UNIVERSITÀ DEGLI STUDI FIRENZE
DISEI
DIPARTIMENTO DI SCIENZE PER L'ECONOMIA E L'IMPRESA

Working Papers - Economics

Health Disparities in Europe: Insights from a Cluster Analysis of Healthcare Systems

Debora Di Gioacchino, Emanuela Ghignoni, Laura Sabani

Working Paper N. 08/2024

DISEI, Università degli Studi di Firenze
Via delle Pandette 9, 50127 Firenze (Italia) www.disei.unifi.it

Health Disparities in Europe: Insights from a Cluster Analysis of Healthcare Systems

Debora Di Gioacchino
Università degli Studi di Roma, La Sapienza.

Emanuela Ghignoni

Università degli Studi di Roma, La Sapienza.

Laura Sabani
Università degli Studi di Firenze

MAY 2024

Abstract: Healthcare typologies are valuable instruments for comparing the similarities and discrepancies in how nations finance, deliver, and structure their healthcare systems. This study concentrates on three distinct aspects of healthcare systems: (1) the overall level of healthcare expenditure; (2) the distribution between public and private funding; (3) the emphasis on primary care versus secondary care. We examine 25 European countries to investigate empirically how these nations cluster based on these three features. To accomplish this goal, we undertake a cluster analysis combining data on healthcare expenditure with metrics on the public-private funding mix and indicators of healthcare sectional orientation, predominantly utilizing OECD Health Data and WHO country reports. The results suggest the identification of at least five distinct healthcare system types. Subsequently, we employ these typologies to examine cross-national differences in health outcomes and health inequalities. Consistent with expectations, our findings show a robust association between healthcare expenditure, particularly public expenditure, and health outcome metrics, alongside a negative correlation with socio-economic health disparities. Primary care emphasis does not appear to correlate with improved health outcomes, nor with reduced health disparities. Finally, our findings challenge the purported *decongestion effect* associated with voluntary health insurance.

Keywords: healthcare systems, public–private mix, primary vs secondary care, voluntary health insurance, health outcomes.

JEL classification numbers: H42, I13, I14, PS1, C40

1. Introduction

Healthcare typologies serve as an essential tool for examining similarities and differences in how nations fund, administer, and organize their healthcare systems. By classifying and comparing these systems, researchers can pinpoint patterns and trends that help explain variations in health outcomes and health disparities across countries. Despite this premise, Beckfield and Krieger (2009) highlighted the minimal collaboration between researchers examining health outcomes and those analysing and classifying healthcare systems. Only in the past decade, recent contributions have started to bridge this gap.[1]

Our contribution relates to this recent strand of literature. We conduct a cluster analysis to classify 25 European healthcare systems and then employ these typologies to analyse the performance of health systems in terms of health outcomes and inequality. In the cluster analysis, we incorporate metrics pertaining to healthcare provision, the balance between public and private sectors, and assessments of the healthcare sectional orientation, specifically the predominant focus of the health system on primary versus secondary care.[2] Differently from previous contributions, in describing the public-private mix, we have overlooked distinctions related to facility ownership, as the boundaries between public and private ownership have become increasingly opaque.[3] We have, in accordance with the literature on the topic, considered the level of out of pocket payment (OOP) as it is an important indicator of the *fragility* of the public healthcare system.[4] However, differently from previous contributions, we have given particular emphasis to duplicate voluntary health insurance (duplicate VHI).[5] VHI in general and duplicate VHI in particular, has traditionally held limited significance in national healthcare systems characterized by universal access to a comprehensive set of services funded through taxes. However, in recent decades, there has been a significant increase in the number of individuals holding VHI in numerous countries, with Ireland being the most prominent example of this shift. This pattern extends to Nordic countries as well (Martinussen and Magnussen, 2019). A

[1] For a comprehensive overview see Wendt and Bambra (2021) and Wendt (2022).

[2] While the lines between primary and secondary care may be indistinct, "primary" care generally refers to fundamental procedures carried out in response to common illnesses and issues. This type of care is predominantly delivered by general practitioners. On the other hand, secondary care involves specialized medical treatment. Unlike primary procedures, secondary care necessitates advanced expertise and more complex equipment. Therefore, it is mainly administered in hospitals by medical specialists (Toth, 2021).

[3] See Allen et al (2011).

[4] A fragile public healthcare system struggles to protect the population from unforeseen events (and therefore unforeseen expenses) arising from health conditions. This vulnerability might stem from various factors, including underdeveloped infrastructure, inadequate staffing, insufficient funding, limited accessibility, managerial inefficiencies, and structural issues.

[5] Duplicate VHI offers coverage for health services already included under government health insurance, while also giving access to different providers (e.g. private hospitals) or levels of service (e.g. faster access to care). Complementary VHI complements coverage /compulsory insured services by covering all or part of the residual costs not otherwise reimbursed (e.g. cost-sharing, co-payments)

broader involvement of private healthcare financing is justified as a strategy to relieve the strain on public budgets referring to the so-called *decongestion* or *substitution* effect. According to this argument, which mainly refers to private health insurance of the duplicate type, VHI could facilitate the redistribution from high-income individuals (who are insured) to low-income individuals (who are not insured). This scenario would unfold as affluent individuals chose privately financed healthcare, thereby easing pressure on the public health system and freeing up more resources for those dependent on it (Besley and Coate, 1991). The validity of the *decongestion* hypothesis relies on very strong assumptions: first, it assumes that the services offered by both sectors are equivalent; second, and perhaps most crucially, it assumes that the expansion of the private sector has no adverse consequences on the capacity and costs of the public sector as well as on the political support for the provision of public healthcare services. An alternative viewpoint suggests that an expansion of the private sector might drain resources from the public sector, resulting in a reduction in access to and quality of public healthcare (Iversen, 1997; Vaithianathan, 2002). [6] In addition, Costa-Font and Font-Vilalta (2004) have argued that if those purchasing private insurance are those who would oppose additional public spending to improve public health services quality, the increase in VHI subscription might result in a lower quality of public health provision in the long run. Therefore, with the introduction of VHI expenditure as a significant distinguishing aspect of the healthcare system, our objective is to discern the potential correlation between VHI and health outcomes, as well as health inequality.

Finally, our emphasis on the specific sectional orientation of healthcare systems stems from recent advancements in the field of comparative health policy. These developments have shed light on the variations among nations in the allocation of healthcare services between primary and secondary care. Both international comparative research and studies within the United States have provided evidence regarding the advantages of robust primary care for overall health outcomes, health inequalities, and healthcare expenditures (Macinko et al., 2003; Starfield et al., 2005; Forslund, 2024).

In summary, to construct our classification of 25 European healthcare systems, we utilize ten variables aimed at representing: the breadth of health service provision; the distribution of total health expenditure between public and private funding, specifically isolating the influence of VHI (duplicate) expenditure; the prevailing emphasis on primary versus secondary care. Through a Principal Component Analysis, these variables are condensed into three principal components. The first component correlates positively with total and public spending, the second with the orientation towards secondary care, and the third with duplicate VHI expenditure. Based on the countries' scores

[6] This opposing argument gains traction by acknowledging the well-documented evidence regarding the inefficiency and inequity of various forms of tax incentives for VHI (Sagan and Thomson, 2016).

on these three components, the 25 European countries are grouped into five healthcare typologies by means of a cluster analysis. The first two clusters encompass high-spending countries, with one group more focused on secondary care (Belgium, France, Iceland, Germany, Switzerland, Austria and Czech Republic) and the other on primary care (Sweden, Denmark, Finland, the Netherlands, Norway, and the United Kingdom). A third cluster consists of medium-spending countries oriented towards primary care (Spain, Italy, Estonia, Slovenia, and Portugal). The fourth group comprises low spenders mainly oriented towards secondary care (Lithuania, Poland, Hungary, Slovak Republic, Latvia and Greece). The fifth cluster includes only Ireland, distinguished by a significant amount of duplicate VHI expenditure.

Finally, we utilize these typologies to assess the performance of health systems regarding health outcomes and inequality. Health outcomes are assessed using three indicators: avoidable mortality, self-rated bad health among the population over 65, and self-rated unmet healthcare needs. We address health inequalities by examining perceived health status among the elderly across minimal and maximal educational attainment levels, as well as disparities in unmet medical needs between the extreme quintiles of the income distribution.

Our main findings are as follows. The level of per capita expenditure and the accessibility of public resources emerge as crucial contributing factors to performance, both in terms of health outcomes and disparities. The orientation of healthcare towards primary or secondary care does not seem to be significantly linked to improved health outcomes or reduced health disparities. As for the role of VHI, while we cannot establish a direct causal link, the evidence gathered appears to bolster the argument that relying on private insurance as a funding mechanism for healthcare does not enhance the goal of ensuring adequate access to healthcare for the more disadvantaged through the working of the decongestion effect.

It is important to note that our analysis serves a descriptive purpose, as the restricted number of observations and issues of endogeneity, due to reverse causality and omitted variables, present significant challenges for establishing causal effects. Nonetheless, our findings might offer valuable insights that can guide further exploration of the subject matter.

The paper is organized as follows. In section 2, we briefly discuss previous literature. Section 3 presents data and methodology. Section 4 discusses the results of the cluster analysis. Section 5 compares the clusters in terms of selected health outcomes and health disparities and finally section 6 concludes.

2. Related literature

Earlier categorizations of healthcare systems have adopted a comparative institutional approach, linking them to the broader body of the comparative welfare state literature.[7] In most of the healthcare typologies discussed in these contributions, two dimensions have been always considered: funding and ownership.[8] While the funding side has been differentiated in terms of taxes, social insurance contributions and private insurance contributions, the health service provision side has been classified according to public and private ownership. Moran's (1999 and 2000) has added to these studies by combining the dimensions of funding and service provision with governance characteristics. To a lesser degree, the typologies identified by Moran reflect real-world examples of countries categorized as having 'national health services,' 'social insurance,' or 'private insurance' healthcare systems. Wendt et al. (2009) and Rothgang et al (2010) have built upon Moran's analysis by examining the involvement of non-governmental and private actors in all three dimensions (funding, ownership and regulation). They have identified three ideal-types characterised by uniform features across all dimensions of healthcare: *state healthcare systems*, where funding, service delivery, and regulation are managed by governmental actors and institutions; *societal healthcare systems*, where non-governmental entities bear the responsibilities of healthcare financing, provision, and regulation; and *private healthcare systems*, where market actors govern all three dimensions. Ultimately, by considering the full spectrum of potential variations in financing, service provision, and regulation involving the roles of state, non-governmental, and private actors, they have delineated 27 potential typologies against which real-world cases can be assessed. Böhm et al (2013), building on the deductively generated typologies by Wendt et al. (2009) and Rothgang et al (2010), have classified 30 OECD healthcare systems into five typologies.

This earlier research, while adopting the same theoretical framework utilized in classifying types of welfare states, has emphasized the unique nature of healthcare by pointing out that healthcare system clusters may not align with welfare state typologies. The main limitation of this method is that it groups together countries with important differences in performance and outcomes. Consequently, the analysis may be unsatisfactory, especially given recent discussions that increasingly have stressed the examination of healthcare management features directly associated with performance and outcomes. In this regard, Reibling et al. (2019)'s contribution is, to the best of our knowledge, the first empirical study that has attempted to integrate previous classifications with information on healthcare sectional orientation and indicators of countries' performance in prevention and healthcare

[7] This literature initiated with the seminal paper by Esping-Andersen (1990). See Arts and Gelissen (2002) for a survey of the comparative welfare state literature.

[8] See Wendt et al (2009) for a survey of the comparative institutional approach to healthcare system.

quality.[9] Their findings, from a series of cluster analyses, have revealed the presence of at least five distinct types of healthcare systems, which partially overlap with previous classifications. According to the performance indicators employed by Reibling et al., the allocation of resources to healthcare is important in explaining healthcare quality. However, the sectional orientation of the healthcare system also plays a role in elucidating top performances. Notably, the cluster identified as the best-performing, labelled as the *performance-and primary-care-oriented public system*, does not correspond to the highest spending group. Contrarily, it is distinguished by a moderate allocation of resources to healthcare, predominantly sourced from public funds, and a pronounced emphasis on primary care. Conversely, the cluster identified as the worst-performing, designated as the *low-supply and low-performance mixed system*, is characterized by a scant allocation of resources to healthcare and by the lowest level of primary care orientation among all five clusters delineated in the study. [10]

A policy-relevant application of healthcare system classification is to utilize resulting typologies for quantitative analysis of health outcomes. Rydland et al. (2020), using individual-level data, have compared the educational gradient in various causes of mortality amenable to healthcare across 21 European populations, national regional or urban, during the period 1998-2006. They first estimate educational differences in amenable mortality separately for each population and then grouping these populations according to the healthcare system types identified by Reibling et al (2019). [11] Although a discernible pattern seems to arise when examining each population in isolation, there does not appear to be a consistent pattern associated with healthcare typologies. Put in different words, the differences between groups are not substantial enough, relative to variation within groups, to support the existence of a significant relationship between the educational gradient in amenable mortality and the healthcare system type.

Another contribution in this emerging area of research is from Schneider et al. (2021). In their study, they have uncovered a significant correlation between self-rated health and educational attainment. However, unlike the findings of Rydland et al. (2020), they have found that this relationship is somewhat influenced by the particular healthcare system in place.

