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Factors associated with place of death: evidence from older adults in 24 European countries *

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Abstract

Using the Survey of Health, Ageing and Retirement (SHARE) data for 16,663 older adults who died between 2004 and 2021 in 24 European countries and with the help of multinomial logistic regression models, this study assesses the correspondence between the place of death and a set of demographic (age, gender), socio-economic (marital status, home ownership, no. of children) and health variables (cause of death, dependency status). We split the sample into two country groups based on the long-term care (LTC) expenditure and share of older adults who died in nursing homes in order to verify whether a shift to formal LTC (generally accompanied by higher public expenditure in LTC) is associated with (a) lower risk of dying at hospitals, compared to dying at home or in care homes and (b) higher risk of resorting to palliative care in last days of life. Our findings suggest that the place of death is partly influenced by individual factors and partly by the country-specific end-of-life care (EOLC) policies. Furthermore, there is evidence that the relative risk of dying in a care home compared to hospitals increases over time, signalling positive changes in the out-of-hospital EOLC. Our results suggest that proper out-of-hospital care may lower the number of hospitalisations, decrease the incidence of late and fatal hospitalisations, and lower the chances of in-hospital deaths. Moreover, an appropriate public policy should support both formal and informal forms of care to avoid discrimination against individuals living alone and thus ensure LTC becomes a fundamental right of citizens.

Keywords: Ageing, End-of-life care, Long-term care, Place of death, SHARE.

JEL: I18; H51; J18.

1 Introduction

One of the greatest human achievements over the past fifty decades, fighting diseases and improving health care, has led to increased longevity. Combined with decreased fertility rates, this has resulted in a growing share of elderly people requiring care and support from an ageing and shrinking working-age population.

While policymakers are confronted with an increased percentage of national income devoted to health care and long-term care (LTC) services, the elderly are faced with uncertainties in disability and associated costs arising from medical, social, and personal care services. Although demographic factors such as population ageing are associated with rises in inpatient health care expenditure (Hartwig, 2008), the 'red herring' hypothesis proposes that time-to-death (a proxy for morbidity) is the key economic driver for higher inpatient care expenditures (Zweifel et al., 1999; Yang et al., 2003; Geue et al., 2014; Howdon and Rice, 2018). However, ageing is the main reason for higher long-term care expenditure. In other words, as the probability of death grows as people get older and because a greater proportion of the population is in their last year of life - the average health care expenditures are bigger for older people at higher ages. Similarly, Alders and Schut 2018 found that the demand for institutional care increases as the effect of the demographic trend takes over.

Gaining insight into the different conditions in which people die in various countries reveals information on the type of care received prior to death and is important for policymakers devising health policies on end-of-life care (EOLC) in order to control health care costs and presuming that hospitalisation increases expenditure in comparison to other types of care. Indeed, past research has shown that dying in a hospital setting is double the cost of dying at home under hospice care (Hoverman et al., 2020) and that a nursing home admission leads to a substantial reduction in spending on medical care (Bakx et al., 2020; Werner et al., 2019). Few other empirical studies have identified that reductions in public long-term care spending led to substantial increases in the number of emergency department (ED) visits made by patients aged 65 and above (Crawford et al., 2021).

On the other hand, the topic is a contributing factor to individual well-being, given that a survey conducted by the OECD (2017) identified a widespread aversion to dying in hospitals.

To verify whether a shift to formal LTC, generally accompanied by higher public expenditure in LTC, is associated with (a) lower risk of dying at hospitals, compared to dying at home or in care homes and (b) higher risk of resorting to palliative care in last days of life, this study assesses the correspondence between the place of death and a set of demographic, socioeconomic and health variables. We studied data for 16,633 people aged 50 years and over who died between 2004 and 2021 in 24 European countries using the Survey of Health, Ageing and Retirement in Europe (SHARE) database and multinomial logistic models. The countries were divided into two clusters in order to account for country health care specifics and analyse differences in place of death. Based on expenditure on LTC (health), the first group of countries provides more generous public funding for EOLC, while in the second group of countries the LTC and the EOLC are still underfunded and poorly organised.

Our research extends the previous literature in several ways. Place of death has already been explored in a panel analysis using data for 16 European countries and Israel using the SHARE database (waves 2 - 5) by Orlovic et al. (2017). This paper is different in several ways. Firstly, the present paper uses the same source but a different selection of countries as the interest is in comparing countries where policymakers support both institutional (long-

term and palliative care) and informal (home) care versus those that rely on informal (home) care provided by family members and for which the only alternative is the most expensive acute care. Furthermore, instead of using a logistic regression and odds ratios (OR), in this paper we employ the multinomial logistic regression where the results are expressed with relative risk ratios (RRR). When there is no association between exposure and outcome, both OR and RR are identical but when there is an association between an exposure and an outcome, OR exaggerates the estimate of the relationship (more on the methodology will be elaborated in the next section). Finally, while Orlovic et al. (2017) use a *wave* as a dummy variable in their analysis to control for fixed cross-national group differences and secular trends, this study uses *time* for the same purposes. The problem with controlling for a wave is that each wave yields data on patients who had died in different years (e.g. in 2004 and 2012), hence the wave dummy variable can never capture time-related differences such as increasing investments in LTC (health) and an increasing number of nursing homes over time. In addition, instead of a single measure of difficulties with ADLs, we use dependency degree approximated by the Katz Index (Katz, 1983; Costa-Font et al., 2018).

