How do policy levers shape the quality of a national health system?

Juan David García-Corchero, Dolores Jiménez-Rubio *

Departamento de Economía Aplicada, Facultad de Ciencias Económicas y Empresariales, Campus de Cartuja, Spain

Abstract

Poor quality of care may have a detrimental effect on access and take-up and can become a serious barrier to the universality of health services. This consideration is of particular interest in view of the fact that health systems in many countries must address a growing public-sector deficit and respond to increasing pressures due to COVID-19 and aging population, among other factors. In line with a rapidly emerging literature, we focus on patient satisfaction as a proxy for quality of health care. Drawing on rich longitudinal and cross-sectional data for Spain and multilevel estimation techniques, we show that in addition to individual level differences, policy levers (such as public health spending and the patient-doctor ratio, in particular) exert a considerable influence on the quality of a health care system. Our results suggest that policymakers seeking to enhance the quality of care should be cautious when compromising the level of health resources, and in particular, health personnel, as a response to economic downturns in a sector that traditionally had insufficient human resources in many countries, which have become even more evident in the light of the current health crisis. Additionally, we provide evidence that the increasing reliance on the private health sector may be indicative of inefficiencies in the public system and/or the existence of features of private insurance which are deemed important by patients.

* Corresponding author.
  E-mail addresses: jdcorchero@ugr.es (J.D. García-Corchero), dolores@ugr.es (D. Jiménez-Rubio).

1. Introduction

Quality of care is widely recognised as a fundamental objective of a health system and is a major concern for many national and supranational organisations. Poor quality of care may have a detrimental effect on access and take-up and can become a serious barrier to the universality of health services (World Health Organization, 2019). While most initiatives to improve health care quality focus on clinical aspects of health services, the adoption of a more patient-centred approach is becoming a universally accepted core dimension of healthcare quality (Hanefeld, Powell-Jackson, & Balabanova, 2017). The use of care-quality measures, from the patients' perspective, in addition to the consideration of other, more traditional health system outcomes (effectiveness, equity, efficiency, etc.), enriches the monitoring of health service performance and strengthens decision-making (Barbazza, Kringos, Kruse, Klazinga, & Tello, 2019). Indeed, the use of self-reported measures to evaluate policy outcomes is not exclusive to the health system, but is increasingly accepted as a valuable contribution to the evaluation of many other public policies, in line with the recommendations of Stiglitz-Sen-Fittoussi (Pak, 2020).

One patient-centred outcome which is attracting growing attention in many countries is the level of satisfaction with the care received. In universal health systems in which patients are allowed to select the provider, such as the Netherlands and the UK, the information obtained from patient experience surveys is used not only to monitor health care delivery but also to promote patient choice. Although health care satisfaction is a self-reported quality outcome, several studies have recorded a strong association between subjective and objective measures of this parameter, which suggests that self-reported measures of satisfaction can be considered valid predictors of more objective mechanisms and can legitimately be used to evaluate the performance of health systems (Fiorentini, Robone, & Verzulli, 2018).

In this field, too, recent systematic literature reviews (Doyle, Lennox, & Bell, 2013; Price et al., 2014) provide suggestive evidence of a positive association between patient experience and clinical quality. Thus, focusing on the patient's perspective might make managers and policy makers more alert to the user's needs, perceptions and concerns and help anticipate areas of failure, thus enhancing health service performance (Doyle et al., 2013; Park, Park, Kwon, Kang, & Noh, 2016; Pascoe, 1983). Satisfied patients are more likely to comply with treatment recommendations, whereas lower levels of patient satisfaction might lead to an underutilisation of public services and negatively impact on public health (Price et al., 2014). Previous studies have also reported that individuals who express dissatisfaction with the public health system are more likely to opt out of public health insurance, and that the privately insured are less likely to favour increased spending on the NHS, or to view public healthcare spending as a priority (Costa-Font & Jofre-Bonet, 2008).

In the present study we explore the key drivers of the performance of a National Health System (NHS) -in terms of patient reported quality of care- by drawing on the monitoring framework proposed by Barbazza et al. (2019), which establishes direct links between the capacity, performance and impact of health care in terms of population health status and well-being. Given that many of the factors analysed (most notably public health expenditure and health resources) are directly subject to the influence of policy makers, our study enables a better understanding of the key drivers of quality of care with the aim of informing policymaking and in turn improving population health.

We contribute to the existing literature along several lines. First, in contrast to much previous work (see section 2.1) our study focuses on variations in health system performance (both users and non-users of the NHS) over a long time series. Second, we use data at the regional rather

than the national level, thus increasing the homogeneity in the measurement of the variables considered, and the reliability of the comparisons made (Fiorentini et al., 2018). In addition, unlike some previous studies (e.g. Kotzian, 2009; Robone, Rice, & Smith, 2011; Xesfingi & Vozikis, 2016) we disentangle the resources of health care funding, since there is evidence that reliance on private care might reveal certain drawbacks of a NHS (Costa-Font & García, 2003; Epstein & Jiménez-Rubio, 2019). Finally, we scrutinise and compare the different areas within a NHS (primary, specialised, hospital and emergency services) in terms of service quality, enabling us to target policy recommendations more precisely. Our focus on the situation in Spain provides a unique opportunity to study the drivers of health care quality, given the highly decentralised nature of health services in this country and the long-time span covered by our data (2002–2016), including the onset of the Great Depression in 2008. In addition, since Spain was one the European countries hardest hit by the economic recession, the extended time span of our analysis provides the opportunity to consider the major financial cutbacks in the health care sector that followed the 2008 recession[1] (Grigorakis, Floros, Tsangari, & Tsoukatos, 2018) and which were asymmetrically implemented across the regions (Gallo & Gené-Badia, 2013; Gené-Badia, Gallo, Hernández-Quevedo, & García-Armesto, 2012).

While we focus our analysis on multilevel modeling, our results are robust to a battery of robustness tests, including first differences estimations, which are less likely to produce spurious results, and lagged estimations of our key policy levers, to account for a non-contemporary effect of our variables of interest.

The study results suggest that regional characteristics such as public health expenditure or the doctor-patient ratio exert a considerable influence on health service quality. Another significant finding is that there seems to be a considerable interaction between private and public health sectors, as for some of the NHS services analysed, the proxy for private healthcare is negatively associated with patient satisfaction.

The remainder of this paper is organised as follows: in the following section, we conduct a review of the main existing literature in the area and describe the main characteristics of the Spanish National Health System, after which we show the empirical strategy employed. The study findings are detailed in section 4 and section 5 presents the main conclusions drawn and identifies relevant policy implications.

