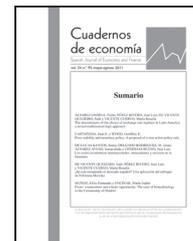




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ARTÍCULO

Socioeconomic inequity in long-term care use in Europe

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KEYWORDS:

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Abstract: We investigate the determinants of the use of long-term care services provided at home as well as the degree of horizontal inequity that may exist in the use of this type of services for a sample of dependent individuals living in Netherlands, Denmark, Sweden, Italy and Spain, using data from 2006/2007. The results suggest that there is not an equitable distribution of use of formal home care and informal care across the selected countries. Pro-poor inequity is found for formal home care in the Netherlands, Denmark and Sweden while Italy and Sweden shows a pro-rich distribution of use when analyzing nursing/personal home care exclusively. With respect to informal care no evidence of inequity was found for all the countries except Sweden. However, in the case of intensive informal care use pro-poor inequity was found in The Netherlands, Sweden and Italy.

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Resumen: Se investigan los determinantes del uso de los servicios de cuidados paliativos brindados exclusivamente en el hogar, así como el grado de inequidad horizontal que puede existir en el uso de este tipo de servicios, para una muestra de personas dependientes residentes en los Países Bajos, Dinamarca, Suecia, Italia y España, utilizando datos de 2006/2007. Los resultados sugieren que no existe una distribución equitativa del uso de este tipo de servicios para el caso que sean proporcionados en el hogar por personal profesional; y mediante medios informales, en los países seleccionados. En particular, se encuentra que existe inequidad pro-pobre en la atención brindada en el hogar por personal profesional en los Países Bajos, Dinamarca y Suecia, mientras que Italia y Suecia muestran una distribución de uso pro rica al analizar exclusivamente la atención domiciliar de enfermería y asistencia personal. Con respecto al cuidado informal, no se encontró evidencia de inequidad en todos los países, excepto Suecia. Sin embargo, en el caso del uso intensivo del cuidado informal, se encontró inequidad pro-pobre en los Países Bajos, Suecia e Italia.

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1. Introduction

Population ageing is taking place across the European continent (Crespo & Mira, 2014). In fact, the percentage of the population over 65 is expected to reach between 20 percent and 36 percent for the year 2050 (Lipszyc, Sail, & Xavier, 2012). But the ageing process is not a problem itself, the problem arises when “*longevity is not accompanied by corresponding improvement in quality of life*” (Lipszyc, Sail, & Xavier, 2012) generating dependency among elderly population. According to the European Commission (2012), in 2009 the dependency rate for individuals aged 85 and up varied between 19.6% for Denmark and 63% for Slovakia, suggesting that an important share of the population will require, in some point of their lives, support for at least some activities of the daily living.

When individuals¹ due to frailty and disability fall into a situation of dependency, the need and therefore the demand for care arises. Long-term care (LTC) refers to “*the care for chronic illness or any type of dependency instead of an acute illness*” (Norton, 2000). In other words, the different services needed by persons who are dependent on help for basic activities of the daily living² (OECD, 2005).

As one may expect, needs in the frame of LTC are mostly linked to disabilities, limitations in performing activities of daily living and specific health conditions. Several reports have found that needs are not equally distributed among socioeconomic groups, but rather concentrated among those in lower income groups (OECD & WHO, 2003). Then, if the use of LTC services is concentrated among the worst-off, one can state that there is an equitable distribution of use of LTC (Andersen, 1995). In other words, if the unequal distribution of use of LTC is due to need factors then, this difference can be catalogued as “justifiable” (Kawachi, Subramanian, & Almeida-Filho, 2002). At this point, it is important to emphasize that there are also other factors that can be characterized as “need factors” such as age and gender (World Health Organization, 2016). On the other hand, inequalities coming from any other sources, namely non-need factors, are considered avoidable or unjustifiable (Kawachi, Subramanian, & Almeida-Filho, 2002; Dahlgren & Whitehead, 1991) leading to horizontal inequity in the use of LTC services (O’Donnell, van Doorslaer, Wagstaff, & Lindelow, 2008).

Non-need factors can be the level of education, marital status, income (Verbeek-Oudijk, Woittiez, Eggink, & Putman, 2014) and occupation that might not also be equally distributed among the population leading to inequities. Regarding education, it has been found in several studies that individuals with higher education are more likely to use health care services (Devaux & de Looper, 2012). In the same sense, higher educated persons might tend to

choose qualified (professional) home care over informal care (Bonsag, 2009). Likewise, the family situation may influence the use of LTC as elderly living with adult children or partner may be more prone to receive informal care from them (Weaver, Stearns, Norton, & Spector, 2009; De Meijer, Koopmanschap, Bago d’ Uva, & van Doorslaer, 2011). Additionally, the current occupation of the individual can play a role in the use of LTC services.

Equity regarding health care has been a major issue for most European countries over years (Stronks, Ravelli, & Reijneveld, 2010). In this context, the goal of “*equal treatment for equal needs*”, which is the concept of horizontal equity in health (Culyer & Wagstaff, 1993), takes place. This means that all individuals facing equal needs should be able to use the type of care they require, regardless their socioeconomic condition or any other additional non-need factors. Under this frame, assessing how access to LTC services is distributed among socioeconomic groups in Europe represents an opportunity for policy actions towards equity especially if it is likely that the better-off experiences fewer barriers to access to this type of services (Hurley & Grignon, 2006).

Despite the relevance of care for the dependent population, few studies are available regarding inequity in LTC use across income groups, contrary to what occurs with respect to inequity in health care use (Van Doorslaer, Koolman, & Jones, 2004; Devaux & de Looper, 2012). García-Gómez et al. (2015); with data from 2008, found that, after controlling for need variables, there is not an equitable distribution of use of LTC services in Spain. They also found that formal home services are concentrated among the better off, while informal care was concentrated among the poor. Other study by Sarasai & Billingsley (2008) found that the worst-off were less likely to use home care in Spain, Italy and Greece, but they found no evidence of inequity in Denmark, Sweden, Austria and Germany. Other study, using data from 2006, found that there is not an equitable distribution of LTC use across some European countries (Rodrigues, Ilinca, & Schmidt, 2014).

In addition, it is known that there are differences across European countries regarding the organization of LTC systems. On the one hand, the northern countries that have extremely generous and universal long term care systems and, on the other hand, the southern countries that only cover basic needs of those considered at a risk situation (Economic Policy Committee, 2009). For example, while the average expending in LTC for the EU-27 in 2010 accounts for 1.8% of GDP, the Netherlands, Sweden and Denmark spent around 4% of their GDP (Lipszyc, Sail, & Xavier, 2012; Mot, Faber, Geerts, & Willemé, 2012). Likewise, northern countries offer a wide range of LTC services such as nursing homes, day care centers, home help and home nursing care under a universal coverage system, while in the southern countries like Italy and Spain these services are mostly financed by out-of-pocket payments.

Based on these distinctions, it becomes important to assess whether there are differences regarding equity in access to LTC services between countries that have universal systems vs. those that don’t, especially if the share of population in potential need is expected to rise due to the ageing process in Europe. In this regard, the main

¹ Long term care is not only for elderly but for any that require support in daily activities. In this paper we focus on middle-age and elderly population.

² The definition given by the OECD states “*long-term care brings together a range of services for people who are dependent on help with basic activities of daily living (ADL) over an extended period of time. Such activities include bathing, dressing, eating, getting in and out of bed or chair, moving around and using the bathroom. These long-term care needs are due to long-standing chronic conditions causing physical or mental disability*”, (OECD, 2005).

objective of this research is to investigate whether there is evidence of horizontal inequity in the use of LTC services provided at home, using outcomes representing informal and formal home care, for middle-aged and elderly (50+) individuals living in two groups of countries; first, the northern composed by The Netherlands, Denmark and Sweden and the southern by Italy and Spain³. In addition, we seek to identify the determinants of the use of the above mentioned LTC services.

In the next section, the institutional background of every country is described as well as the concept behind long-term care. Section 3 describes the data and methods used. In section 4, the results on the determinants of informal and formal home care use are presented as well as horizontal inequity in the use of LTC services. Finally, the last section discusses the policy implications, limitations, opportunities of future research and conclusions regarding the present study.

