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TESIS DOCTORAL

The Spanish National Health System. Resource management, quality and welfare.

El Sistema Nacional de Salud español. Gestión de recursos, calidad y bienestar.

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ABSTRACT

Health is a key factor in any society. As such, public policies should be formulated in light of the contributions made by different researchers in reference to the management of public resources.

This paper relates how economic decisions, in terms of the destination of resources or expenditure allocations, have a significant and positive impact on patient satisfaction. The latter variable being a predictor of the health system's quality, we analyze how the performance and sustainability of the health system affect the health-illness status of citizens. The analysis is also carried out by discriminating the results according to sex.

In the bibliography review, we were able to find works in which patient satisfaction was evaluated, but from a medical perspective. Due to the importance that we believe should be given to this field of research and suspecting that previous works were not abundant, a bibliometric analysis was carried out, which confirmed our conjecture. The database used was extracted from Scopus, and the tools used for data analysis were VOSviewer and SciMAT. The works on patient satisfaction as a basis for the formulation of public policies in the area of economic sciences and management do not reach 3% of the total scientific production within the field of research analyzed.

The methodology used for the statistical work was the application of partial least squares structural equation models (PLS-SEM). In one of the models constructed, higher-order constructs composed of lower-order constructs were used. Data were obtained from official Spanish sources (Ministry of Health, Social Services and Equality).

The health system's performance represented by a set of lower-order constructs (effectiveness, safety, opinion and relevance) has a positive impact on the health-illness status of the population. On the contrary, the higher-order construct sustainability (symbolized by the volume of expenditures, resource allocations, and degree of use of the health system) negatively affects the health-illness status of the population.

RESUMEN

La salud es un factor clave en cualquier sociedad y, como tal, las políticas públicas que se lleven a cabo deben ser formuladas a la luz de las aportaciones que realizan los diferentes investigadores en referencia a la gestión de los recursos públicos.

En este trabajo se relaciona cómo las decisiones económicas, en lo referente al destino de los recursos o a las asignaciones de los gastos, tienen un impacto significativo y positivo en la satisfacción de los pacientes. Siendo esta última variable una predictora de la calidad del sistema sanitario, a su vez se analiza cómo el desempeño y la sostenibilidad del sistema de salud afecta al estado de salud-enfermedad de la ciudadanía. El análisis se realiza también discriminando los resultados en función del sexo.

En la revisión de la bibliografía se pudieron encontrar trabajos donde se evaluaba la satisfacción de los pacientes, pero desde una perspectiva médica. Debido a la importancia que creemos que debe darse a este campo de investigación y sospechando que los trabajos previos no abundaban, se realizó un análisis bibliométrico que dio por confirmada nuestra conjetura. La base de datos utilizada fue extraída de Scopus y las herramientas utilizadas para el análisis de los datos fueron VOSviewer y SciMAT. Los trabajos sobre la satisfacción del paciente como base para la formulación de las políticas públicas en el área de las ciencias económicas y gestión no alcanzan el 3% del total de la producción científica dentro del campo de investigación analizado.

La metodología utilizada para la realización del trabajo estadístico fue la aplicación de modelos de ecuaciones estructurales de mínimos cuadrados parciales (PLS-SEM). En uno de los modelos confeccionados se utilizaron constructos de orden superior compuestos por constructos de orden inferior. Los datos se obtuvieron de fuentes oficiales españolas (Ministerio de Sanidad, Servicios Sociales e Igualdad).

El desempeño del sistema de salud representado por un conjunto de constructos de orden inferior (eficacia, seguridad, opinión y pertinencia) tiene un impacto positivo en el estado de salud-enfermedad de la población. Por el contrario, el constructo de orden superior sostenibilidad (simbolizado por el volumen de gastos, asignaciones de recursos y grado de uso del sistema sanitario) tiene un efecto negativo sobre el estado de salud- enfermedad de la población.

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CHAPTER 1: INTRODUCTION

1.1. INTRODUCTION

Medicine is one of the most important, and at the same time complex, pillars of society. For its part, the health system is no longer evaluated solely for technical or scientific aspects. The data support that Spanish healthcare is one of the most complete and qualified public systems at an international level [1], a benchmark in terms of universality, accessibility, and effectiveness [2]. Although with the health crisis of Covid-19, the previous statement is questioned since Spain is one of the most affected countries in terms of infections and deaths per million inhabitants [3].

Since the 2008 crisis, the Spanish health budget has been austere. For example, in 2012, the Spanish state restricted the health budget by 14% [4], which may have had an impact on the health outcomes of the covid-19 crisis [5]. Additionally, Spanish healthcare costs increased by 10% annually between 2003 and 2006 due to the increase in the population due to immigration and aging, the rise in labor costs in the sector, and the cost of new technologies [6].