2. Literature Review and Spanish Health System

2.1. Literature review

Several recent studies have evaluated health system reforms on the basis of self-reported health system satisfaction and other non-clinical factors (Hekkert, Cihangir, Kleefstra, van den Berg, & Kool, 2009; Valentine, Prasad, Rice, Robone, & Chatterji, 2010; Barbazza et al., 2019), in contrast to previous literature in this area, which has mainly focused on the effect of demand-side characteristics ("patient expectations") usually in terms of individual covariates such as gender, education, age or income (Costa-Font & Jofre-Bonet, 2008; Kotzian, 2009; Pak, 2020; Park et al., 2016; Pascoe, 1983; Price et al., 2014). However, in recent years, there has been growing interest

---

[1] In line with many other European countries such as the UK, Greece or Portugal, Spain implemented a pro-cyclical economic policy on public health budgets to address fiscal pressure in the aftermath of the 2008 economic recession (Grigorakis et al., 2018).

in analysing the influence on service quality of the patient's socioeconomic environment and of health system supply factors. Hekkert et al. (2009) argued that although an important part of the patient satisfaction- explained variance depends on the patient's own characteristics (such as socioeconomic status), hospital-specific attributes like hospital type and size and catchment-area population density also play an important role. In this line, Robone et al. (2011) examined how the characteristics of health systems, the structure of the population and the economic, cultural and institutional characteristics of the health system context may influence patient-perceived quality and health system responsiveness in different countries[2] . This study concluded that a country's education level and overall health expenditure have a significant impact on responsiveness. On the other hand, the percentage of public health care expenditure in total expenditure is inversely related to this responsiveness, which suggests that market incentives may play an important role in promoting patient responsiveness.

In this context, Malhotra and Do (2017) explored disparities in health service quality in a large set of richer and poorer countries and found that public health expenditure appears to be closely related to patient-perceived quality, especially in the case of less well-off individuals. The authors concluded that increasing the capacity of the public health service, by improving healthcare coverage and reducing out-of-pocket expenditure, could significantly reduce socio-economic disparities in terms of health system responsiveness. Several empirical studies of the role played by publicly-financed health services have measured the capacity of the health system, for example in terms of the health care resources allocated to the health system. In this regard, Xesfingi and Vozikis (2016) reported that patient satisfaction was mostly influenced by healthcare-related indicators proxied by the proportion of clinical staff (positively) and of hospital beds (negatively). In Spain, Pérez-Romero, Gascón-Cánovas, Salmerón-Martínez, Parra-Hidalgo, and Monteagudo-Piqueras (2017) looked into the influence of socioeconomic and health factors on satisfaction with the health system. These authors highlighted the existence of considerable differences among Spanish regions in terms of supply-side factors such as total health expenditure. On the other hand, Gené-Badia et al. (2012) argued that the substantial increase in public spending that took place in Spain immediately before the 2008 recession did not seem to have directly increased the health-care satisfaction of the population. Indeed, patient-reported satisfaction with health care was reported to have increased during the subsequent economic recession in Spain (2009-2011).

Overall, most previous studies have observed a positive impact of public health-related resources on quality, proxied by satisfaction with the health services, although the results are somewhat inconclusive. In addition, owing to the cross-sectional nature of the data employed, most previous research in this respect (e.g. Gené-Badia et al., 2012; Pérez-Romero et al., 2017; Xesfingi & Vozikis, 2016) does not reflect the long-term evolution of the main variables of interest, thus ignoring the lagged effect of macroeconomic policies.

2.2. Spanish health care system

Spain has a universal health care system that is free at the point of delivery with the exception of pharmaceuticals, which may require co-payment (Bernal-Delgado et al., 2018). To a large

---

[2] Health system responsiveness is a measure of how well a health system responds to non-clinical aspects of health care and meets the population's legitimate expectations in their interaction with the health system. The notion of patient satisfaction does not fully coincide with the concept of responsiveness because it "may not capture what actually happens when people come in contact with the health system, and the responses are strongly influenced by prior expectations of what will or should happen" (Darby, Valentine, Murray, & De Silva, 2000).
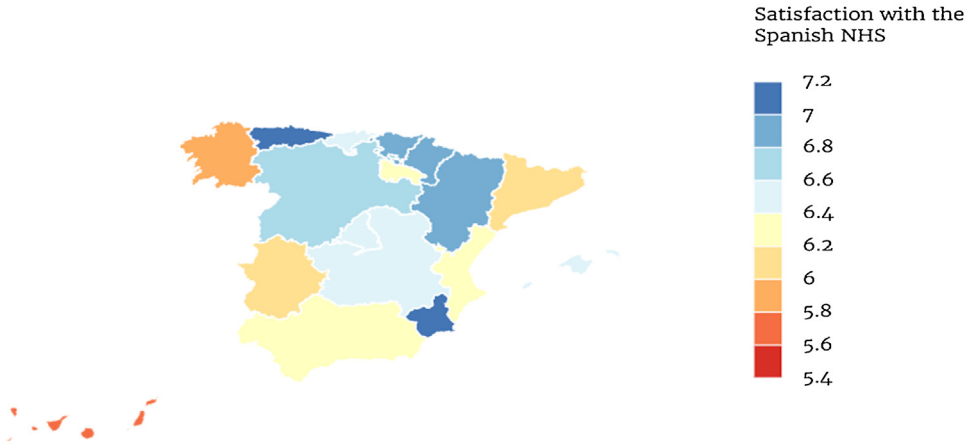
Fig. 1. Average satisfaction with the Spanish NHS, 2002–2016.
[1]Source: The authors, based on the Spanish National Health Barometer.

extent, health services are publicly provided (the public sector accounted for 70.8% of total health spending in 2019) (OECD Statistics, 2020). Decentralisation was negotiated region by region over a period of twenty years (1981-2001) in a transformation that was largely politically motivated (Bustillo et al., 2014; Antón, De Bustillo, Macías, & Rivera, 2014; Costa-Font & Ferrer-i-Carbonell, 2019). In addition to a comprehensive common health care package, a complementary package is provided at the discretion of each of the highly devolved Autonomous Communities.

While the Spanish NHS provides universal health care to all individuals residing in the country and is funded mainly by general taxation, the last decade has witnessed a considerable increase in the importance of health services that are publicly financed but privately produced, through different forms of management (Bernal-Delgado et al., 2018). In addition, the proportion of the population covered by private insurance rapidly increased from 7.6 per cent in 2001 to 16.5 per cent in 2017 (OECD Statistics, 2020), a growing trend that have also experienced many other countries in recent years (OECD, 2019). To a large extent, private insurance in Spain provides either a larger choice of providers or a faster access to health care services (duplicate insurance), a feature which is also shared by many other OECD countries.

In view of the strong decentralisation of the Spanish health system and the resulting geographic heterogeneity (see Fig. 1), this country provides an excellent setting in which to study the drivers of health service quality (Antón et al., 2014; Costa-Font & Ferrer-i-Carbonell, 2019). Interestingly, as Fig. 2 shows, despite a considerable decrease in public health expenditure during the recession, the level of satisfaction with the Spanish NHS actually increased at first, although it later fell. Gallo and Gené-Badia (2013) suggested that the economic crisis and the consequent cutbacks had the initial effect of lowering expectations, making them easier to meet.