2. Theoretical framework and Institutional background

2.1 Types of Long-term care services

LTC services consist of help and support with activities of daily living such as dressing, eating, bathing, getting in and out of bed and making use of the toilet. These personal care components can also be provided together with medical services such as drug administration, rehabilitation and others related. Moreover, LTC services also include assistance with lower-level help activities, known as “Instrumental activities of daily living (IADL), such as shopping and managing money (Lipszyc, Sail, & Xavier, 2012; Colombo, LLena-Nozal, Mercier, & Tjadens, 2011).

LTC services can be provided in different settings including formal care, informal care or a combination of both. Formal care refers to paid help given by a professional that can be provided both at institution and at home. Examples of formal care provided in institutions are nursing homes, residential centers and day care centers. Formal care provided at home refers to professionals being paid under some kind of employment contract (Norton, 2000). Depending on the country these services can be public, private funded or a combination.

Informal care can be defined as “a nonmarket composite commodity consisting of heterogeneous parts produced (paid or unpaid) by one or more members of the social environment of the care recipient as a result of the care demands of the care recipient” (Van den Berg, Brouwer, & Koopmanschap, 2004) where the social environment members are usually spouses or older daughters providing care to their dependent elderly parents (Attias-Donfut, Ogg, &

³ We have chosen these specific countries according to the availability of data. For the northern, for SHARE wave 2, there was only information about Denmark, Netherlands, and Sweden and for the southern, we only chose Spain and Italy, because there was no information for Portugal, as it joined SHARE on 2010. For Greece there was missing all the information regarding formal home care use in wave 2 version 5.0.0.

Wolff, 2005; Crespo & Mira, 2014) but may also other relatives or friends living inside or outside the household.

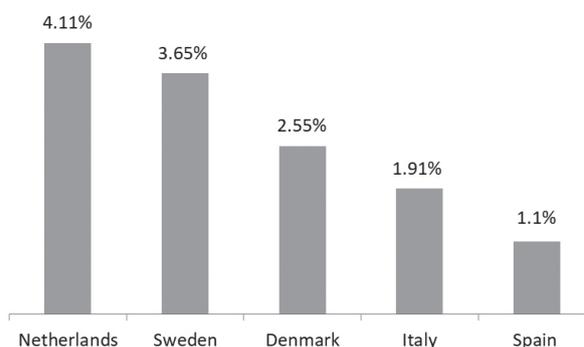
Formal care and informal care can co-exist depending on the severity of the disability (Bolin, Lindgren, & Lundborg, 2008). However, informal and formal home cares often start at a lower level of limitations and/or disabilities than institutional care (De Meijer, Koopmanschap, Koolman, & van Doorslaer, 2009).

2.2 Overview of the characteristics of LTC systems for the selected countries

LTC organization varies across European countries, some providing universal coverage and a wide number of services making LTC services more affordable, compared to systems with lower levels of benefits that might lead to barriers of access giving place to inequities (Rodrigues, Ilinca, & Schmidt, 2014).

Thus, across the selected countries there are sizeable differences on public long-term care⁴ expenditures (Graph I). In terms of percentage of GDP, in 2012, The Netherlands, Sweden and Denmark report the highest levels of expenditure while Italy and Spain spend a lower share of GDP on LTC (Lipszyc, Sail, & Xavier, 2012; Eurostat, 2016).

Graph I. Public LTC expenditure, as % of GDP, 2012



Source: Eurostat (latest available year)

Note: For Italy the latest year available is 2010.

The Netherlands operate under public social insurance with a high level of public over private spending (Marcinkowska & Sowa, 2011). Institutional formal care has a high share of consumption and the prevalent social norm is that the state is responsible for the elderly (Mot E., 2010). Even though there is public insurance there are income-related copayments for practically all LTC services available and an eligibility criterion applies. The available LTC services are: formal care at institutions, such as nursing homes (for the most severe cases) and homes for the elderly (less health problems); formal care at home in the way of assistance, domestic help, personal care, nursing care and treatment; and informal care that is, somehow, supported through cash benefits given to the elderly that, in some cases, is destined to compensate informal care givers. The current policy is to stimulate the use of formal home care over institutional care to reduce costs.

⁴ Including both institutional and home care.

LTC system in Denmark is mainly based on home formal care rather than institutional care with relatively less individuals in LTC institutions, compared with other northern European countries (Schulz, 2010). As in the Netherlands, the responsibility of the elderly lays on the state. All forms of LTC provided at home are free of charge and there are no minimum requirements for being beneficiary for individuals in need. The system is universal in coverage financed mostly by taxes. Among the available LTC services, there are institutional formal care provided through nursing homes and day care centers; formal home care in the way of home help (personal care, domestic tasks, etc) and home nursing (medical treatments); informal care is not very common and, actually, family's contribution to LTC has been considered negligible (Leeson, 2004).

The LTC system of the last northern country of the present analysis, Sweden, is also a state-responsibility model being institutional formal care the principal piece. The system is universal for all residents under need with fixed fees that are regulated by the government. However, if the income doesn't exceed a specific threshold then, the entire LTC services are free of charge for the beneficiary (Fukushima, Adami, & Palme, 2010). Formal LTC services offered are divided into institutional and home care. The first is targeted for individuals who are residents in centers for care for the elderly while the latter includes both home care (personal care) and home nursing care (medical care not requiring a physician). Informal care, like in Denmark and the Netherlands, is not very common but there are some ways to support informal care-givers including financial compensation, support centers, education and support groups (Jegermalm, 2004). The main aim of the government is to gradually move towards informal care and home

formal care as a tool of cost containment (Fukushima, Adami, & Palme, 2010).

Turning to the southern countries, Italy has a combination of both public and privately financed LTC system (Tediosi & Gabriele, 2010) where the latter is the most predominant source of financing. The structure is very fragmented and disintegrated, being informal care the backbone of the system (Kraus, et al., 2010). The formal LTC services available are home health care, home personal care and residential care. Some of these services provided are free of charge while others such as social care have mean-tested copayments that, in some cases, represent the full cost of the service. In addition, Italy has a universal cash benefit for all disabled people, independent of their economic situation. This is an unconditional cash transfer, meaning that there is no obligation of using the money in buying goods or services directly related to the care of the disabled (Tediosi & Gabriele, 2010).

Finally, Spain has universal means-tested benefit packages for elderly people in need of help for carrying out basic activities of daily living. The benefit package is provided according to degrees of dependency which are established by law (Guterrez, Jiménez-Martín, Vegas, & Vilaplana, 2010). Like in Italy, care for the elderly is perceived as a responsibility of the family (Guterrez, Jiménez-Martín, Vegas, & Vilaplana, 2010) leading to a mostly informal care-based system. Formal care services include both at home and institutional. Regarding institutional, there are residential care centers, day centers covering rehabilitation, promotion of autonomy, personal care, etc. At home, services include housework, domestic activities and personal care in ADL. There are also financial incentives but these only apply to the cases when the competent authority is not able to provide the care needed.

Table I. Summary of long-term care systems

Country	Type of system	Formal care services	Funding	Predominant
The Netherlands	Universal insurance	Nursing homes Homes for the elderly Day care centers Home care Home nursing care	Social security premiums Income-based co-payments Taxes	Institutional formal care
Denmark	Universal	Nursing homes Day care centers Home help Home nursing care	Mainly taxes Co-payments in institutional care	Formal home care
Sweden	Universal	Nursing homes Home care Home nursing care Support centers Support groups	Mainly taxes Co-payments in all types of formal care	Institutional formal care
Italy	Means-tested Universal unconditional cash transfer for disabled	Nursing homes Day care centers Home care Home nursing care	Privately paid is predominant Taxes	Informal care
Spain	Universal Cash transfer under specific circumstances	Nursing homes Day care centers Home care Home nursing care	Taxes Co-payments Privately paid	Informal care

Source: (Fukushima, Adami, & Palme, 2010; Guterrez, Jiménez-Martín, Vegas, & Vilaplana, 2010; Mot E. , 2010; Schulz, 2010; Tediosi & Gabriele, 2010; Rodrigues, Ilinca, & Schmidt, 2014)

All the characteristics mentioned above are summarized in Table I.