Our results reveal the importance of investing in the LTC as a substitute for acute care, with the aim of de-hospitalisation of care. Many needs of the elderly can be met by hospices (palliative care) or nursing homes, given that countries with particularly strong public financing and organisation of LTC have a higher share of out-of-hospital (care home and home deaths). In comparison, countries with private financing of the EOLC and low investments in the LTC have a higher share of hospital and home deaths.

The rest of the paper is organised as follows. The introduction is followed by the 'Data and Methodology' section, where details on the SHARE database are given together with an explanation of the criterion used to organise certain countries into two groups is given. The construction of variables used in the model and the model itself is also described. After explaining the methodology, the results are presented in the third section, followed by conclusions in the last section.

2 Background

The latest data on LTC spending was taken from the Eurostat database to investigate the relationship between place of death and LTC (health) expenditures. Figure 1 (panel (a)) shows a strong positive relationship between the LTC expenditure and proportion of persons aged 50 and over from the sample who died outside hospitals, precisely in care homes. In addition—to account for the effects of population ageing—we compare the share of people aged 65 and over and LTC expenditure to the EU-27 average values (panel (b)). We now aim to gain a clearer understanding of this observed positive relationship. To this end, we start by grouping countries into clusters, where members of the same cluster are similar but distinct to members of other clusters. Depending on the LTC expenditure and the proportion of older adults deceased in care homes, countries from this study can be divided into two groups. The first group (Country group 1) consists of countries that spend more than 1.5 per cent of GDP on LTC and have over 15% of the deaths occurring in care homes. These countries are Austria, Belgium, Denmark, Finland, France, Germany, the Netherlands, Sweden, and Switzerland. Most of them have relatively strong public financing and organisation of the LTC (e.g. Belgium, Denmark, the Netherlands or Sweden). The second cluster (Country group 2) includes countries that scored lower both in expenditure on LTC (below the EU-27 average) and the share of deceased in care home settings (mainly less

than 15%). Specifically, these countries were Bulgaria, Croatia, Czechia, Estonia, Latvia, Lithuania, Greece, Hungary, Italy, Poland, Portugal, Romania, Slovakia, Slovenia and Spain. Countries from this group have a less developed LTC landscape, usually stretched between the health care and social security systems. In addition, there is a clear division between countries concerning homecare services and community-based LTC that are most developed in the Nordic countries and some continental countries (e.g. Austria, Belgium, France, Germany, Netherlands). These services are mainly insufficient in countries from the 2nd cluster (Spasova et al., 2018).

Figure 1: Expenditure on LTC (health) in terms of GDP in 2019 and share of deaths in care homes (2004-2021; panel a) and share of people aged 65 and over (panel b)
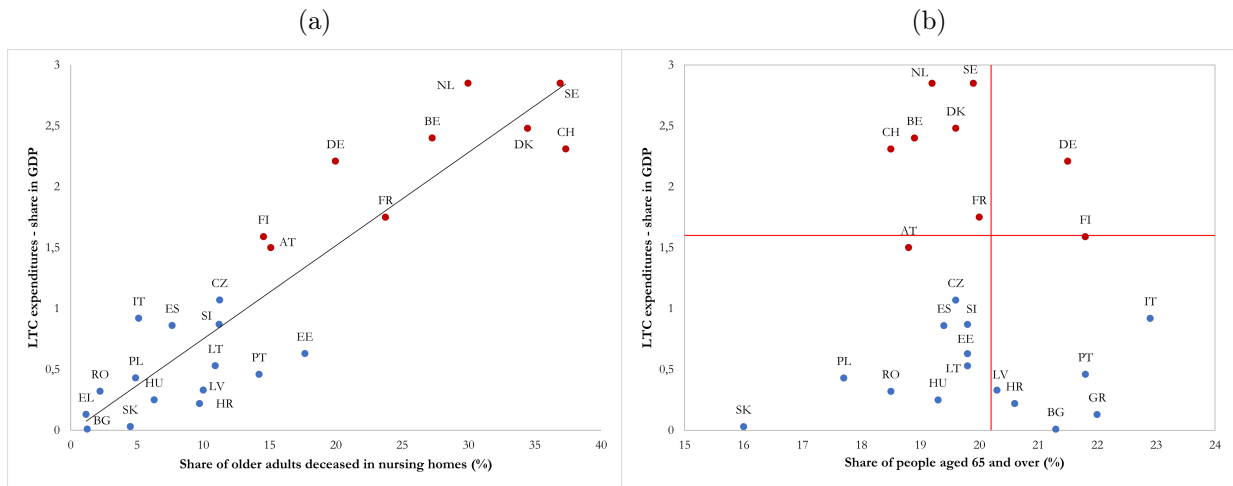
Note: Country group 1 in red, Country group 2 in blue.

