

# Financial social protection and individual out-of-pocket costs of long-term care in the USA and Europe: An observational study

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## Summary

**Background** Empirical evidence informing policies aiming at ensuring affordability of long-term care (LTC) costs is limited. Combining system-level with individual-level data, we quantify the burden of out-of-pocket costs of LTC services on households in 13 European countries and the USA and explore how social protection systems impact affordability of care.

**Methods** In this observational study, we use harmonised data from the Health and Retirement Study (HRS), collected between 2012 and 2016, and from the Survey of Health, Ageing and Retirement in Europe, collected between 2013 and 2017. We assess the severity of LTC needs of older adults (65+) on the basis of self-reported limitations in activities of daily living (ADLs) and instrumental activities of daily living (IADLs). We classify countries' social protection systems in terms of affordability and progressivity using information obtained from country officials. We examine variation in individual-level out-of-pocket LTC costs by social protection systems' affordability and progressivity.

**Findings** Out-of-pocket LTC costs are heterogeneous across countries and increase with individuals' needs. In countries where LTC is more affordable and social protection systems less progressive, older adults incur significantly lower levels of LTC costs. Within Europe, not only are costs lower where systems are characterized by higher affordability and lower progressivity, but they also represent a lower share of households' disposable income.

**Interpretation** Our findings indicate that the social protection systems significantly affect the level of out-of-pocket costs faced and reported by older adults with LTC needs as well as the share of their income that is devoted to pay for care.

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**Keywords:** Long term care expenditure; Social protection systems; Cross-country analysis

## Introduction

Globally, populations are ageing rapidly due to increasing life expectancy and declining fertility rates.<sup>1</sup> As people grow older, their physical and mental health deteriorates, and they may struggle with everyday activities that were once second nature. In Europe, the

increasing number of people reaching or passing 65 years is expected to lead to higher levels of dependency, dementia, and comorbidity in the coming decades.<sup>2,3</sup> In fact, there is evidence that extra years lived from age 65 are less likely to be spent independently.<sup>4,5</sup> How to finance and provide the personal care and assistance services that the elderly require, commonly referred to as long-term care (LTC), is a critical question for policymakers.

Older adults find a first line of support in their spouses, children, relatives, and friends (i.e., informal care). Yet, some may choose to, or have no choice but

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### Research in Context

#### *Evidence before this study*

We searched in PubMed and Google Scholar for articles published in English from January 1, 2000, to December 31, 2020, using combinations and variations of the search terms "long term care," "costs," "expenditure," "affordability," "assessment," "adequacy," "comparison," "benefits," and "social protection". We found no empirical international comparisons using both country-level information about long-term care (LTC) services affordability and survey reports of individual out-of-pocket LTC costs in old age.

#### *Added value of this study*

To the best of your knowledge, this is the first international comparison of household out-of-pocket costs on LTC services using harmonised, individual-level data from representative surveys, combined with information on systems of LTC from country officials. We rely on survey data from two similar ageing and retirement studies in the USA and Europe and on a classification of countries by LTC service affordability created by the Organisation for Economic Cooperation and Development (OECD) using information from countries' officials.

#### *Implications of all the available evidence*

Out-of-pocket spending increases monotonically with the severity of LTC needs. In countries where LTC is relatively more affordable and the social protection system is less progressive, older adults report both lower out-of-pocket LTC costs and a lower share of their incomes devoted to pay for LTC services, especially within Europe.

to, use formal care provided by paid professionals. Individuals who do not have access to or cannot afford formal care and whose families and friends cannot support them, have unmet needs. Besides the personal toll this can take on older people's wellbeing and quality of life, it can also lead to avoidable higher costs due to unplanned hospital admissions, delayed discharge, and extended hospital stays.<sup>6,7</sup> An argument can be made for states to finance some, if not all, of the costs of LTC for all who need it, based on fairness (those who need LTC should not bear its potentially catastrophic costs) and market failures (private insurance for LTC is not widely available and/or affordable).<sup>8</sup>

While the out-of-pocket costs of health care services are extensively documented, those of LTC services have received far less attention.<sup>9</sup> No study to date has explored how the characteristics of countries' social protection systems are associated with differences in individual out-of-pocket costs observed in nationally representative household surveys. This is despite evidence that out-of-pocket payments for LTC services in

Europe constitute a higher share of individual income than out-of-pocket costs of health care and that, in the USA, one in six people with LTC needs face catastrophic expenses.<sup>10,11</sup> Existing research has focused on single countries and assessed the risk of poverty due to out-of-pocket expenses for LTC services across different segments of the population.<sup>12-15</sup> International comparisons are limited to LTC services' access, and do not consider level of spending on and affordability of LTC services.<sup>16</sup> Some studies explore institutional differences in LTC needs assessments and eligibility for public support across countries, but adopt a qualitative rather than a quantitative approach.<sup>17-19</sup>

The COVID-19 pandemic has led to renewed calls for rethinking LTC.<sup>20</sup> Yet, there is little empirical evidence to inform which strategies should be pursued and unclear baselines for setting actionable targets.<sup>21</sup> The aim of this study is to start filling these gaps, building on previous analyses exploiting country-level information on affordability and progressivity of LTC social protection systems.<sup>22,23</sup> To this end, we estimate and compare out-of-pocket spending on LTC in the USA and Europe using individual-level data. We then document the extent to which differences in financial social protection – namely in prospective affordability and progressivity derived from country-level data – are reflected into observed differences in out-of-pocket LTC costs for older individuals. Previous research has described differences in the nature and organization of social protection programs and health systems across countries.<sup>19,22-24</sup> To the best of our knowledge, this is the first international comparison of household out-of-pocket expenditure on LTC services using harmonised, individual-level data from representative surveys as well as measures of prospective affordability and progressivity derived from country-level data.