3. Data and methods

3.1 Data

We use data from wave 2⁵ version 5.0.0 (May 2016 release) of the Survey of Health Ageing and retirement in Europe (SHARE) conducted during 2006/2007 across several European countries, for the non-institutionalized middle-age and elderly population (50+), to measure horizontal inequity in LTC utilization. SHARE is “a multidisciplinary and cross-national panel database of micro data on health, socio-economic status and social and family networks of approximately 123,000 individuals from 20 European countries (+Israel) aged 50 or older” (Börsch-Supan, 2013).

For LTC services, the relevant population is the dependent individuals because those who are independent have zero probability of using LTC services (García-Gómez et al., 2015; European Commission, 2015), contrary to what occurs in other types of health care services. In this sense, a subsample of the dependent population living within a household in Denmark, Sweden, The Netherlands (northern group), Italy and Spain (southern countries) is used for the analysis.

In the present analysis, an individual is considered dependent if he/she has reported having had any type of difficulty (mild, moderate or severe), with one or more physical or mental function due to a health problem. To obtain the dependent subsample, a dummy variable was constructed, taking the value of one when the individual reports having any type of difficulty with him/her physical function regarding mobility issues such as walking, carrying weights,

⁵ We decided to choose wave 2 (and not a more updated wave) because the interest is to assess inequality in the use of services provided at home, taken into account the whole LTC system (both formal and informal care). In this sense, information regarding formal home care is available only until wave 2.

etc; difficulties in performing activities of daily living (ADL) and instrumental activities of daily living (IADL) and zero otherwise. Table II shows in detail the construction of the variable.

The size of the total sample per country and the subsample of the dependent individuals obtained from SHARE are shown in table III.

Table III. Sample per country Wave 2

Country	Dependent		Non dependent		Total
	No.	%	No.	%	
The Netherlands	1480	57.36%	1100	42.64%	2580
Denmark	1237	49.20%	1277	50.80%	2514
Sweden	1527	58.15%	1099	41.85%	2626
Italy	1829	63.03%	1073	36.97%	2902
Spain	1266	58.91%	883	41.09%	2149

Unweighted results.

From table III we can see that southern European countries have a highest share of dependent population compared to the northern. Thus, in Italy the 63.03% of the sample is considered as dependent while in Denmark the proportion is 49.20%. This pattern may reflect the different structures of LTC systems and the target population of SHARE, which considers only individuals living in a household and not in institutions (nursing homes). In this sense, for example, as Italy is a country based on informal care one may expect a higher share of dependent individuals living in households compare to northern countries that are mostly based on institutional care.

3.2 Methods

To measure the level of horizontal inequity (HI), this analysis uses as a first step the Concentration Index (CI) (Kakwani, 1977) which is a widely used indicator to measure

Table II. Composition of the “dependent individuals” sample

Question	Description
1. Limited activity	“For the past six months at least, to what extent have you been limited because of a health problem in activities people usually do? 1. Severely limited; 2. Limited, but not severely; 3. Not limited.”
2. Difficulties with physical function (mobility)	“Because of a health problem, do you have difficulty doing any of these activities: walking 100 mts; sitting for about two hours; getting up from a chair after sitting for long periods; climbing several flights of stairs without resting; climbing one flight of stairs without resting; reaching or extending your arms above shoulder level; pulling or pushing large objects; lifting or carrying weights over 10 pounds/5 kilo, like a heavy bag of groceries; picking up a small coin from the table.? Exclude any difficulties that you expect to last less than three months.”
3. Difficulties with daily activities because of mental or health problem	“Because of a health or memory problem, do you have difficulty doing any of these activities: bathing or showering; eating such as cutting up your food; getting in or out of bed; using the toilet including getting up or down; using a map to figure out how to get around a strange place; preparing a hot meal; shopping for groceries; making telephone calls; taking medications; doing work around the house or garden; managing money such as paying bills and keeping track of expenses? Again exclude any difficulties you expect to last less than three months.”

Source: SHARE generic wave 2 main questionnaire.

both inequalities and inequities (Wagstaff & van Doorslaer, 2000) in health related outcomes (Wagstaff, Paci, & van Doorslaer, 1989). One of the advantages of CI is that it can be used to compare the magnitude of inequality across countries, time periods and any other unit of comparison (O'Donnell, van Doorslaer, Wagstaff, & Lindelow, 2008).

The CI is derived from the concentration curve and is defined as “twice the area between the concentration curve and the line of equality (the 45-degree line)”. A convenient way to express the CI is as the result of the covariance between LTC use (y_i), and the individuals ranked by income (R_i) divided by the average of LTC use (μ), as formula (1) shows (O'Donnell, van Doorslaer, Wagstaff, & Lindelow, 2008).

$$CI = \frac{2}{\mu} cov(y_i, R_i) \quad (1)$$

The CI ranges between -1 and 1; where negative values indicate that the outcome is concentrated among the poor and values greater than zero indicate that LTC use is concentrated among the better-off. However, in the case where the outcome variable is bounded with an upper and lower limit (i.e. a dummy variable), it has been demonstrated that the conventional CI may depend on the mean of the variable making comparisons of groups with different means problematic (Wagstaff, 2005). For these types of bounded variables a corrected version of the CI (CCI) is more appropriated as the one proposed by (Erreygers, 2009). For variables bounded between 0 and 1, the CCI can be rewritten as (Van de Poel, Van Doorslaer, & O'Donnell, 2012):

$$CCI = 4 * \mu * CI(y) \quad (2)$$

Assuming that the outcome health-variable is a linear function of some determinants, need (x_k) and non-need (z_p) variables, then, its CI can be written as the contribution of each of the need and non-need variables as follows (Wagstaff, van Doorslaer, & Watanabe, 2003):

$$y_i = \alpha + \sum_k \gamma x_k + \sum_p \delta z_p + \varepsilon_i \quad (3)$$

$$CI = \sum_k \gamma \bar{x}_k CI_x + \sum_p \delta \bar{z}_p CI_z + GC_\varepsilon \quad (4)$$

Equation (4) shows that the CI can be decomposed into the contribution of each of the explanatory variables, where the contribution is computed as the “product of the health variable's elasticity with respect to the determinant and the latter's concentration index” (O'Donnell, van Doorslaer, Wagstaff, & Lindelow, 2008; Wagstaff, van Doorslaer, & Watanabe, 2003).

The same approach can be applied to the CCI (Van de Poel, Van Doorslaer, & O'Donnell, 2012), resulting in:

$$CCI = 4 * \left[\sum_k \frac{\gamma \bar{x}_k}{\mu} CI_x + \sum_p \frac{\delta \bar{z}_p}{\mu} CI_z + \frac{GC_\varepsilon}{\mu} \right] \quad (5)$$

Where μ is the mean of the outcome variable (use of LTC services), \bar{x}_k is the mean of the need variables and \bar{z}_p the mean of the non-need. CI_x , CI_z are the CI of these variables. GC_ε is the generalized CI for the error term

representing unexplained socioeconomic inequality due to unobservable factors.

Thus, the level of horizontal inequity (HI) is obtained by subtracting the contribution of need variables to the CI, attributing inequity to the remaining inequality after adjusting for need variables (Kakwani, Wagstaff, & van Doorslaer, 1997). The same procedure can be applied to the CCI resulting in the corrected horizontal inequity index (CHI):

$$HI = CI - \sum_k \frac{\gamma \bar{x}_k}{\mu} CI_x \quad (6)$$

$$CHI = CCI - 4 * \sum_k \frac{\gamma \bar{x}_k}{\mu} CI_x \quad (7)$$

Positive values of the CHI indicate that there is pro-rich inequity in the use of LTC services once standardized by needs. If CHI equals to zero there is no inequity and a negative value of CHI indicates a pro-poor inequity (concentrated among the worst-off) in the use of LTC (Van Doorslaer, Koolman, & Jones, 2004).

To estimate the determinants of long term care use (formal home and informal care) a linear probability model⁶ is regressed on the need and non-need factors, that are also used to compute the CCI and CHI. The estimation is performed for every type of service, for every country using robust standard errors and sampling weights already provided by SHARE. The statistical software employed is STATA 13.0.

3.3 Definition of variables

3.3.1 Outcomes of interest

The outcomes of interest in the present analysis are: formal home care and informal care use for the individuals living within a household of the selected countries.