One should note that practices of unpaid caregiving are linked to social norms about who should be responsible for caring for the elderly. In country group 1 it is often the state, while in country group 2, it is usually the family (Cohen et al., 2007; Grootegoed and Van Dijk, 2012; Koren, 2010; Brown et al., 2012). To complete the overview of the LTC in each country group, we proceed by giving a short description of LTC organisation, financing and characteristics of the end-of-life care. The LTC in countries of the first cluster is often organised as a separate insurance scheme—for example, in Austria, Denmark, Germany and the Netherlands—or is a part of health care and general social welfare, for instance, in Belgium, France or Switzerland. In addition, the provision of the LTC in this group of countries can be either relatively decentralised (e.g. in Austria or Belgium) or more centralised (e.g. in the Netherlands). On the other hand, most countries in the second cluster do not have a single or separate LTC scheme. Conversely, the LTC is often incorporated within the health care, social assistance, social services, invalidity or old-age schemes (MISSOC, 2022).

Only a few European countries organise their LTC system by horizontally integrating social and health systems (Denmark or Portugal). In most others, we observe clear horizontal split (sharing responsibilities in regulation, funding and service provision) between health and social systems and a vertical division of responsibilities (Spasova et al., 2018). Integrated care became a synonym for defragmentation of service provision inside health and social systems. However, there are several challenges for (more) integrated care. For

example, it is less favourable in health systems with more players (e.g. 'Bismarckian' systems), and funding issues arise when trying to account for social services provided outside health systems in integrated care models (Garattini et al., 2021). Many countries prioritise provision of home care over residential care (e.g. Austria, Denmark, Finland, France, Germany, Slovenia, Spain, Sweden). On the other side, in many countries (mailny from the 2nd cluster), residential LTC services are not developed (e.g., Croatia, Estonia, Greece, Hungary, Poland, and Romania). Traditionally, most home-based LTC in the latter group countries has been (and it still is) provided informally. The consequence of a fragmented LTC system, among others, is the LTC demand that exceeds supply, making room for private sector provider and ineffective use of healthare provisions within hospitals (Spasova et al., 2018).

The EOLC, provided at the end of life of an individual, is another important challenge for ageing societies, and the place of death can be used as a measure of the EOLC quality. Although a patient's home is often the preferred place of death, the most common place of death in most developed (OECD) countries are hospitals (OECD, 2021). In 2019, the Netherlands, Switzerland, Denmark and Sweden had the lowest proportion of deaths occurring in hospitals, while Czechia, Estonia and Lithuania reported at least 60% of all deaths occurring in hospitals (OECD, 2021). Furthermore, it should be noted that culture can explain the EOLC practices and preferences across countries (Menaca et al., 2012). To this end, we emphasise the legislation on euthanasia — the intentional ending of life by a physician at the patient's explicit request (Dierickx et al., 2016). Belgium and Netherlands legalised euthanasia in 2002[1], and between September 2002–December 2007, nearly 10,000 cases were reported in the Netherlands and almost 2,000 in Belgium. The study of Rurup et al. (2012) shows that the large majority of the patients who have undergone euthanasia suffered from cancer (87 per cent in the Netherlands and 83 per cent in Belgium). Interestingly, almost four out of five deceased in the Netherlands died at home compared to two out of five in Belgium, as euthanasia in Belgium happens more often in hospitals. Belgium is known for its model of so-called integral end-of-life care, and since the introduction of euthanasia there has been a strong expansion of palliative care (Bernheim et al. 2014).

According to Eurostat (2022), countries of the second cluster spent on average nearly 0.5% of GDP on LTC services in 2019, while countries in the first group spent around 2% of GDP. In almost all countries, no voluntary insurance against the risk of the need for LTC is possible. When it comes to entitlements within the LTC, they usually consist of in-kind personal and practical assistance and are often combined with cash benefits. Several countries offer specific benefits for informal caregivers, usually family members (e.g. Austria, Croatia, Denmark). However, informal caregivers are provided with no particular benefits in Belgium, Czechia, Greece, Italy, Spain, Portugal, the Netherlands, and Switzerland. Interestingly, in all countries of southern Europe, where many older adults rely on family as a care provider (influenced by social norms), there is no scheme to compensate family members for care provided (MISSOC, 2022). Figure 1 panel (b) combines the share of the population aged 65 and over and expenditures on LTC in two country groups. It is clear that almost all countries from the second group had the LTC spending above the EU-27 average compared to countries in the first group. Countries in the upper-left and upper-right quadrants can be regarded as more LTC-focused, while countries in the lower-right and lower-left quadrants (most of them in the first group) are still lagging behind.

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[1]Among analysed countries, euthanasia is also legal in Switzerland.

Another important indicator that splits further two country groups is a total number of LTC beds (in LTC facilities and in LTC departments in hospitals) per 1,000 adults aged 65 and over. The OECD describes it as a measure of available LTC resources. To demonstrate the difference between two country groups, it is enough to add that Luxembourg, the Netherlands, Belgium, Sweden and Switzerland had more than 60 beds per 1,000 adults aged 65 and over while Italy, Latvia, Poland, and Greece had less than 20 beds (OECD, 2021). It should be emphasised that expenditure on LTC has been increasing over the past 20 years, while it is expected that LTC spending will be high on the list of public priorities for the EU countries, rising from 1.6 (in 2015) to 2.7 per cent of the GDP in 2070 (Spasova et al., 2018).