Using country-specific measures of LTC costs and financial support obtained from country officials as well as income and wealth distributions, the prospective affordability of a country's system is inversely proportional to the share of the older population that would not be able to afford LTC.<sup>22,23,25</sup> We hypothesize that older adults in countries with social protection systems that have higher prospective affordability report lower levels of out-of-pocket expenditure on LTC services and lower LTC expenditure to income ratios, compared to their counterparts facing systems with lower prospective affordability. We empirically test this hypothesis using survey data from a representative sample of the older population in the USA and Europe. In a similar fashion, we gauge the prospective progressivity of a country's system by assessing the difference between the public LTC cost share at the bottom and at the top of the income distribution. Our hypothesis, which we test using survey data, is that in countries with more progressive systems, the difference in both expenditure level and expenditure to income ratio between high- and

low-income older individuals should be larger. Our analysis informs the debate on how the characteristics of social protection systems impact household financial security at older ages, a key aspect to consider when designing efficient, equitable and sustainable funding systems for the elderly's LTC needs.<sup>26</sup>

## Methods

### Data and research strategy

The Organisation for Economic Cooperation and Development (OECD) collects information about the costs of LTC services in participating countries through a questionnaire featuring stylised cases of LTC needs.<sup>22,23</sup> The OECD uses the LTC definition in the System of Health Accounts, excluding nursing/medical care and restricting attention to individuals aged 65 and older.<sup>27</sup> The focus is on financial protection, with other aspects of social protection (e.g., access to goods and services) not considered. Three levels of LTC needs – low, moderate, and severe – are based on the number and type of difficulties with activities of daily living (ADLs) and instrumental activities of daily living (IADLs), and defined after consultation with government experts and geriatricians to ensure clinical plausibility. For each typical case, country representatives provide estimates of the cost of professional care to meet the specified LTC needs, whether in institutions or at home, and the monetary value of public support provided by the existing social protection system. By subtracting public coverage from the total cost of care, the amount of out-of-pocket expenditure necessary to meet an older person's needs can be computed.

We develop an index of LTC affordability based on the aforementioned information provided by country officials to the OECD and country-specific income and wealth distributions (details are provided in the Supplementary Material).<sup>22</sup> Specifically, the index measures the extent to which a representative individual in a given country has sufficient resources to afford the out-of-pocket costs associated with the LTC services to meet their needs. We assign a country to either a high or low affordability group depending on whether its affordability index is below or above the median value of the index across the countries considered in the study. We assess the extent to which these estimates align with observed, individual-level out-of-pocket LTC costs elicited by two major surveys representative of the elderly populations in the USA and in Europe, namely the Health and Retirement Study (HRS) and the Survey of Health, Ageing and Retirement in Europe (SHARE). We also explore whether there is an association between how progressive public social protection systems are and self-reported out-of-pocket costs by income level. The OECD provides the share of LTC costs (separately for home and institutional care) covered by a country's

social protection system for a person with moderate needs and average wealth at each income decile.<sup>22</sup> For each country, we compute the average share of LTC cost covered by the public system in the bottom and top three income deciles. We then classify a social protection system as "low-progressive" if the difference between the public cost share for the bottom and top three income deciles is smaller than 25 percentage points, and as "high-progressive" if the difference between the public cost share for the bottom and top three income deciles is greater or equal than 25 percentage points (we perform sensitivity analyses using different classification criteria in the Supplementary Material).

### Statistical analysis

The HRS and the SHARE are longitudinal studies interviewing respondents on a biannual frequency about health, cognition, and economic situation, and using very similar survey instruments. We rely on fully harmonised versions of the data provided by the Gateway to Global Aging Data repository, including imputations for missing values. We pool together three waves of HRS data, 2012, 2014, and 2016, and three waves of SHARE data, 2013, 2015, and 2017. These years coincide with the time when a higher degree of homogeneity between HRS and SHARE questionnaires had been achieved, thus reducing measurement comparability issues between the two studies. This choice also ensures that observational data are roughly contemporaneous with the OECD country-level information on LTC service costs. We have OECD data and individual-level data from the HRS and the SHARE for 14 countries: USA (USA), Austria (AUT), Germany (DEU), Sweden (SWE), Netherlands (NLD), Spain (ESP), Italy (ITA), France, (FRA), Belgium (BEL), Czechia (CZE), Luxembourg (LUX), Slovenia (SVN), Estonia (EST), and Croatia (HRV). All our analyses based on survey data use the original sample weights provided by the HRS and the SHARE. In addition, since there is evidence of substantial under-representation of nursing home residents in the SHARE, we construct weights that align the fraction of nursing home residents in the SHARE with that provided by official OECD statistics.<sup>28,29</sup> We express all monetary variables in 2015 US dollars equivalent using the OECD Purchasing Power Parities index.<sup>30</sup> The empirical analyses are performed using the software Stata S 15.1. We provide further methodological details in the Supplementary Material.