3. Empirical Strategy

3.1. Data source

This study is mainly based on microdata drawn from the Spanish Health Barometer (SHB) survey for the years 2002-2016. The SHB survey (Ministerio de Sanidad, Consumo y Bienestar
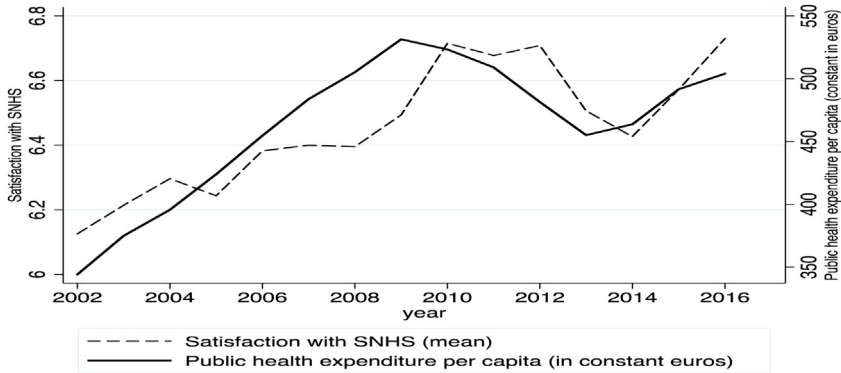
Fig. 2. Evolution of satisfaction with the Spanish National Health System (SNHS) and public health expenditure in Spain (2002–2016).
[1] Source: The authors, based on the Spanish National Health Barometer and the Health Ministry Data Base.
[2] Regional public health expenditure in constant euros.

Social, 2018a) is conducted annually, with a representative sample of the Spanish population, aged 18 and above, totalling more than 7800 people per year, and collects information on opinions, attitudes, utilisation and perceptions of health services. Our total study sample is composed of 103,509 individuals. Data for public health care resources and health spending were obtained from the Spanish Health Ministry Database (Ministerio de Sanidad, Consumo y Bienestar Social, 2018b). Data for GDP and other regional covariates were obtained from the Instituto Nacional de Estadísitca (2018).

3.2. Study variables

The main dependent variable is the level of satisfaction with the Spanish public health system, as measured by the Spanish Health Barometer using the question: "How well do you think the Spanish public health system is working?". As an alternative dependent variable, we use the level of satisfaction with specific health care services, with the questions: "How would you rate the following services: Primary Care (general practice or paediatrics), Specialist Care; Hospital service; Emergency service?". Opinions about general and specific health care services are rated by both actual and potential users of public health services, on a scale from 1 (very dissatisfied) to 10 (very satisfied).

The socioeconomic variables considered at the individual level include gender; age; and education and employment status as proxies for socio-economic status. Finally, a set of dummies for area of residence are included to account for rurality (areas with fewer than 10,000 inhabitants). We adjust for frequency of use by including a set of dummies for respondents who made one or two health visits and those who made three or more visits, to one or more health services, during the year immediately prior to the survey. For estimations based on specific health services, the self-assessed health (SAH) status of individuals is also included to take into account the possibility of reporting heterogeneity in terms of health status, following the procedure adopted previously by Fiorentini, Ragazzi, and Robone (2015).

Among the region-specific characteristics that might be considered, we focus in particular on public health expenditure, which is a major driver of health system performance and health care satisfaction (Malhotra & Do, 2017; Xesfingi & Vozikis, 2016). The influence of private healthcare

on patients' satisfaction with the health services received is measured by reference to regional expenditure on private health insurance (PHI) per capita. Previous studies have shown that there is a high level of interdependence between public and private provision of healthcare (Augurzky & Tauchmann, 2011; Costa-Font & García, 2003; Jofre-Bonet, 2000; Chan et al., 2015; Wang, Ghislandi, & Torbica, 2020), with private insurance often revealing some deficiencies in publicly provided health care. Our study also controls for public health resources in terms of clinical staff (doctors and nurses) and hospital beds, which is in line with the approach adopted by Xesfingi and Vozikis (2016). Detailed analyses of health service resources are based on the ratios of doctors and nurses in primary and in specialised care and (for hospital and emergency services), the ratio of hospital beds. The impact of regional economic development is addressed by a dummy variable[3] which equals one if income is below the average of the sample, which we expect to highlight income-related differences among Spanish regions.

The descriptive statistics considered and the definitions of the variables employed in our estimations are presented in Table 1.

3.3. Analysis technique: specification and estimation

According to previous research, the variance of health care-related variables might be influenced not only by patients' individual characteristics or their own experience but also by regional attributes (Pérez-Romero et al., 2017; Robone et al., 2011; Valentine & Bonsel, 2016). Some characteristics of regional health systems are under the direct influence of policy makers and managers, and thus constitute potential policy levers. In the highly decentralised Spanish NHS, the financing and management of the health system is controlled directly by regional governments, and therefore it is highly likely that individuals in the same region will report a more similar degree of satisfaction than individuals living in a different region. Accordingly, our analysis must take into account the fact that individuals are clustered hierarchically within regions. In view of these considerations, random intercepts are included to allow mean values to differ across regions. Two levels were analysed: individuals, as level 1, and region-year combinations, as level 2. On this basis, we consider the following equation:

$$Y_{i,j} = (\beta_0 + u_j) + \beta_1 X_{ij} + \beta_2 Z_j + \varepsilon_{ij} \text{ or}$$

$$Y_{i,j} = \beta_{0i} + \beta_1 X_{ij} + \beta_2 Z_j + \varepsilon_{ij}$$

where $\beta_{0i} = \beta_0 + u_j$

Let $Y_{i,j}$ denote the reported health satisfaction with the Spanish public health system or with respect to the primary, specialist and hospital care received by an individual i living in region j. β_0 is the overall intercept coefficient. X includes a set of individual variables (level 1) and Z reflects the regional characteristics (level 2). ε_{ij} is the random error at the individual level. The residuals, σ_ε^2 and σ_u^2, are assumed to have a normal distribution with zero mean and a variance of one. The STATA 15 (StataCorp, 2017) command *mixed* was used to perform the econometric analysis. The marginal effects of the explanatory variables are estimated via maximum likelihood.

---

[3] We use a dichotomous variable of regional income in our baseline results. However, results are generally qualitatively very similar using the log of regional GDP (results not shown here for the sake of brevity but available from authors upon request).

Table 1
Sample characteristics.

Variable	Mean	SD	Min	Max	Period
Satisfaction					
Health public system	6.39	1.95	1	10	2002–2016
Primary services	7.34	1.88	1	10	2010–2016
Specialist services	6.81	1.99	1	10	2010–2016
Hospital care	6.83	2.04	1	10	2010–2016
Emergency service	6.13	2.29	1	10	2010–2016
Individual level covariates					
Gender					
Female	51.11%	0.5	0	1	2002–2016
Education					
No qualification	2.90%	0.17	0	1	2002–2016
Primary studies	22.43%	0.42	0	1	2002–2016
Secondary studies	49.08%	0.5	0	1	2002–2016
University degree	20.28%	0.4	0	1	2002–2016
Age					
18 to 35	29.45%	0.46	0	1	2002–2016
36 to 45	19.76%	0.4	0	1	2002–2016
46 to 65	29.56%	0.46	0	1	2002–2016
66 to 75	12.10%	0.33	0	1	2002–2016
76 or more	9.13%	0.29	0	1	2002–2016
Activity					
Employed	45.06%	0.5	0	1	2002–2016
Unemployed	17.76%	0.38	0	1	2002–2016
Retired	25.04%	0.43	0	1	2002–2016
Inactive	11.97%	0.32	0	1	2002–2016
Area of residence					
Rural (<10,000 inhabitants)	23.55%	0.42	0	1	2002–2016
Self-assessed health status					
Good	73.81%	0.44	0	1	2010–2016
Fair	21.95%	0.41	0	1	2010–2016
Poor	4.24%	0.2	0	1	2010–2016
Health services use					
0 visits	29.47%	0.46	0	1	2002–2016
1−2 visits	35.27%	0.48	0	1	2002–2016
3 or more visits	28.55%	0.45	0	1	2002–2016
Regional level covariates					
Public health spending					
Regional public expenditure per capita (real)	454.37	69.39	306.1	648	2002–2016
Private healthcare					
Private health insurance expenditure p.c.	18.28	14.99	1.04	67.33	2002–2016
Public healthcare resources					
Hospital beds per 1,000 pop.	2.5	0.47	1.65	3.7	2004–2016
Physicians per 1,000 pop.	2.41	0.26	1.88	3.4	2004–2016
Nurses per 1,000 pop.	3.78	0.52	2.92	5.65	2004–2016
Primary care resources					
Nurses per 1,000 pop.	0.77	0.1	0.58	1.11	2004–2016
Physicians per 1,000 pop.	0.65	0.1	0.45	0.89	2004–2016
Specialist care resources					
Nurses per 1,000 pop.	3.08	0.49	2.31	4.93	2004–2016
Physicians per 1,000 pop.	1.61	0.22	1.19	2.6	2004–2016
Hospital/Emergency service resources					
Nurses per 1,000 pop.	3.08	0.49	2.31	4.93	2004–2016