3 Data

This study used data on 16,633 individuals from 24 European countries pooled from the end-of-life questionnaire module administered for waves 2 (2006–07), 3 (2008–09), 4 (2011–12), 5 (2013), 6 (2015), 7 (2017), 8 (2019) and 9 (2021) of the SHARE project (Börsch-Supan, 2022a-i). The end-of-life module — based on SHARE exit interviews — provides information on the demographic and socio-economic status of deceased such as age, gender, number of children, marital status but also information on the individual's last year of life and the circumstance of their death such as place, time and cause of death.

The sample of the individual-level survey data consists of 16,633 older adults who died in the period from 2004 to 2021. As shown in Table A.3, there are more deceased males in the sample, 53.7% compared to 46.3% females. The majority (55.05%) of the deceased in the sample were 80 years of age or older, and 45.95% were younger than 80 years of age. The mean age of the deceased in the sample was 79.6 years.

The most common cause of death was a heart attack, stroke or other cardiovascular diseases (CVDs; 39.8%), whereas the second most common was cancer (27.3%). Nearly two out of three cancer patients were younger than 80 years, while persons who died of heart attack, stroke or other CVDs were mainly older than 80. The highest share of recorded deaths from heart attack and stroke was in Bulgaria (56.5%) and lowest in Denmark (20.9%). Cancer was the main cause of death in Finland (47.3%)[2], the Netherlands (38.1%) and Slovakia (37.1%), whereas the lowest proportion of persons who died of cancer was in Greece (17.4%). Most of the deceased who died of cancer had been ill for one year or longer, and those who were ill for one year or longer were also hospitalised more than five times. These trends suggest that health care policies aiming at de-hospitalisation of care for cancer patients may reduce health care costs. Except for decrepitude, dotage and senility, where 63% of the deceased were females, males were more likely to die from all other causes.

The data analysed in this paper shows substantial differences in the proportion of patients dying in hospital, care homes or at home across countries (Table A.5), suggesting a country-specific difference in end-of-life practices. Even though hospital was the most common place of deaths for most countries included in the study, the share of hospital deaths varied from 25% in the Netherlands to 62% in Czechia and 71% in Finland. The highest share of care home deaths was recorded in Switzerland (37.3%), followed by Sweden (36.9%), Denmark (34.5%), the Netherlands (30%) and Belgium (27.3%). The highest proportion of the deceased who died at home was in Bulgaria (78.9%) and Romania (68.9%), which is not

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[2]Due to small sample size (n = 55), the results for Finland should be interpreted with caution.

surprising given that those countries also had very high proportion of deceased who died of heart attack and stroke (ranging from 56.5% in Bulgaria to 48.5% in Romania; Table A.4). Based on these trends, Table A.5 shows that most of the deceased in each country group died in hospital (44.4% in Country group 1, 51.2% in Country group 2). A substantial share of patients died in care homes (28%) in Country group 1, compared to only 8.8% in Country group 2. If we look at the most common place for deaths of cancer patients (Table A.6), most of them died at hospital in Country group 2 (55.8%), while in Country group 1, share of cancer patients (47.3%) who died at hospital was lower. However, the share of cancer patients who died at home was lower in country group 1 (30.7% compared to 37.6%), whereas the share of cancer patients who died in a care home was substantially higher in country group 1 (22% compared to 6.6%).

4   Empirical Strategy

With the help of multinomial logistic models, we investigate differences in some form of association of place of death between two country groups with a set of sociodemographic and health variables using the Survey of Health, Ageing and Retirement in Europe (SHARE) database on 16,663 people aged 50 years and over who died between 2004 and 2021 in 24 European countries.

We estimate three models. Firstly, we control for the country group to evaluate whether individuals from a specific country group have a higher risk of dying at home than in a hospital or a care home compared to a hospital. Secondly, we are interested in the differences in the magnitude of demographic, socioeconomic and health-related factors between two country groups. Therefore, we estimated the same set of variables separately on the sample of country group 1 and country group 2.

The outcome measure in multinomial logistic regression analysis is the place of death, with hospitals treated as the referent group, given that it is the most frequently occurring group. Under place of death are two replicates of predictor variables, representing the estimated two models: home relative to hospital and care home relative to hospital. Three sets of predictors of place of death were included: first, predisposing factors, such as demographic characteristics (age, gender) and socio-economic status and support (marital status, number of living children, own home). Secondly, need-based factors, such as factors related to illness (cause of death, duration of illness) and the dependency status of the patient (approximated by the Katz Index[3], Katz, 1983). Thirdly, enabling factors, such as country-specific end-of-life care system characteristics (Country group). In addition, and "year died" (2004-2013, 2014-2021) – a temporal dummy variable to provide control for the effect of time, such as an increasing number of LTC beds. The choice of the variables is based on the past similar research (see Cohen and Deliens, 2012; Cohen et al., 2007; Pivodic et al., 2017).