We classify individuals on the basis of self-reported needs, as elicited by the HRS and the SHARE. We define groups that closely mimic the OECD typical cases and, at the same time, allow us to reproduce in the sample key population stylised facts as much as possible. We considered four alternative classification methods to separate respondents into three groups with low,

moderate, and severe needs. We performed a validation exercise, described in the Supplementary Material, to select our preferred classification method. The chosen one relies on a composite “difficulty score” ranging from 0 to 14, which counts the number of reported difficulties with ADLs and IADLs. Individuals are assigned to having low, moderate, or severe needs depending on whether their difficulty score is between 1 and 2, between 3 and 6, or between 7 and 14, respectively. Our results are robust to adopting alternative needs classifications (see Supplementary Material). This study adheres to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines.

### Ethical approval

Ethical approval for this study was received from the Institutional Review Board at the University of Southern California (IRB: UP-17-00618-AM002). We rely on secondary data collected by the HRS and SHARE. In both studies, prior to each interview, survey participants are provided with a written informed consent and read a confidentiality statement. All the individuals for whom we have data have given their consent to be interviewed by the HRS and SHARE and for their de-identified data to be made available to the research community. To access the data, the three authors have registered with the HRS and SHARE and comply with the conditions of use.

### Role of the funding source

The funding sources had no role in the design of the study, data collection, analysis or interpretation, writing or decision to submit the manuscript for publication. The three authors had access to the data, critically revised different versions of the paper, and decided to submit the manuscript for publication.

### Results

After selecting individuals age 65 and older and dropping missing values for relevant variables, we have 26 955 individual-time observations for the USA and 65 139 individual-time observations for the 13 European countries considered in the study (details about sample selection criteria and count breakdowns are provided in the Supplementary Material). Table A7 in the Supplementary Material shows the prevalence of nursing home and home care utilisation by need across countries. Nursing home utilisation is significantly more prevalent in the USA than in Europe at all levels of needs. Conversely, reliance on home care is much more common in Europe than in the USA at all levels of needs. Given the observed low degree of nursing home utilisation in Europe, we will not analyse nursing home

and home care expenditures separately, but combine both into a composite measure of LTC costs.

### Spending on LTC services across countries

The HRS and the SHARE elicit information about use and cost of LTC services adopting 2 years and 1 year as reference periods, respectively. To make the HRS and the SHARE measures of out-of-pocket LTC expenditure comparable, we assume that amounts reported by HRS respondents are equally spread over the two years they refer to (i.e., we divide the reported amounts by two). While necessary to proceed with the analysis, we acknowledge the restrictiveness of this assumption. Because of that, and given the very different composition of LTC spending – nursing home vs. home care – and health-system organisation between the USA and European countries as well as the much larger sample size for the USA than for any other single country, we perform analyses with and without the USA.

Table 1 shows weighted averages of out-of-pocket LTC expenditure in nursing home and home care across countries for individuals who report utilisation of any of these services. In the first two columns, we consider the entire sample of utilizers; in the last two columns, we focus on utilizers with moderate or severe needs. Out-of-pocket LTC expenditures are heterogeneous across countries. The USA exhibits the highest level of spending at about \$2 250 per year for the entire sample and \$3 000 per year for individuals with moderate or severe needs. The average level of out-of-pocket LTC expenditure within Europe is significantly lower than in the USA, although in countries such as Austria, Luxembourg, Spain, and Italy, it is above \$1 600 per year, on average.

### Generosity of public social protection and spending on LTC services

After ranking countries according to the aforementioned affordability index, the higher affordability group ( $G_{ha}$ ) comprises Belgium, Germany, France, Netherlands, Luxembourg, Sweden, and Austria; the lower affordability group ( $G_{la}$ ) includes Estonia, Slovenia, Czechia, Croatia, Italy, Spain, and the USA. In the first panel of Table 2, we focus on individuals who used either institutional or home care. We report the average level of out-of-pocket LTC spending for the high and lower affordability groups (difference in utilisation between affordability groups are provided in Table A8 in the Supplementary Material) and present separate statistics for the lower affordability group with and without the USA ( $G_{la}$ -USA). We consider the entire sample of utilizers regardless of whether they report non-zero LTC costs and utilizers reporting strictly positive LTC costs. We repeat the same analysis on the sub-sample of utilizers with moderate and severe needs (again without

	All			Moderate or Severe Needs		
	UnweightedSample	Mean	Std. Dev.	UnweightedSample	Mean	Std. Dev.
Unites States	3 939	2 225	10 085	2 848	2 997	11 713
Austria	754	2 003	4 787	493	2 299	5 162
Germany	713	1 100	3 436	467	1 273	3 838
Sweden	564	840	1 957	298	983	2 472
Netherlands	338	779	1 163	109	911	1 511
Spain	1 000	1 633	3 406	632	1 907	4 053
Italy	575	1 731	3 921	324	2 174	4 799
France	1 008	1 273	3 485	602	1 492	4 185
Belgium	1 594	1 283	2 751	743	1 693	3 813
Czechia	583	406	870	382	497	1 021
Luxemburg	234	1 615	3 501	115	1 610	4 019
Slovenia	188	728	2 017	137	860	2 329
Estonia	683	389	1 960	526	491	2 209
Croatia	48	464	853	32	515	973

**Table 1: Nursing home and home care expenditure across countries (conditional on utilisation).**

N is the number of available observations for each country. Weighted averages are reported with corresponding standard deviations. All monetary amounts are in 2015 US dollars equivalent.

and with strictly positive LTC costs). Throughout the analysis, we test the statistical significance of mean differences between groups using a t-test.