[9] Reibling et al. (2019) aimed to introduce indicators assessing the extent to which healthcare systems strive to achieve performance goals in prevention and quality of care. Due to the lack of comparable data on regulatory activities, such as smoking regulations or the monitoring of evidence-based procedures, across many countries, they had to resort to using actual performance indicators as proxies for these healthcare management features.

[10] Referring to European countries, the *low-supply and low-performance mixed system,* encompasses Greece, Hungary, Poland and Slovak Republic, while the *performance- and primary-care-oriented public system* encompasses Finland, Sweden and Norway and Portugal.

[11] Note, however, that the typology proposed by Reibling et al. is derived from data spanning 2011 to 2014, while the data analyzed in Rydland et al. (2020) pertain to the years 1998-2006. This misalignment poses a challenge if the intention is to infer causality.

Our analysis closely resembles that of Reibling et al (2019). Like their approach, to build our clusters, we incorporate indicators related to healthcare supply, the public-private mix, and the sectional orientation of the healthcare system. However, we differ in several aspects. Firstly, we employ a different indicator of primary care strength, drawing from various studies by Kringos et al. (2010, 2012 and 2013) and Schafer et al. (2015). Secondly, regarding the public-private mix, we isolate the influence of duplicate VHI expenditure. Additionally, while we acknowledge the importance of measuring system performance in prevention and healthcare management, the indicators utilized by Reibling et al. (2019) are subject to criticism. As the authors themselves have acknowledged, the prevalence of smokers and daily alcohol consumption are weak proxies for prevention policies. Moreover, the index used to gauge healthcare management performance combines six OECD healthcare quality indicators, potentially masking various critical issues of differing significance. Most importantly for our purposes, incorporating healthcare quality indicators— which represent outcomes specific to the healthcare system— into country clustering analysis may obscure the distinct role of the healthcare system's features in influencing health outcomes. Finally, on the methodological side, differently from Reibling et al, before performing the cluster analysis, we summarize our chosen variables applying a principal component analysis.

As a result, while there is some overlap between our classification of countries and that of Reibling et al, notable differences exist. For example, while the Reibling et al's *low-supply and low-performance mixed system* largely corresponds to our fourth cluster (with the exception of Estonia), we group Southern European countries such as Italy, Spain, and Portugal together. Furthermore, Ireland stands out uniquely in our classification due to its notably high duplicate VHI expenditure, while in Reibling et al.'s classification, Ireland is grouped with Austria, Germany, and France.

Following our five-fold categorization of countries, we proceed to undertake a comparative analysis of the clusters' performance. As in Rydland et al. (2020), we focus on avoidable mortality comparing clusters' performance relative to this variable. Furthermore, we examine variations in the clusters' performances focusing on self-reported poor health among individuals over 65 and self-reported unmet medical needs. Additionally, we highlight the interconnection between these outcomes and variables of greater significance in determining our healthcare system typology, such as long-term care expenditure and out-of-pocket payments.

3. Data and methodology

In this section, we describe the data and the methodology used to perform a Cluster Analysis over 25 European countries. Data come from the online OECD database and refer to the average over the period 2010-2019, unless otherwise specified.

Our purpose is to provide evidence on differences among European countries in healthcare financing and characteristics, focusing on the private-public funding mix and on the healthcare sectional orientation. To this aim, we use three different groups of variables to cluster the countries (Table A1 reports the list of variables used in the analysis and the data source).

First, to grasp the extension of the supply of health services in different countries, we use the following variables: total health expenditure per capita (h_exp_pc), number of nurses per 1,000 population (nurses) and number of hospital beds per 1,000 population (beds). In this group of variables, we also consider long-term care expenditure (as a share of current expenditure on health, long_term).

Second, to measure the public/private mix of total health expenditure, we make use of OECD indicators about health expenditure from public sources (pub_exp) and household OOP payments (out_pocket), both as a share of total health spending. To measure the expenditure on duplicate VHI (vhi_exp_dup), we built an indicator by multiplying OECD data on total expenditure for voluntary health care payment schemes (as a share of current expenditure on health, vhi_exp) by the duplicate VHI coverage rate.

To assess the predominant focus on primary versus specialist care, we employ an indicator of the overall strength of primary care, as developed by Schafer et al. (2015) (pri_strenght). This indicator encompasses various facets of primary care system governance, economic parameters, and workforce development, as identified through the contributions of Kringos et al. (2010, 2012, and 2013). Additionally, alongside this indicator, we incorporate the expenditure allocated to preventive care as share of total current health expenditure (preventive). Furthermore, to gauge the emphasis on secondary care, we utilize the proportion of expenditure allocated to inpatient curative and rehabilitative care relative to total current health expenditure (inpatient).

Table A2, in the appendix, reports the value of the ten chosen variables across countries. Switzerland exhibits the highest level of health expenditure per capita, followed by Central and Northern countries. Conversely, Southern European countries, notably Greece, and Eastern European countries display the lowest recorded levels of per capita health expenditure. The share of current health expenditure dedicated to long-term care and the number of nurses seem to be following nearly the same pattern. By contrast, the number of hospital beds is higher in most Eastern countries than in Northern ones.

The share of public health expenditure varies from over 80% in Northern countries to less than 60% in Latvia. Conversely, Latvia exhibits the highest level of out-of-pocket expenditure, followed by two Mediterranean countries, Greece and Portugal, along with several Eastern countries. Notably, Czech

Republic and Slovenia stand out among Eastern countries with relatively low levels of private spending, resembling the very low levels observed in Northern countries and France.

Examining the spending structure across different types of care, we note that Schafer et al.'s indicator of primary care strength seems notably elevated in Northern and Southern countries (except for Greece), while it tends to be lower in many Eastern countries, as well as in Switzerland and Iceland. In terms of expenditure on inpatient curative and rehabilitative care, roughly 42% of healthcare spending in Greece is allocated to it. Conversely, in most Nordic countries, inpatient services represent a quarter or less of total expenditure. Greece also holds the lowest share of expenditure on preventive care, accounting for less than 2% of total health expenditure, while the UK and Italy lead in this aspect.

To synthesize the information from the variables under consideration, we initially conduct a Principal Component Analysis. Subsequently, we utilize the first three principal components to conduct a hierarchical Cluster Analysis, aiming to delineate homogeneous country groups. Standardized variable values are employed to ensure equal contribution from each variable in defining the clusters, thus mitigating distortions arising from variables with disparate ranges, as highlighted by Afifi et al. (2019). The findings of our analysis are outlined in the ensuing section.

4. Results

In this section, we report the results of the Principal Component Analysis and the cluster analysis performed on the first three components. As shown in Table A4, the three principal components account for 73% of the variance.

The first component, termed *total and public health spending*, exhibits strong positive correlations with health expenditure per capita and the share of public spending (see Table A5). Additionally, it shows high weights for long-term care and nurses, two variables that are highly correlated with each other, as well as with public health spending and health expenditure per capita. We interpret this component as indicative of countries where healthcare emerges as a significant political priority. This is evidenced by the substantial per capita public health expenditure and the considerable allocation towards long-term care.[12] This interpretation is further reinforced by the substantial and negative weight attributed to household out-of-pocket payments within this component, corroborating the

[12] Indeed, by allocating resources to long-term care, countries proactively prepare to meet the evolving healthcare needs of elderly citizens, thereby mitigating potential burdens on healthcare infrastructure and services. This proactive approach reflects a commitment to ensuring the well-being and quality of life for aging populations while also safeguarding the sustainability of healthcare systems in the face of demographic shifts.

interpretation that countries scoring high in this dimension show a political will to ensure a fair and universal access to healthcare services.

The second component displays a negative correlation with preventive expenditure and primary care strength and a positive correlation with beds and inpatient services. Additionally, per capita health expenditure and the share of public expenditure exhibit positive weights. This component primarily reflects the healthcare orientation, where countries with high scores display health systems oriented towards secondary care. We refer to this dimension as *hospitalization* because, unlike primary procedures, secondary care necessitates advanced knowledge and more sophisticated equipment. Consequently, it is predominantly administered in hospitals by medical specialists (Toth, 2021 p.95).

The third component is characterized by the high weight of duplicate VHI (vhi_exp_dup) and for this reason we name it *duplicate insurance***.**

The countries' scores on the three dimensions (refer to Table A6) align with the findings summarized in Table A2. Specifically, the Netherlands, followed by Norway, exhibit the highest positive scores on the first component, with respective scores of 3.4 and 3.1. Conversely, Greece and Latvia have the highest scores on the negative end of the spectrum, with respective scores of -4.3 and -3.4. On the second component, *hospitalization*, high positive scores are recorded for Iceland (2.0), Germany (1.7), and Switzerland (1.7) followed closely by Austria (1.6). Conversely, the highest negative scores are observed for Portugal and the UK, both at -2.5. Regarding the third component, Ireland leads the ranking with a score of 3.9, followed by Portugal and Switzerland, though not as closely, with respective scores of 1.5 and 1.4. Ireland's high score is attributed to its significant expenditure on duplicate VHI. In Portugal, both OOP and duplicate VHI are notably high. In Switzerland, duplicate VHI is absent, but the country demonstrates high levels of OOP.

The position of each country along the first two principal components (figure 1) and the hierarchical tree-diagram (figure 2), resulting from the cluster analysis based on the three principal components, identify five groups of countries at the dissimilarity level shown by the red line.[13]

[13] A Ward's linkage clustering with Euclidean distance as a dissimilarity measure is adopted. The vertical axis of the dendrogram represents the distance or dissimilarity between clusters. The horizontal axis represents the countries and clusters. The purpose is to obtain few groups, each containing elements that are similar among themselves and dissimilar to elements belonging to other groups. In practice, the choice on the number of groups is the choice of the vertical level at which to cut the tree.

Figure 1 - Correlation circle

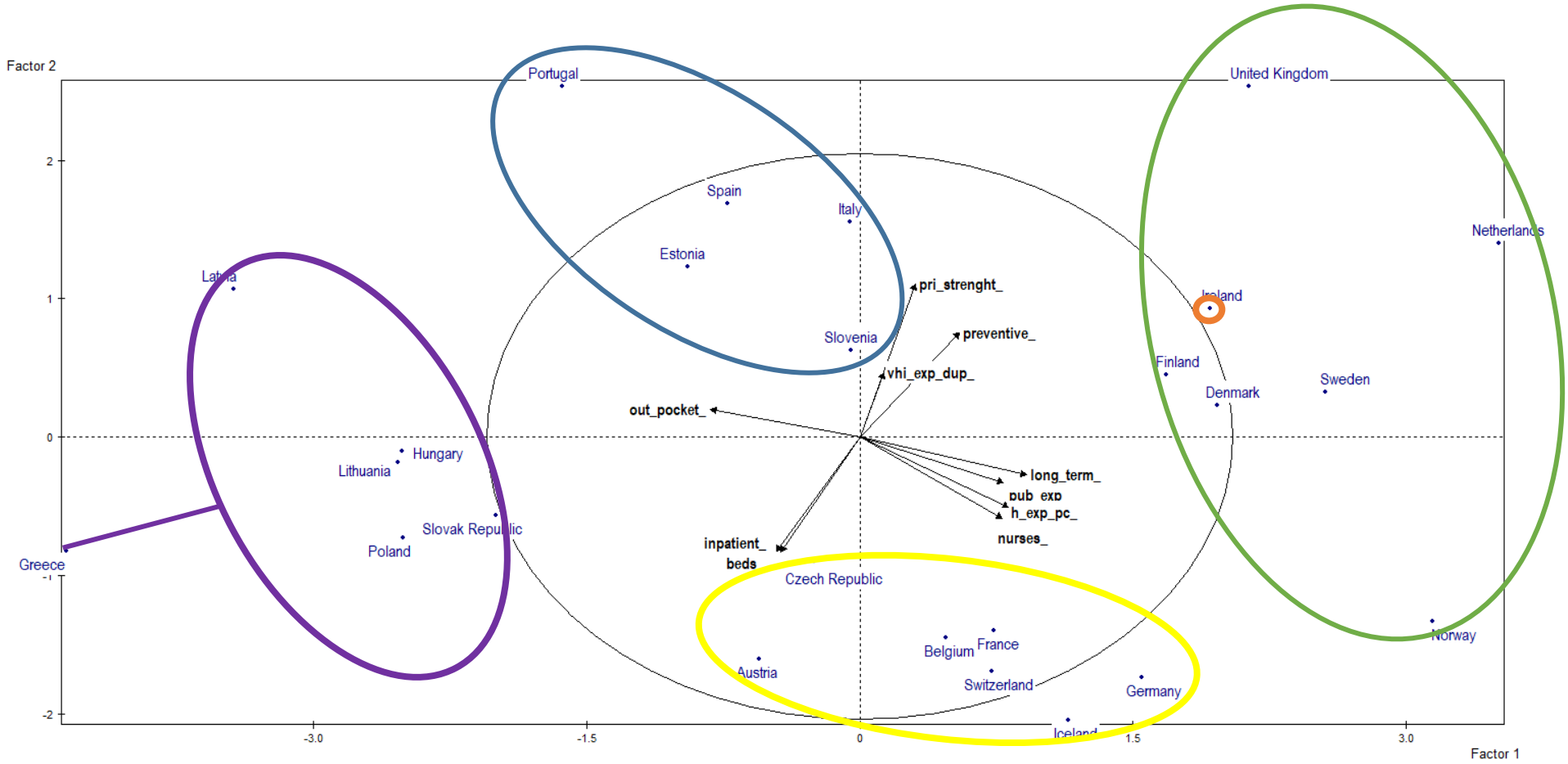
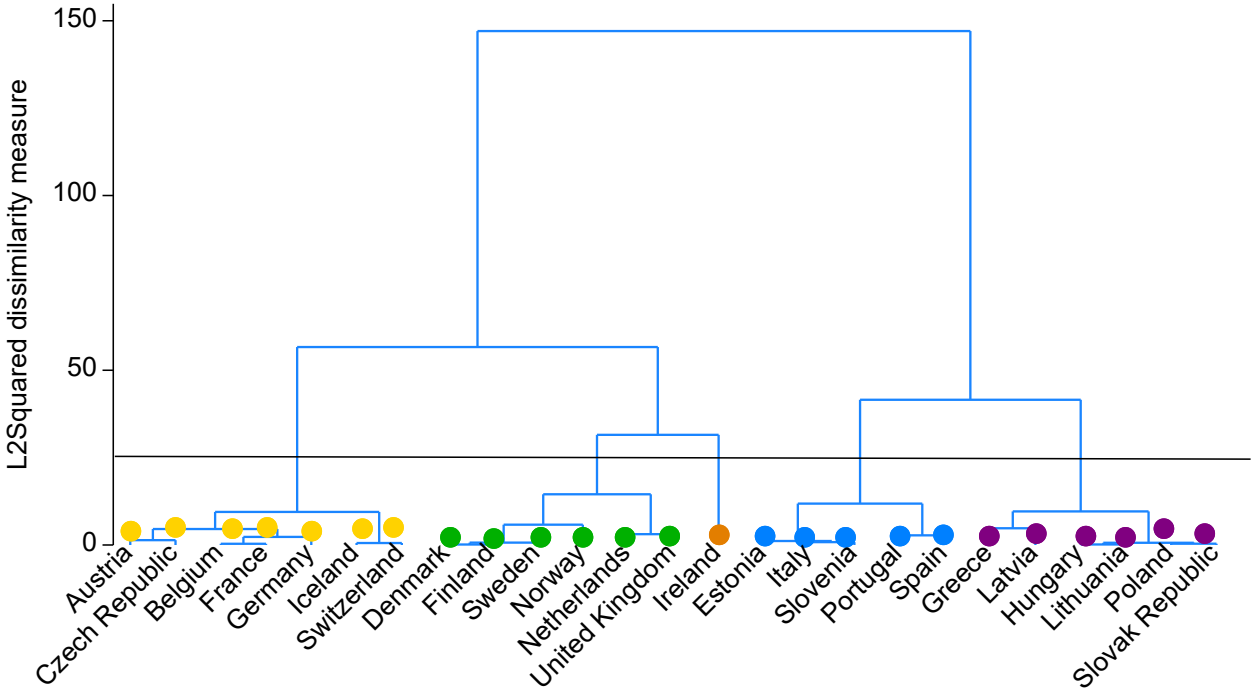


