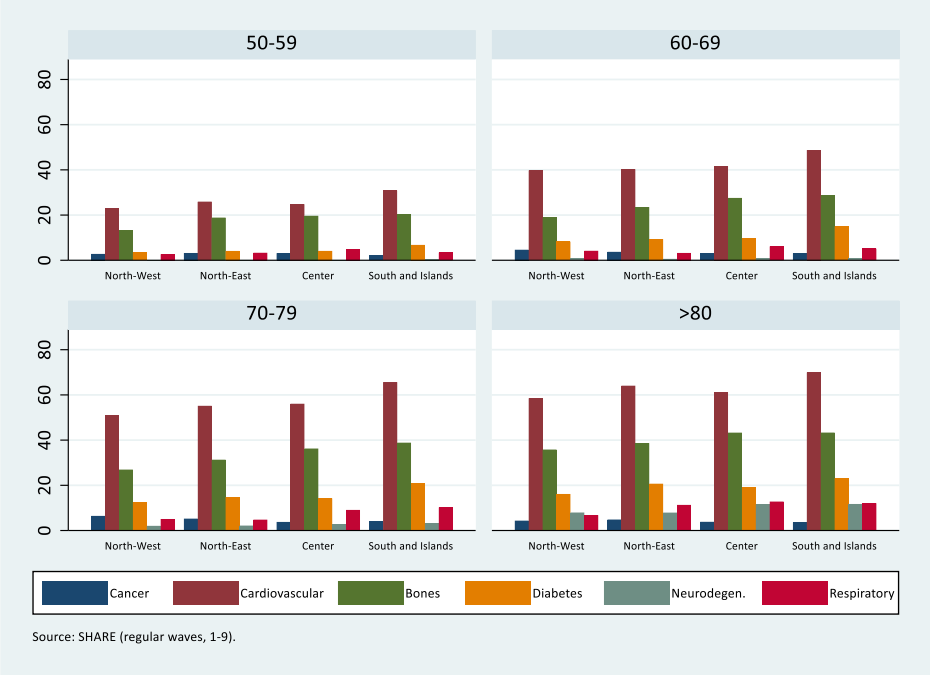
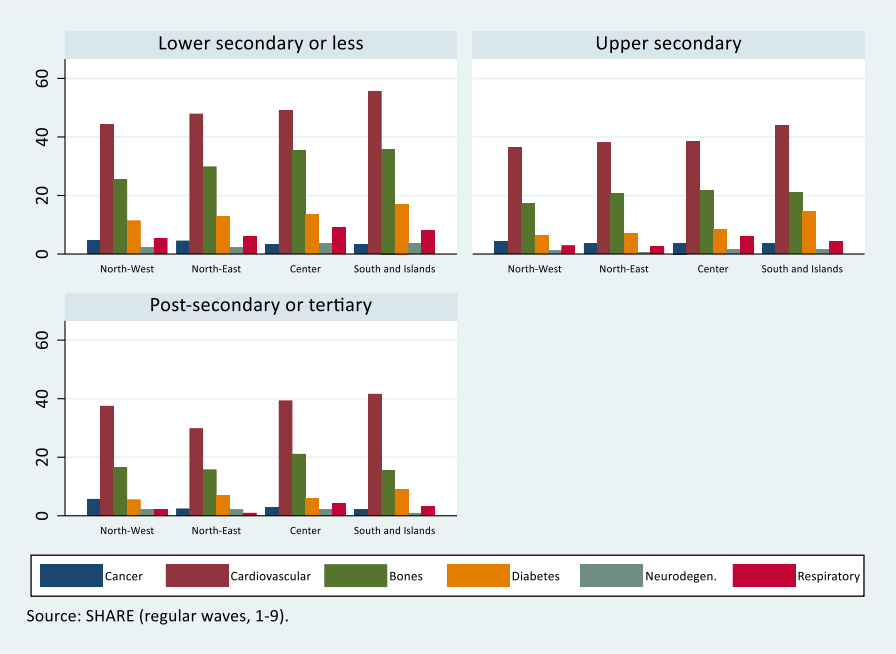


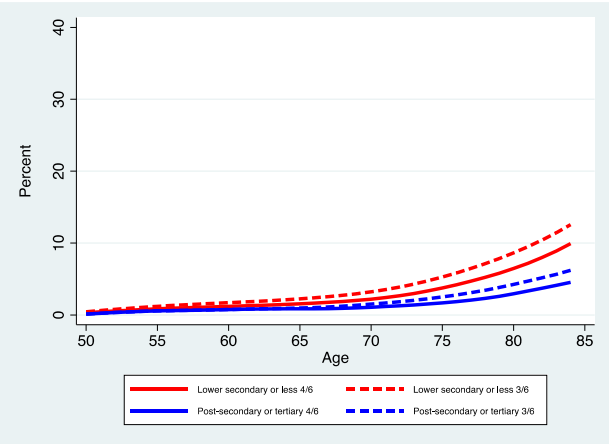
Figure A2.3. Prevalence of diseases (percent) by geographical area and level of education in Italy.