Regarding formal home care, three questions were used from wave 2. In these questions, individuals were asked whether they have received in their own home, during the past twelve months, any kind of care such as professional or paid nursing or personal care; professional or paid home help for domestic tasks; and meals-on-wheels. With this information, a dummy variable was constructed taking the value of one if the individual had received any of the above mentioned services and zero otherwise. In addition, we measure inequity in nursing/personal home formal care⁷ using an indicator that reflects whether the individual has received this type of care in the last twelve months.

For informal care, we use two different measures. First, a dummy variable was constructed taking the value of one if the individual reports to have received help from others

⁶ We use a linear probability model instead a non-linear (logit or probit) because Concentration Index for standardized utilization of health services are relatively insensitive to the use of MCO or non-linear models for standardization (O'Donnell, O., van Doorslaer, E., Wagstaff, A., & Lindelow, M. 2008).

⁷ Nursing home care has been defined as a type of care that required medium or high skills among caregivers (Bonsag, 2009) and usually needed by individuals with higher levels of dependency than those that need help for domestic tasks.

living outside or inside the household in activities regarding personal help (i.e. dressing, bathing, eating, getting in/out of bed, etc), practical household work (i.e. gardening, shopping, etc) and help with paperwork such as filling out forms, in the last twelve months. Second, as the intensity of informal care received may differ across countries, with the southern countries providing more hours of help in ADL compared to northern countries (Colombo, LLena-Nozal, Mercier, & Tjadens, 2011), then, assessing equity in the use of intensive informal care becomes important especially if we expect a pro-poor distribution in the use of intensive informal care. For this purpose, we follow García et al. (2015) constructing a dummy variable that takes the value of one when the individual receives more than four hours per day (on average) of informal care and zero otherwise⁸.

3.3.2 Need variables

For the need variables, following other studies in the literature (Bago d'Uva, Jones, & Van Doorslaer, 2009; Van de Poel, Van Doorslaer, & O'Donnell, 2012; García-Gómez, Hernández-Quevedo, & Jiménez-Rubio, 2015), age, gender and several measures of health status are included in the analysis (Andersen, 1995).

Regarding the health-status variables, three dummies were constructed to control for dependency; whether the individual has any difficulty in performing activities of daily living; difficulties with physical function and any limitation in instrumental activities of daily living. In addition, a group of dummy variables were included to control for the presence of specific conditions diagnosed by a physician such as cardiovascular, endocrine, respiratory, osteoarticular, digestive, nervous system illnesses, cancer, mental and visual disorders. A measure of self-assessed health (SAH) is included using a dummy variable that takes the value of

⁸ Due to lack of data in the survey, intensive informal care can only be measure for the cases when the caregiver lives outside the household of the recipient.

one when reporting less than very good health and zero when reporting very good or excellent health.

For age, four categories were constructed (50-59, 60-69, 70-79, 80+) and gender, is a dummy taking the value of one for female and zero for males.

3.3.3 Non-need variables

The socioeconomic measure used is the yearly total gross household income⁹ in Euros adjusted by household size using the squared root scale. In order to allow comparison across countries the income measure is adjusted for purchasing power parity of the corresponding year.

Additionally, marital status (married/register partner, divorced/separated, widowed, and single), educational level (no education, primary, upper secondary and tertiary education) and occupation (retired, employed, unemployed, permanently sick and other) are included as non-need variables.

Finally, to control for geographic differences, due to lack of data, it was not possible to control for region of residence. However, a broader variable was constructed resulting in three categories: big city, large/small town and rural area.

Table IV offers a description of the variables used in the analysis.

4. Results

4.1 Descriptive statistics

Table V shows the mean of the variables included in the analysis.

⁹ This variable is obtained by aggregating at the household level all individual income components (Börsch-Supan, 2013).

Table IV. Variables used in the empirical analysis

Variable	Description
Outcome of interest	
Formal home care	Takes the value of 1 if the individual reports to have received home professional/paid help during the last 12 months and 0 otherwise.
Formal home care type 1	Takes the value of 1 if the individual reports to have received nursing/personal professional/paid help during the last 12 months and 0 otherwise.
Informal care	Takes the value of 1 if the individual reports to have received help from inside or outside the household during the last 12 months and 0 otherwise.
Intensive informal care	Takes the value of 1 if the individual reports to have received more than 4 hours/day of informal care and 0 otherwise.
Need variables	
Age	50-59 years old (reference category)
	60-69 years old
	70-79 years old
	80+ years old
Female	Takes the value of 1 for females and 0 for males

Difficulties with physical function	Takes the value of 1 if the individual reports to have any difficulties with physical function.
Limitations in IADL	Takes the value of 1 if the individual reports to have any difficulties with instrumental activities of daily living such as shopping, managing money, etc and 0 otherwise.
Limitations in ADL	Takes the value of 1 if the individual reports to have any difficulties with activities of daily living such as bathing, dressing, eating, etc and 0 otherwise.
Cardiovascular system illness	Takes the value of 1 if diagnosed heart attack, high blood pressure, high blood cholesterol, stroke and 0 otherwise.
Endocrine system illness	Takes the value of 1 if diagnosed diabetes or high blood sugar and 0 otherwise.
Respiratory system illness	Takes the value of 1 if diagnosed chronic lung disease, asthma and 0 otherwise.
Osteoarticular problems	Takes the value of 1 if diagnosed arthritis, osteoporosis, hip fracture, other fractures and 0 otherwise.
Cancer	Takes the value of 1 if diagnosed any type of cancer and 0 otherwise.
Digestive system illness	Takes the value of 1 if diagnosed ulcer and 0 otherwise.
Nervous system illness	Takes the value of 1 if diagnosed Parkinson disease and 0 otherwise.
Visual illness	Takes the value of 1 if diagnosed cataracts and 0 otherwise.
Mental illness	Takes the value of 1 if diagnosed Alzheimer, dementia, senility or any other serious memory impairment and 0 otherwise.
Less than very good SAH vs. Very good/excellent	Takes the value of 1 when reporting less than very good self-assessed health and 0 when very good or excellent.
Non-need variables	
Equivalent income	PPP adjusted total gross household income in Euros adjusted by household size using the squared root scale.
Marital status	Married/Reg partner (reference category)
	Divorced/Separated
	Widowed
	Single
Level of education	No education (reference category)
	Primary and lower sec education
	Upper secondary educ.
	Tertiary education
Area of residence	Big city and surroundings (reference category)
	Large/small town
	Rural area
Occupation	Retired (reference category)
	Employed or self-employed
	Unemployed
	Permanently sick or disable
	Other(Homemaker,etc)

Source: SHARE generic wave 2 main questionnaire.

From table V, we can see that the share of the dependent population receiving formal care, as one may expect, is largest for Denmark (20%)¹⁰ than any other country. Regarding informal care, we can see that the share of population receiving this type of care is larger than the share receiving formal care for all the countries, ranging from 27% (Italy

and Spain) to 33% (Denmark). At first sight, these results might seem contradictory to the structure of LTC systems in the selected countries. However, we need to keep in mind that the mean of informal care is considering both intensive and non-intensive informal care. In fact, if we consider only intensive informal care the share of individuals receiving intensive informal care is larger for Italy than Denmark where the proportion barely reaches a 0.1%. Additionally, we need to consider the type of care provided by informal

¹⁰ However, community health centers are not included and, in the case of Denmark, the services provided by these centers are the base of the system.