Figure 2 - Dendrogram



Group 1 (Belgium, France, Iceland, Germany, Switzerland, Austria and Czech Republic), in yellow, contains countries that score high on the second dimension, hospitalization and low on the third dimension. As for the first component, the countries in this group have higher than average per capita health expenditure (apart from the Czech Republic), while some differences are observed in the public-private mix. At one extreme, Germany has a share of public expenditure of 84% and a share of OOP of 13%, similar to the Nordic countries. At the other end, Switzerland has a share of public expenditure of 64% and a share of OOP of 25.6%. The countries in this group, apart from Switzerland, have a social health insurance (SHI) system; Switzerland has a mandatory residence insurance (MRI).[14] Other prevalent characteristics shared by the healthcare systems of these countries include the division between primary and secondary care providers, the lack of gatekeeping, and the significant degree of freedom for patients in choosing their providers (see Toth, 2021). Furthermore, in instances where a substantial portion of the population is covered by VHI, such as in France and Belgium, it primarily consists of complementary coverage (Sagan and Thompson, 2016). To summarize, this group is characterized by high health expenditure oriented towards hospitalization

[14] Although similar, MRI differs from SHI because the insurance is mandatory not only for workers but for all residents. In addition, in the MRI systems policyholders pay a premium rather than a community-based rate. In the Swiss MRI system, we observe a very high deductible, which explains the high share of out-of-pocket payments observed in this country.

(secondary care). Belgium is the prototype of this group, while the Czech Republic, the sole country spending less than the average on healthcare per capita, is positioned at the periphery (see table A7).

Group 2, in green, comprising Sweden, Denmark, Finland, the Netherlands, Norway, and the United Kingdom, exhibits a high and positive score on the first dimension and, with the exception of Norway, a negative score on the second dimension. Their scores along the third dimension (*duplicate insurance*) is negative. This group of countries is characterized by high per capita health expenditure, mainly funded through public resources, and a primary care orientation. In all countries but the Netherland, public spending is financed through general taxation (universalistic health systems). The Netherland has a MRI mandatory residence insurance system with universal coverage for exceptional medical expenses (long-term care).[15] Other common characteristics are the integrated (or 'quasi-integrated') relationship between primary and secondary care providers, the presence of gatekeeping, and the limited freedom of choice for providers granted to patients (see Toth, 2021).[16] Sweden is the prototype of this group, while UK and Norway are at the periphery (see table A7).

Group 3, in blue, consisting of Spain, Italy, Estonia, Slovenia, and Portugal, encompasses countries with a negative score in the first two components, particularly in the second one. Per capita healthcare expenditures are below the average of our sample of countries and are predominantly from public funding. Healthcare systems exhibit a strong emphasis on primary care. The third component displays more variability. Portugal stands out with a positive score, indicating a notable presence of duplicate VHI. In contrast, the other countries exhibit minor positive or negative signs, suggesting either a marginal role for VHI expenditure or, as in Slovenia, a prevalence of complementary coverage. The three southern European countries in the group finance public healthcare through general taxation, while Estonia and Slovenia operate health care systems based on a social health insurance model. Spain is the center of gravity of the group. Portugal is the country with the maximum distance from the center of gravity (see table A7). The reason rests on the high score of this country on the third component.

Group 4 (Lithuania, Poland, Hungary, Slovak Republic, Latvia and Greece), in purple, contains countries that have a high negative score in the first component: health spending per capita is lower than the average and OOP expenditure is higher than in most countries in our sample. Some slight variability is evident in the second and third components. All countries in this group display a positive

[15] In the Netherland, VHI is almost entirely of the complementary type and covers services not included in the basic package (dentalcare, glasses and and physioterapy), see Toth (2021).

[16] In the context of healthcare systems, the "quasi integrated" relationship between primary and secondary care providers suggests that there may be some level of coordination or collaboration between primary and secondary care providers, but it might not be as seamless or comprehensive as in fully integrated systems.

score in the second component, indicating healthcare systems oriented towards specialist care. Latvia is an exception, as its health system is primary care-oriented. Regarding the third component, all countries, except for Greece, exhibit a negative score. Overall, the predominant characteristic of this group is represented by the negative score on the first dimension: these countries allocate limited resources, particularly public funds, to healthcare. With the exception of Greece, whose health care system, according to Toth (2015, p. 137) cannot be catalogued as a NHI or SHI system since displays mixed characteristics, the other countries in the group have experienced a transformation in their healthcare systems since the fall of communism, shifting towards a social insurance-based system with market-oriented features. Following the reforms, OOP payments increased significantly, with households being asked with financing healthcare through formal (and informal) cost-sharing mechanisms (Tambor et al., 2021). Lithuania is the prototype of this group, while Greece, the only Southern European country in the group, is the country at the periphery (see table A7).

Group 5, in orange, exclusively comprises Ireland which exhibits an exceptionally high positive score on the third component, a positive score in the first component, and a negative score in the second component. Notwithstanding the remarkably high level of per capita health expenditure, public healthcare, financed through general taxation, encompasses only 73% of the total expenditure. In contrast to other countries in our sample, and despite Ireland's primary care focus, access to general practitioners is impeded by significant user charges. [17] Consequently, the system's ability to respond to common illnesses and issues may be restricted by financial constraints. Another notable aspect of Ireland's healthcare system is the considerable role played by duplicate VHI coverage, as evidenced by the high positive score in the third component, rather than relying heavily on out-of-pocket payments.[18]

5. Health outcomes and inequalities

The objective of this section is to discern identifiable patterns of variation in health outcomes and health inequalities among the clusters identified in the previous section. As we have seen, the clusters are organized along three principal components: *Total and Public health spending* (PC1); *Hospitalization* (PC2); *Duplicate Insurance* (PC3). To investigate how these components are related to health outcomes and disparities, we examine three indicators: avoidable mortality, self-rated bad health in the population over 65, and self-assessed unmet medical needs for financial reasons. Cross-

[17] In contrast, Starfield et al. (2005) contend that the successful delivery of primary care is linked with favourable governmental policies, particularly minimal or non-existent co-payments for GP services.

[18] The high VHI coverage is partially explained by the fact that take up is subsidized by the State through various means, such as tax relief on premiums and the practice of not charging private insurers the full economic cost of private beds in public hospitals (Johnston et al. 2019).

country variation in these indicators are shown in Figures A1 to A3. The colours highlight the cluster to which the countries belong. The significance of these indicators in our analysis is as follows.[19]

The indicator of avoidable mortality, which encompasses preventable and treatable deaths, provides insight into the system's ability to deliver timely and effective preventive and curative care, thereby minimizing the number of deaths attributable to conditions that could be addressed through appropriate healthcare interventions.[20] Monitoring avoidable mortality allows for assessing the degree of access to healthcare services, the effectiveness of disease prevention strategies, and the level of healthcare provided to patients in critical situations. Thus, this indicator offers a comprehensive view of the healthcare system's performance and its capacity to shield the population from severe health outcomes that could be prevented through proper healthcare interventions.

The emphasis on indicators of health outcomes within the population aged over 65 is pertinent due to the rapid aging of European societies.[21] As populations age, there is an increased demand for healthcare services, particularly for chronic diseases and age-related conditions such as dementia, arthritis, and cardiovascular diseases. This puts pressure on healthcare systems, leading to higher costs and strains on resources.

Finally, self-assessed unmet medical needs is a widely employed metric for assessing healthcare system efficacy, given its correlation with health outcomes and responsiveness to individuals' expectations.[22] Typically, the conventional measure utilized in the literature entails determining the prevalence of self-assessed unmet needs across the entire population. We adopt an alternative approach, specifically examining the prevalence of self-assessed unmet needs among those requiring healthcare, rather than across the entire population.[23] The comparisons of unmet needs across countries that do not consider their different levels of need might produce biased health system assessments, since countries face different challenges. We focus on unmet needs for financial reasons,

[19] For brevity, we present results for three indicators. Additionally, we have considered other health outcomes, such as life expectancy at birth, infant mortality, healthy life expectancy at age 65, and self-reported bad health across the population.

[20] Preventable mortality quantifies the count of deaths that could have been largely averted through the implementation of efficacious public health measures and primary prevention strategies, occurring prior to the manifestation of diseases or injuries. It is an indicator correlated with the efficiency of the primary care sector, as it refers only to death that can be prevented through efficient primary intervention strategies. Treatable mortality delineates the deaths that could predominantly be prevented through prompt and efficient healthcare interventions, encompassing secondary prevention methods like screening and treatment (i.e., administered after the onset of diseases, aimed at decreasing case-fatality rates).

[21] Self-rated health indicators are widely used and validated measures of individuals' overall health status (Doiron et al. 2015 and Wourela et al 2020).

[22] See Smith and Connolly (2020) for a discussion on the types of unmet needs that can and should be addressed by health care policymakers. Allin et al. (2007) and Cavalieri (2013) identify a number of reasons for why subjective measures of unmet need may be superior to clinical measures in assessing unmet need.

[23] Refer to Ramos et al. (2019) for a detailed discussion on these different measures of unmet medical needs.

as this indicator is more suited to signal the failure of the health system to shield individuals from financial strain due to unexpected health expenses.

To investigate how these health outcomes are related to the principal components identified in the previous section, we run multiple linear regression analysis. Subsequently, utilizing scatter plots, we endeavour to discern common patterns within each cluster. Initially, our focus is on health quality outcomes, followed by an examination of inequalities.

5.1 Health outcomes

Table 1 summarises correlations between each of the health outcomes considered, namely avoidable mortality, self-rated bad health in the population over 65, and unmet medical needs for financial reasons, and the three principle components identified and discussed in sections 3 and 4.

Table 1 – Health outcomes and Principal components

VARIABLES	(1) Avoidable deaths[(a)]	(2) bad_health65[(b)]	(3) unmet_f[(c)]
PC1	-0.295***	-0.418***	-0.014**
	(0.070)	(0.061)	(0.007)
PC2	-0.038	-0.169*	-0.016
	(0.111)	(0.097)	(0.011)
PC3	-0.187	-0.187	0.046***
	(0.134)	(0.118)	(0.013)
Constant	2.283***	1.891***	0.169***
	(0.145)	(0.127)	(0.014)
Observations	24	24	23
R-squared	0.493	0.718	0.534

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
[(a)]Avoidable deaths/100
[(b)]Perceived bad health over 65 /10
[(c)]Missing data for Belgium and Switzerland

Not surprisingly, *Total and Public health spending* (PC1) is associated with better health outcomes, as measured by our three variables: countries investing more in healthcare, especially through public funding, tend to achieve better performance across all dimensions of health outcomes considered.