Source: SHARE (regular waves, 1-9).

Figure A2.4. Prevalence of frailty using 4/6 vs 3/6 definitions, by level of schooling.

SHARE



ISTAT

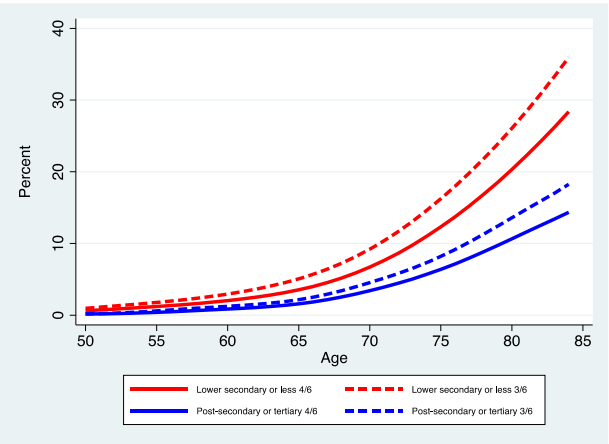


Figure A2.5. Prevalence of frailty using 4/6 vs 3/6 ADL limitations definitions, by NUTS-1 region.

SHARE ISTAT

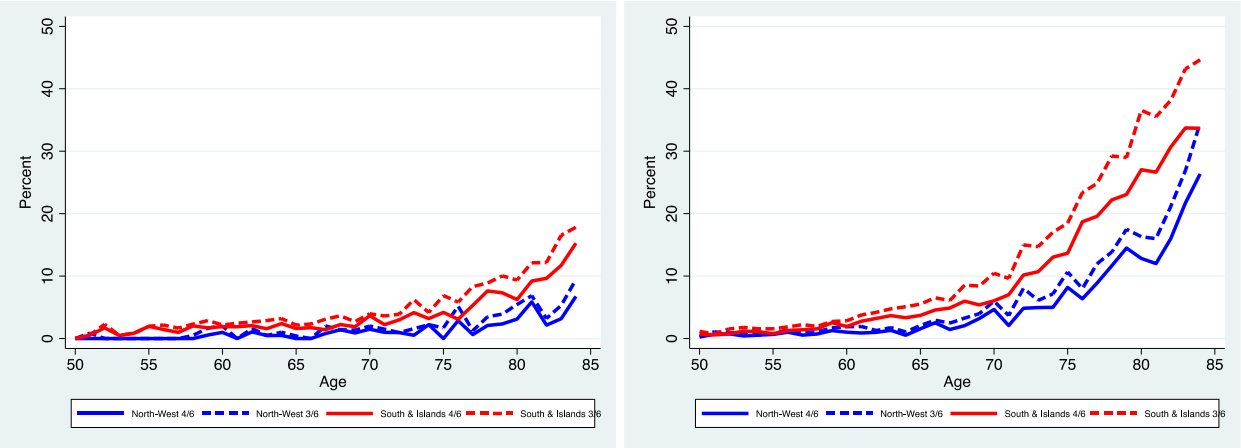


Figure A2.6. Frailty status and number of chronic illnesses; frailty: 3/6 ADL limitations.

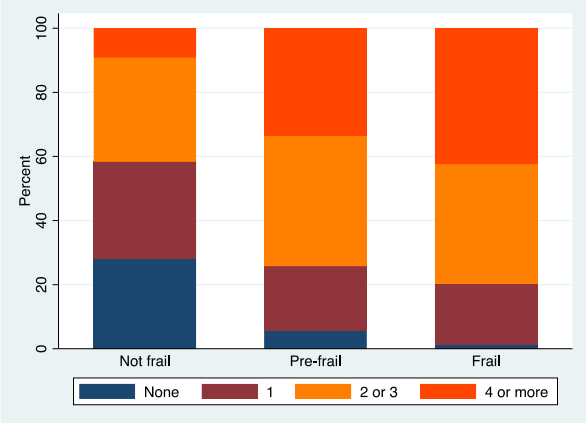


Figure A2.7. Number of chronic illnesses and frailty by gender.