Table 1 (*Continued*)

Variable	Mean	SD	Min	Max	Period
Physicians per 1,000 pop.	1.61	0.22	1.19	2.6	2004–2016
Beds per 1,000 pop.	2.5	0.47	1.65	3.7	2004–2016
Sociodemographic factors					
Ageing index	119.91	34.24	68.13	207	2002–2016
Poorer (Centred log GDP)	0.51	0.5	0	1	2002–2016
Regional GDP per capita (real)	7925.99	1481.72	4645.72	11966.88	2002–2016

[1]Source: The authors, based on the Spanish National Health Barometer and the Health Ministry Data Base.

Various robustness tests are carried out in this study. The multilevel regressions detailed in Table 3 illustrate the lag assumed in public expenditure and resources to allow for the possibility of non-contemporary effects of these variables on health care-related outcomes. Furthermore, since the estimations based on overall health services are obtained using a very long time series dataset (2002−2016), we provide estimations based on first differences (see Table 4), which is an efficient means of dealing with the problems of omitted variables and of spurious correlations (Wooldridge, 2016), and of addressing regional variations in quality over time. Lastly, in order to test whether any of the regions was driving the results, leaving-one-out tests were performed, by deleting in turn the observations for each of the Spanish regions included.

4. Results and discussion

4.1. Satisfaction with the Spanish National Health System

Table 2 presents the linear multilevel estimations obtained for overall satisfaction with the Spanish NHS. Model 0 represents the empty model, and shows the extent to which the data on satisfaction with the Spanish NHS are nested. The intraclass correlation[4] (ICC) for level 2 (region-year) is 0.0577, implying that there is a 5.77% of variance between groups. Accordingly, the total variance for the dependent variable is explained not only by the variations among individuals but also by those among regions.

Models 1, 2 and 3 represent the regressions of each random-intercept model on individual level covariates, including health spending and other region-specific socioeconomic characteristics. These models show that female sex, higher-education qualifications and employed status are all negatively associated with the perceived quality of health services. Our detection of a negative gradient for the relationship between education background and health system satisfaction corroborates previous research in the field (e.g. Park et al., 2016), which suggested that individuals with higher education qualifications have greater expectations of public health services. In contrast, in line with previous studies, age is found to be positively associated with health care quality. This finding may be explained by the fact that older people in Spain have had access to universal tax-funded healthcare since 1986, and they seem to value this provision[5] . Interestingly, low-frequency users (one or two visits per year) of public health services are more satisfied with the Spanish NHS than are non-users.

---

[4] The intra class correlation (ICC) is defined as the proportion of total variance that can be explained by the upper level [39]. In our study, for the level 2 (region- year) as 0.2214/(0.2214+3.6170)=0.0577.

[5] Alternative explanations point to the fact that higher frequency of utilization by elderly people is related to higher levels of satisfaction due to more realistic expectations (Park et al., 2016).

Table 2
Estimations of satisfaction with the SNHS. Random-intercept multilevel models (2002–2016).

VARIABLES	Model 0	Model 1	Model 2	Model 3	Model 4	Model 5
Fixed part						
Individual level covariates						
Gender		−0.101***	−0.101***	−0.102***	−0.101***	−0.103***
Female		(0.0123)	(0.0123)	(0.0123)	(0.0123)	(0.0131)
Age						
36 to 45		−0.00125	−0.00194	−0.00185	−0.00299	−0.0120
		(0.0170)	(0.0170)	(0.0170)	(0.0170)	(0.0183)
46 to 65		0.132***	0.130***	0.130***	0.130***	0.115***
		(0.0161)	(0.0161)	(0.0161)	(0.0161)	(0.0172)
66 to 75		0.547***	0.545***	0.545***	0.543***	0.510***
		(0.0268)	(0.0268)	(0.0268)	(0.0268)	(0.0291)
76 or more		1.008***	1.006***	1.005***	1.002***	0.986***
		(0.0301)	(0.0301)	(0.0301)	(0.0302)	(0.0325)
Education						
Primary studies		−0.0132	−0.0144	−0.0158	−0.0180	−0.0247
		(0.0247)	(0.0247)	(0.0247)	(0.0247)	(0.0272)
Secondary studies		−0.151***	−0.153***	−0.154***	−0.155***	−0.157***
		(0.0260)	(0.0260)	(0.0260)	(0.0260)	(0.0287)
University degree		−0.0458	−0.0485*	−0.0499*	−0.0505*	−0.0462
		(0.0283)	(0.0283)	(0.0283)	(0.0283)	(0.0310)
Activity						
Retired		−0.0644***	−0.0629***	−0.0633***	−0.0630***	−0.0488*
		(0.0240)	(0.0240)	(0.0240)	(0.0240)	(0.0259)
Employed		−0.190***	−0.188***	−0.189***	−0.189***	−0.190***
		(0.0206)	(0.0206)	(0.0206)	(0.0206)	(0.0221)
Unemployed		−0.141***	−0.139***	−0.139***	−0.140***	−0.141***
		(0.0227)	(0.0227)	(0.0227)	(0.0227)	(0.0243)
Area of residence						
Rural		0.0932***	0.0924***	0.0930***	0.0933***	0.0803***
		(0.0142)	(0.0142)	(0.0142)	(0.0142)	(0.0153)
Health services use						
1−2 visits		0.0455***	0.0454***	0.0455***	0.0447***	0.0439**
		(0.0170)	(0.0170)	(0.0170)	(0.0170)	(0.0177)
3 or more visits		−0.0249	−0.0236	−0.0235	−0.0235	−0.0209
		(0.0152)	(0.0152)	(0.0152)	(0.0153)	(0.0160)
Regional level covariates						
Public healthcare resources						
Regional public expenditure per capita (log)			1.181***	1.096***	1.115***	0.717***
Sociodemographics						
Ageing index				0.00207***	0.00177**	0.00161
				(0.000754)	(0.000778)	(0.00103)
Higher-income region				ref.	ref.	ref.
Lower-income region				−0.127**	−0.146**	−0.262***
				(0.0530)	(0.0581)	(0.0767)
Private health insurance per capita (log)					−0.0237	−0.0900**
					(0.0379)	(0.0402)
Public healthcare resources						
Hospital beds per 1,000 pop.						−0.408***