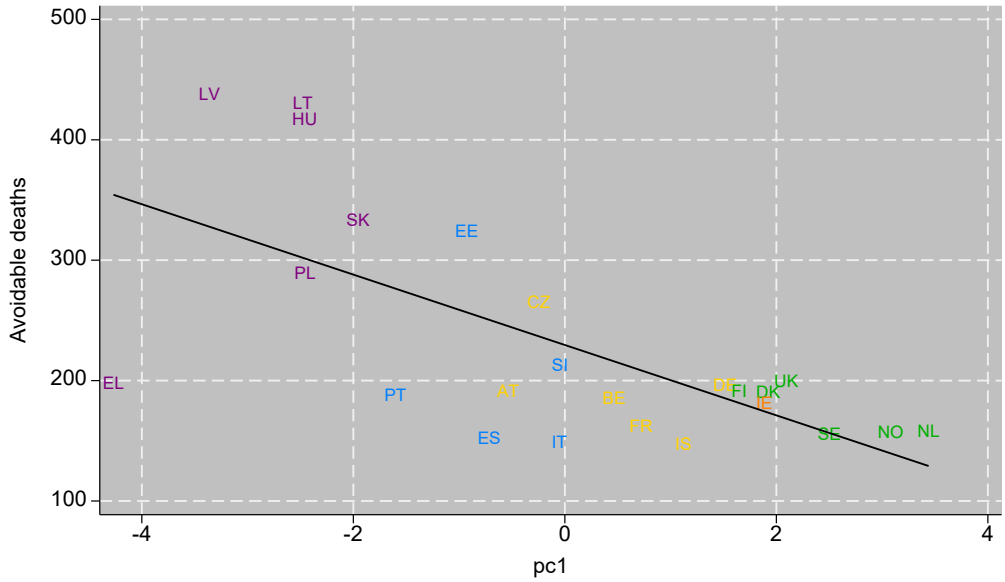
Looking at PC2 (*Hospitalization*), a secondary care orientation seems to be associated with better health outcomes, although the relationship is not significant in the case of avoidable deaths and unmet needs and only weakly significant (at 10% level) for bad_health65. Lastly, *Duplicate Insurance* (PC3)

is not correlated with avoidable deaths and bad_health65, while it is positively and significantly associated with unmet medical needs for financial reasons. [24]

To further investigate countries' health systems performance in terms of health outcomes and to illustrate the variability beyond the average associations summarized in Table 1, we depict countries' positions through a series of scatter plots. Each plot showcases a principal component on the horizontal axis and a health outcome on the vertical axis.

Figure 3 portrays the correlation between avoidable mortality and countries' scores in the first principal component PC1. The correlation appears distinctly negative, possibly indicating a nonlinear trend. Indeed, it is notable that countries within the blue group (excluding Estonia) have avoidable mortality rates similar to countries scoring higher in the first dimension (countries within the yellow and green groups), despite their lower average health expenditure per capita compared to the other two groups. [25]

Figure 3 – Avoidable mortality and PC1

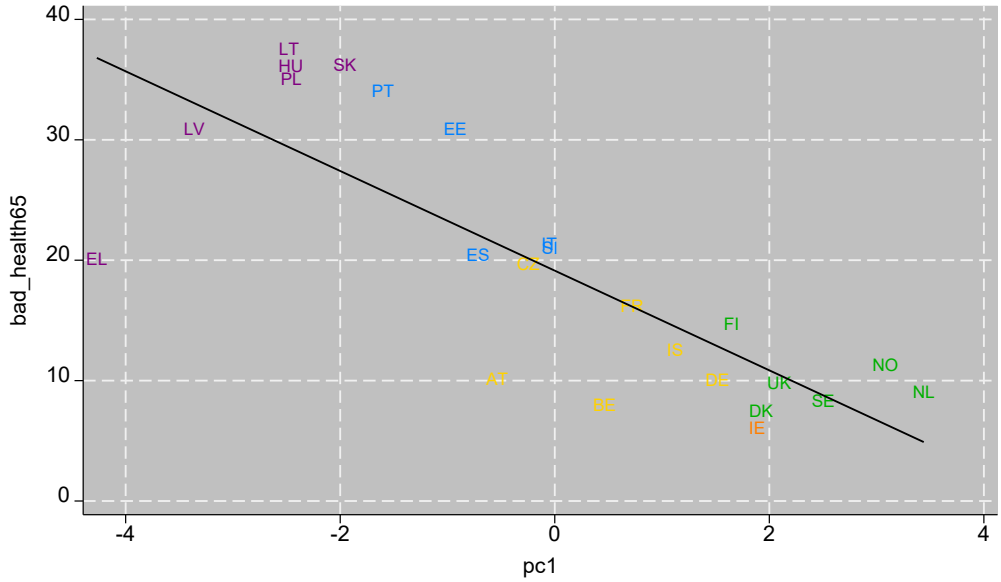


Likewise, the scatter plot depicting the association between self-rated poor health among individuals over 65 and PC1 portrays a clear negative correlation (Figure 4). The clusters are arranged along the regression line, with the green group exhibiting the lowest perceived poor health in the population over 65 and the purple group displaying the highest. It is important to underscore that PC1 exhibits a significant positive correlation with health expenditure per capita and the proportion of public spending, while also showing a substantial positive weighting of long-term care expenditure.

[24] We run a regression for unmet needs without Ireland (a clear outlier) and the results are very similar.
[25] Non-linearity could indicate that resources are not related to performance beyond a certain point.

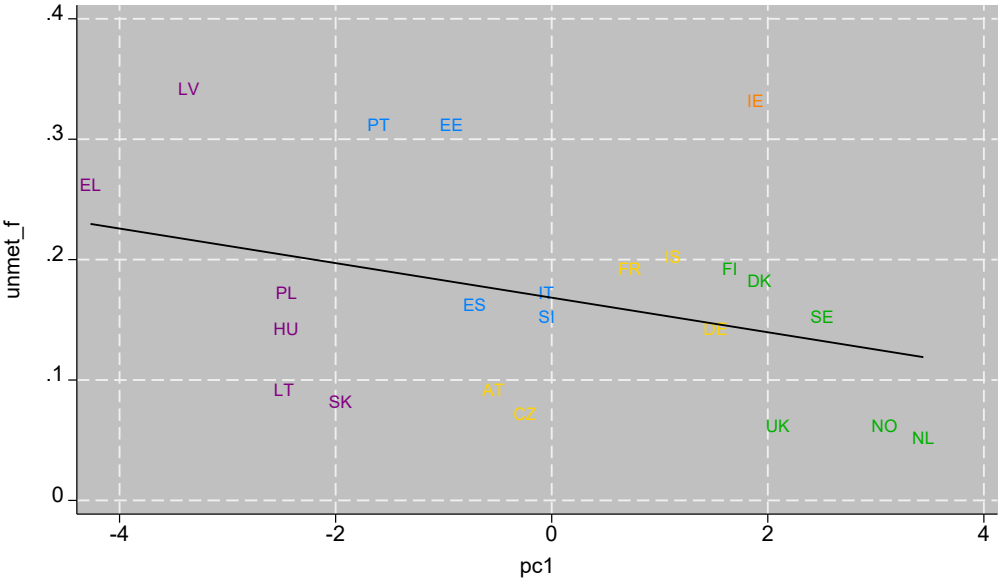
Remarkably, countries that excel in this health outcome are also those allocating the highest resources to long-term care (see table A2).

Figure 4 – Bad health (>65) and PC1



More variability and a less clear-cut association is observed in Figure 5 displaying the negative relationship between self-assessed unmet medical needs for financial reasons and PC1.

Figure 5 – Unmet needs for financial reasons and PC1



The yellow and green groups typically encounter on average fewer instances of unmet needs due to financial constraints compared to the purple and blue groups. What stands out is the significant

variability within the purple group. Indeed, Latvia and Greece demonstrate levels of unmet needs for financial reasons notably higher than other countries within their group. In contrast, Lithuania, the Slovak Republic, Hungary, and Poland encounter instances of unmet needs for financial reasons more akin to the values observed in countries in the yellow or green group. To unravel this puzzle, it is crucial to consider two arguments. First, opinions of health system responsiveness might be influenced by system features or the respondents' characteristics. The WHO (2000) notes that less affluent people may have fewer expectations than wealthy individuals and be more accommodative to unresponsive services. Therefore, this argument might explain why certain countries within the purple group exhibit unexpectedly low levels of unmet needs, despite allocating lower resources to healthcare. Additionally, if the main source of private expenditure consists of out of pocket payments, individuals in need become more vulnerable to substantial health expenses they may not have been anticipated. This assertion is supported by the observation that the share of OOP over total health expenditure in Greece and Latvia, which demonstrate considerably higher levels of unmet needs compared to other countries in their group, stands at 33% and 38%, respectively, while the average in the purple group is equal to 28,8%.

In Figure 6, Ireland is a clear outlier and warrants a separate analysis. Its performance is very disappointing despite its high score in PC1 and despite having a very low level of OOP (12.4%), even lower than the average out of pocket payments of countries in the green group. [26] The system is characterized by a well-established two-tier approach to accessing hospitals and market-based access to general practitioners for the majority of the population (Thomas et al., 2020). Despite its primary care focus, indicated by the negative score in the second principal component, access to general practitioners is hindered by substantial user charges. Consequently, the system's responsiveness to the most common illnesses and problems may be limited by financial constraints. Another significant aspect of Ireland's healthcare system is the substantial role played by duplicate VHI (high positive score in the third component): the country boasts the highest rate of duplicate VHI expenditure as a proportion of total healthcare funding (13.5%) among our sample of countries.[27] Theoretically, if public health services are difficult to access, private insurance, being a prepayment mechanism, should shield insured individuals from unexpected health expenses. Additionally, as more affluent individuals opt for privately financed healthcare, the expectation is that it would alleviate pressure on the public health system and free up more resources for those dependent on it. However, Ireland's

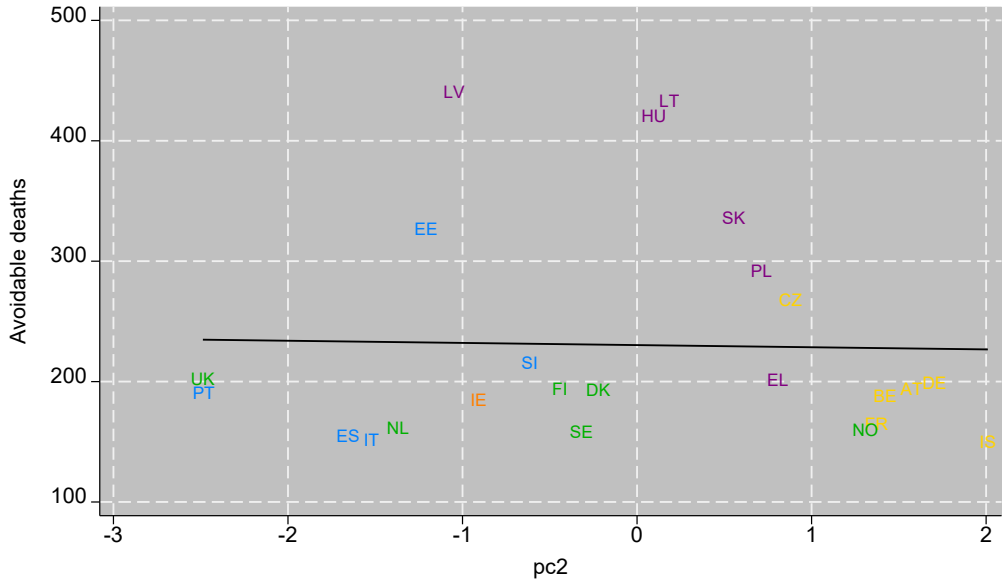
[26] It is noteworthy to stress that, notwithstanding the low level of OOP, the share of public funding in total expenditure in Ireland is the second lowest (73.2%) among high-spending countries, with Switzerland being the only country lower in this regard (65%).

[27] Slovenia has a marginally higher rate of VHI, but of the complementary type.

notably high level of unmet needs for financial reasons does not seem to confirm these predictions. We will delve further into unravelling the puzzle of Ireland in the next section.