Table V. Mean of the variables

Variable	Netherlands	Denmark	Sweden	Italy	Spain
Outcomes of interest					
Formal home care	0.18	0.200	0.116	0.082	0.107
Formal home care type 1	0.053	0.093	0.042	0.031	0.059
Informal care	0.311	0.330	0.309	0.272	0.275
Intensive informal care	0.014	0.0069	0.014	0.1147	0.0872
Need variables					
50-59 years old	0.379	0.299	0.268	0.245	0.223
60-69 years old	0.275	0.289	0.287	0.295	0.269
70-79 years old	0.215	0.237	0.237	0.293	0.325
80+ years old	0.129	0.175	0.208	0.165	0.181
Female	0.579	0.597	0.609	0.624	0.642
Male	0.421	0.403	0.391	0.376	0.358
Difficulties with physical function	0.976	0.986	0.990	0.985	0.99
Limitations in IADL	0.267	0.289	0.253	0.301	0.335
Limitations in ADL	0.122	0.182	0.166	0.176	0.202
Cardiovascular system illness	0.458	0.538	0.552	0.608	0.561
Endocrine system illness	0.119	0.100	0.116	0.153	0.197
Respiratory system illness	0.14	0.175	0.146	0.156	0.133
Osteoarticular problems	0.293	0.518	0.302	0.534	0.499
Cancer	0.053	0.093	0.074	0.042	0.028
Digestive system illness	0.027	0.080	0.042	0.074	0.05
Nervous system illness	0.01	0.017	0.004	0.014	0.009
Visual illness	0.08	0.156	0.167	0.094	0.106
Mental illness	0.019	0.017	0.031	0.019	0.033
Less than very good SAH vs Very good/ excellent	0.85	0.745	0.793	0.926	0.963
Non-need variables					
Equivalent income	28348.65	19089.21	18899.05	13938.39	13112.07
Married/Reg partner	0.605	0.556	0.551	0.64	0.608
Divorced/Separated	0.122	0.151	0.170	0.049	0.052
Widowed	0.197	0.219	0.207	0.252	0.246
Single	0.074	0.074	0.072	0.057	0.092
No education	0.004	0.001	0.002	0.05	0.241
Primary and lower sec education	0.554	0.326	0.581	0.725	0.65
Upper secondary educ	0.226	0.395	0.267	0.186	0.034
Tertiary education	0.214	0.279	0.150	0.037	0.073
Big city and surroundings	0.445	0.276	0.318	0.135	0.314
Large/small town	0.377	0.485	0.532	0.402	0.595
Rural area	0.176	0.239	0.150	0.461	0.09
Retired	0.366	0.572	0.677	0.547	0.43
Employed or self-employed	0.265	0.239	0.264	0.135	0.099
Unemployed	0.011	0.039	0.019	0.009	0.01
Permanently sick or disable	0.121	0.135	0.031	0.042	0.101
Other(Homemaker,etc)	0.234	0.015	0.008	0.264	0.357

Weighted results using the dependent subsample.

caregivers that in southern countries tends to be on ADL and in northern more related to IADL (World Health Organization Europe, 2008).

With respect to the need variables, there is a higher share of women in the sample and most of the individuals are between 50 and 69 years old for all countries, with Denmark and Sweden having the highest proportion of the oldest old (80+) across the five countries. A non surprising result is the one regarding self-reported health status, where we see that a high share of the dependent sample reports less than very good health. A particular large proportion is seen in Italy (92.6%) and Spain (96.3%) countries whose systems are mainly based on informal care. The most prevalent illnesses are those related to the cardiovascular system (45%-69%) and osteoarticular problems (30%-53%) for all the countries in the sample. Around 30% (for all countries) of the individuals report to have at least one limitation in instrumental activities of daily living, and a proportion between 12%, in the case of the Netherlands, and 20% for Spain declare to have at least one limitation in performing activities of daily living. For all the countries, a great majority of the sample (more than 97%) reports to have some type of limitation with physical functions such as walking, sitting, getting up, etc.

Turning to the non-need variables, the most prevalent marital status is married or living with a registered partner, with a proportion ranging between 55% in Denmark and Sweden and 64% for Italy. Due to the age of the sample, most of them report to be retired having the highest shares Sweden (67%) and Denmark (57.2%) and the lowest The Netherlands (36.6%). Regarding the educational level, all countries have the highest proportion of individuals with primary and lower secondary education except Denmark where upper secondary education is the most prevalent among the sample (39.5%). Finally, with respect to the area of residence for Denmark, Italy, Sweden and Spain the greatest proportion of individuals live in large/small towns while in the Netherlands in big cities (44.5%).

Overall, the characteristics of the dependent population are quite similar across countries. As seen, for all countries most of the population is female and have similar share of individuals reporting difficulties with mobility, IALD and ADL. In addition, cardiovascular and osteoarticular are the most prevalent conditions and, in all countries, most of the population is married/living with a partner. Only slight differences exist in education levels and age distribution.

4.2 Determinants of long term care use

4.2.1 Formal home care

Tables AI and AII in the appendix show the estimate results for the probability of formal home care use and nursing/personal home care in each of the countries respectively. Both the coefficients and statistical significance are shown for all the variables included.

With respect to the need variables, most of them have the expected sign for all countries. In the Netherlands, individuals having any difficulties with mobility, ADL, IADL, cancer or cardiovascular-related illness show a higher probability of using formal home care compared to those not report-

ing these types of conditions. In the same way, women and older individuals have a higher probability of using home care help. These results are in line with other studies that found that females, dependent and older individuals (80+) have a higher probability of using formal home care (De Meijer, Koopmanschap, Koolman, & van Doorslaer, 2009). The same pattern is seen in the other countries, where older individuals (80+) and those having limitations in ADL (not in Sweden) and IADL have a higher probability of using formal home care. Regarding specific health conditions, endocrine, respiratory, cancer and osteoarticular related illnesses are associated with the use of formal care in Sweden. In Italy and Spain additional to the IADL and ADL indicators, cardiovascular, respiratory and nervous system illness are associated with a higher probability of the use of home care help (Italy), and only endocrine-related disorders for Spain. Contrary to The Netherlands, in the rest of countries being female is not statistically significant associated with a higher use of formal home care services. With respect to the probability of using nursing/personal home help, the results are very similar to the general formal care variable; the main difference yields on the older group category that becomes not significant for Denmark and Italy; more variables referring to specific illnesses show a significant association for all countries.

Turning to the non-need variables, equivalent income is not associated with a higher/lower use of formal home care in any of the countries¹¹. This is a non surprising result for the Netherlands, Denmark and Sweden with universal systems regarding the provision of long term care services. For example, Bakx, P. (2010) also found a no statistically significant association between income and the use of formal home care in The Netherlands. However, in the case of Italy and Spain may be due to the lack of supply or availability of professional home care. A similar result is found by Marcinkowska, I., & Sowa, A. (2011) for Spain and Italy, who found no association between income and the use of formal home care, in the same line, García-Gómez, P et al. (2015) found that income was not statistically significant associated with the probability of using formal home care.

In the case of nursing/personal home care use, no significant association was found between the probability of use and income, except in the case of Sweden, where a positive relation was found. Regarding marital status, in the Netherlands, Denmark and Sweden being divorced, widowed or single is associated with a higher probability of using formal home care compared to those who are married. In Italy and Spain only being single is associated with a higher probability of using this type of care. Similar results apply for the more specific measure of formal home care.

With respect to the level of education, there is not a significant association between this socioeconomic measure and the use of home care in none of the countries except in Denmark, where having any type of education is associated with a lower probability of using home care compared to those with no education. This might be related to the fact that higher educated people may be more prone to chose

¹¹ The results are very similar if using income in logarithms $\ln(\text{income})$, as a linear function or in quartiles instead of a quadratic income function.

institutions rather than home care (Leeson, 2004). For the probability of using nursing/personal home help, no significant relation was found with the level of education in any of the countries.

Additionally, living outside the big cities is found to have a negative association with the use of formal home care in Denmark, Sweden, Italy and Spain, countries that coincidentally have LTC systems where the regional governments determine the available services, suggesting regional differences in the supply (Rodrigues, Ilinca, & Schmidt, 2014). The exception is the Netherlands (country-wide LTC insurance) where, as seen in other studies (Bakx, 2010), no significant association was found between the probability of use and the area of residence. With respect to the probability of using nursing/personal home care, similar results are found for all the countries.

4.2.2 Informal care

Table AIII and AIV in the appendix, show both the coefficients and significance of the linear probability model estimated for the use of informal and intensive informal care among the dependent population in the five countries. From table AIII (informal care use), we see that the significance, magnitude and sign of the variables are similar to those found for formal home care use. It is so that having limitations in IADL and ADL are associated with a higher probability of using informal care as well as suffering health cancer (Netherlands, Italy and Spain), endocrine (Italy and Spain) visual (Denmark and Sweden) and mental illness (Spain). For the oldest group (80+), there is a higher probability of using informal care in the Netherlands, Italy and Spain compared to the youngest (50-59 years old). However, being in the oldest group becomes insignificant in Sweden and Denmark, this might be because ageing is associated with higher levels of dependency and therefore increasing the probability of using institutional care instead of informal care (European Commission, 2015).