Table 2 (*Continued*)

VARIABLES	Model 0	Model 1	Model 2	Model 3	Model 4	Model 5
						(0.0787)
Nurses per 1,000 pop.						−0.0425
						(0.0810)
Physicians per 1,000 pop.						0.800***
						(0.159)
Constant	6.457***	6.500***	−0.736	−0.396	−0.402	1.560
	(0.0302)	(0.0450)	(1.051)	(1.036)	(1.031)	(1.329)
Random part						
ICC	5.77%	5.56%	4.68%	4.48%	4.42%	3.42%
AIC	429,775	423,485	423442.5	423429.5	422399.9	368588.1
BIC	429803.6	423637.7	423604.8	423429.5	422609.9	368823.3
Observations	104,027	103,509	103,509	103,509	103,236	89,995
Number of groups	255	255	255	255	254	220

[1]Model 0: empty model. Model 1: only variables at individual level. M2: M1+ public expenditure. M3: M2: + socioeconomic characteristics. Model 4: M3+ Private healthcare insurance. Model 5: M4+ Public healthcare resources.
[2]Note: Standard errors are shown in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
[3]Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) were calculated to compare the goodness-of-the-fit. A smaller AIC or BIC indicates a better-fitting model.
[4]Source: The authors, based on the Spanish National Health Barometer and the Health Ministry Data Base.

Table 3

Multilevel estimations for satisfaction with the SNHS with lagged public expenditure and resources.

Variables	Model 1	Model 2
Lag of public health care resources		
Lag regional public expenditure per	1.991***	1.510***
capita (real) (log)	(0.507)	(0.524)
Lag physicians per 1000 pop.	0.669***	0.558***
	(0.157)	(0.166)
Lag nurses per 1000 pop.	−0.0282	−0.0193
	(0.0791)	(0.0837)
Lag hospital beds per 1000 pop.	−0.405***	−0.421***
	(0.0773)	(0.0828)
Lag of private health care resources		
Lag of private health Insurance per capita	−0.00228	−0.00232
	(0.00212)	(0.00229)
ICC	2.92%	2.91%
AIC	342142.9	315880.5
BIC	342366.8	316102.5
Observations	83,437	76,872
Number of groups	203	186

[1]Model 1: Public spending and resources are included with lagged resources for one year. Model 2: Lagged effect for two years.
[2]Note: Standard errors are shown in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
[3]Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) were calculated to compare the goodness-of-the-fit. A smaller AIC or BIC indicates a better-fitting model.
[4]Source: The authors, based on the Spanish National Health Barometer and the Health Ministry Data Base.
[5]Results for Individual-level variables and for no-lagged covariates at regional level not shown for simplicity but available upon request from authors.

Our results show that there are statistically significant differences among individuals according to their area of residence, with individuals from rural areas reporting a higher level of satisfaction than those living in urban ones. This finding might be explained by the fact that patients in rural areas are assigned a higher priority in waiting lists for specialist attention (Abásolo, Negrín-Hernández, & Pinilla, 2014).

A significant positive relationship was recorded between the level of regional health expenditure and patients' satisfaction with the Spanish NHS. Specifically, an increase of 10% in regional public health expenditure per capita was associated with an increase of around 0.1 points on the perceived quality scale. However, after controlling for differences in health staff and hospital beds (see model 5), this relationship was found to be weaker. Although Robone et al. (2011), among others, have reported that greater expenditure on public health, per se, may not lead directly to improvements in public health care quality, other authors (e.g. (Malhotra & Do, 2017; Xesfingi & Vozikis, 2016)) maintain that higher public expenditure does indeed enhance the quality of care provided. Moreover, according to Banka et al. (2015) and Fiorentini et al. (2018), increases in the level of health resources reduce workloads and thus improve the relationship between patients and staff.

Models 4 and 5 represent the estimations obtained when private health insurance expenditure (PHI) per capita and public resources devoted to healthcare are included in the estimations. Remarkably, whereas the ratio of doctors per 1000 inhabitants is positively associated with health system satisfaction (see model 5), with an increase of 0.8 points in satisfaction for each additional doctor per 1000 inhabitants, persons living in regions with a higher ratio of public beds per 1000 inhabitants reported a significantly lower level of satisfaction with health system quality (0.4 points less).

With respect to PHI, persons living in regions with a larger per capita expenditure on PHI are less satisfied with the Spanish NHS than those living where this expenditure is less, even after controlling for various levels of public health resources (in Model 5). This might be explained by the fact that those who opt out of public services tend to be generally less satisfied with publicly funded healthcare (e.g. see Costa-Font & García (2003)). However, as suggested by Robone et al. (2011), choice and competition may also play an important role in explaining the higher level of responsiveness associated with private health care.

The level of satisfaction with the Spanish NHS in low-income regions is significantly lower than in richer regions, even after adjusting for other regional characteristics, such as aging, private healthcare expenditure and public health resources. According to the results obtained from model 5, persons living in low-income regions are likely to perceive 0.26 points lower health system quality than those in higher-income regions.

The Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) were calculated to compare the goodness-of-the-fit[6] of each model considered. According to these test results and the ICC values obtained, model 5 (which includes all regional characteristics) performs best. Regarding the sensitivity analysis, the results obtained from the first-differences models are generally in line with those of the baseline multilevel results (see Table 4). However, with respect to private expenditure, although still negative and substantial in magnitude, the power of the estimations for the first-differences model is slightly reduced, especially for the estimations including

---

[6] AIC and BIC are written in the form $[-2\log L + kp]$, where L is the likelihood function, p is the number of parameters in the model and k is 2 for AIC and $\log(n)$ for BIC. In the case considered, a smaller AIC or BIC indicates a better-fitting model.

Table 4
First-differences estimations for satisfaction with the SNHS.

	Model 0	Model 1	Model 2	Model 3
Variables				
Public healthcare resources				
Regional public expenditure per capita (log)	0.250	0.278*	0.305**	0.381**
	(0.156)	(0.136)	(0.136)	(0.152)
Physicians per 1000 pop.				0.618**
				(0.277)
Nurses per 1000 pop.				−0.242*
				(0.135)
Hospital beds per 1000 pop				0.183
				(0.183)
Sociodemographics				
Ageing index		0.010*	0.009*	0.009
		(0.005)	(0.005)	(0.008)
Higher education index		−0.054**	−0.056**	−0.046**
		(0.019)	(0.019)	(0.020)
Lower-income region		−0.096*	−0.088*	−0.062
		(0.047)	(0.042)	(0.045)
Private healthcare				
Private health insurance per capita (log)			−0.007**	−0.007*
			(0.003)	(0.004)
Time trend	−0.001	−0.003	−0.003	0.000
	(0.002)	(0.003)	(0.003)	(0.004)
Constant	2.016	6.538	5.130	−0.600
	(4.518)	(5.479)	(5.395)	(8.953)
AIC	−33.13	−42.77	−41.09	−41.04
BIC	−22.52	−21.94	−16.84	−7.958
Observations	254	238	236	202

[1] Model 0: Regional health expenditure. Model 1: M0 + socioeconomic characteristics. M2: M1+ Private healthcare insurance expenditure. M3: M2 + public healthcare resources.
[2] Note: Standard errors are shown in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
[3] Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) were calculated to compare the goodness-of-the-fit. A smaller AIC or BIC indicates a better-fitting model.
[4] Source: The authors, based on the Spanish National Health Barometer.

other public health-related resources, probably due to the more limited time span corresponding to these variables (see Table 1). Finally, for our baseline model, the multilevel estimations, there seems to be a considerable non-contemporary effect of public resources (according to the AIC-BIC analyses, the model in which two lags are included performs best; see Table 3). Finally, as an alternative sensitivity analysis, we performed leaving-one-out tests in which we estimate all six models, deleting in turn the observations for each of the 17 regions considered, to address the possibility that one of the regions in particular may be driving the results. From these findings, we conclude that in general the effect of public expenditure is substantial across all regions, regardless of their income level (results of this sensitivity analysis not reported for brevity here but available upon request from authors).