Average out-of-pocket LTC expenditure is twice as large within the low affordability group compared to the high affordability group. The difference is about \$1 000 per year and statistically significant (p-val<0.01). While it decreases to about \$500 per year when we exclude the USA from G<sub>1a</sub>, this difference remains sizeable and significant (p-val<0.01). The distributions of LTC spending

in both the HRS and the SHARE are highly skewed. Even among utilizers of institutional or home care, about 40% of the sample report zero amounts. Because of that, when we restrict attention to utilizers with non-zero expenditures, the average level of out-of-pocket LTC costs increases substantially, and so does the difference between affordability groups. Specifically, when the USA is included, the average difference between G<sub>1a</sub> and G<sub>ha</sub> is about \$3 500 per year, regardless of needs (p-val<0.01), and about \$4 500 per year, conditional on

		All			Moderate or Severe Needs		
		Unweighted Sample	Mean (s.e.)	H <sub>0</sub> := (p-val)	Unweighted Sample	Mean (s.e.)	H <sub>0</sub> := (p-val)
Levels: Utilizers	G <sub>ha</sub>	5 205	1 197 (47)		2 827	1 404 (75)	
	G <sub>1a</sub>	7 256	2 013 (102)	<0.01	5 119	2 662 (144)	<0.01
	G <sub>1a</sub> -USA	3 077	1 579 (64)	<0.01	2 033	1 906 (95)	<0.01
Levels: Utilizers with Exp>0	G <sub>ha</sub>	3 720	1 879 (67)		1 915	2 231 (110)	
	G <sub>1a</sub>	2 731	5 250 (257)	<0.01	1 911	6 921 (362)	<0.01
	G <sub>1a</sub> -USA	1 570	2 403 (105)	<0.01	955	3 044 (165)	<0.01
Exp/Inc Ratio: Utilizers	G <sub>ha</sub>	4 869	0.06 (0.003)		2 695	0.07 (0.005)	
	G <sub>1a</sub>	6 809	0.08 (0.003)	<0.01	4 744	0.10 (0.005)	<0.01
	G <sub>1a</sub> -USA	2 933	0.11 (0.005)	<0.01	1 952	0.14 (0.007)	<0.01
Exp/Inc Ratio: Utilizers with Exp>0	G <sub>ha</sub>	3 474	0.09 (0.004)		1 821	0.12 (0.007)	
	G <sub>1a</sub>	2 502	0.24 (0.011)	<0.01	1 722	0.32 (0.015)	<0.01
	G <sub>1a</sub> -USA	1 497	0.18 (0.011)	<0.01	917	0.25 (0.017)	<0.01

**Table 2: Nursing home and home care expenditure by affordability of social protection systems.**

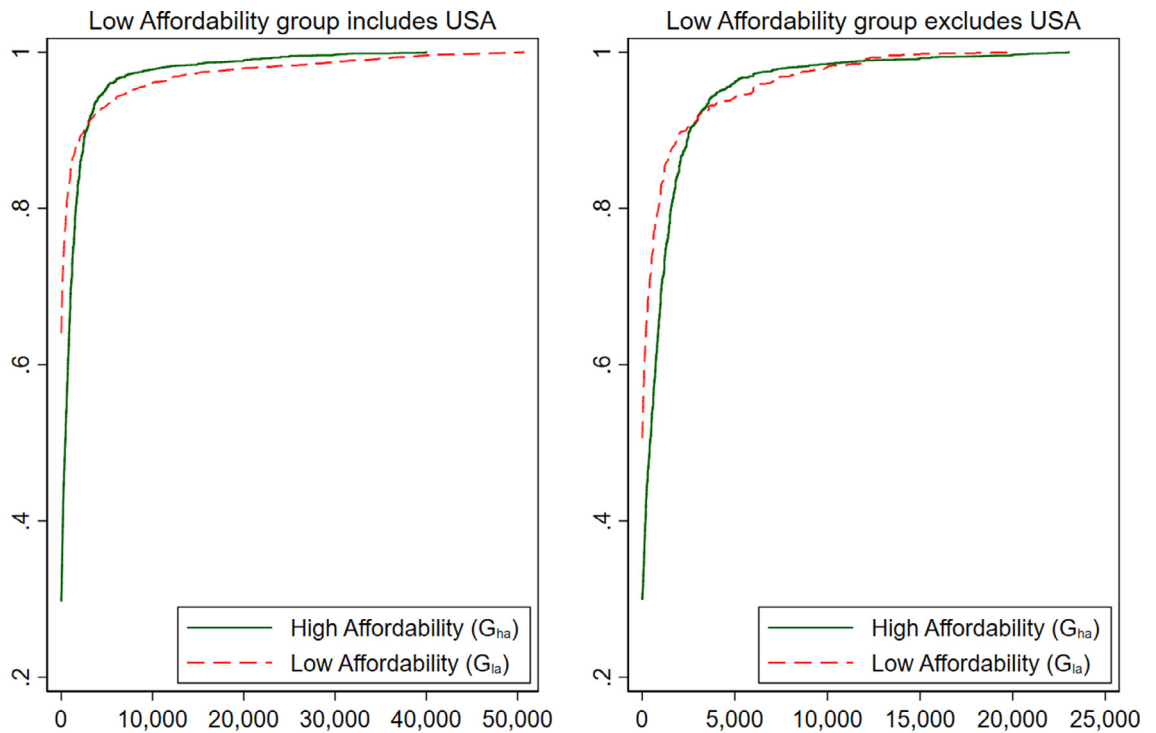
G<sub>ha</sub>: high affordability group; G<sub>1a</sub>: low affordability group; G<sub>1a</sub>-USA: low affordability group excluding the USA. H<sub>0</sub>:= is a t-test of equality of means between G<sub>ha</sub> and G<sub>1a</sub> and G<sub>ha</sub> and G<sub>1a</sub>-USA. For the analysis using the expenditure to income ratio, the top 0.5% of the expenditure to income ratio distribution is excluded. All monetary amounts are in 2015 US dollars equivalent.