Both developed and emerging countries suffer from a lack of financing for their health services due to increased demand and costs [7]. So we can infer that both from the resource constraints side [8] and the growing demand for health services in terms of quality and quantity [9], it is critical to managing the system's efficiency. With this, we must bear in mind that patient satisfaction and the reallocation of resources are not disjunctive concepts. On the other hand, proper management of health resources will allow for a sustainable health system in such a way that the rights of future generations are not violated. Prevention plays a fundamental role in sustainability because the use of resources is low, and the positive impact on health is high.

The Spanish Constitution itself recognizes the right to health protection. Article 148.1 of the Spanish Constitution decentralizes many powers, including health, in the hands of the autonomous communities that were previously exclusive to the national state [9]. Decentralization has increased public spending on health services, which meant that since the end of the 1980s, the effort to rationalize spending in the sector has increased [10], but it also expedited the necessary reforms and facilitated the implementation of creative initiatives [6].

Decentralization also promoted more significant inequalities in health between the different territories of Spain [11]. This could conflict with the guarantees that the law [12] enunciates for the National Health Service regarding mobility, in article 24 and quality in article 28. Spain is a member of the WHO and, consequently, it supports the inclusion of health indicators as well as the Sustainable Development Goals that this organization promotes

Health is recognized as a fundamental social, universal, and enforceable right at the international level and not as a right of free choice [13]. Even the United Nations 2030 Agenda deploys the promotion of global health in its entirety and sets it out in detail in its "Goal 3".

Health and the economy are not antagonistic ideas. The first has an effect on the second and vice versa. Health has a fundamental role in the workplace, and therefore the economy of a country because it has the challenge of keeping individuals capable of occupying their jobs in case of illness [10]. Some authors even consider that health is a productive capital and generator of economic growth [14]. As a determining factor of human capital, others assign them a role as a consumer and investment good [15,16]. For this reason, we say that health is critical in the economic growth of a country since people, taken as productive agents, improve with investment in health and therefore generate higher returns [17]. Like a vicious circle, some authors indicate that a more robust production system will allow higher health expenditures and improve the quality of life of the population [18]. The concept of health in terms of investment began to be treated more intensely when the World Bank, in 1993, assigned health the role of means to accelerate development [19].

Regarding the integral care of the human being, we must consider the significant influence that social factors such as poverty or social injustice have [20] o lifestyle factors such as tobacco use, diet, or physical activity [6]. In the context of the coronavirus crisis, Spain was the European country with the most remarkable drop in GDP [21], which in turn led to a poverty rate of over 23% [22], an obstacle to improving health.

The objective of health policies is to protect the population's health, that is, to ensure the physical and mental integrity of individuals [23], providing primary

care, hospital, and pharmaceutical type services [10]. When Winslow defined, in 1920, public health, he did not only do so in terms of treatment and prevention of diseases but also in matters of education, environmental sanitation and social development [24]. Public health policies must respond to the real problems of citizens [25]. And for this, they must have accurate information on the subject to make the best decisions [20].

Some studies confirm that patient satisfaction is capable of being an indicator of the level of use of medical services [26], as well as compliance with medical orders [27–30]. In turn, when patients are more satisfied, their loyalty to the health system will increase [26]. One of the variables that patients consider significantly when defining their loyalty to the health system is safety [26], which is logical since an error in applying a practice exposes the health to significant risk [31]. The risk can be reduced if deficiencies are detected through the evaluation and control of the system [32]. A previous study indicated that women tend to be more loyal than men [26].

Public policies have recently become a topic of interest because they are considered the concrete fruit of the relations between politics and society [10]. For the development of an efficient public policy, it will be necessary to carry out a correct diagnosis of the real problems and their possible solutions and financial, economic, social, and political costs [25].

Because resources are limited and the needs infinite, the opportunity cost is inherent in the decision-making process. It is important to note that when we talk about costs, we also refer to the opportunity cost representing the benefit that the alternative rejected in decision-making would have provided.

Analyzing public policies has the main benefit of providing one more instrument when making decisions in the policy and actions of the state [10] and, in addition, its purpose is to study if countries have the capacity to implement those that comprehensively help development in the social, political and economic sphere of citizens, institutions, organizations and authorities [25].

Conflict of interest is an implicit concept in human nature. Stakeholders will be the ones who will support one or another policy option based on the benefits they provide. In this way, we can conceive of society from a pluralistic vision

where an autonomous multitude, heterogeneous, and competitive interests coexist [10]. Not all of these interest groups have the same power to influence because resources are unevenly distributed, but they do all have a legitimate interest [10]. Frequently, even if you have the economic resources to carry out a specific policy, it is not completed due to the political costs that it entails, that is, due to the effect on interests that lead to its nullity [25].