4.2. Satisfaction with the primary, specialist, hospital and emergency services of the Spanish National Health System

Table 5 describes the multilevel regressions obtained for patients' satisfaction with primary, specialist hospital care and emergency care for the period 2010−2016. The explained variance of satisfaction with public health services, by region and year (ICC), taking into account regional variables, ranges from 2.05% for primary care, 2.24% for specialist services, 3.57% for hospital services and 3.34% for emergency services in the empty model.

The associations between each of these variables and satisfaction with all public health services are mostly similar to those for overall satisfaction with the public health system. The estimations obtained for specific health services also include self-assessed health status[7] (SAH). In this respect, our analysis shows that persons with a lower self-reported health status report greater dissatisfaction with the quality of the services provided by the Spanish NHS, all else being equal. This result shows a pattern of reporting bias in terms of health status which is in line with Fiorentini et al. (2015) for health system responsiveness.

The influence of regional variables on indicators of quality varies according to the health service considered. In this respect, the impact of public expenditure remains positive and is of considerable magnitude for primary health care. Although patients who live in poorer regions appear to be far less satisfied with public health services (in all cases), this effect only persists for primary care once we control for public health resources. As in the case of general services, the effect of public health resources is substantial and highly significant for all health services. However, for emergency care, spending has a weaker impact, but a larger (and positive) association is found with the patient-nurse ratio than that obtained for general health services. In this line, too, Kotzian (2009) argues that the Higher the doctor-patient ratio, the greater the degree of satisfaction with the health system, since staff shortages can seriously impact on the quality of the service and ultimately on health-related outcomes. In this respect, Jofre-Bonet (2000) and Fernández-Pérez and Sánchez (2020), among others, have suggested that the time spent waiting for health care attention is one of the most important responsiveness domains related to patients' satisfaction with the public health care system. Similarly, Irving et al. (2017) recorded significant associations between national health care spending, the duration of consultations and the burnout that may be suffered by medical personnel. These authors argue that shorter consultations in primary care due to budget constraints are prejudicial to patients' health and to physicians' workloads and mental health.

Interestingly, while PHI per capita is negatively associated with satisfaction, for all services, the magnitude of this effect is only large and statistically significant for emergency services. Lastly, for hospital care, the ratio of public beds (per 1000 inhabitants) is negatively associated with health system satisfaction. This finding is in line with Xesfingi and Vozikis (2016), and may reflect a problem of over-supply. The latter authors argue that the level of hospital bed occupancy is decreasing across Europe as a result of less invasive surgical procedures and more effective drugs, both of which reduce the length of hospital stays. However, as concerns Spain, this question requires further research. It could also be the case that despite increases in the number of hospital beds, levels of bed occupancy remain high. In fact, in a study conducted in the UK, lowering

---

[7] Information about self-assessed health is only available from 2010 onwards (see Table 1). However, estimations for overall satisfaction with health services controlling for SAH generally yield very similar results and with the magnitude of SAH in line with those for specific healthcare services (results available from authors upon request).

Table 5

Estimations of satisfaction with health care services of the SNHS. Random-intercept multilevel models (2010–2016).

VARIABLES	Primary			Specialist			Hospital			Emergency		
	Model 0	Model 1	Model 2	Model 0	Model 1	Model 2	Model 0	Model 1	Model 2	Model 0	Model 1	Model 2
Regional level covariates												
Public health care resources												
Regional public expenditure per capita (in constant euros)		0.452**	0.534**		0.474*	0.0578		0.942***	0.467		0.841***	−0.0839
		(0.218)	(0.217)		(0.257)	(0.302)		(0.303)	(0.371)		(0.312)	(0.399)
Sociodemographics												
Ageing index		0.000800	0.000332		0.000800	0.000332		0.000788	0.000217		0.00255**	0.000131
		(0.000705)	(0.000793)		(0.000829)	(0.000974)		(0.000977)	(0.00136)		(0.00101)	(0.00146)
Lower-income region		−0.174***	−0.187***		−0.180***	−0.0665		−0.291***	−0.215*		−0.263***	0.0537
		(0.0564)	(0.0582)		(0.0665)	(0.0887)		(0.0785)	(0.126)		(0.0806)	(0.136)
Private health care												
Private health insurance per capita (log) (in constant euros)		−0.0194	−0.0120		−0.0354	−0.0379		−0.0755	−0.103*		−0.174***	−0.186***
		(0.0451)	(0.0513)		(0.0531)	(0.0494)		(0.0627)	(0.0555)		(0.0643)	(0.0596)
Public health care resources												
Physicians			1.043**			0.981***			0.937***			0.551**
			(0.452)			(0.230)			(0.258)			(0.277)
Nurses			−0.819*			−0.116			0.0416			0.322***
			(0.472)			(0.0907)			(0.116)			(0.124)
Beds									−0.279***			−0.0244
									(0.0886)			(0.0951)
Constant	7.378***	4.127***	6.258***	6.837***	4.263***	5.735***	6.889***	1.152	3.128	6.190***	1.149	5.061**
	(0.0262)	(1.384)	(1.399)	(0.0289)	(1.624)	(1.698)	(0.0368)	(1.917)	(1.997)	(0.0400)	(1.967)	(2.145)
Random part												
ICC	2.05%	1.59%	1.22%	2.24%	1.94%	1.64%	3.57%	2.67%	2.09%	3.34%	2.19%	1.82%
AIC	202807.1	199656.2	199644.2	199,680	175978.2	175965.4	193,647	170562.5	170539.9	211748.8	186689.4	186677.4
BIC	202833.5	199841.2	199864.5	199706.3	176177.3	176181.7	193673.1	170760.6	170755.2	211775.1	186888.3	186902.3
Observations	49,661	49,501	44,231	47,594	42,332	42,332	45,697	40,659	40,659	47,348	42,138	42,138
Number of groups	119	119	119	119	119	119	119	119	119	119	119	119

[1]Model 0: empty model. M1: Variables at individual level + public spending. M2: M1 + socioeconomic characteristics + private healthcare + public health resources.

[2]Note: Standard errors are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

[3]Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) were calculated to compare the goodness-of-the-fit. A smaller AIC or BIC indicates a better-fitting model.

[4]Source: The authors, based on the Spanish National Health Barometer and the Health Ministry Data Base.

[5]Results for Individual-level variables not shown for simplicity but available upon request from authors.

levels of bed occupancy below 90% was found to be positively associated with better hospital performance and with lower rates of mortality (Boden et al., 2016).