In this case, relative risks of reference group ($Y_j = 0$) for subject i is:

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[3]The Katz Index determines functional status as a measurement of the ability to perform six daily living activities independently. We have computed this index using the information on daily living activities provided by SHARE. Respondents have been classified into four categories: Katz0 indicates that the individual performs all activities independently; Katz1 indicates that the individual performs four or five activities independently; Katz2 indicates that the individual only performs two or three activities independently; Katz3 indicates that the individual needs help with all activities.

$$\frac{p(Y_i = j | X_i = x, Z)}{p(Y_i = 0 | X_i = x, Z)} = \beta_0 + \beta_1 Demo + \beta_2 Soc + \beta_3 Ill + \beta_4 Time + \beta_5 CG, \qquad (1)$$

where $Demo$ denotes individual demographic characteristics (age, gender), Soc refers to the socio-economic characteristics of an individual (marital status, number of children, owning a home), Ill denotes factors related to illness (cause of death) and the dependency status (approximated by the Katz Index), $Time$ is a temporal dummy variable, and CG captures country-specific end-of-life care system.

Multinomial logistic regression is often chosen because it does not assume normality, linearity, or homoskedasticity but assumes independence among dependent variable choices. This assumption states that the choice or outcome in one category is not related to the choice or outcome of another category. This research tested the assumption of independence using the Hausman-McFadden test, which is a usual procedure. Besides assuming independence, multinomial logistic regression also assumes non-perfect separation meaning that if the groups of the outcome variable are perfectly separated by the predictor(s), then unrealistic coefficients will be estimated, and effect sizes will be greatly exaggerated (Greene, 2018).

The results from a multinomial logistic regression are expressed by relative risk ratios (RRR). The RRR of a coefficient compares the risk of the outcome falling in the comparison group to the risk of the outcome falling in the reference group changes with the respective variable. A RRR > 1 indicates that the risk of the outcome falling in the comparison group relative to the risk of falling in the referent group increases as the variable increases. In other words, the comparison outcome (home, care home) is more likely. Conversely, an RRR < 1 indicates that the risk of the outcome falling in the comparison group relative to the risk of falling in the referent group decreases as the variable increases. In general, if the RRR < 1, the outcome is more likely to be in the referent group (hospital).

5 Results and Discussion

The results of the first multinomial analysis show that the place of death is partly influenced by individual factors such as the person's age, gender and living situation. Older patients and those who died of "old-age" (decrepitude, dotage or senility) seem to have a higher risk of dying in a care home setting relative to a hospital (Table 1), subject to other factors remaining constant. Existing studies on the relationship between dementia and institutionalisation directly after hospital discharges in older people show that dementia patients are more likely to be discharged to care institutions compared with non-dementia patients, and this can be partially explained by the fact that dementia patients are more likely to have injury-related admissions and extended hospital stays (Bu and Rutherford, 2019).

Further, our results show that females have a higher risk of dying in a care home setting rather than a hospital. Descriptive analysis from the previous section showed that the majority of patients who died of "old-age" were female, which is in line with other studies showing that women have a higher need for formal LTC services at the end of life due to the fact that (1) their life expectancy is higher, and (2) they are usually younger than and hence survive their spouses, which often implies that they are living alone and in need for formal care (Eisen and Sloan, 1996). Furthermore, since women often remain widows, they are more likely to depend on their own resources, such as children, when needing care (Bettio and Platenga, 2004). Indeed, our results show that being married lowers the risk of dying

at a nursing home rather than in a hospital and persons without children have a higher risk of dying at a care home than in a hospital. In contrast, persons with three or more children have a lower risk of dying at a care home rather than a hospital and a higher risk of dying at home rather than a hospital which is in line with existing evidence that informal care by adult children can reduce formal health care use and medical expenditures accordingly (Van Houtven and Norton, 2004).

When it comes to economic status, home-ownership is associated with a higher risk of dying in a hospital than in a care home. There could be several reasons for that. Models of altruism assume that family members provide services or transfer to one another because they care about each other (Courbage and Eeckhoudt, 2012). By contrast, strategic exchange models emphasise that family members exchange services for cash or in-kind transfers (Piculescu, 2012). Some of the authors found out that the elderly with higher pensions and housing wealth are less likely to enter a nursing home (Norton, 2000). They assume that this occurs because the wealth can be used as a transfer payment to children. A parent who prefers care provided by children to care from a nursing home could use the promise of a bequest to induce children to visit, call, and provide help. It can be said that the amount of pensions defines the autonomy of the elderly and make them more or less dependent on services in-kind and/or care provided by family members (Bettio, 2004). However, the picture is unclear without considering opportunity costs to informal care providers. There is some evidence suggesting that employment participation and earnings both impact negatively willingness to supply informal care (Carmichael et al., 2010). Authors such as Van Houtven et al. (2013) who investigated the effect of informal care on work and wages, found out that female chore caregivers are more likely to be retired and care for the elderly (compared to men), while for female care providers who remain working, they find evidence that they decrease work by 3–10 hours per week and face a 3 per cent lower wage than non-caregivers. Moreover, they find little effect of caregiving on working men's hours or wages. Similarly, Schmitz and Westphal (2017) found that there are significant initial adverse effects of informal care provision on the probability of working full-time when it comes to females. Never mind the incentives, in some countries, family responsibilities between children and parents are enshrined in law (e.g. Hungary, Latvia, Lithuania), where a limited number of countries grant cash benefits directly to the carer (e.g. Czechia, Finland, Hungary, UK), and many countries have care leave schemes, that allow caring relatives to take some time off from employment or to reduce their working time (Spasova et al., 2018).