having moderate or severe needs ( $p\text{-val} < 0.01$ ). When the USA is excluded, the estimated differences become smaller – about \$500, unconditional, and \$850, conditional on moderate or severe needs – but remain highly significant ( $p\text{-val} < 0.01$ ). Figure 1 offers a more comprehensive picture by comparing the entire distributions of out-of-pocket LTC expenditures. The cumulative distribution functions (CDFs) tend to be similar in the two groups up to the top quartile and start to diverge after that. In the top quartile, the CDF of  $G_{1a}$  is systematically below the one for  $G_{ha}$ , indicating higher spending levels in the former. Among utilizers with non-zero expenditure, whose distributions are shown in Figure 2, average outlay in the top quartile is more than \$5 000 higher in  $G_{1a}$  than in  $G_{ha}$  (\$10 617 vs. \$5 359). Among individuals with moderate/severe needs and non-zero expenditure, average outlay in the top quartile is twice as large in  $G_{1a}$  than in  $G_{ha}$  (\$13 450 vs. \$7 462). When the USA is excluded, these differences are reduced but still sizeable at around \$1 000.

While informative, the level of out-of-pocket LTC expenditure does not fully convey the extent to which

incurred out-of-pocket costs constitute a burden for households. A measure of this burden is the ratio of LTC expenditure to disposable income. In the bottom panel of Table 2, we analyse the average behaviour of this ratio between the two affordability groups. Due to the presence of outliers, we drop observations in the top 0.5% of the LTC expenditure to income ratio (the results remain unchanged when we exclude only the top 0.05% of the distribution – Table A9 in the Supplementary Material). In countries where LTC is more affordable, expenditure to income ratio is, on average, 6% regardless of needs, and 7% conditional on moderate or severe needs. These fractions increase to 8% (11% without the USA) and 10% (14% without the USA), respectively, when considering countries with less affordable systems. Differences between  $G_{ha}$  and  $G_{1a}$  are substantially larger – 9% vs. 24% (18% without the USA) and 12% vs. 32% (25% without the USA) among individuals who report strictly positive out-of-pocket LTC expenditures.

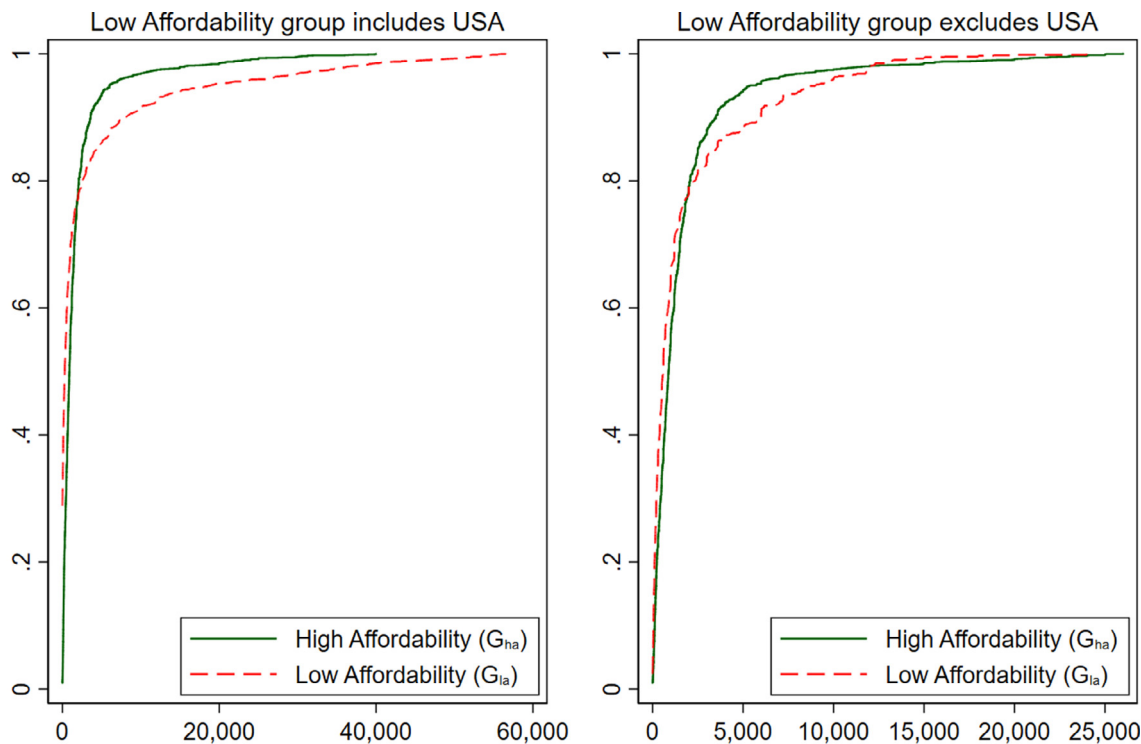
We further explore the extent to which differences in spending associated with the degree of generosity of social protection programs are observed within income



Kolmogorov-Smirnov test for equality of distributions  $p\text{-value} = 0.00$   
 Top 0.5% of the distribution is excluded

**Figure 1.** Nursing home and home care expenditure: cumulative distribution function by affordability of social protection systems for utilizers with some needs: In these two graphs, the solid green curves and the dashed red curves represent the cumulative distribution functions of LTC expenditure for individuals in low- and high-affordability countries, respectively. Only utilizers of LTC services are considered. The  $p$ -value of the Kolmogorov-Smirnov test for the equality of the two distributions is provided. In the graph on the left, the group of low-affordability countries includes the USA; in the graph on the right, the USA is excluded.