In the case of income, there is a statistically significant association only in the case of the Netherlands showing a non-linear relation between income and the use of informal care. The family situation, in our sample the marital status, shows to be a significant determinant of use in the five countries. For example, in the Netherlands and Denmark those individuals who are divorced, widowed and single are more likely to receive informal care compared to those married. It is worth noting that informal care use can be provided from persons living inside or outside the household including any type of relationship, and not only family/relatives, suggesting that help may be mainly coming from individuals from outside the household to those not having a partner. Regarding education, this variable does not show a significant association with the use of informal care, except in Italy where individuals with higher levels of education are less likely to receive informal care compared to those with no education. The area of residence only shows a significant association in Sweden, where living in towns and rural area increases the probability of receiving informal care in comparison to individuals living in big cities.

With respect to intensive informal care use, the magnitudes and direction of the associations are very similar. A remarkable difference is the variable income for Italy, that now

becomes significant and negative indicating that higher levels of income is associated with a lower probability of intensive use of informal care. In the same way, all age categories become significant only for Denmark where being in the older groups increases the probability of using intensive informal care compared to those between 50-59 years-old, and the association between intensive use and the indicators of dependency is no longer significant (only Denmark).

4.3 Inequity in long-term care use

Table VI presents the corrected concentration index (CCI) for inequality and the corrected inequity index (CHI) for the use of formal home across the selected countries.

Table VI. CCI and CHI for formal home care use.^a

	Formal home care		
	CCI	CHI	Obs
Netherlands	-0.1056*** (0.0301)	-0.0580** (0.0252)	1360
Denmark	-0.2411*** (0.0296)	-0.0857** (0.0342)	1156
Sweden	-0.1212*** (0.0384)	-0.0438* (0.0271)	1357
Italy	0.0245 (0.0203)	0.0240 (0.0173)	1745
Spain	-0.0669** (0.0316)	-0.0322 (0.0286)	1184

^a Bootstrapped standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

For the probability of using formal home care, the majority of CCI are negative indicating pro-poor inequality that is, the worst-off are more likely to receive this type of long-term care services. Only in Italy we found that there is a pro-rich distribution of use, but the estimated CCI is not statistically significant. There are also differences across countries where Spain shows the smallest level of inequality and Denmark the largest.

The unequal distribution of use of formal home care services seen through the CCI may be driven by need factors such as health conditions gender and age. It has long been remarked in the literature that needs tend to be more concentrated among the poor (OECD & WHO, 2003), and therefore a pro-poor distribution of use is somehow expected. Once standardized for needs, the differences seen are much lower but still significant in the three northern countries, where the probability of use is concentrated among the worst-off whereas for the southern countries there is no evidence of horizontal inequity.

It is interesting to find evidence of inequity in the sample of northern countries that have universal long-term care systems. However, one have to keep in mind that the sample used does not consider individuals that are institutionalized, service that is by definition more costly than those provided at home, then, it might be the case that

the better-off are using more institutional care and home care remains for the worst-off. For example in Denmark, institutional care requires the payment of a monthly rent but permanent personal and practical home help is free of charge (Schulz, 2010).

In table VII, we show CCI and CHI for a specific type of formal home care, nursing/personal home help. These services are often used by individuals that experience higher levels of dependency where inequities might be even more worrisome and problematic (World Health Organization Europe, 2008).

Table VII. CCI and CHI for Nursing&personal home care ^a.

	Nursing&personal home care		
	CCI	CHI	Obs
Netherlands	-0.0305* (0.0149)	-0.0110 (0.0138)	1360
Denmark	-0.0954*** (0.0210)	-0.0257 (0.0260)	1156
Sweden	-0.0098 (0.0109)	0.0196* (0.0101)	1357
Italy	0.0206* (0,0108)	0.0196* (0.0108)	1745
Spain	-0.0542* (0.0301)	-0.0349 (0.0281)	1184

^a Bootstrapped standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

We see there is pro-rich inequity in Sweden and Italy. In Italy, these services are mainly privately financed, what might imply that only who can afford are using nursing/personal home care after standardized for needs. In Sweden, a possible explanation might be that individuals may not be able to afford the co-payments for these types of services. As seen, even though the more general measure of formal

home care does not show inequity for Italy, when disaggregating into a more specific service pro-rich inequity is found.

Table VIII shows the CCI and CHI for informal and intensive informal care use.

Income related inequality in the use of informal care is concentrated among the poor in all the countries of the sample as in the case of formal home care use. However, only Denmark and Sweden have a CCI statistically significant and with fairly similar magnitudes. After standardizing for needs, we see that only Sweden shows evidence of horizontal inequity in favor of the worst-off.

Additionally, we see that in the Netherlands and Italy, while informal care is equally distributed, intensive informal care shows pro-poor inequity meaning that the use of intensive informal care is concentrated among the worst-off after standardizing for needs. The results for Italy and Spain¹² are consistent with other studies that found intensive informal care to be disproportionately concentrated among the poor (García-Gómez et al., 2015; World Health Organization Europe, 2008).

5. Discussion and conclusions

To achieve an equitable access, not only in health care but also in long-term care services, is an important objective across European countries. An equitable access, “*equal treatment for equal need*” means that, for the same level of needs, there should not be differences in access by socioeconomic condition, sex or age (Kakwani, Wagstaff, & van Doorslaer, 1997). Monitoring the extent to which this objective has been achieved becomes part of the agenda across countries, and has received wide attention regarding health care use. However, there are few studies assessing inequity in long-term care use for the dependent elderly population that integrate different European countries to

¹² Even the result is not significant for Spain, the sign of the CHI goes in the same direction.

Table VIII. CCI and CHI for informal care use ^a.

	Informal care			Intensive informal care		
	CCI	CHI	Obs	CCI	CHI	Obs
Netherlands	-0.0396 (0.0416)	-0.0050 (0.0354)	1227	-0.0138** (0.0066)	-0.0132* (0.0070)	951
Denmark	-0.1127*** (0.0327)	-0.0285 (0.0407)	1049	0.0031 (0.0023)	0.0104 (0.0074)	753
Sweden	-0.1351*** (0.0367)	-0.0869** (0.0365)	1249	-0.0113* (0.0067)	-0.0059* (0.0032)	943
Italy	-0.0204 (0.0317)	-0.0341 (0.0274)	1673	-0.0425*** (0.01483)	-0.0412*** (0.0130)	1162
Spain	-0.0551 (0.0387)	0.0102 (0.0341)	1127	-0.0205* (0.0105)	-0.0148 (0.0124)	782

^a Bootstrapped standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

allow for comparisons. Understanding long-term care use and income-related inequity in both formal and informal care takes relevance as these types of services are mostly used by the elderly, whose share in population is expected to increase in the upcoming years¹³. If population ageing is not accompanied by an improvement in health status, then, the share of dependent elderly is likely to increase and with these, an increase in the need of LTC leading to higher health expenditures (European Commission, 2015).

In the present document, we analyze the distribution of use across socioeconomic groups for formal home and informal care, being the main contributions the ones that follow. First, we use a cross-country uniform data set (SHARE) making comparison across countries more feasible with uniformity in the variables used. Second, the sample used is composed by the dependent individuals and not the general population as the latter has no probability of using long-term care services. Third, we take a step further by assessing inequity in a specific type of formal home care and intensive informal care to see if there are differences regarding equity within each type of home care. Finally, the findings can be taken as a first insight in assessing income-related inequality across European countries.

The results show that there is evidence of horizontal inequity in the use of long term care services across European countries. In particular, pro-poor inequity is found in the use of formal home care in the three northern countries with Denmark showing the highest levels of inequity, which may be related to the fact that home care services are free of charge and institutional services required out-of-the-pocket payments, being affordable only to those that have the ability to pay. The fact that no inequity is found for the southern countries must be interpreted with caution as the outcome variable is composed only by services provided at home without including others such as day care centers and community care that are also part of formal care. However, if we assess inequity by different types of services we find pro-rich inequity in the probability of using nursing/personal home care in Italy and Sweden. Nursing and personal home care may be used in a higher magnitude by individuals with more severe conditions than home help and in this sense, the pro-rich inequity found in Italy and Sweden might be reflecting barriers of access for poorer individuals to this type of formal home services, that is not entirely free in Sweden, and mainly privately provided in Italy.