Health is a complex element that does not always allow rational decision-making due to the volume of people involved, the heterogeneity of user needs, the magnitude of the workers involved, and the increase in expenses, among others [33]. In turn, it is an element that must be articulated with other sectors since many of the health determinants are not the health sector's responsibility [33]. Therefore, it is recommended that intersectoral public policies be carried out [17]

Policies are considered to be in the public interest when they promote the general welfare [34]. This public interest is closely linked to the concept of efficiency. In this context, if the formulation of a particular public policy unduly favors some sectors to the detriment of others, they would not be leading towards the general interest [34]. Hence the importance of studying the efficiency of the health system. With the aging of the population and the epidemiological and technological dynamics of the health systems, which translates into higher costs, the health systems will inevitably have to adapt to provide a timely and quality service [35].

Industry in general, and healthcare in particular, increasingly focuses on consumers with the aim of not just meeting the needs but also meeting the expectations of patients [27,32,36], which are fueled by access to information and increased quality of life [6]. The word "quality" went from being an objective concept understood as compliance with the company's specifications to a more subjective approach, displaced to the customer, where the customer's judgment is critical [36]. In other words, it will be the client who determines if a service is of quality or not, according to their perception [37]. The measurement of perception is extremely complex because people are different from each other, as is their opinion, which, additionally, is dynamic

over time [37,38]. Even more so in modern times characterized by frequent changes and more demanding customers [38].

In turn, quality is a complex concept since it encompasses many independent characteristics. That is, it is multidimensional [37]. The feedback process will allow obtaining valuable information from the customer's perception that will be translated into information to make better and timely decisions and improve the health system [39–47].

A third complex concept is patient's satisfaction [48,49], which is understood as the distance between patient expectations and the services provided by the system [44,50–53]. Its complexity lies in the subjectivity of the concept, which is projected in the absence of a standardized method for its measurement [54,55]. It was even a forum for debate in different fields of study such as marketing, psychology and philosophy. Moreover, in the study of the patient's perception, satisfaction was related to various dimensions such as infrastructure, technique, interaction, etc.

In recent years, attention has been turned to the patient's role in the doctor-patient relationship, incorporating his perception as a measure of the health service's quality [27,29,30,36,45,46,50,56–58]. The model adopted by the European Foundation Quality Management (EFQM) confirms that patient satisfaction reveals 20% of the quality of the healthcare system [51]. Jointly, patients' opinion is welcome when intended to manage health resources [28,57] adequately. For this reason, there are sufficient reasons to think that the desire to achieve patient satisfaction will be a quality stimulator.

The concept of "patient-centered care" arises, where the patient takes an active role in the relationship, participating in decision-making about their health [27]. The importance of this new clinical practice has two perspectives. On the one hand, it lies in the positive effects on the patient's health [27,29,30,57,59]. On the other hand, it is considered the key to achieving business success [60–62].

Harvey Picker was the one who started studies on the perception of patients, and his institute was a pioneer in collecting information of this type [63]. At the European level, we currently find the ECHI indicators that compile data

from different countries to make them comparable and useful for health management.

There are cases where it can be observed that the health policies taken by governments are driven more by political interests than by professional decisions [64]. Professionals and users are less and less satisfied with the Spanish health system, while those who formulate public policies are more interested in reducing costs [6].

1.2. JUSTIFICATION

The study of the key indicators or variables that determine patient satisfaction is important since it is proven that greater satisfaction has a positive impact on the population's health. This idea is aligned with all health systems' objectives and with the economic interests of the governments that seek a prosperous country.

In the literature studies, it is common to find how aspects such as communication, treatment, and professionalism of health personnel influenced satisfaction [8,39,57,65]. However, no studies have been found on how the allocation of resources, costs, and investments affects patient satisfaction to improve the quality of the national health system.

Frequently, we find analysis of the performance and sustainability of health systems, although not its effect on the health-disease state of citizens.

For its part, we encourage the creation of knowledge from a multidisciplinary point of view, contributing from the economic and management perspective to the field of medicine and political science. We do not believe that the social sciences should be confronted with the medical sciences. On the contrary, it will be more beneficial for both to create bridges between them, opening up to debate and cooperation.

Policymakers must apply a series of strategies according to the pre-established objectives [55,62], allocating limited public resources in a way that does not undermine the quality and efficiency of the system. It is about keeping patient satisfaction unchanged, with higher quality at the lowest possible cost [66].

Increasingly, scientists must justify the political implication of their findings since they have no real value if they are not used and applied in a concrete way to improve the population's quality of life. [67–69].