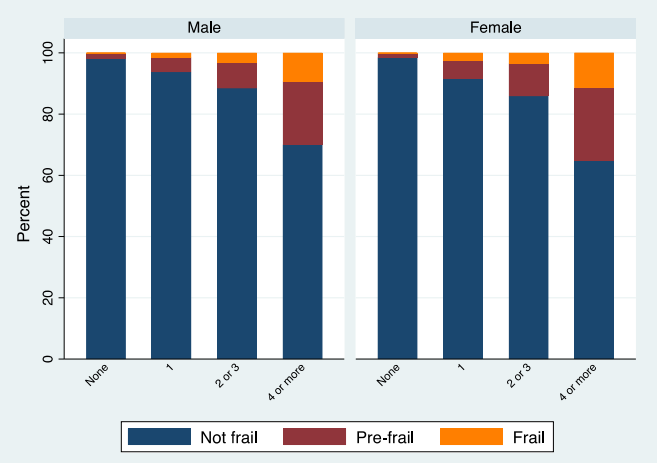


Figure A2.8. Morbidity and frailty/dependence by NUTS-1 region.

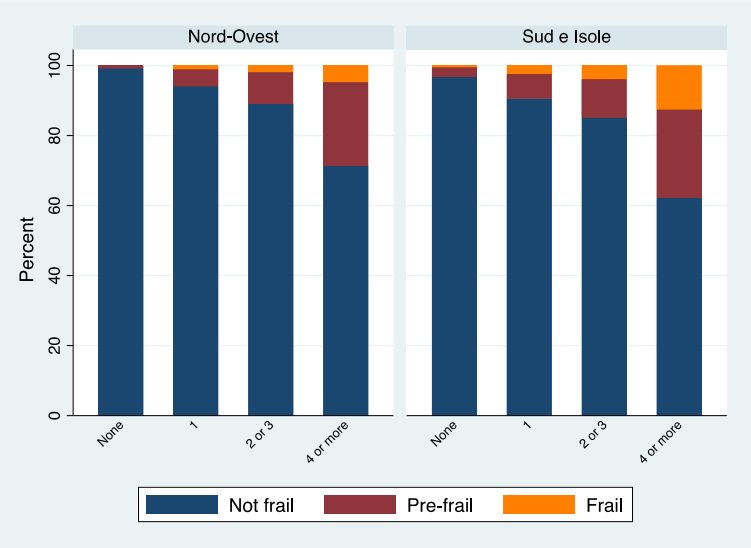


Table A3.1 Average marginal effects on the probability of being frail (individuals aged 30-90 in ISTAT).

VARIABLES	ISTAT individuals 30-90		
	Full sample	**Men**	**Women**
Age	0.00234***	0.00225***	0.00244***
	(0.000261)	(0.000364)	(0.000375)
Female	0.00483***		
	(0.000734)		
Geographical area			
North-East	-0.000440	0.000613	-0.00156
	(0.000933)	(0.00132)	(0.00132)
Center	0.00525***	0.00388***	0.00671***
	(0.00104)	(0.00142)	(0.00151)
South and Islands	0.0158***	0.0147***	0.0172***
	(0.000947)	(0.00131)	(0.00137)
Level of education			
High school	-0.0130***	-0.0134***	-0.0123***
	(0.000837)	(0.00113)	(0.00125)
Post-secondary and tertiary	-0.0158***	-0.0150***	-0.0162***
	(0.00107)	(0.00146)	(0.00160)
Single	0.0147***	0.0156***	0.0134***
	(0.000876)	(0.00130)	(0.00122)
Cohort controls	✓	✓	✓
Wave controls	✓	✓	✓
Observations	152,100	77,554	74,546

Note. Indicators for North-West and lowest level of education (i.e., lower secondary or less) are omitted.