One of the primary determinants of the place of death on a micro level is health status and the best measurement of health status used throughout the literature is a measure of the basic function called activities of daily living (ADL). This scale measures whether a person needs help with each of six activities – eating, bathing, toileting, transferring into and out of the bed, dressing, and continence. Disability status is defined using ADLs as a disability by itself and does not imply dependency. The dependency degree, in this case, is approximated using the Katz Index[4] (Katz, 1983) as in Costa-Font et al. (2018). Results show that compared to individuals who can perform all activities independently, individuals with a moderate (Katz1) to severe (Katz2) degree of dependency have a higher risk of dying

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[4]The Katz Index is not directly provided by SHARE but has been computed using the information on disabilities from the End-of-life questionnaire. Respondents have been classified into four categories: Katz0 indicates that the individual performs all activities independently, Katz1 indicates that the individual performs four or five activities independently; Katz2 indicates that the individual only performs two or three activities independently; Katz3 indicates that the individual needs help for all activities.

in hospital than at home. In contrast, major dependent persons (Katz3) have a higher risk of dying at home rather than in a hospital, which is the case in both country groups. Results also show that individuals who need help with performing all of or some ADLs (compared to those who are independent) have a higher risk of dying at a care home compared to hospitals, highlighting the importance of care homes in addressing the needs of older and dependent people in both country groups. This result is in line with other research whose results suggest that informal care is an effective substitute for long-term care as long as the needs of the elderly are low and require an unskilled type of care (Bonsang, 2009).

With regard to factors related to illness, some of these results are straightforward and include dying of heart attack, stroke or other CVDs, which increases the risk of dying at home rather than in a hospital. However, results obtained in the case of cancer patients are rather interesting. The multinomial analysis shows that cancer patients have a higher risk of dying at home rather than in a hospital in both country groups and a higher risk of dying in a care home rather than a hospital in a country group that invests more at the end of life care (Table 2). This evidence suggests that those countries that invest more in LTC provide cancer patients with out-of-hospital palliative care, meaning that they can even receive care in a care home or home setting at the end of their lives. The descriptive statistics in this research show that most of the persons who died of cancer had been ill for one year or more. These results suggest that persons who died of cancer needed EOLC the longest and may benefit the most from hospice and palliative care which seems to be a good substitute for the most expensive acute care hospitals provide.In countries like Greece, Italy and Spain, with predominantly private funding for EOLC and low investments in this type of care in general, there is a higher propensity to be admitted to an acute care setting given the financial burden.

However, the dummy variable "year died" results suggest some positive trends. The relative risk of dying at home or care home rather than in hospital increases with time, suggesting certain positive trends in unobserved variables such as investment in LTC over time or some behavioural changes such as a shift in the attitudes of who should be responsible in caring for a family which is especially true for the second group of countries. We can see that this result is especially true for the second group of countries (Table 2) which is in line with a recent study of Spasova et al., (2018) reporting a clear trend toward increasing the number of LTC beds for people aged 65+ in Southern Europe (e.g. Spain, Italy, Portugal), due to changes in labour market structure (more women working), increase in the pensionable age and changes in the family structure.

To sum up, there are many benefits to substituting acute care with long-term or hospice care. Existing literature suggests that proper out-of-hospital care may lower the number of hospitalisations, lower the incidence of late and fatal hospitalisations, lower the chances of in-hospital deaths and reduce the length of stay (Donnelly et al., 2017; Morciano et al., 2020; Schulz et al., 2004; Weaver and Weaver, 2012; Weaver and Goncalves, 2016). Besides that, an appropriate public policy should support both formal and informal forms of care in order to avoid discrimination against individuals living alone and thus ensure LTC becomes a fundamental right of citizens.

Table 1: The relative risk ratio for factors related to the probability of dying in hospital, at home or in the care home, 2004-2021

Factor	Home (ref: Hospital)	Care Home (ref: Hospital)
Intercept	0.289****	0.150****
Demographic characteristics:		
Age 80 and older (ref: 50-79)	1.045	2.244****
Female (ref: Male)	1.005	1.334****
Socioeconomic status and support:		
Married	1.125***	0.622****
Home ownership	1.025	0.748****
N. of children: 0 (ref: 1-2)	1.147*	1.149****
N. of children: 3 or more (ref: 1-2)	1.154****	0.851***
Factors related to illness:		
Cause of death: Hearth attack, stroke or other CVDs (ref: other)	2.263****	1.111
Cause of death: Cancer (ref: other)	1.546****	1.046
Cause of death: COVID-19 or other respiratory disease (ref: other)	0.847**	0.689****
Cause of death: Decrepitude, dotage, senility (ref: other)	4.010****	3.103****
Duration of illness: 6m or more (ref: less than 6m)	1.063	1.352****
Katz 1 (ref: Katz 0)	0.860****	1.631****
Katz 2 (ref: Katz 0)	0.908*	2.732****
Katz 3 (ref: Katz 0)	1.257****	4.050****
"Year died": 2014-2021 (ref: 2004-2013)	1.108***	1.288****
Country group 2 (ref: Country group 1)	1.168****	0.254****

*p < 0.10 **p < 0.05 ***p < 0.01 ****p < 0.001

Table 2: The relative risk ratio for factors related to the probability of dying in hospital, at home or in the care home, 2004-2021