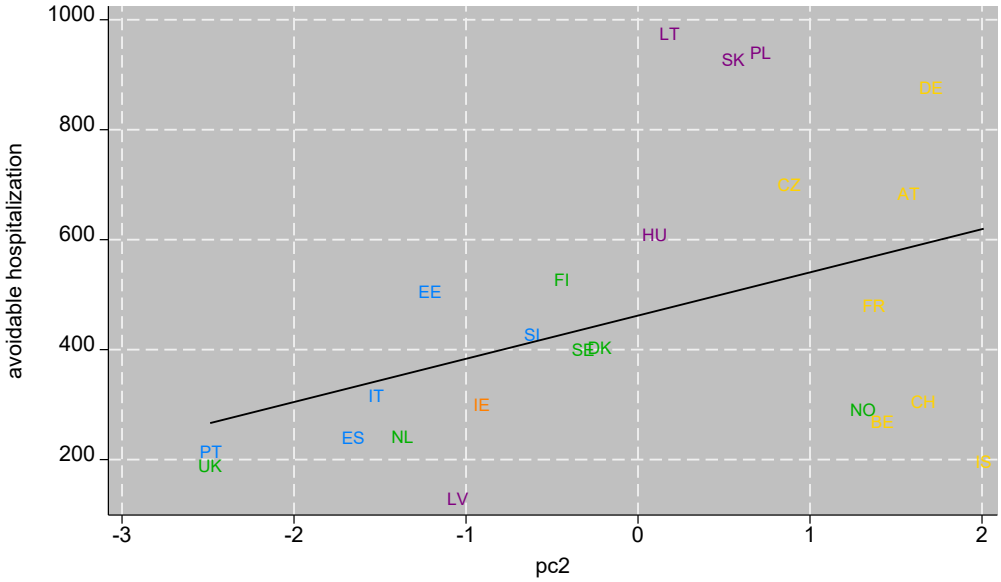
Despite the regression analysis does not indicate a significant correlation between PC2 (*Hospitalization*) and avoidable mortality, there are insights from the scatter plot (Figure 7) that warrant further discussion. It reveals that the blue group, characterized by a primary care orientation and fewer allocated health resources, exhibits avoidable mortality rates comparable to those of the yellow and green groups. Notably, Spain's performance, positioned centrally within the blue group, does not significantly differ from that of Sweden. This observation might suggest that a primary care orientation facilitates a more efficient allocation of resources. In this context, it is noteworthy to delve into avoidable hospitalization, seen as a metric for assessing the efficacy of healthcare system. Indeed, hospital stays incur elevated healthcare expenses due to their considerable costs. A strong positive correlation with PC2 is observed (Figure 8). Therefore, countries whose healthcare system is oriented towards hospitalization seem to allocate resources inefficiently, although this does not appear to jeopardize health outcomes at least for countries belonging to the yellow group (high spenders). [28]

Figure 7 – Avoidable mortality and PC2



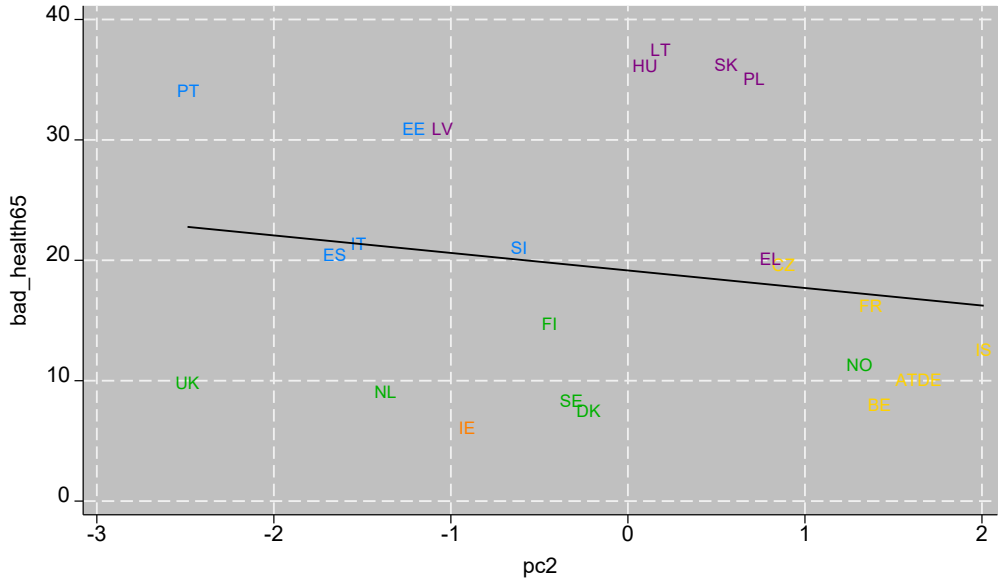
[28] This might be explained noting that secondary care providers have incentives to increase production in order to keep using available capacity (Schäfer et al, 2019).

Figure 8 – Avoidable hospitalization and PC2



On the contrary, visual examination of Figures 9 confirms that secondary care enhances the health status of the elderly, at least in high-spending countries (the yellow group).

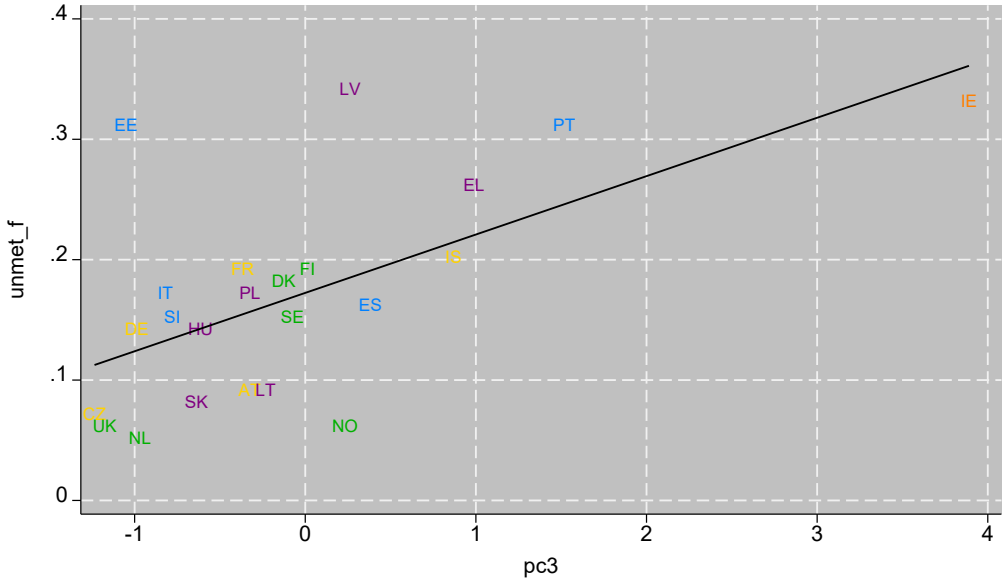
Figure 9 - Bad health (>65) and PC2



As for the lack of a clear association between PC2 and unmet medical needs, this result is indirectly confirmed by Schäfer et al (2019). Indeed, in their survey study, they did not find any relationship between the strength of the national primary care structure and patient-level data about the postponement of care for financial reasons.

Lastly, we consider the third principal component PC3 (*Duplicate Insurance*). As shown in Table 1, this component is significantly correlated only with unmet medical needs: a higher score in PC3 is associated with higher unmet medical needs for financial reasons. Figure 10 visually illustrates this finding, which is further corroborated by running a regression analysis excluding Ireland, which emerges as a distinct outlier. Nevertheless, note that in the scatter, the clusters are not clearly identifiable. The reason is probably due to the fact that, with the exception of few countries, duplicate VHI expenditures are very low and null in some cases.

Figure 10 – Unmet needs for financial reasons and PC3



While we cannot establish a direct causal link, the evidence gathered appears to bolster the argument that relying on private insurance as a funding mechanism for healthcare does not seem to enhance the fundamental goal of ensuring appropriate access to healthcare.

5.2 Health inequalities

Health disparities have gained significant attention in policy discussions. Merely assessing average achievements is no longer deemed adequate to gauge a country's health performance; instead, the distribution of health across the population is deemed crucial. Thus, health inequality is a distinct aspect of health system performance. In this context, the focus is generally on social inequality that assesses how a health indicator varies according to different socio-economic or demographic individuals' characteristics.

Summary measures of health inequality typically evaluate either absolute or relative disparities. Absolute measures quantify the extent of inequality among distinct population subsets, preserving

the health indicator's unit of measurement, whereas relative measures depict proportional disparities between groups without utilizing a specific unit. Here, we use simple measures for assessing health inequality through pairwise comparisons between two population subsets, such as the poorest and wealthiest income quintiles, or individuals with the lowest and highest levels of education. Specifically, we compare perceived health status among the elderly between those with minimal and maximal educational attainment. We also examine disparities in unmet medical needs for financial reasons between the two extreme quintiles of the income distribution.[29] In the first case, we opted to focus on educational disparities due to their lesser susceptibility to reverse causation—educational achievement for adults typically remains unchanged if health deteriorates. Although variations in inequality rates across countries and healthcare systems underscore the importance of presenting both absolute and relative measures, as they offer distinct insights into the distribution of health outcomes, for brevity, in what follows we focus on absolute measures of health inequality (differences between two population subsets health indicators) .[30]

Table 2 reports the results of a multi-regression analysis of our chosen measures of health inequalities and the principal components previously identified.

Table 2 – Health inequalities and Principal Components

VARIABLES	(1) d_bad65_educ	(2) d_unmet_f	(3) d_unmet_f (without Ireland)
PC1	-2.022***	-0.020**	-0.012
	(0.348)	(0.009)	(0.008)
PC2	-0.789	-0.014	-0.018
	(0.553)	(0.015)	(0.013)
PC3	-0.915	0.008	0.062**
	(0.668)	(0.017)	(0.024)
Constant	10.715***	0.178***	0.199***
	(0.719)	(0.019)	(0.018)
Observations	24	23	22
R-squared	0.649	0.243	0.438

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Similarly to health outcomes, PC1 is significantly (and negatively) correlated with both indicators of health inequality: a higher score in PC1 corresponds to a lower education gradient in perceived bad health among individuals over 65 and in income-related self-assessed unmet medical needs. Countries

[29] Due to lack of data availability, we do not consider socio-economic disparities in avoidable deaths.
[30] While for perceived bad health over 65 the two measures (differences and ratios) appear to be highly correlated, as for unmet medical needs some discrepancies are observed (scatter plots available from the authors).

with higher levels of healthcare expenditure, particularly public spending, not only achieve better health outcomes, but also lower health disparities.

Figures 11 and 12 below show the countries position in a Cartesian diagram with health disparities – as measured by our indicators – and PC1.

Figure 11 – Differences in perceived bad health (>65), by education, and PC1

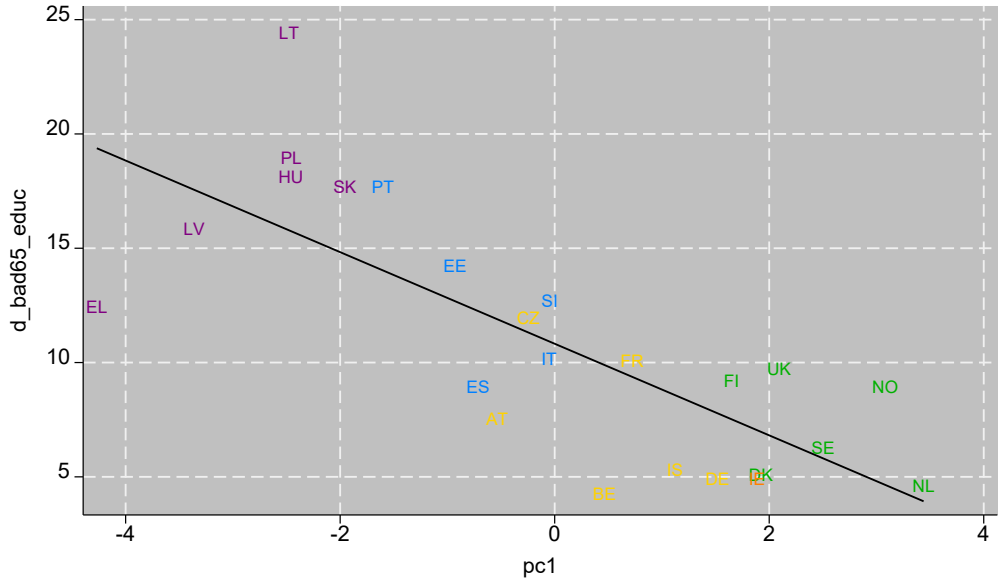
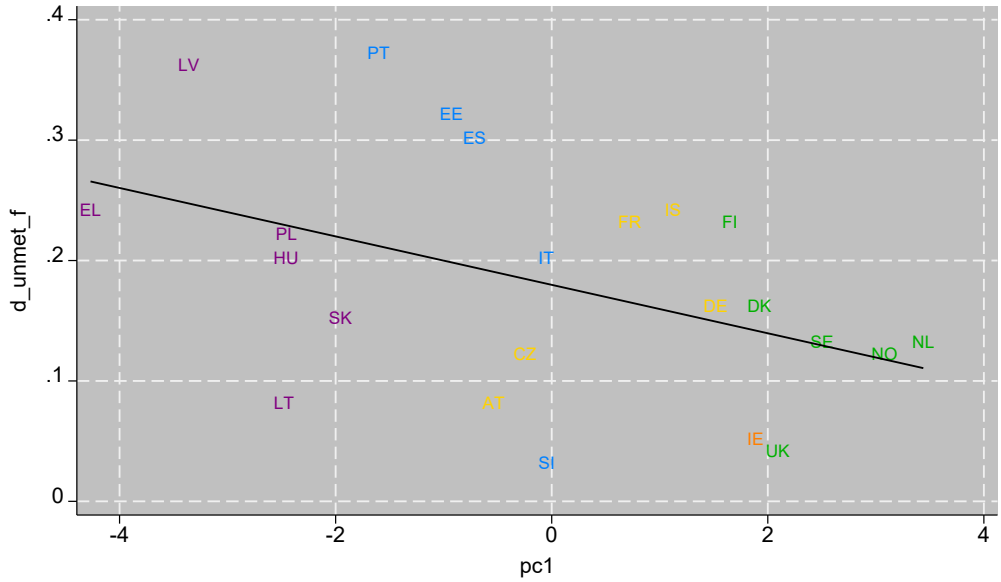