Jointly estimating prefrailty and frailty

Table A3.2. Average marginal effects on the probability of non-frailty, prefrailty or frailty based on an ordered probit specification

a) SHARE

Variables	Full sample			Men			Women		
	Non-frail	Pre-frail	Frail	Non-frail	Pre-frail	Frail	Non-frail	Pre-frail	Frail
Age	-0.0056***	0.0034***	0.0022***	-0.0054***	0.0034***	0.0021***	-0.0057***	0.0033***	0.0024***
	(0.0004)	(0.0002)	(0.0002)	(0.0005)	(0.0003)	(0.0002)	(0.0005)	(0.0003)	(0.0002)
Women	-0.0228***	0.0151***	0.0077***						
	(0.0035)	(0.0023)	(0.0012)						
High school	0.0256***	-0.0172***	-0.0084***	0.0189***	-0.0126***	-0.0064***	0.0345***	-0.0226***	-0.0119***
	(0.0046)	(0.0031)	(0.0015)	(0.0069)	(0.0046)	-0.0023	(0.0073)	(0.0048)	(0.0026)
Post-secondary or tertiary	0.0323***	-0.0219***	-0.0105***	0.0116	-0.0077	-0.0039	0.0610***	-0.0400***	-0.0210***
	(0.0057)	(0.0040)	(0.0018)	(0.0086)	(0.0057)	(0.0029)	(0.0107)	(0.0070)	(0.0038)
Single	-0.0302***	0.0198***	0.0103***	-0.0185***	0.0123***	0.0062***	-0.0314***	0.0206***	0.0108***
	(0.0044)	(0.0029)	(0.0016)	(0.0066)	(0.0044)	(0.0022)	(0.0052)	(0.0034)	(0.0018)
North-East	-0.0064	0.0044	0.0019	-0.0098	0.0065	0.0033	-0.0067	0.0044	0.0023
	(0.0050)	(0.0034)	(0.0015)	(0.0084)	(0.0056)	(0.0028)	(0.0084)	(0.0055)	(0.0029)
Center	-0.0114**	0.0079**	0.0035**	-0.0070	0.0046	0.0024	-0.0193**	0.0127**	0.0067**
	(0.0046)	(0.0032)	(0.0014)	(0.0077)	(0.0051)	(0.0026)	(0.0077)	(0.0050)	(0.0027)
South and Islands	-0.0600***	0.0397***	0.0203***	-0.0493***	0.0327***	0.0166***	-0.0669***	0.0438***	0.0231***
	(0.0045)	(0.0031)	(0.0016)	(0.0068)	(0.0045)	(0.0024)	(0.0067)	(0.0044)	(0.0025)
Cohort	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	27,234			12,297			14,937		

b) ISTAT

Variables	Full sample			Men			Women		
	Non-frail	Pre-frail	Frail	Non-frail	Pre-frail	Frail	Non-frail	Pre-frail	Frail
Age	-0.0089***	0.0042***	0.0048***	-0.0083***	0.0038***	0.0045***	-0.0096***	0.0045***	0.0051***
	(0.0002)	(0.0001)	(0.0001)	(0.0003)	(0.0002)	(0.0002)	(0.0004)	(0.0002)	(0.0002)
Women	-0.0311***	0.0162***	0.0150***						
	(0.0019)	(0.0010)	(0.0009)						
High school	0.0456***	-0.0249***	-0.0207***	0.0452***	-0.0230***	-0.0222***	0.0530***	-0.0281***	-0.0249***
	(0.0024)	(0.0014)	(0.0011)	(0.0038)	(0.0019)	(0.0019)	(0.0044)	(0.0024)	(0.0021)
Post-secondary or tertiary	0.0588***	-0.0326***	-0.0262***	0.0635***	-0.0323***	-0.0311***	0.0722***	-0.0383***	-0.0340***
	(0.0032)	(0.0019)	(0.0014)	(0.0059)	(0.0030)	(0.0029)	(0.0075)	(0.0040)	(0.0036)
Single	-0.0423***	0.0213***	0.0210***	-0.0399***	0.0203***	0.0196***	-0.0382***	0.0203***	0.0180***
	(0.0029)	(0.0014)	(0.0015)	(0.0034)	(0.0018)	(0.0017)	(0.0035)	(0.0019)	(0.0017)
North-East	0.0029	-0.0016	-0.0013	-0.0026	0.0013	0.0013	0.0106**	-0.0056**	-0.0050**
	(0.0026)	(0.0014)	(0.0011)	(0.0042)	(0.0021)	(0.0020)	(0.0048)	(0.0026)	(0.0023)
Center	-0.0130***	0.0071***	0.0059***	-0.0130***	0.0066***	0.0064***	-0.0172***	0.0091***	0.0081***
	(0.0028)	(0.0015)	(0.0013)	(0.0042)	(0.0021)	(0.0021)	(0.0047)	(0.0025)	(0.0022)
South and Islands	-0.0626***	0.0324***	0.0301***	-0.0553***	0.0282***	0.0272***	-0.0666***	0.0353***	0.0313***
	(0.0025)	(0.0014)	(0.0012)	(0.0035)	(0.0018)	(0.0018)	(0.0039)	(0.0021)	(0.0019)
Cohort	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	80,304			42,219			38,085		

Figure A3.1. Predicted probability of prefrailty and frailty by macro area, men (left) vs women (right).