Kolmogorov-Smirnov test for equality of distributions p-value= 0.00  
Top 0.5% of the distribution is excluded

**Figure 2.** Nursing home and home care expenditure: cumulative distribution function by affordability of social protection systems for utilizers with some needs and non-zero expenditure. In these two graphs, the solid green curves and the dashed red curves represent the cumulative distribution functions of LTC expenditure for individuals in low- and high-affordability countries, respectively. Only utilizers of LTC services with non-zero expenditure are considered. The p-value of the Kolmogorov-Smirnov test for the equality of the two distributions is provided. In the graph on the left, the group of low-affordability countries includes the USA; in the graph on the right, the USA is excluded.

groups. In [Table 3](#), we separate utilizers with moderate or severe needs (without and with non-zero LTC costs) into two groups according to whether their income is below or above the median income in their country of residence. We then compare out-of-pocket LTC spending and LTC spending to income ratio for these two income groups (in [Table A11](#) in the Supplementary Material, we repeat this exercise for non-homeowners and homeowners and reach similar conclusions).

The results reveal that differences between high and low affordability countries are also apparent within income categories. When the USA is included in the analysis, the average level of LTC spending is between \$1 000 and \$1 600 higher in  $G_{la}$  than in  $G_{ha}$  across income groups; among those reporting strictly positive costs, the average level of LTC spending is between \$4 300 and \$5 100 higher in  $G_{la}$  than in  $G_{ha}$  across income groups. When the USA is excluded, these differences are reduced, but still sizeable and statistically significant

for individuals with income above the median. As shown in the bottom panel of [Table 3](#), the share of disposable income covering LTC costs is systematically larger in  $G_{la}$  than in  $G_{ha}$  across income groups, with estimated differences being statistically significant ( $p\text{-val} < 0.01$ ).

Notably, the difference between affordability groups exhibits a clear decreasing tendency with income. The LTC expenditure to income ratio is 4 (7 without the USA) percentage points higher in  $G_{la}$  than in  $G_{ha}$  for individuals with income below the median and 3 (6 without the USA) percentage points higher in  $G_{la}$  than in  $G_{ha}$  for individuals with income above the median. Among those with non-zero LTC costs, these differences are 23 (14 without the USA) and 11 (8 without the USA) percentage points, respectively. This suggests that a higher generosity of LTC social protection programs is relatively more beneficial for low-income households. Building on this finding, we investigate whether social protection systems' progressivity correlates with

		≤ Country Med Income			> Country Med Income		
		Unweighted Sample	Mean (s.e.)	H <sub>0</sub> := (p-val)	Unweighted Sample	Mean (s.e.)	H <sub>0</sub> := (p-val)
Levels: Utilizers	G <sub>ha</sub>	1 811	1 285 (85)		896	1 717 (159)	
	G <sub>la</sub>	3 225	2 317 (172)	<0.01	1 620	3 352 (264)	<0.01
	G <sub>la</sub> -USA	1 265	1 418 (89)	>0.10	732	2 955 (222)	<0.01
Levels: Utilizers with Exp>0	G <sub>ha</sub>	1 219	2 048 (127)		608	2 689 (233)	
	G <sub>la</sub>	1 122	6 420 (461)	<0.01	642	7 810 (595)	<0.01
	G <sub>la</sub> -USA	582	2 436 (159)	>0.10	355	4 035 (355)	<0.01
Exp/Inc Ratio: Utilizers	G <sub>ha</sub>	1 799	0.09 (0.006)		896	0.04 (0.003)	
	G <sub>la</sub>	3 138	0.13 (0.008)	<0.01	1 619	0.07 (0.005)	<0.05
	G <sub>la</sub> -USA	1 223	0.16 (0.011)	<0.01	731	0.10 (0.005)	<0.01
Exp/Inc Ratio: Utilizers with Exp>0	G <sub>ha</sub>	1 210	0.14 (0.009)		608	0.06 (0.005)	
	G <sub>la</sub>	1 071	0.37 (0.020)	<0.01	641	0.17 (0.011)	<0.01
	G <sub>la</sub> -USA	560	0.28 (0.021)	<0.01	354	0.14 (0.008)	<0.01

**Table 3: Nursing home and home care expenditure by affordability of social protection systems and household disposable income (moderate or severe needs only).**

G<sub>ha</sub>: high affordability group; G<sub>la</sub>: low affordability group; G<sub>la</sub>-USA: low affordability group excluding the USA. H<sub>0</sub>:= is a t-test of equality of means between G<sub>ha</sub> and G<sub>la</sub> and G<sub>ha</sub> and G<sub>la</sub>-USA. For the analysis using the expenditure to income ratio, the top 0.5% of the expenditure to income ratio distribution is excluded. All monetary amounts are in 2015 US dollars equivalent.

different spending patterns across households with different levels of income.