Figure 12 – Differences in unmet needs for financial reasons, by deciles of income and PC1

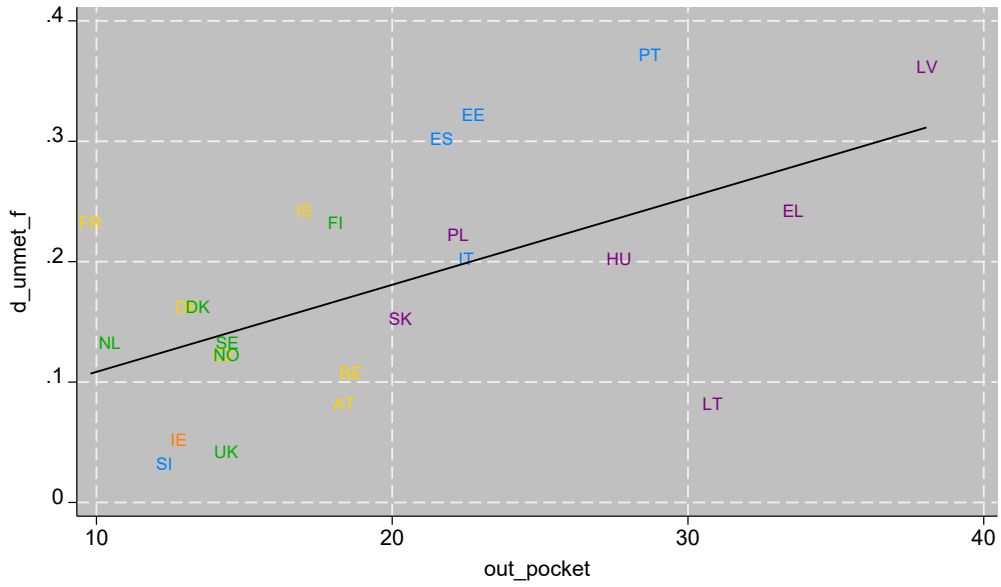


In Figure 11, the clusters are clearly located along the regression line, suggesting a good fit in the relationship between PC1 and education gradient in health for the elderly. More variability is observed in figure 12, where income disparities in unmet needs seem to be disproportionally high in

the countries of the blue group (with the possible exception of Slovenia) and a lot of variability is observed within the purple group.

Finally, the scatter plot (figure 13) analysis supports the argument that health disparities are closely associated with the level of out-of-pocket (OOP) spending, which carries significant weight in the first component.

Figure 13 - Differences in unmet needs for financial reasons and out of pocket expenditure



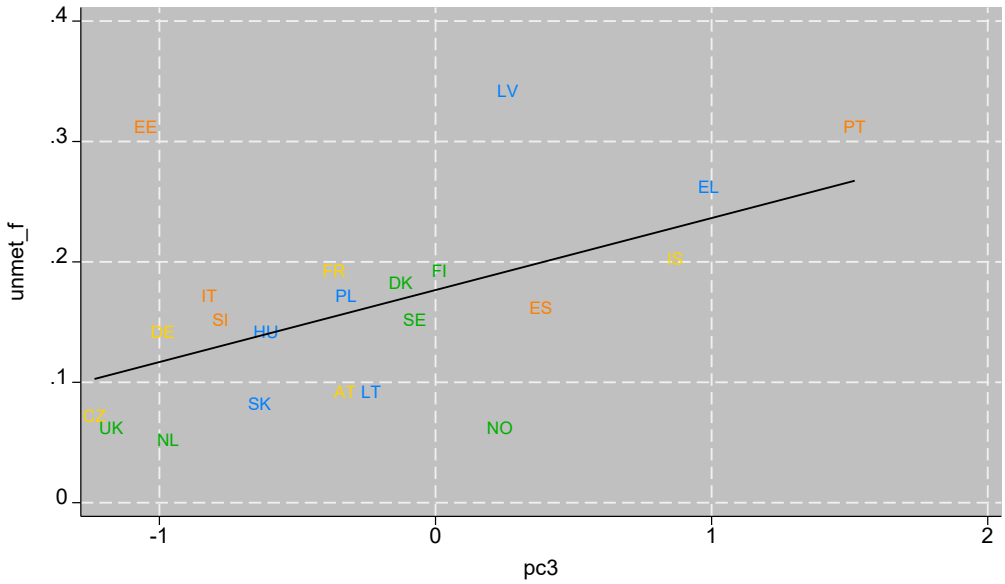
As for *Hospitalization* (PC2), this component does not appear to be associated to health disparities.[31]

Lastly, *Duplicate Insurance* (PC3) is not correlated with the education gradient in perceived bad health in the population over 65, but it is correlated with the income gradient in unmet medical needs in the regression without Ireland. This is shown graphically in figure 14. The positive correlation between VHI duplicate and unmet needs disparities in the regression without Ireland casts doubts on the *decongestion effect* hypothesis, as individuals who continue to rely on the public sector are purportedly those with lower socioeconomic status. To gather additional evidence supporting this argument, we conducted further analysis by replacing unmet medical needs due to financial reasons with unmet medical needs due to waiting lists. This variable appears to better capture postponed or foregone care resulting from the unavailability of required services in the public sector (Besley et al 1999). Our findings indicate that, in the regression model excluding Ireland, PC3 is positively and

[31] We do not show the scatter plots with PC2 because it is not correlated with our measures of health disparities.

significantly associated with disparities in unmet needs due to waiting lists, confirming doubts regarding the decongestion effects hypothesis.[32]

Figure 14 – Differences in unmet needs for financial reasons, by deciles of income, and PC3, No Ireland



To conclude, let us discuss the case of Ireland that displays a high level of unmet medical needs and a comparatively low level of disparities. Ireland lacks comprehensive universal public coverage for primary care, however, individuals in the low-income bracket (first percentile) are eligible to obtain a medical card through the General Medical Scheme (GMS), which facilitates free access to primary care services. Therefore, it is plausible that medical card allowances effectively shield the more disadvantaged segments of the population, explaining the relatively low level of inequalities, despite high aggregate levels of unmet needs. [33]

It is important to note that health outcomes and socioeconomic health disparities appear to be interdependent, as illustrated in Figures 15 and 16. Generally, countries with higher levels of unmet medical needs also exhibit a more pronounced income gradient in these needs, with Ireland being an exception. This relationship becomes even more evident when examining the health status of the population over 65 years old.

[32] All the other PCs are not significant in both regressions (with and without Ireland). Regressions are available upon request

[33] In 2016, individuals without any form of medical card were estimated to comprise 36% of the population (see Johnston, 2019).

Figure 15 - Unmet needs for financial reasons: country-averages and income gradient

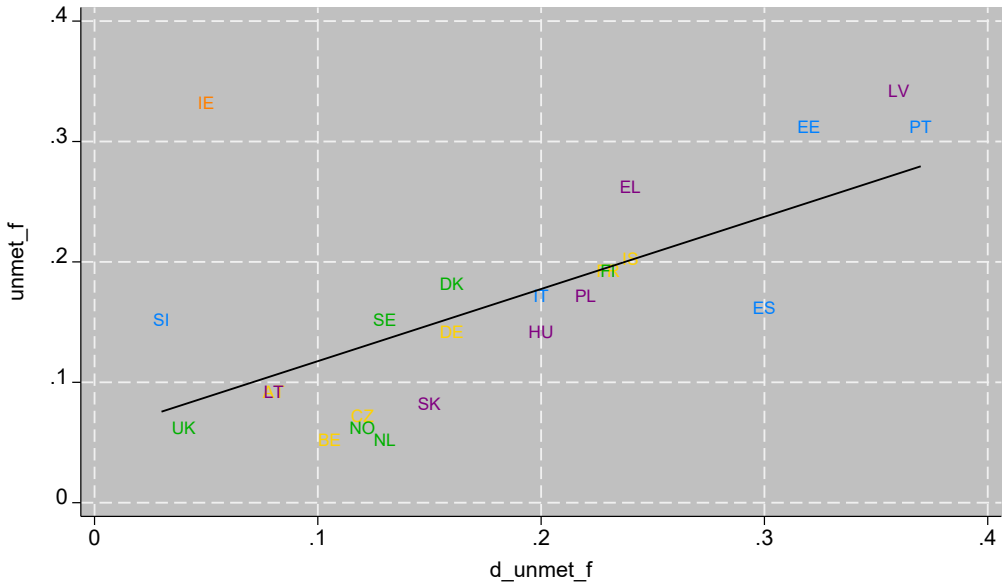
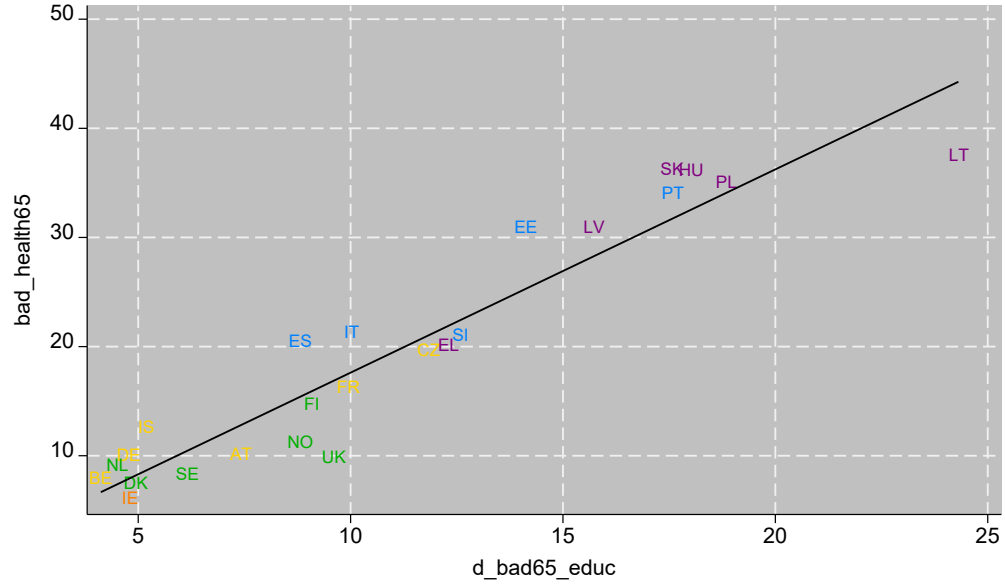


Figure 16 - Perceived bad health (>65): country-differences and education gradient



6. Concluding remarks

Healthcare institutions and policies are designed to contribute to population health and to address health disparities. Countries organise their healthcare systems emphasising different aspects, due to their preferences, demographic structure and economic resources. Trying to understand which features of the healthcare system contributes to health improvement and to mitigate health disparities is a relevant policy question. In this paper, we have proposed a five-fold taxonomy of European healthcare systems based on three dimensions: total and public healthcare spending, hospitalization and duplicate insurance. These dimensions capture the amount of resources devoted to healthcare, particularly from public funding, the healthcare sectional orientation, and the relevance of voluntary health insurance of the duplicate type. Our analysis has shown how these dimensions relate to health outcomes and disparities. The main results can be summarized as follows. (i) The features of the healthcare system that are associated with health outcomes are the same as those associated with health disparities. (ii) The amount of resources allocated to healthcare is associated with improved overall health and reduced health disparities. In particular, spending on long-term care improves health status and diminishes the income-related health gradient among the elderly. (iii) Overall, our analysis does not give evidence of a superiority of primary care-oriented health systems. The only clear evidence, gathered through the analysis of avoidable hospitalizations, is that a primary care orientation can save on healthcare costs as confirmed by most of the literature on the topic (Schäfer et al, 2019). (iv) Expenditure on duplicate voluntary health insurance (VHI) is positively correlated with both the level of unmet medical needs and its income gradient. Thus, we do not find evidence of a *decongestion effect*.

Although only descriptive, our analysis can inform the policy debate and contribute to evidence-based policy-making. The positive association between health outcomes and healthcare spending is well-established, but often underemphasized in policy discussions. Contrary to some recent findings in the literature, we do not find evidence that primary-care orientation is a more efficient producer of health outcomes, due to lower costs. This suggests the need for further research potentially utilizing new, comparable data and methodologies. Finally, our empirical evidence does not support the rationale behind the recent trend of incentivizing affluent individuals to opt out of the public system by subscribing to voluntary duplicate health insurance. This policy has been generally justified as a means to alleviate the strain on public budgets and in the same time to free up more resources for those less affluent individuals remaining in the public system. Our analysis casts doubts on the validity of such arguments.

References

Afifi, A., May, S., Donatello, R., & Clark, V. A. (2019). Practical multivariate analysis. Chapman and Hall/CRC.

Allen, P., Bartlett, W., Pérotin, V., Matchaya, G., Turner, S., & Zamora, B. (2011). Healthcare providers in the English National Health Service: public, private or hybrids? *International Journal of Public and Private Healthcare Management and Economics (IJPPHME)*, *1*(3): 1-18.

Allin, S., Masseria, C., Sorenson, C., Papanicola, I., & Mossialos, E. (2007). Measuring inequalities in access to health care: a review of the indices. *London Sch Econ Polit Sci*, 1-24.