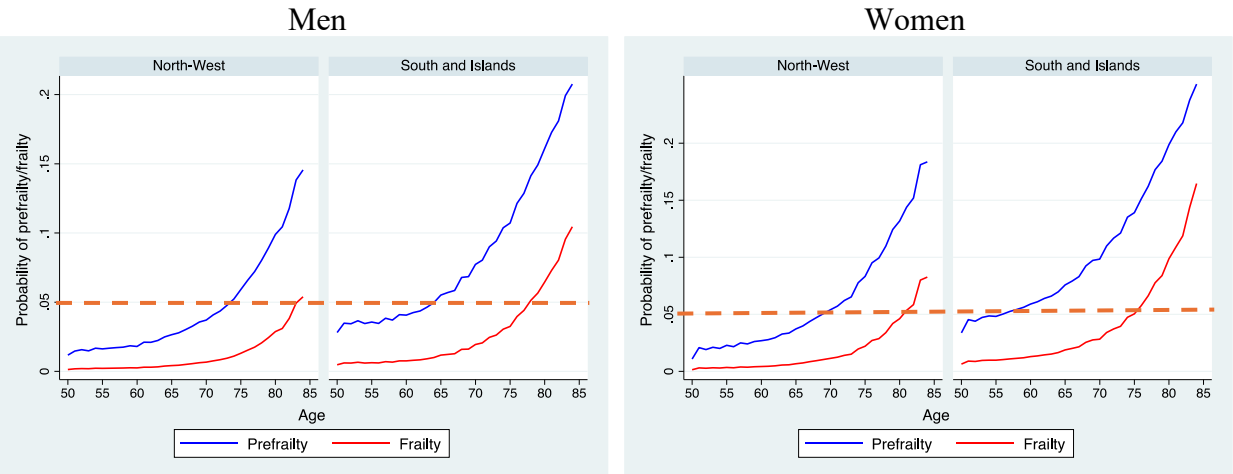


Figure A3.2. Predicted probability of prefrailty and frailty by macro area, women with less than high-school degree (left) vs women with a tertiary education (right).

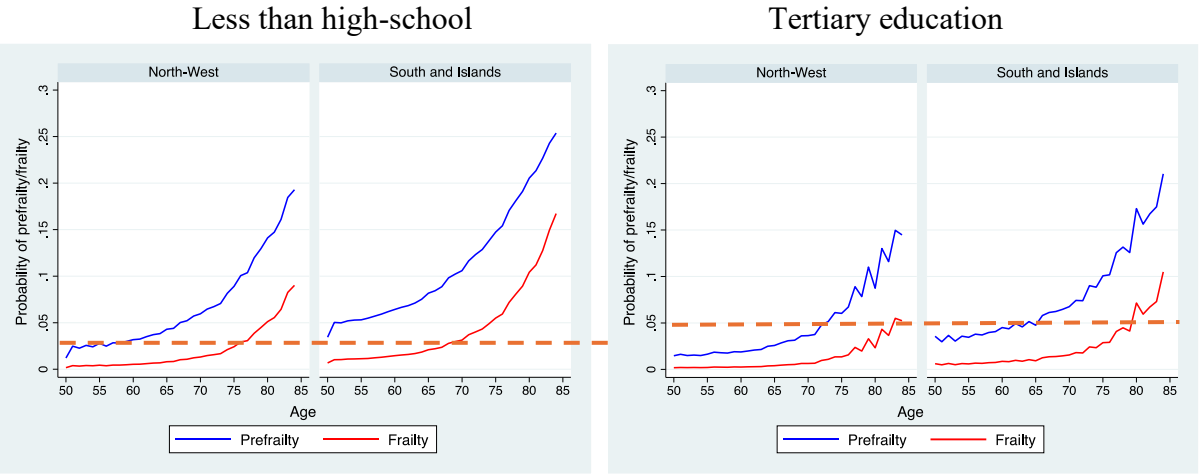


Figure A3.3. Predicted probability of prefrailty and frailty by macro area, men with less than high-school degree (left) vs men with tertiary education (right).