With respect to informal care use, only in Sweden pro-poor inequity is found. At first read, these results might seem contradictory, but if look at the use of intensive informal care, we found that the use appears to be disproportionately concentrated among the worst-off, for example in Italy, a country where care of the elderly and disable lies on the family. Therefore, the fact that we found no evidence of inequity in the use of informal care in Italy and Spain has to be interpreted with caution as informal care involves both intensive and non-intensive informal care. This shows the importance of analyzing the differences within the type of care "informal care". The same result is found in the

Netherlands and Sweden, countries with universal but not totally free services.

Although, we have found evidence of inequity in the use of long-term care services, it is worth mentioning that the magnitudes of the CHI are quite small, which might suggest that the countries of analysis are going on the correct way. In any case, in those countries where inequity was found it would be interesting to investigate where the inequity is mainly coming from to develop policies to improve the use of LTC services.

One of the limitations comes from the source of the data; SHARE is a survey with representative population of individuals living within a household implying that potentially vulnerable groups in need of long-term care are not being taken into account, such as those with more severe limitations and mental disease. In this sense, there is scope for future research that includes data on institutionalized population to obtain a complete panorama of inequity in LTC use. Second, the results obtained cannot be interpreted as causal effect but only as associations to understand the distribution of long-term care use across socioeconomic groups. Third, those coming from self-reported measures as individuals may be more prone to give answers that are socially accepted, hiding or exaggerating some situations. Fourth, in the case of intensive informal care only data from helpers living outside the household of the care recipient was available, missing information from closer caregivers such as partners. Fifth, due to lack of disaggregated data, regional differences in the supply of LTC services that may be important might not be being taken into account. Finally, the data set used corresponds to year 2006/2007 and after that period some countries, like, Spain, have changed their systems turning to universal coverage in LTC. However, due to lack of data regarding formal home care use in more recent waves of SHARE it was not possible to do a more updated analysis.

To conclude, long term care services are expected to become an important share of medical expenses across European countries as the elderly population is increasing (European Commission, 2015). However, is not only age but also the dependency levels what are strongly associated with the use of long term care services (Lipszyc, Sail, & Xavier, 2012). In this sense, policy makers should focus on the design and implementation of "active ageing programs" that can be performed inside the households to improve quality of life and reach a healthy old age decreasing the levels of dependency. Additionally, encouragement of elderly citizens to extend their working lives beyond retirement might be a policy that should be considered in the long-term care agenda, as this can provide benefits for both individuals and the society as a whole (European Commission, 2015). Finally, a deeper look in inequities in both formal home and informal care should be given regarding the pro-poor distribution found to assess whether less income groups are not having access to a more specialized care.

¹³ The share of elderly (65+) as % of total population in year 2050 is expected to be 23.6% for Denmark; 33.3% for Spain; 29.9% for Italy; 26.9% for Netherlands and 22.5% for Sweden (European Commission, 2015).

Abbreviations

LTC: Long term care; IADL: Instrumental activities of daily living; SHARE: Survey of Health Ageing and Retirement in Europe; ADL: Activities of daily living; HI: Horizontal inequity; CI: concentration index; CCI: Corrected concentration index; CHI: Corrected horizontal inequity index; SAH: self-assessed health.

Declarations

Availability of data and material

The data that support the findings of this study are available in the SHARE Project website with the identifier DOIs: 10.6103/SHARE.w2.500

Competing interest

The author declares that she has no competing interests.

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Appendix

Table AI. Linear probability model estimates on the probability of formal home care use ^a.

	Netherlands Coefficients	Denmark Coefficients	Sweden Coefficients	Italy Coefficients	Spain Coefficients
60-69 years old	-0.0371	0.0049	0.0298	0.0059	-0.0641**
70-79 years old	0.0589*	0.0677	0.0520*	-0.0009	-0.0441
80+ years old	0.3775***	0.2263***	0.2294***	0.1029***	0.0865**
Female	0.0466**	-0.0217	0.0009	0.0186	0.0211
Difficulties with physical function	0.2631***	0.0794	0.0943	0.0408	0.1098
Limitations in IADL	0.1889***	0.2197***	0.2124***	0.0565***	0.0830***
Limitations in ADL	0.1432***	0.1544***	0.0306	0.1087***	0.1330***
Cardiovascular system	0.0341*	-0.0092	-0.0157	0.0337***	0.0046
Endocrine system	0.0241	-0.0378	0.0625***	-0.0054	0.0412*
Respiratory system	-0.0229	0.0167	0.0759***	0.0811***	0.0383
Osteoarticular	0.0299	0.0006	0.0290*	0.0074	-0.0191
Cancer	0.2131***	0.0995***	0.0579**	0.0284	-0.0516
Digestive system	-0.1205**	0.0173	-0.0762**	-0.0274	0.0276
Nervous system	-0.0034	-0.0131	0.0718	0.3106***	0.0578
Visual illness	0.0400	0.0517*	0.0027	0.0250	0.0340
Mental illness	-0.0333	0.1425	0.0928	0.0263	-0.0093
Less than very good SAH	-0.0144	0.0604***	0.0234	0.0200	-0.0110
Equivalent income	0.0000	0.0000	-0.0000	0.0000	-0.0000
Squared equiv income	-0.0000	-0.0000	0.0000	-0.0000	0.0000
Divorced/Separated	0.1705***	0.0702**	0.0736***	0.0190	-0.0672*
Widowed	0.1747***	0.2069***	0.0723***	0.0249	0.0094
Single	0.0767**	0.2614***	0.0867***	0.0521**	0.0888***
Primary and lower sec education	0.1006	-0.7653**	0.1936	-0.0087	-0.0057
Upper secondary educ	0.0941	-0.8102***	0.2397	0.0321	0.0279
Tertiary education	0.1207	-0.7867**	0.1837	0.0203	-0.0582
Large/small town	-0.0078	-0.0397*	-0.0281*	-0.0359*	-0.0469**
Rural area	-0.0299	-0.0835***	-0.0502**	-0.0568***	-0.0802**
Employed or self-employed	0.0114	-0.0195	0.0468*	-0.0155	-0.0376
Unemployed	0.0734	-0.0615	0.0098	-0.0014	-0.0409
Permanently sick or disable	0.0791**	0.0502	0.0247	0.0179	0.0824**
Other(Homemaker,etc)	0.0205	-0.1080	0.0623	-0.0104	-0.0333
Constant	-0.4139***	0.6780**	-0.3650*	-0.0578	-0.0049
Observations	1360	1156	1357	1745	1184

*** p<0.01, ** p<0.05, * p<0.1

^a The set of dummies variables for illnesses are jointly statistically significant (1% NL, SW, IT; and 5% DN) for all countries, except Spain.

Table AII. Linear probability model estimates on the probability of nursing/personal home care use ^a