Arts, W., and Gelissen, J. (2002). Three worlds of welfare capitalism or more? A state-of-the-art report. *Journal of European Social Policy*, 12(2): 137-158.

Bambra, C. (2011). Health inequalities and welfare state regimes: theoretical insights on a public health 'puzzle'. *Journal of Epidemiology & Community Health*, *65*(9): 740-745.

Beckfield, J. and Krieger, N. (2009). Epi+ demos+ cracy: linking political systems and priorities to the magnitude of health inequities—evidence, gaps, and a research agenda. *Epidemiologic reviews*, 31(1), 152-177.

Besley T., Coate S. (1991), Public provision of private goods and the redistribution of income. *American Economic Review*, 81(4): 979–984.

Besley, T., Hall, J., and Preston, I. (1999). The demand for private health insurance: do waiting lists matter? *Journal of Public Economics*, 72(2): 155-181.

Böhm, K., Schmid, A., Götze, R., Landwehr, C., & Rothgang, H. (2013). Five types of OECD healthcare systems: empirical results of a deductive classification. *Health Policy*, *113*(3): 258-269.

Cavalieri M (2013). Geographical variation of unmet medical needs in Italy: a multivariate logistic regression analysis. *International Journal of Health Geographics* 12: 1–11.

Costa-Font, J., & Font-Vilalta, M. (2004). Preference for National Health Service use and the demand for private health insurance in Spain. *The Geneva Papers on Risk and Insurance-Issues and Practice*, 29: 705-718.

Doiron, D., D. G. Fiebig, M. Johar, and A. Suziedelyte (2015). Does Self-Assessed Health Measure Health? *Applied Economics* 47(2): 180–194.

Esping-Andersen G. (1990). The Three Worlds of Welfare Capitalism, 1st ed. Cambridge, UK: Polity Press.

EUROSTAT, (2014, 2019). European Health Interview Survey, (EHIS), Wave 2, Wave 3, European health interview survey - Eurostat (europa.eu)

Forslund, M. (2023). Education and self-rated health: The moderating effect of primary care quality in 24 OECD countries, 2002 to 2018. *Wellbeing, Space and Society* 5: 1-9.

Kringos, D. S., Boerma, W. G., Hutchinson, A., Van der Zee, J., & Groenewegen, P. P. (2010). The breadth of primary care: a systematic literature review of its core dimensions. *BMC Health Services Research*, 10: 1-13.

Kringos, D.S. (2012). The strength of primary care in Europe (De sterkte van de eerste lijn in Europa). The Netherlands: NIVEL - The Netherlands Institute for Health Services Research.

Kringos, D., Boerma, W., Bourgueil, Y., Cartier, T., Dedeu, T., Hasvold, T., and Groenewegen, P. (2013). The strength of primary care in Europe: an international comparative study. *British Journal of General Practice*, *63*(616), e742-e750.

Iversen, T. (1997). The effect of a private sector on the waiting time in a national health service. *Journal of Health Economics*, 16(4): 381-396.

Johnston, B. M., Burke, S., Barry, S., Normand, C., Fhallúin, M. N., and Thomas, S. (2019). Private health expenditure in Ireland: Assessing the affordability of private financing of health care. *Health Policy*, 123(10): 963-969.

Macinko, J., Starfield, B., and Shi, L. (2003). The contribution of primary care systems to health outcomes within Organization for Economic Cooperation and Development (OECD) countries, 1970–1998. *Health Services Research*, 38(3): 831-865.

Martinussen, P. E., Magnussen, J. (2019). Is having private health insurance associated with less support for public healthcare? Evidence from the Norwegian NHS. *Health Policy* 123(7): 675-680.

Moran, M. (1999). Governing the health care state: a comparative study of the United Kingdom, the United States, and Germany. Manchester University Press.

Moran, M. (2000). Understanding the welfare state: the case of health care. *The British Journal of Politics & International Relations*, *2*(2): 135-160.

OECD, OECD.Stat, OECD Statistics

Ramos, L. M., Quintal, C., Lourenço, Ó. and Antunes, M. (2019). Unmet needs across Europe: Disclosing knowledge beyond the ordinary measure. *Health Policy* 123(12): 1155-1162.

Reibling, N., Ariaans, M., and Wendt, C. (2019). Worlds of healthcare: a healthcare system typology of OECD countries. *Health Policy*, *123*(7): 611-620.

Rothgang, H., Cacace, M., Frisina, L., Grimmeisen, S., Schmid, A., & Wendt, C. (2010). The state and healthcare: comparing OECD countries. Springer.

Rydland HT, Fjær EL, Eikemo TA, Huijts T, Bambra C, Wendt C, et al. (2020). Educational inequalities in mortality amenable to healthcare. A comparison of European healthcare systems. *PLoS ONE* 15(7): e0234135. https://doi.org/10.1371/j

Sagan, A., and Thomson, S. (2016). Voluntary health insurance in Europe: Role and regulation: Health policy series.

Schäfer W.L., Boerma WGW,van den Berg MJ, De Maeseneer J, De Rosis S,Detollenaere J, Greß S, Heinemann S, vanLoenen T, Murante AM, Pavlič DR, Seghieri C,Vainieri M, Willems S, Groenewegen PP. (2019). Are people's health care needs better met when primary care is strong? A synthesis of the results of the QUALICOPC study in 34 countries. Primary Health Care Research & Development 20(e104): 1–9. doi: 10.1017/S1463423619000434

Schäfer, W.L., Boerma, W.G., Murante, A.M., Sixma, H.J., Schellevis, F.G., & Groenewegen, P.P. (2015). Assessing the potential for improvement of primary care in 34 countries: A cross-sectional survey. *Bulletin of the World Health Organization*, 93: 161–168.

Schneider, S. M., Roots, A., Rathmann, K., Immergut, E. M., Anderson, K. M., Devitt, C., and Popic, T. (2021). Health outcomes and health inequalities. Health politics in Europe: A handbook. (pp.32-48). Oxford University Press.

Smith, S. and Connolly, S. (2020). Re-thinking unmet need for health care: introducing a dynamic perspective. *Health Economics, Policy and Law* 15, 440–457 doi: 10.1017/S1744133119000161

Starfield, B., L. Shi and J. Macinko (2005). Contribution of Primary Care to Health Systems and Health. *The Milbank Quarterly*, 83 (3): 457–502.

Tambor M, Klich J, Domagała A. (2021). Financing Healthcare in Central and Eastern European Countries: How Far Are We from Universal Health Coverage? *Int J Environ Res Public Health* 18(4):1382. doi: 10.3390/ijerph18041382. PMID: 33546157; PMCID: PMC7913209.

Thomas S., Sarah B., Bridget J., Rikke S., Sara B. 2020. Embracing and Disentangling from Private Finance: The Irish System. In Flood C.M., Thomas B., eds., Is Two-Tier Health Care the Future? University of Ottawa Press.

Toth, F. (2021). Comparative health systems: A new framework. Cambridge University Press.

Vaithianathan, R. (2002). Will subsidising private health insurance help the public health system? *Economic Record*, 78(242): 277-283.

Wendt, C. (2022). Comparative research on health and health care. In Social Policy in Changing European Societies (pp. 50-65). Edward Elgar Publishing.

Wendt, C., and Bambra, C. (2021). Towards Applying Ideal Types in Health Care System Comparison. Ideal Types in Comparative Social Policy.

Wendt, C. Frisina L, Rothgang H (2009). Healthcare System Types: A Conceptual Framework for Comparison. Social policy and administration 43(1): 70-90.

World Health Organization (2000). The world health report 2000: health systems: improving performance.

Wuorela, M., Lavonius, S., Salminen, M., Vahlberg, T., Viitanen, M., & Viikari, L. (2020). Self-rated health and objective health status as predictors of all-cause mortality among older people: a prospective study with a 5-, 10-, and 27-year follow-up. *BMC Geriatrics*, 20, 1-7.

Appendix A

Table A1 - List of variables and data source

Variable name	Label	Source	Period
Cluster variables			
Household out-of-pocket payments/Share of current expenditure on health	out_pocket	OECD_Stat	2010-2019
Inpatient curative and rehabilitative care/Share of current expenditure on health	inpatient	OECD_Stat	2010-2019
Preventive care/Share of current expenditure on health	preventive	OECD_Stat	2010-2019
Health expenditure from public sources as a share of total health spending	pub_exp	OECD_Stat	2010-2019
Number of nurses (density per 1 000 population)	nurses	OECD_Stat	2010-2019
Number of hospital beds per 1000 population	beds	OECD_Stat	2010-2019
strenght of primary care	pri_strenght	Schafer et al, 2015	2011-2013
Long-term care expenditure/Share of current expenditure on health	long_term	OECD_Stat	2010-2019
Total health expenditure pro capite	h_exp_pc_	OECD_Stat	2010-2019
Voluntary health care payment schemes/Share of current expenditure on health (substitute)	vhi_exp_dup	OECD_Stat Sagan and Thomson, 2016	2010-2019
Outcome variables			
Avoidable deaths per 100,000 population	avoidable_	OECD_Stat	2010-2019
Perceived bad health conditions (% of the population over 65 who declares bad or very bad health conditions)	bad_health65	EHIS2	2014
Unmet care needs for medical examination, for financial reasons (% of the population in need)	unmet_f	EHIS2	2014
Unmet care needs for medical examination, due to waiting lists (% of the population in need)	unmet_w	EHIS2 (EHIS3 for Belgium)	2014 (2019 for Belgium)

Table A2 – Cluster variables

Country	h_exp_pc	nurses	beds	long_term	pub_exp	out_pocket	vhi_exp	duplicate	vhi_exp_dup(*)	pri_strenght	inpatient	preventive
Austria	5164.17	7.09	7.50	14.76	74.58	18.36	6.73	6.60	44.39	2.24	33.01	2.23
Belgium	4876.86	10.49	5.81	22.16	76.55	18.63	4.53	0.00	0.00	2.23	27.73	1.66
Czech Republic	2879.75	8.16	6.78	10.28	82.78	14.31	1.73	1.00	1.73	2.16	27.56	2.85
Denmark	4960.64	9.95	2.79	21.23	83.93	13.43	2.26	20.00	45.17	2.39	27.58	2.78
Estonia	2071.71	6.07	4.91	7.59	75.66	22.75	1.65	0.00	0.00	2.30	23.84	3.42
Finland	4132.69	14.12	4.46	19.13	77.41	18.09	4.42	17.00	75.11	2.31	23.27	3.78
France	4841.04	9.77	6.15	15.27	79.11	9.80	9.06	0.00	0.00	2.17	25.25	1.97
Germany	5663.53	12.66	8.16	17.10	84.05	13.07	2.80	11.00	30.80	2.22	26.97	3.23
Greece	2304.96	3.33	4.29	1.17	61.71	33.56	3.87	11.50	44.54	2.12	40.65	1.31
Hungary	2011.31	6.42	7.00	3.97	67.60	27.67	4.38	0.00	0.00	2.10	26.98	3.15
Iceland	3928.57	15.02	3.12	20.13	81.27	17.02	1.59	0.50	0.80	1.84	27.09	2.58
Ireland	4641.60	12.56	2.77	21.62	73.17	12.78	13.46	43.60	586.78	2.18	24.88	3.01
Italy	3329.17	6.44	3.30	10.43	75.38	22.51	2.13	10.00	21.33	2.34	27.79	4.37
Latvia	1646.42	4.72	5.68	5.44	59.63	38.06	2.01	0.00	0.00	2.17	22.42	2.45
Lithuania	2117.37	7.62	6.96	8.16	67.60	30.82	1.00	1.00	1.00	2.28	28.23	1.94
Netherlands	5251.44	12.01	3.56	27.21	82.18	10.45	7.10	0.00	0.00	2.49	18.83	4.28
Norway	5883.86	17.16	3.82	28.74	85.25	14.40	0.36	6.00	2.15	2.27	26.63	2.72
Poland	1903.73	5.22	6.57	6.35	70.81	22.23	6.90	7.00	48.30	2.14	33.23	2.31
Portugal	2866.66	6.31	3.40	4.33	62.59	28.72	8.63	22.20	191.66	2.41	17.84	1.90
Slovak Republic	2091.01	5.79	5.88	0.35	77.66	20.28	2.21	1.00	2.21	2.05	26.15	2.15
Slovenia	2824.80	9.03	4.52	10.06	72.62	12.30	15.11	0.20	3.02	2.37	28.18	3.18
Spain	3172.16	5.42	2.99	9.40	71.56	21.68	6.60	14.90	98.34	2.43	24.83	2.25
Sweden	5023.92	10.91	2.44	24.78	84.27	14.43	1.11	5.80	6.43	2.25	21.20	3.18
Switzerland	6232.24	16.38	4.81	20.39	65.84	25.60	8.22	0.00	0.00	2.05	26.53	2.63
United Kingdom	4045.51	8.07	2.65	17.83	79.93	14.39	5.23	10.40	54.34	2.51	23.50	5.23
Mean	3754.60	9.23	4.81	13.92	74.92	19.81	4.92	7.59	50.32	2.24	26.41	2.82

(*) The expenditure on duplicate voluntary healthcare payment scheme (vhi_exp_dup) is the product between the expense for Voluntary health care payment schemes (as a share of current expenditure on health, vhi_exp) and the duplicate VHI coverage (duplicate)