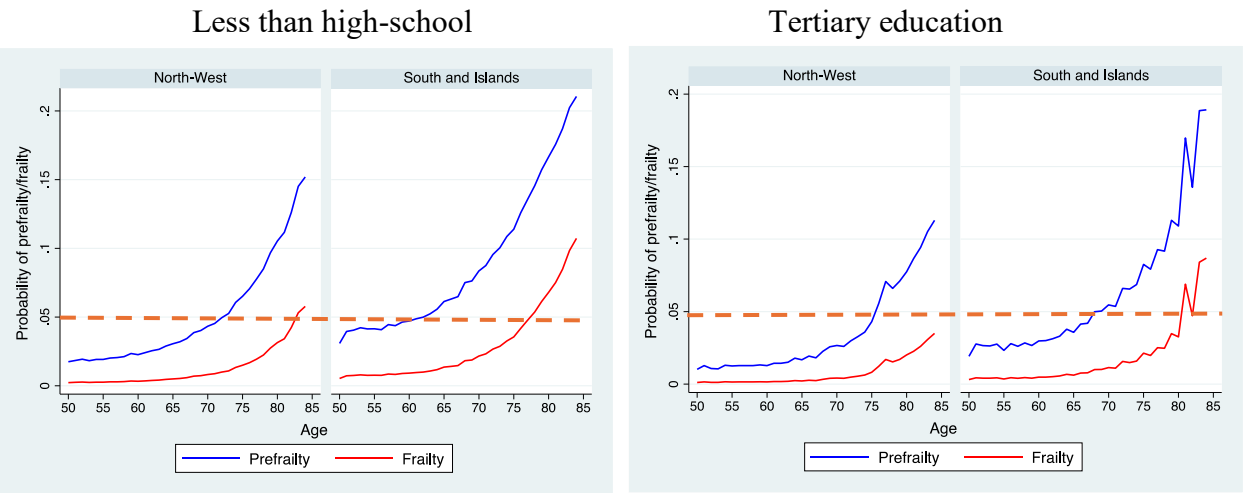


Figure A3.4. Years in good health between ages 65 – 85, by macro-area.

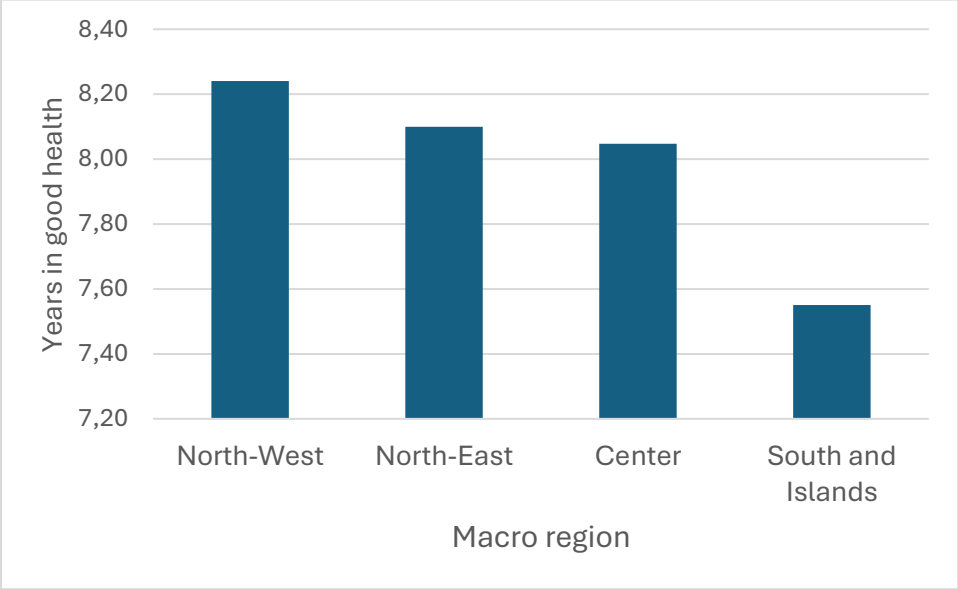


Figure A3.4 displays the average number of years in good health between ages 65 and 85, separately by geographical macro area. In the North-West the number of years in good health out of 20 is about 8.24 years, similar measures are obtained for the North-East and the Center. The discrepancy is significantly large in Southern Italy, with an average of about 7.75 years in good health: a gap of about 0.7 years of good health.