	Netherlands Coefficients	Denmark Coefficients	Sweden Coefficients	Italy Coefficients	Spain Coefficients
60-69 years old	0.0041	-0.0168	0.0166	-0.0068	-0.0351
70-79 years old	0.0456**	0.0148	0.0345**	0.0033	-0.0227
80+ years old	0.0578**	0.0507	0.0862***	0.0277	0.0522*
Female	0.0027	-0.0100	-0.0001	-0.0062	-0.0048
Difficulties with physical function	0.0587	-0.0403	0.0952**	0.0148	0.0509
Limitations in IADL	0.0402***	0.0363*	0.0812***	0.0075	0.0510***
Limitations in ADL	0.2287***	0.2417***	0.0472***	0.0511***	0.0778***
Cardiovascular system	-0.0099	-0.0254	0.0116	0.0018	0.0044
Endocrine system	0.0551***	0.0252	0.0314**	-0.0236**	-0.0091
Respiratory system	-0.0061	0.0105	0.0006	0.0418***	0.0010
Osteoarticular	0.0112	-0.0287*	-0.0061	0.0086	0.0047
Cancer	0.0512**	0.0967***	0.0020	0.0178	-0.0332
Digestive system	-0.0159	0.0235	-0.0235	-0.0277*	0.0350
Nervous system	0.1367**	-0.0352	0.1545**	0.1325***	0.0472
Visual illness	0.0306	0.0569**	-0.0090	0.0194	-0.0124
Mental Illness	-0.0984*	0.2497***	0.0424	0.1533***	0.0672*
Less than very good SAH	-0.0103	0.0282	0.0076	-0.0045	0.0155
Equivalent income	0.0000	0.0000	0.0000*	0.0000	-0.0000
Squared equiv income	-0.0000	-0.0000	-0.0000	-0.0000	0.0000
Divorced/Separated	0.0064	0.0507**	0.0305**	-0.0379*	-0.0336
Widowed	0.0346**	0.0763***	0.0096	-0.0005	-0.0252
Single	-0.0070	0.1097***	0.0364**	0.0285*	0.0683***
Primary and lower sec education	0.1371	0.0762	-0.0033	-0.0162	-0.0242
Upper secondary educ	0.0963	0.0411	0.0060	-0.0200	0.0191
Tertiary education	0.1137	0.0567	0.0036	-0.0387	-0.0338
Large/small town	0.0167	-0.0034	0.0167*	-0.0069	-0.0355**
Rural area	-0.0041	-0.0293	-0.0073	-0.0245**	-0.0477*
Employed or self-employed	0.0264	-0.0130	0.0161	-0.0143	-0.0101
Unemployed	0.0238	-0.0296	0.0196	-0.0005	-0.0184
Permanently sick or disable	0.0612***	0.0474	-0.0194	0.0328	0.0964***
Other(Homemaker,etc)	0.0083	-0.0641	0.0229	-0.0160	-0.0022
Constant	-0.2156**	-0.0366	-0.1737	0.0225	0.0074
Observations	1360	1156	1357	1745	1184

*** p<0.01, ** p<0.05, * p<0.1

^a The set of dummies variables for illnesses are jointly statistically significant (1% NL, DN, IT; and 5% SE) for all countries, except Spain.

Table AIII. Linear probability model estimates on the probability of informal care use ^a.

	Netherlands Coefficients	Denmark Coefficients	Sweden Coefficients	Italy Coefficients	Spain Coefficients
60-69 years old	-0.0074	0.0222	-0.0295	-0.0040	-0.0107
70-79 years old	0.0504	-0.0117	-0.0377	0.0156	0.0310
80+ years old	0.1179**	0.0821	0.0399	0.0947**	0.1479***
Female	0.0532*	0.0071	0.0347	-0.0440*	0.0252
Difficulties with physical function	0.2327**	0.2359	0.0789	0.2489***	0.2609
Limitations in IADL	0.2090***	0.1282***	0.1418***	0.1332***	0.1571***
Limitations in ADL	0.0691	0.0948**	0.1536***	0.2479***	0.2094***
Cardiovascular system	-0.0389	0.0267	0.0312	0.0508**	0.0128
Endocrine system	-0.0025	0.0437	0.0527	0.0985***	0.0853***
Respiratory system	0.0164	0.0931**	0.0293	0.0259	0.0295
Osteoarticular	-0.0135	0.0060	-0.0015	0.0409*	0.0147
Cancer	0.2418***	0.0609	0.0397	0.0854*	0.1579**
Digestive system	0.0259	0.0057	0.0482	0.0642*	-0.1048*
Nervous system	-0.0736	0.1691	-0.1824	0.2001**	0.1924
Visual illness	0.0188	0.1230***	0.0600*	0.0299	0.0221
Mental illness	0.1022	-0.0199	0.0976	0.0306	0.2614***
Less than very good SAH	0.0112	0.0109	-0.0273	0.0633*	0.0247
Equivalent income	0.0000**	-0.0000	0.0000	-0.0000	0.0000
Squared equiv income	-0.0000*	0.0000	0.0000	0.0000	-0.0000
Divorced/Separated	0.2510***	0.0751*	0.2561***	0.0130	0.1395**
Widowed	0.1820***	0.2221***	0.2408***	0.1346***	0.0374
Single	0.2553***	0.2250***	0.0677	0.3551***	-0.0537
Primary and lower sec education	0.0012	-0.5966	0.2700	-0.1415***	0.0030
Upper secondary educ	0.0168	-0.6035	0.2375	-0.1376***	-0.0852
Tertiary education	0.0235	-0.5577	0.2670	-0.1631**	0.0189
Large/small town	-0.0298	-0.0125	0.0464*	0.0540*	0.0217
Rural area	0.0314	-0.0177	0.1136***	0.0087	0.0806*
Employed or self-employed	0.0605	0.0813	-0.0057	0.0567	-0.0062
Unemployed	-0.0045	0.1650*	-0.1454*	-0.0820	0.0345
Permanently sick or disable	0.1561***	0.0625	0.0563	0.0401	0.1435***
Other(Homemaker,etc)	0.0049	0.1681	0.0014	0.0364	-0.0101
Constant	-0.2025	0.4284	-0.2927	-0.1581	-0.2593
Observations	1227	1049	1249	1673	1127

*** p<0.01, ** p<0.05, * p<0.1

^a The set of dummies variables for illnesses are jointly statistically significant (1% NL, DN, IT, ES) for all countries, except Sweden.

Table AIV. Linear probability model estimates on the probability of intensive informal care use ^a.

	Netherlands Coefficients	Denmark Coefficients	Sweden Coefficients	Italy Coefficients	Spain Coefficients
60-69 years old	-0.0072	0.0169***	0.0032	-0.0030	0.0004
70-79 years old	0.0049	0.0171**	0.0020	-0.0099	0.0129
80+ years old	-0.0009	0.0169**	0.0197**	-0.0077	0.0169
Female	-0.0056	0.0046	0.0085*	0.0070	-0.0035
Difficulties with physical function	0.0143	0.0037	-0.1119***	0.0341	0.0305
Limitations in IADL	0.0115*	-0.0004	0.0089*	0.0297**	-0.0015
Limitations in ADL	0.0136	-0.0010	-0.0051	0.0485***	0.0304*
Cardiovascular system	0.0032	-0.0019	0.0042	0.0259**	0.0111
Endocrine system	0.0184**	-0.0026	0.0151**	0.0350**	0.0197
Respiratory system	-0.0072	0.0003	-0.0023	-0.0022	-0.0104
Osteoarticular	-0.0059	-0.0036	-0.0078*	-0.0211*	-0.0057
Cancer	-0.0059	-0.0036	-0.0052	-0.0252	0.0907***
Digestive system	-0.0070	0.0015	-0.0014	0.0129	-0.0131
Nervous system	-0.0235	-0.0017	-0.0095	0.1764***	0.0157
Visual illness	-0.0135	-0.0005	0.0027	-0.0243	0.0020
Mental Illness	-0.0156	0.0027	0.1511***	0.0404	0.0927***
Less than very good SAH	-0.0035	0.0037	0.0017	0.0129	-0.0954***
Equivalent income	-0.0000	0.0000	-0.0000	-0.0000**	0.0000
Squared equiv income	0.0000	-0.0000	0.0000	0.0000	-0.0000
Divorced/Separated	0.0207***	0.0002	0.0081	-0.0156	-0.0351
Widowed	0.0030	0.0013	-0.0012	0.0467***	0.0329**
Single	-0.0040	0.0187***	0.0025	-0.0124	-0.0238
Primary and lower sec education	0.0138	0.0033	-0.0066	-0.0644***	-0.0176
Upper secondary educ	0.0065	0.0046	-0.0106	-0.0742***	-0.0294
Tertiary education	0.0061	0.0089	-0.0106	-0.0463	-0.0304
Large/small town	-0.0129**	0.0040	-0.0060	-0.0073	0.0012
Rural area	-0.0134*	0.0006	0.0132**	0.0072	-0.0098
Employed or self-employed	-0.0030	0.0175***	0.0047	0.0037	0.0221
Unemployed	0.0005	0.0128	0.0027	-0.0246	0.0202
Permanently sick or disable	-0.0016	0.0080	0.0060	0.0660**	0.0653***
Other(Homemaker,etc)	0.0023	0.0054	0.0042	-0.0312**	-0.0140
Constant	-0.0090	-0.0313	0.1061**	0.0272	0.0685
Observations	951	753	943	1162	782

*** p<0.01, ** p<0.05, * p<0.1

^a The set of dummies variables for illnesses are jointly statistically significant (1% SE, IT; 5% ES) for all countries, except The Netherlands and Denmark.