Table A3 – Outcome variables

Country	Avoidable deaths	bad_health65	unmet_f	unmet_w
Austria	192.17	9.89	0.09	0.11
Belgium	186	7.75		0.07
Czech Republic	266	19.44	0.07	0.11
Denmark	191.17	7.31	0.18	0.23
Estonia	325	30.69	0.31	0.18
Finland	191.8	14.52	0.19	0.2
France	163	16.03	0.19	0.14
Germany	197.17	9.82	0.14	0.25
Greece	199	19.93	0.26	0.16
Hungary	418.17	35.94	0.14	0.13
Iceland	148.17	12.38	0.2	0.29
Ireland	182.33	5.87	0.33	0.24
Italy	149.5	21.13	0.17	0.3
Latvia	438.67	30.69	0.34	0.24
Lithuania	431.17	37.3	0.09	0.14
Netherlands	159.17	8.88	0.05	0.11
Norway	157.67	11.06	0.06	0.04
Poland	290	34.82	0.17	0.26
Portugal	188.5	33.88	0.31	0.26
Slovak Republic	334.2	36.03	0.08	0.06
Slovenia	213.67	20.8	0.15	0.21
Spain	152.67	20.25	0.16	0.17
Sweden	156	8.14	0.15	0.18
Switzerland				
United Kingdom	200.17	9.62	0.06	0.15
Mean	230.47	19.26	0.17	0.18

Table A4 - Principal components, Eigenvalues

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	4.28	2.47	0.43	0.43
Comp2	1.81	0.57	0.18	0.61
Comp3	1.24	0.47	0.12	**0.73**
Comp4	0.77	0.17	0.08	0.81
Comp5	0.60	0.03	0.06	0.87
Comp6	0.57	0.13	0.06	0.93
Comp7	0.44	0.33	0.04	0.97
Comp8	0.12	0.01	0.01	0.98
Comp9	0.10	0.04	0.01	0.99
Comp10	0.06	.	0.01	1.00

Table A5 - Principal components, Eigenvectors

Variables	PC 1	PC 2	PC 3
out_pocket_	-0.40	0.10	0.16
inpatient_	-0.22	-0.40	-0.01
preventive_	0.27	0.37	-0.33
pub_exp_	0.38	-0.16	-0.34
nurses_	0.38	-0.29	0.22
beds_	-0.21	-0.41	-0.34
pri_strenght_	0.15	0.54	-0.24
long_term_	0.45	-0.13	0.12
h_exp_pc_	0.40	-0.25	0.15
vhi_exp_dup_	0.06	0.23	0.70

Table A6 – Principal components, Scores

Countries	PC1	PC2	PC3
Austria	-0.54	1.57	-0.33
Belgium	0.47	1.42	0.17
Czech Rep.	-0.25	0.88	-1.23
Denmark	1.92	-0.22	-0.13
Estonia	-0.93	-1.21	-1.05
Finland	1.65	-0.44	0.01
France	0.72	1.37	-0.37
Germany	1.52	1.70	-0.99
Greece	-4.27	0.81	0.99
Hungary	-2.46	0.10	-0.61
Iceland	1.12	2.01	0.87
Ireland	1.89	-0.91	3.89
Italy	-0.05	-1.52	-0.82
Latvia	-3.37	-1.05	0.26
Lithuania	-2.48	0.18	-0.24
Netherlands	3.44	-1.37	-0.97
Norway	3.08	1.31	0.23
Poland	-2.46	0.71	-0.32
Portugal	-1.60	-2.48	1.52
Slovak Rep.	-1.95	0.55	-0.64
Slovenia	-0.05	-0.61	-0.78
Spain	-0.71	-1.65	0.38
Sweden	2.50	-0.32	-0.07
Switzerland	0.71	1.66	1.39
U. K.	2.09	-2.49	-1.17

Table A7 – Principal components, Distance from the gravity center

RG	Cluster 1		Cluster 2		Cluster 4		Cluster 5	
	DISTANCE	Country	DISTANCE	Country	DISTANCE	Country	DISTANCE	Country
1	0,07	Belgium	0.16	Sweden	0.32	Spain	0.15	Lithuania
2	0,15	France	0.48	Denmark	0.87	Italy	0.44	Hungary
3	1,28	Austria	0.83	Finland	1.00	Estonia	0.46	Poland
4	1,53	Iceland	2.06	Netherlands	1.62	Slovenia	1.23	Slovak Rep.
5	1,92	Germany	4.52	Norway	4.82	Portugal	2.10	Latvia
6	2,29	Switzerland	4.60	U. K.			3.73	Greece
7	2,47	Czech Rep.						

Figure A1 – Avoidable mortality by country and group

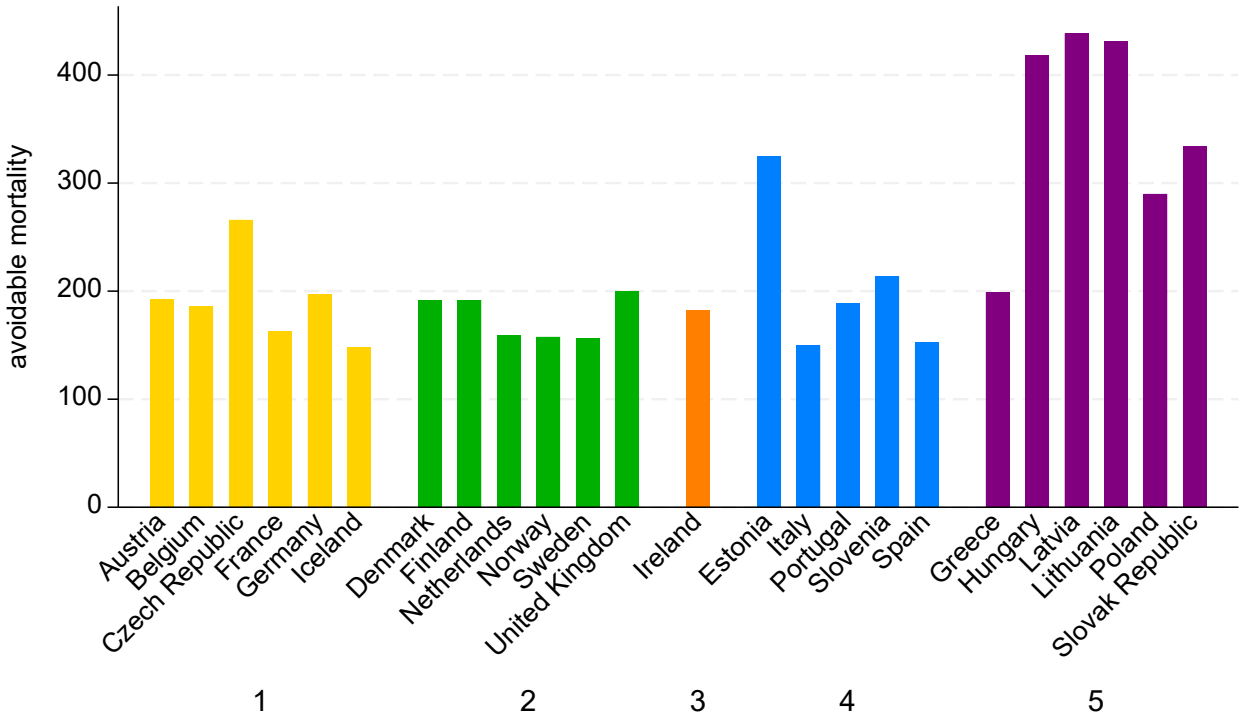


Figure A2 – perceived bad health (>65) by country and group

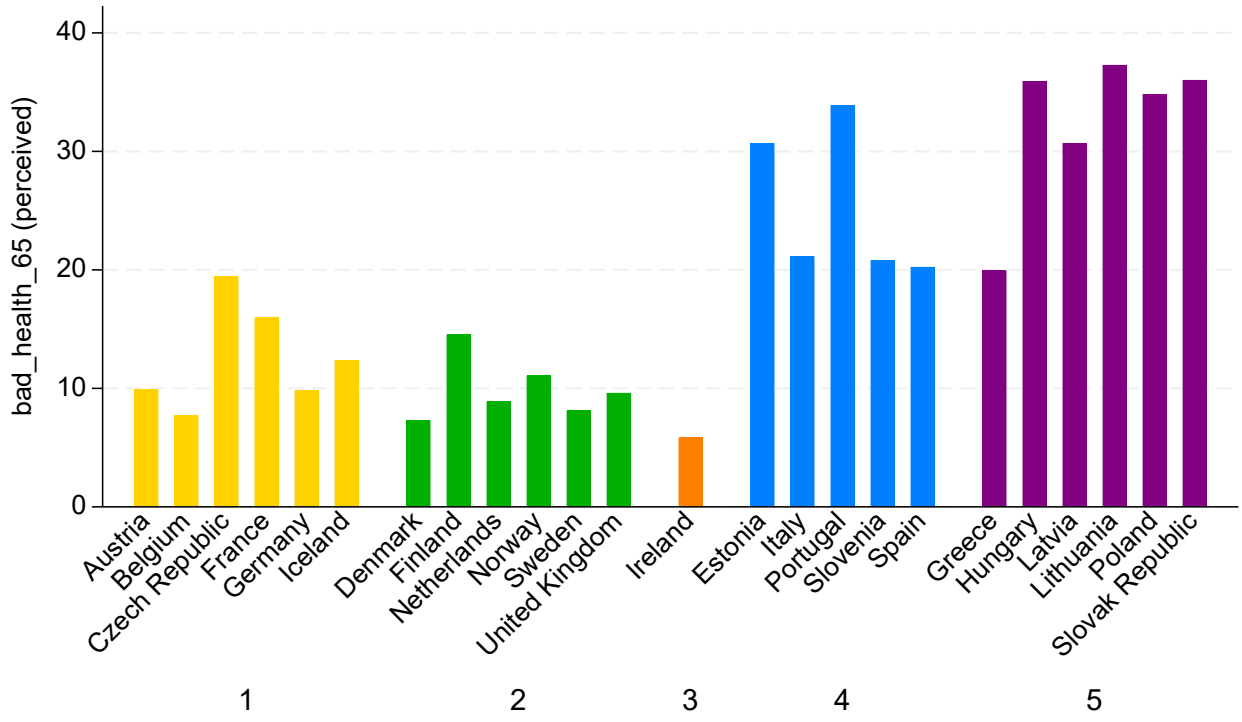


Figure A3 – Unmet needs for financial reasons by country and group

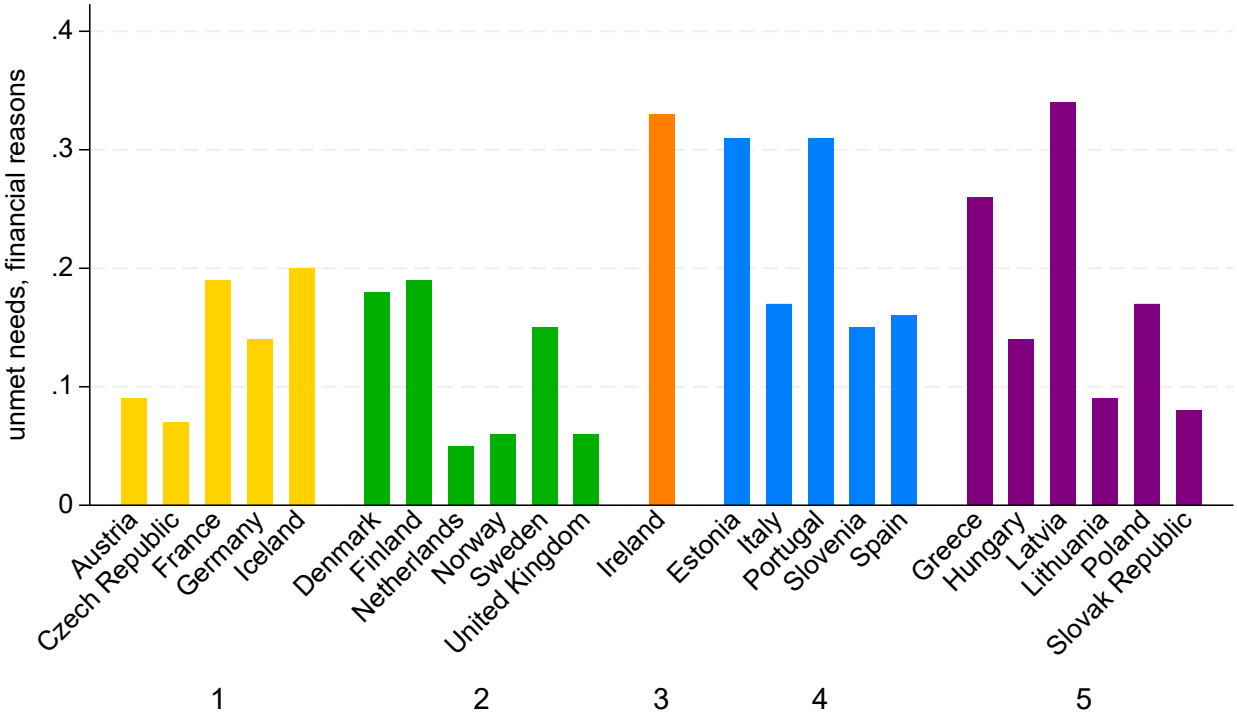


Figure A4: Bad health (>65) and Long Term Care expenditure