**Progressivity of public social protection and spending on LTC services**

We separate countries by system progressivity, captured by the difference in public cost-share for either institutional or home care at low and high levels of income (see the Methods section for details and the Tables A15 and A16 in the Supplementary Material for sensitivity analyses using different progressivity definitions). According to our definition, the countries with low progressivity (G<sub>lp</sub>) – small difference in cost-sharing between low and high levels of income – are France, Germany, Sweden, Belgium, Luxemburg, Czechia, and Slovenia; those with high progressivity (G<sub>hp</sub>) – large difference in cost-sharing between low and high levels of income – are Austria, Netherlands, Estonia, Croatia, Spain, Italy, and the USA. It should be noted that, for the most part, countries with low progressive systems are also characterised by higher affordability. Conversely, countries with highly progressive systems also exhibit relatively low affordability.

In Table 4, we assign survey respondents to two groups, depending on whether their household disposable income is below or above the median income in their country of residency. We then compare average out-of-pocket LTC expenditure (top panel) and ratio of LTC expenditure to income (bottom panel) for these two income groups in G<sub>lp</sub> and G<sub>hp</sub>. Again, we perform our analysis for all utilizers and for utilizers with strictly positive expenditures as well as with and without the USA. We repeat this exercise for individuals with non-

housing wealth below the national average, who would likely be eligible for public assistance in the presence of assets-tests, and obtain similar results (Table A13 in the supplementary material).

Since low progressive systems tend to offer higher affordability as well, average out-of-pocket LTC expenditure and share of LTC expenditure relative to income are significantly lower in G<sub>lp</sub> than in G<sub>hp</sub> for both income categories. Within G<sub>lp</sub>, the difference in out-of-pocket LTC expenditure between households with low (below median) and high (above median) income is about \$350 per year. Within G<sub>hp</sub>, this difference is about \$1 100 per year, when the USA is included, and \$1 600, when the USA is excluded. A similar pattern is observed when restricting attention to utilizers with strictly positive costs. In this case, within G<sub>lp</sub> the difference in out-of-pocket LTC expenditure between households with low (below median) and high (above median) income is about \$550 per year. Within G<sub>hp</sub>, this difference is about \$1 400 per year, when the USA is included, and \$1 650, when the USA is excluded. In the last column of Table 4, we test our second hypothesis, that is, whether the difference between income categories, which we denote by ΔInc, is the same in G<sub>lp</sub> and G<sub>hp</sub>. This double difference is significant at least at the 5% level when the USA is excluded, in line with the expectation that, in highly progressive systems, individuals with high income should pay relatively more than individuals with low income (this result, however, is somehow sensitive to how system progressivity is defined – see Tables A15 and A16 in the Supplementary Material). It tends to be not significant when the USA is included, reflecting that, even among individuals with low income, out-of-



		≤ Country Med Income			> Country Med Income			ΔInc (p-val)
		Unweighted Sample	Mean (s.e.)	H <sub>0</sub> := (p-val)	Unweighted Sample	Mean (s.e.)	H <sub>0</sub> := (p-val)	
Levels: Utilizers	G <sub>lp</sub>	1 769	1 245 (85)		867	1 596 (155)		
	G <sub>hnp</sub>	3 267	2 322 (169)	<0.01	1 649	3 396 (260)	<0.01	<0.10
	G <sub>hnp</sub> -USA	1 307	1 503 (92)	<0.10	761	3 134 (225)	<0.01	<0.01
Levels: Utilizers with Exp>0	G <sub>lp</sub>	1 192	1 978 (126)		559	2 527 (235)		
	G <sub>hnp</sub>	1 149	6 340 (448)	<0.01	691	7 773 (567)	<0.01	>0.10
	G <sub>hnp</sub> -USA	609	2 588 (163)	<0.05	404	4 230 (342)	<0.01	<0.05
Exp/Inc Ratio: Utilizers	G <sub>lp</sub>	1 753	0.09 (0.006)		867	0.04 (0.006)		
	G <sub>hnp</sub>	3 184	0.13 (0.007)	<0.01	1 648	0.07 (0.005)	<0.01	>0.10
	G <sub>hnp</sub> -USA	1 269	0.15 (0.011)	<0.01	760	0.10 (0.005)	<0.01	>0.10
Exp/Inc Ratio: Utilizers with Exp>0	G <sub>lp</sub>	1 184	0.14 (0.010)		559	0.06 (0.005)		
	G <sub>hnp</sub>	1 097	0.36 (0.019)	<0.01	690	0.16 (0.010)	<0.01	<0.01
	G <sub>hnp</sub> -USA	586	0.27 (0.020)	<0.01	403	0.13 (0.008)	<0.01	<0.10

**Table 4: Nursing home and home care expenditure by progressivity of social protection systems and household disposable income (moderate or severe needs only).**

G<sub>lp</sub>: low progressivity group (difference between the public cost share for the bottom and top 30% of the income distribution < 25pp); G<sub>hnp</sub>: high progressivity group (difference between the public cost share for the bottom and top 30% of the income distribution ≥ 25pp); G<sub>hnp</sub>-USA: high progressivity group excluding the USA. H<sub>0</sub>:= is a t-test of equality of means between G<sub>lp</sub> and G<sub>hnp</sub> and G<sub>lp</sub> and G<sub>hnp</sub>-USA. ΔInc is a difference-in-differences test of whether differences by income groups are different between G<sub>lp</sub> and G<sub>hnp</sub> and G<sub>lp</sub> and G<sub>hnp</sub>-USA. For the analysis using the expenditure to income ratio, the top 0.5% of the expenditure to income ratio distribution is excluded. All monetary amounts are in 2015 US dollars equivalent.

pocket LTC expenditures are much higher in the USA than in Europe.