5. Conclusion and policy implications

This study explores the determinants of an increasingly employed patient-reported dimension of quality of care, as measured by satisfaction with health care and drawing on micro-data provided by the Spanish Health Barometer (SHB) together with macro-data related to regional characteristics.

We provide novel evidence on the role of regional factors in shaping the quality of a health system (proxied by health system satisfaction) drawing special attention to the effects of relevant supply-side factors which can be considered important policy levers and have been insufficiently addressed in previous research. According to our results, the most important drivers of satisfaction at an aggregate level seem to be the level of public resources available and, in particular, staffing levels in the health system (positively) and the amount of private spending on health care (negatively). Therefore, we tentatively suggest that policymakers seeking to enhance health system satisfaction may require higher spending levels in health care, most notably in the form of clinical staff. Indeed, the health sector already had insufficient human resources in many high and low-income countries even before the COVID-19 crisis, a shortcoming that has become even more evident today (International Labour Organization, 2021). Our results also indicate that a growing importance of the private health sector within a universal NHS may be a revealing indicator of inefficiencies in the public health system and/or the existence of features of private insurance which are deemed important by patients, such as shorter waiting lists or greater choice.

In addition, we find evidence of a considerable non-contemporary effect for some of the main policy levers, including expenditure in health care, which should be taken into consideration when analysing the impact of budgetary cuts (or increases) in health system satisfaction. Finally, our results suggest that a sector-specific analysis such as the one we present may detect important relationships among variables which a more aggregated analysis might not, like the role of specific sector-level supply characteristics.

The results of this study offer interesting and novel insights into the key drivers of a core dimension of healthcare quality which may be particularly relevant for tax-funded health systems heavily dependent on the economic cycle, especially those more willing to implement pro-cyclical fiscal policies as a response to economic downturns such as the one we examine (see e.g. Grigorakis et al., 2018).

Our findings highlight that any worsening of the quality of public health care should be of great concern to policy makers since this could impel wealthier individuals towards the private sector, thus undermining one of the main pillars of social cohesion in the modern welfare state and possibly exacerbating health-related disparities (Costa-Font & García, 2003). This consideration is of particular interest in view of the fact that health systems in many countries must address a growing public-sector deficit, respond to increasing pressures on the health care system (due to COVID-19) and coexist with a considerable increase in the take-up of private health care insurance.

Some limitations of this study should be mentioned. Firstly, since vignettes are not included in the SHB questionnaires, we cannot correct for possible reporting bias in the self-reported levels of satisfaction (Angelopoulou, Kangis, & Babis, 1998; Jones, Rice, & Robone, 2012) with the NHS. However, as noted in our introduction, previous studies have corroborated the use of self-reported measures of perceived quality as credible indicators of how patients are treated by health care

systems. Proxy measures for private healthcare were used in our estimations since no data were available on out-of-pocket spending in this respect at the regional level for the period under study. Moreover, due to the nature of the SBH survey, data for specific health services are only available since 2010 and so the time span covered is relatively short. Another significant consideration is that some public-sector workers in Spain can opt out of the public health system (Epstein & Jiménez-Rubio, 2019), and so the amount of PHI obtained, in each of the regions considered, may be influenced by the number of public servants employed in each case.

As useful areas for future research, studies could be undertaken to explore in more detail the relationship between satisfaction and essential aspects of private healthcare such as waiting lists and choice. In addition, alternative supply side factors of satisfaction with the health services, such as the type of health provider could be examined in more depth.

In short, studies such as the present one may help policymakers and managers design and implement evidence-informed policy regarding key dimensions of health service quality which complements and enriches more traditional measures of health system performance and which may ultimately benefit health outcomes throughout the population.

Acknowledgements

References

Abásolo, I., Negrín-Hernández, M. A., & Pinilla, J. (2014). Equity in specialist waiting times by socioeconomic groups: Evidence from Spain. *The European Journal of Health Economics*, *15*(3), 323–334. https://doi.org/10.1007/s10198-013-0524-

Angelopoulou, P., Kangis, P., & Babis, G. (1998). Private and public medicine: A comparison of quality perceptions. *International Journal of Health Care Quality Assurance*, *11*(1), 14–20.

Antón, J. I., De Bustillo, R. M., Macías, E. F., & Rivera, J. (2014). Effects of health care decentralization in Spain from a citizens' perspective. *The European Journal of Health Economics*, *15*(4), 411–431.

Augurzky, B., & Tauchmann, H. (2011). Less social health insurance, more private supplementary insurance? Empirical evidence from Germany. *Journal of Policy Modeling*, *33*(3), 470–480. https://doi.org/10.1016/j.jpolmod.2010.12.002

Banka, G., Edgington, S., Kyulo, N., Padilla, T., Mosley, V., Afsarmanesh, N., . . . & Ong, M. K. (2015). Improving patient satisfaction through physician education, feedback, and incentives. *Journal of Hospital Medicine*, *10*(8), 497–502. https://doi.org/10.1002/jhm.2373

Barbazza, E., Kringos, D., Kruse, I., Klazinga, N. S., & Tello, J. E. (2019). Creating performance intelligence for primary health care strengthening in Europe. *BMC Health Services Research*, *19*(1), 1–16. https://doi.org/10.1186/s12913-019-4853-z

Bernal-Delgado, E., García-Armesto, S., Oliva, J., Martínez, F., Repullo, J., Peña-Longobardo, L., . . . & Hernández-Quevedo, C. (2018). *Spain-health system review*.

Boden, D. G., Agarwal, A., Hussain, T., Martin, S. J., Radford, N., Riyat, M. S., . . . & Whale, C. I. (2016). Lowering levels of bed occupancy is associated with decreased inhospital mortality and improved performance on the 4-hour target in a UK District General Hospital. *Emergency Medicine Journal*, https://doi.org/10.1136/emermed-2014-204479

Costa-Font, J., & García, J. (2003). Demand for private health insurance: How important is the quality gap? *Health Economics*, *12*(7), 587–599. https://doi.org/10.1002/hec.756

Costa-Font, J., & Jofre-Bonet, M. (2008). Is there a "secession of the wealthy"? Private health insurance uptake and National Health System support. *Bulletin of Economic Research*, *60*(3), 265–287. https://doi.org/10.1111/j.1467-8586.2008.00285.x

Costa-Font, J., & Ferrer-i-Carbonell, A. (2019). *Regional decentralisation and the demand for public health care*. FEDEA.

Darby, C., Valentine, N., Murray, C., & De Silva, A. (2000). *WHO strategy on measuring responsiveness (GPE discussion paper No. 23)*. Geneva: WHO.