Factor	Country group 1		Country group 2	
	Home	Care Home	Home	Care Home
Intercept	0.290****	0.136****	0.340****	0.042****
Demographic characteristics:				
Age 80 and older (ref: 50-79)	1.001	2.667****	1.053****	1.727****
Female (ref: Male)	0.914	1.3409****	1.032	1.343****
Socioeconomic status and support:				
Married	1.235***	0.658****	1.090*	0.599****
Home ownership	1.073	0.763****	0.991	0.741****
N. of children: 0 (ref: 1-2)	1.825	1.348***	1.142*	1.703****
N. of children: 3+ (ref: 1-2)	1.237***	0.941	1.121**	0.735****
Factors related to illness:				
Cause of death: Hearth attack, stroke or other CVDs (ref: other)	2.208****	1.043	2.251****	1.121
Cause of death: Cancer (ref: other)	1.689****	1.219**	1.458****	0.840
Cause of death: COVID-19 or other respiratory disease (ref: other)	1.009	0.780*	0.789**	0.622***
Cause of death: Decrepitude, dotage, senility (ref: other)	3.543****	3.038****	4.315****	2.809****
Duration of illness: 6m or more (ref: less than 6m)	1.053	1.197**	1.064	1.597****
Katz 1 (ref: Katz 0)	0.853*	1.712****	0.871**	1.546****
Katz 2 (ref: Katz 0)	0.795**	3.078****	0.963	2.226****
Katz 3 (ref: Katz 0)	1.178*	4.254****	1.299****	3.793****
"Year died": 2014-2021 (ref: 2004-2013)	1.043	1.112	1.149**	1.569****

*$p < 0.10$ **$p < 0.05$ ***$p < 0.01$ ****$p < 0.001$

6 Conclusion and Policy Options

Under the premise that an acute care setting is a substitute for hospice and the LTC in countries where the EOLC is (mostly) privately funded, this paper explored the differences in the place of death between two groups of countries in order to account for country health care specifics.

Using the Survey of Health, Ageing and Retirement (SHARE) data for 16,663 older adults who died between 2004 and 2021 in 24 European countries and with the help of multinomial logistic regression models, we investigated differences in some form of association of place of death and a set of demographic, socio-economic and health variables. First, we split the sample into two country groups based on the long-term care (LTC) expenditure and share of older adults who died in nursing homes in order to verify whether a shift to formal LTC (generally accompanied by higher public expenditure in LTC) is associated with (a) lower risk of dying at hospitals, compared to dying at home or in care homes and (b) higher risk of resorting to palliative care in last days of life. With a higher expenditure on long-term (health) care, the first group of countries (Austria, Belgium, Denmark, Finland, France, Germany, the Netherlands, Sweden, and Switzerland) provides public funding of the EOLC, while the second group of countries (Bulgaria, Croatia, Czechia, Estonia, Latvia, Lithuania, Greece, Hungary, Italy, Poland, Portugal, Romania, Slovakia, Slovenia and Spain) is orientated more toward private funding of the EOLC.

Our findings suggest that the place of death is partly influenced by individual factors and partly by the country-specific EOLC policies. Countries where public financing and organisation of the EOLC are particularly strong have a higher share of out-of-hospital (care home and home) deaths compared to the other group of countries. In addition, patients in the former country group have a higher risk of dying in a care home setting compared to a hospital, which is especially true for cancer patients. These results indicate that health policies targeting de-hospitalisation of care of cancer patients may lead to a substantial reduction in public health care costs and reveal the importance of investing in long-term and palliative care as a substitute for acute care, aimed at de-hospitalisation of care, given that many elderly needs can be met by hospices (palliative care) or nursing homes.

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A Appendices

Table A.3: Socio-demographic characteristics of deceased persons

Country	Characteristics of deceased persons				
	N	Female (%)	Mean Age - Female	Mean Age - Male	Married (%)
Austria	762	47.4	81.2	78.1	50.8
Belgium	1060	45.0	82.6	79.4	57.4
Bulgaria	161	41.0	78.3	74.4	62.1
Croatia	432	42.8	79.6	75.7	58.6
Czechia	1193	46.9	79.3	76.4	51.1
Denmark	798	49.9	81.1	79.0	46.9
Estonia	1761	46.9	81.3	76.7	54.6
Finland	55	23.6	67.1	77.7	70.9
France	758	46.3	83.4	79.4	55.5
Germany	586	41.1	78.1	76.5	71.8
Greece	1123	53.3	84.8	81.8	44.5
Hungary	619	47.7	78.9	75.9	54.1
Italy	1113	42.9	81.0	79.2	65.9
Latvia	100	47.0	80.1	71.7	49.0
Lithuania	220	53.6	79.2	72.4	47.7
Netherlands	407	43.5	77.1	77.0	76.9
Poland	959	46.3	79.1	75.7	60.5
Portugal	345	48.7	80.2	75.9	57.7
Romania	270	40.0	76.1	74.4	57.4
Slovakia	89	31.5	72.4	70.9	75.3
Slovenia	848	42.3	81.5	77.5	61.8
Spain	1555	48.0	84.1	80.7	54.2
Sweden	975	47.8	82.4	81.5	52.3
Switzerland	474	43.9	82.8	80.5	56.1
Total	16,663	46.3	81.3	78.1	56.1

Note: Percentages might not sum to 100 because the categories "other" and "unknown" were omitted.