The difference in LTC expenditure to income ratio for households below and above median income is 5 percentage points within G<sub>lp</sub>. It remains around that value within G<sub>hnp</sub> regardless of whether the USA is included in the sample. The picture is very different if we focus on the sub-sample of individuals reporting non-zero expenditure. In this case, the difference in LTC expenditure to income ratio for households below and above median income is 8 percentage points within G<sub>lp</sub>, but it is significantly higher within G<sub>hnp</sub>, reaching 20 percentage points with the USA and 14 without the USA. The ΔInc parameter is significant at the 1% level when the USA is included and at the 10% level when the USA is excluded.

## Discussion

Household out-of-pocket LTC spending is heterogeneous across countries and increase with individuals' needs. We find strong empirical support for our hypothesis that in countries where social protection systems are more generous and LTC more affordable, older adults report significantly lower levels of out-of-pocket LTC expenditures and exhibit lower LTC expenditure to income ratios. Within Europe, not only are out-of-pocket LTC costs lower where systems are characterized by higher affordability, but they also represent a lower share of households' disposable income compared to countries with less affordable systems. This pattern suggests that individuals with lower levels of available

resources benefit the most from more generous (and typically inclusive) public support programs for LTC services.

We find less conclusive support for the hypothesis that in more progressive systems the difference in both LTC spending and LTC expenditure to income ratio between high- and low-income older individuals should be larger. When restricting attention to European countries, we observe that high-income households spend systematically more than low-income households and this difference is significantly larger in systems with higher progressivity. This result, however, is somehow sensitive to how progressivity is defined and not confirmed when the USA is included in the analysis. The ratio of LTC expenditure to income is systematically lower among high-income than low-income households. Remarkably, this difference is significantly larger within highly progressive systems than within those characterized by low progressivity. This indicates that a higher level of affordability, which mostly coincides with low progressivity, represents the most effective protection against high LTC expenditure relative to available resources for low-income households. A plausible justification for this finding is that, in a system characterized by low affordability and high progressivity, households at the bottom of the income distribution incur costs that are large relative to their available resources. In contrast, a system with high affordability and low progressivity guarantees that LTC expenditures remain modest across the income distribution. This feature is more protective of low-income households, while implying that the LTC expenditure to

income ratio decreases as the income level increases. Empirically, we observe that countries' systems converge towards one of two models, either high affordability and low progressivity, or low affordability and high progressivity.

There are a number of limitations to our study. First, there is no unique way of defining LTC needs using self-reported difficulties with ADLs and IADLs. Instruments assessing older adults' LTC needs and establishing eligibility for public support are very diverse and highly detailed across countries.<sup>16</sup> This level of specificity cannot be replicated in survey data. While we experimented with different LTC needs definitions, we certainly did not exhaust all possibilities. Second, we classify countries based on prospective affordability and progressivity of their social protection systems, but other features could be considered (e.g., means-tested vs. universal charging arrangements). We face the trade-off between more granular system classifications and reduced sample size when the number of groups increases. Third, our data do not contain information on the “intensity” of use and “quality” of received LTC services, which may vary across countries with the kind of social protection policies in place. Also, we cannot assess the extent to which individual needs remain unmet depending on systems' generosity. Fourth, we restrict our analysis to utilizers to net out the effect of different levels of affordability on utilisation of LTC services. An important caveat is that this may introduce differential sample selectivity. The sample of utilizers in low-affordability countries could over-represent high-need individuals, even after conditioning on moderate/severe needs. This, in turn, may contribute to increase the level of out-of-pocket LTC spending in low-affordability countries relative to the level observed in countries with a more affordable system. Finally, we do not assess whether individuals in countries with less generous and inclusive systems have higher rates of poverty.

To our knowledge, this is the first international comparison of affordability of LTC services combining harmonised, individual-level data from large, representative surveys of the elderly population and information about LTC costs and public financial support directly obtained from country officials. Our analysis provides compelling empirical evidence of how public social protection system arrangements affect the burden of out-of-pocket LTC expenditure on households. Future research should focus on improving integration between government-level and survey-level data. This can be achieved by tailoring the hypothetical cases for which country officials provide prospective out-of-pocket LTC costs to the types that can be identified in survey data (in terms of individual needs and financial resources). In parallel, survey instruments could elicit additional information allowing researchers to replicate institutional classifications in survey data as closely as possible. With more accurate, comprehensive, and

integrated information, future work could explore the relationships between features of social protection systems and households' out-of-pocket LTC expenditures in more detail and with better precision and reliability. The goal is to inform policies aiming at ensuring adequate support for older adults with LTC needs at reasonable costs while limiting public spending and adhering to health and social welfare budgets.

### Contributors

Marco Angrisani (MA) and Tiago Cravo Oliveira Hashiguchi (TCOH) designed the study. José Carlos Ortega Regalado (JCOR) did the literature search. MA gathered and analysed the data. MA, JCOR, and TCOH all had access to the dataset, interpreted the empirical results, and wrote the manuscript. They were all responsible for the decision to submit the manuscript for publication.

### Data sharing statement

We obtained harmonized versions of HRS and SHARE from the Gateway to Global Aging Data, which is accessible at this link: <https://g2aging.org/>. Access to the data requires registration with HRS and SHARE. This can be done in one step through the Gateway.

### Declaration of interests

The authors have no conflict of interest to declare.

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### Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:[10.1016/j.eclinm.2022.101503](#).

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