Doyle, C., Lennox, L., & Bell, D. (2013). A systematic review of evidence on the links between patient experience and clinical safety and effectiveness. *BMJ Open*, *3*(1) https://doi.org/10.1136/bmjopen-2012-001570

Epstein, D., & Jiménez-Rubio, D. (2019). What does the decision to opt for private health insurance reveal about public provision? *Gaceta Sanitaria*, *33*(5), 442–449. https://doi.org/10.1016/j.gaceta.2018.03.009

Fernández-Pérez, Á., & Sánchez, Á. (2020). Improving people's self-reported experience with the health services: The role of non-clinical factors. *International Journal of Environmental Research and Public Health*, *17*(1) https://doi.org/10.3390/ijerph17010178

Fiorentini, G., Ragazzi, G., & Robone, S. (2015). Are bad health and pain making us grumpy? An empirical evaluation of reporting heterogeneity in rating health system responsiveness. *Social Science & Medicine*, *144*, 48–58. https://doi.org/10.1016/j.socscimed.2015.09.009

Fiorentini, G., Robone, S., & Verzulli, R. (2018). How do hospital-specialty characteristics influence health system responsiveness? An empirical evaluation of in-patient care in the Italian region of Emilia-Romagna. *Health Economics*, *27*(2), 266–281. https://doi.org/10.1002/hec.3540

Gallo, P., & Gené-Badia, J. (2013). Cuts drive health system reforms in Spain. *Health Policy*, *113*(1-2), 1–7.

Gené-Badia, J., Gallo, P., Hernández-Quevedo, C., & García-Armesto, S. (2012). Spanish health care cuts: Penny wise and pound foolish? *Health Policy*, *106*, 23–28. https://doi.org/10.1016/j.healthpol.2012.02.001

Grigorakis, N., Floros, C., Tsangari, H., & Tsoukatos, E. (2018). Macroeconomic and financing determinants of out of pocket payments in health care: Evidence from selected OECD countries. *Journal of Policy Modeling*, *40*(6), 1290–1312. https://doi.org/10.1016/j.jpolmod.2018.02.006

Hanefeld, J., Powell-Jackson, T., & Balabanova, D. B. (2017). Understanding and measuring quality of care: Dealing with complexity. *Bulletin of the World Health Organization*, https://doi.org/10.2471/BLT.16.179309

Hekkert, K. D., Cihangir, S., Kleefstra, S. M., van den Berg, B., & Kool, R. B. (2009). Patient satisfaction revisited: A multilevel approach. *Social Science & Medicine*, *69*(1), 68–75.

[Data set] Instituto Nacional de Estadísitca (2018) Contabilidad Regional Data set. Retrieved from: https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica_C&cid=1254736167628&menu=resultados&idp=1254735576581

International Labour Organization. (2021). ilostat.ilo.org. https://ilostat.ilo.org/covid-19-are-there-enough-health498workers/.

Irving, G., Neves, A. L., Dambha-Miller, H., Oishi, A., Tagashira, H., Verho, A., . . . & Holden, J. (2017). International variations in primary care physician consultation time: A systematic review of 67 countries. *BMJ Open*, *7*(10), Article e017902

Jofre-Bonet, M. (2000). Public health care and private insurance demand: The waiting time as a link. *Health Care Management Science*, *3*(1), 51–71. https://doi.org/10.1023/A:1019024903898

Jones, A. M., Rice, N., & Robone, S. (2012). A comparison of parametric and non-parametric adjustments using vignettes for self-reported data. In *University of York, Health, Econometrics, and Data Group (HEDG) Working Paper*. (12/10).

Kotzian, P. (2009). Determinants of satisfaction with health care system. *The Open Political Science Journal*, *2*, 47–58. https://doi.org/10.2174/1874949600902010047

Malhotra, C., & Do, Y. K. (2017). Public health expenditure and health system responsiveness for low-income individuals: Results from 63 countries. *Health Policy and Planning*, *32*(3), 314–319. https://doi.org/10.1093/heapol/czw127

Ministerio de Sanidad [Data set], Consumo y Bienestar Social (2018) Barómetro Sanitario. Retrieved from: https://www.mscbs.gob.es/estadEstudios/estadisticas/BarometroSanitario/home.htm.

[Data set] Ministerio de Sanidad, Consumo y Bienestar Social (2018) Banco de datos. Retrieved from: https://www.mscbs.gob.es/estadEstudios/estadisticas/bancoDatos.htm.

OECD. (2019). *Population coverage for health care, in Health at a Glance 2019: OECD Indicators*. Paris: OECD Publishing.

OECD Statistics. (2020). *(Organisation for Economic Cooperation and Development)* Retrieved October 2, 2020, from. https://stats.oecd.org/Index.aspx?ThemeTreeId=9

Pak, T. Y. (2020). Social protection for happiness? The impact of social pension reform on subjective well-being of the Korean elderly. *Journal of Policy Modeling*, *42*(2), 349–366. https://doi.org/10.1016/j.jpolmod.2019.12.001

Park, K., Park, J., Kwon, Y. D., Kang, Y., & Noh, J. W. (2016). Public satisfaction with the health-care system performance in South Korea: Universal healthcare system. *Health Policy*, *120*(6), 621–629. https://doi.org/10.1016/j.healthpol.2016.01.017

Pascoe, G. C. (1983). Patient satisfaction in primary health care: A literature review and analysis. *Evaluation and Program Planning*, *6*(3–4), 185–210. https://doi.org/10.1016/0149-7189(83)90002-2

Pérez-Romero, S., Gascón-Cánovas, J. J., Salmerón-Martínez, D., Parra-Hidalgo, P., & Monteagudo-Piqueras, O. (2017). Relevancia del contexto socioeconómico y sanitario en la satisfacción del paciente. *Gaceta Sanitaria*, *31*(5), 416–422. https://doi.org/10.1016/j.gaceta.2017.05.003

Price, R. A., Elliott, M. N., Zaslavsky, A. M., Hays, R. D., Lehrman, W. G., Rybowski, L., ... & Cleary, P. D. (2014). Examining the role of patient experience surveys in measuring health care quality. *Medical Care Research and Review*, *71*(5), 522–554. https://doi.org/10.1177/1077558714541480. SAGE Publications Inc

Robone, S., Rice, N., & Smith, P. C. (2011). Health systems' responsiveness and its characteristics: A cross-country comparative analysis. *Health Services Research*, *46*(6 PART 2), 2079–2100. https://doi.org/10.1111/j.1475-6773.2011.01291.x

StataCorp. (2017). *Stata statistical software: Release 15*. College Station, TX: StataCorp LLC.

Valentine, N. B., & Bonsel, G. J. (2016). Exploring models for the roles of health systems' responsiveness and social determinants in explaining universal health coverage and health outcomes. *Global Health Action*, *9*(1) https://doi.org/10.3402/gha.v9.29329

Valentine, N., Prasad, A., Rice, N., Robone, S., & Chatterji, S. (2010). Health Systems responsiveness: A measure of the acceptability of Health-care processes and Systems from the user's perspective. In Performance Measurement for Health System Improvement: Experiences, Challenges and Prospects. In *Performance measurement for health system improvement*. pp. 138–186. https://doi.org/10.1017/CBO9780511711800.007

Wang, Y., Ghislandi, S., & Torbica, A. (2020). Investigating the geographic disparity in quality of care: The case of hospital readmission after acute myocardial infarction in Italy. *The European Journal of Health Economics*, *21*(8), 1149–1168.

Wooldridge, J. M. (2016). *Introductory econometrics: A modern approach*. Nelson Education.

World Health Organization. Regional Office for Europe (2019). Improving healthcare quality in Europe: Characteristics, effectiveness and implementation of different strategies. In *Improving Healthcare Quality in Europe*.

Xesfingi, S., & Vozikis, A. (2016). Patient satisfaction with the healthcare system: Assessing the impact of socio-economic and healthcare provision factors. *BMC Health Services Research*, *16*(1), 1–7. https://doi.org/10.1186/s12913-016-1327-4