Table A.4: Cause of death

Country	Cause of death				
	Hearth attack, stroke or other CVDs	Cancer	Covid-19 or other respiratory diseases	Decrepitude, dosage, senility	Other disease
Austria	37.1	21.1	4.5	7.0	30.3
Belgium	28.8	26.5	7.2	10.2	27.4
Bulgaria	56.5	20.5	3.7	1.9	17.4
Croatia	51.6	26.4	3.5	5.6	13.0
Czechia	42.6	24.4	4.9	9.0	19.2
Denmark	20.9	32.8	8.5	11.9	25.8
Estonia	48.8	27.5	4.5	5.9	13.2
Finland	32.7	47.3	0.0	3.6	16.4
France	29.9	32.8	7.4	8.0	21.8
Germany	31.4	32.3	4.8	4.8	26.8
Greece	59.8	17.4	9.2	2.5	11.2
Hungary	48.9	23.1	4.2	6.9	16.8
Italy	41.2	32.6	7.5	7.5	14.6
Latvia	56.0	24.0	5.0	3.0	12.0
Lithuania	54.1	21.8	5.5	1.4	17.3
Netherlands	23.1	38.1	4.9	4.9	29.0
Poland	48.0	27.0	7.8	5.0	12.2
Portugal	31.6	30.4	10.4	3.5	24.1
Romania	48.5	23.7	6.3	7.0	14.4
Slovakia	46.1	37.1	14.6	0.0	2.2
Slovenia	38.9	29.1	6.1	3.3	22.5
Spain	35.6	23.5	12.5	6.6	21.8
Sweden	31.7	31.4	5.3	12.2	19.4
Switzerland	29.3	32.1	4.4	15.2	19.0
Total	39.8	27.3	6.8	6.8	19.3

Note: Category "other" includes "unknown".

Table A.5: Place of death, %

Country	Hospital		Home		Care home	
	Total	Female	Total	Female	Total	Female
Austria	51.8	47.1	33.1	33.0	15.1	19.9
Belgium	46.2	44.7	26.5	19.1	27.3	36.3
Bulgaria	19.9	6.1	78.9	93.9	1.2	0.0
Croatia	48.6	47.6	41.7	41.1	9.7	11.4
Czechia	62.2	59.1	26.6	25.4	11.2	15.5
Denmark	38.9	38.2	25.7	20.4	34.5	41.5
Estonia	45.0	41.5	37.4	34.6	17.7	23.8
Finland	70.9	84.6	14.5	15.4	14.5	0.0
France	53.6	50.7	22.7	19.7	23.7	29.6
Germany	49.0	44.4	31.1	29.0	20.0	26.6
Greece	51.6	50.7	47.2	48.2	1.2	1.2
Hungary	55.3	51.2	38.4	41.0	6.3	7.8
Italy	44.7	41.3	50.2	52.6	5.1	6.1
Latvia	35.0	44.7	55.0	38.3	10.0	17.0
Lithuania	50.5	48.3	38.6	33.9	10.9	17.8
Netherlands	24.6	17.5	45.5	45.2	30.0	37.3
Poland	51.1	51.1	44.0	43.2	4.9	5.6
Portugal	62.0	54.2	23.8	25.6	14.2	20.2
Romania	28.9	37.0	68.9	59.3	2.2	3.7
Slovakia	46.1	46.4	49.4	39.3	4.5	14.3
Slovenia	57.0	53.9	31.8	28.1	11.2	18.9
Spain	56.7	54.2	35.7	36.2	7.7	9.7
Sweden	39.5	35.2	23.6	20.4	36.9	44.4
Switzerland	39.7	40.9	23.0	15.9	37.3	43.3
Total	48.8	46.3	35.6	33.8	15.6	20.0
Country Group 1	44.4	41.3	27.6	23.8	28.0	35.0
Country Group 2	51.2	49.0	39.9	39.1	8.8	11.9

Table A.6: Place of death of cancer patients as a percentage, 2004-2021

Country	Hospital	Home	Care home
Austria	56.5	33.5	9.9
Belgium	56.2	27.8	16.0
Bulgaria	15.2	84.8	0.0
Croatia	58.8	33.3	7.9
Czechia	64.9	29.8	5.5
Denmark	41.2	32.4	26.3
Estonia	48.2	39.4	12.4
Finland	73.1	7.7	19.2
France	59.8	21.3	18.9
Germany	48.7	29.6	21.7
Greece	61.5	37.9	0.5
Hungary	67.8	26.6	5.6
Italy	46.8	49.0	4.1
Latvia	8.3	83.3	8.3
Lithuania	60.4	25.0	14.6
Netherlands	16.1	65.2	18.7
Poland	49.8	42.1	8.1
Portugal	80.0	11.4	8.6
Romania	20.3	76.6	3.1
Slovakia	54.5	45.5	0.0
Slovenia	59.9	33.2	6.9
Spain	66.0	29.9	4.1
Sweden	41.8	27.8	30.4
Switzerland	48.0	21.7	30.3
Total	52.5	34.9	12.6
Country group 1	47.3	30.7	22.0
Country group 2	55.8	37.6	6.6