1.3. OBJECTIVES

The objective of this work was branched into three parts:

1- As the objective of any health system is to improve the health of citizens [70–75], one of the quality indicators of the health system is patient satisfaction, and according to the WHO, governments must guarantee citizens access to health [76]. It was necessary to study the scientific production on formulating public health policies based on patient satisfaction. We wrote the article "Health Policies Based on Patient Satisfaction: A Bibliometric Study" based on this premise.

2- In the first place, the objective of the thesis is to detect those key variables that determine patient satisfaction in the Spanish Health System. For this, the article entitled "Health Investment Management and Healthcare Quality in the Public System: A Gender Perspective" studied how mortality or economic aspects, such as expenses or the volume of resources, affected patient satisfaction. Additionally, the possible existence of a mediating relationship of mortality between resources and satisfaction was analyzed; likewise, the mediation of resources between expenses and satisfaction. Because satisfaction is related to the demographic characteristics of the patients [28–30], the analysis is carried out by identifying in which cases the configuration of satisfaction is not identical between men and women. We consider that in the field of health, differentiation by sex is not a minor issue. Previous work stated that it was logical that if the system's users had more resources available, they would make greater use of health services [70]. Therefore, we incorporated this variable to confirm it. Additionally, we included a macroeconomic variable (GDP) as a control variable since previous studies revealed that those countries with higher per capita income had a longer life expectancy [17].

3- Once the economic aspects that affected patient satisfaction were identified, it was necessary to study how the health system's management affected citizens' well-being. Namely, if the performance and sustainability of the health system had a positive impact on the state of health-disease of the population being reflected in a longer life expectancy and a reduction in the mortality rate. Referring to a sustainable system, we are talking about satisfying current needs without compromising future ones. We can study according to the health system's level of use, allocations of resources, and volume of expenses, while when we speak of performance, we refer to the system's performance in terms of effectiveness, security, perception and relevance. In this sense, we published the article "Using Higher-Order Constructs to Estimate Health-Disease Status: The Effect of Health System Performance and Sustainability" in the journal Mathematics.

The three objectives converge in a general objective that consists of generating useful information for policymakers to use in decision-making. For its part, the importance of studying policies based on patient satisfaction distinguishing by gender lies in the natural differences between men and women that are manifested in the disparity of individual needs and perceptions.

1.4. METHODOLOGY

Regarding the methodology used to carry out this work, we highlight the following procedures and instruments:

- Compilation of data from the Ministry of Health, Consumption and Social Welfare of Spain on key indicators that provide an image of the population's health status, the determinants of health, and the health system's response to the needs of the people. The data is also explained according to demographic characteristics. Additionally, GDP data were obtained from the National Institute of Statistics of Spain.
- Compilation of the Scopus database on the scientific activity in question and its subsequent coding for analysis.

- The statistical technique used to evaluate the proposed research model was structural modeling using partial least squares. The program used was SmartPLS, which additionally allowed a multigroup analysis to be carried out to verify the existing differences between the male and female sexes. The PLS-SEM analysis enables the analysis of lower-order constructs (LOC) as higher-order constructs (HOC) where the scores of the latent LOC variables constitute the HOC, reducing the complexity of the model.
- The VOSViewer and SciMAT software were used. The first allows graphical representations of the information to perform a better analysis. The second one makes it possible to elaborate adequate strategic maps to measure the centrality and density of the research topics. Excel was also used as a support tool.

1.5. ORGANIZATION

For the development of this Doctoral Thesis by a compendium of articles, we will follow the following structure.

In Chapter 2, we analyze scientific activity in relation to public health policies formulated based on patient satisfaction. The temporal evolution of publications, citations and keywords was analyzed; and the distribution of scientific production according to subject areas and geographical areas. Additionally, the most prolific authors and institutions were identified.

Chapter 3 was the first published article. It focuses on identifying key variables or factors related to resource management that influence patient satisfaction. This investigation provides us with non-trivial indicators for the fulfillment of the organizational objectives of health service providers in terms of support for planning and strategic control. On the other hand, a sensitivity analysis of both sexes is carried out in the face of variations in the indicators.

In Chapter 4, higher-order models are created where added variables have a joint theoretical sense and, consequently, can be interpreted as a unit. Higher-order models were used to study the performance of the Health System, the Sustainability of the Health System and the State of health-disease. A health-

disease state model was developed that reveals that health system administrators must pay special attention to the performance and sustainability of the health system to achieve its ultimate mission, that is, to improve the health of citizens.

Chapter 5 shows the conclusions that arise from the investigations carried out and the final considerations derived from the preparation of this study. Moreover, the possible future lines of research are presented.

Finally, the bibliography section details all the references consulted for the realization of published academic articles and the preparation of this doctoral thesis.

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CHAPTER 2:
HEALTH POLICIES BASED ON PATIENT SATISFACTION: A BIBLIOMETRIC STUDY

Grasso MS, Valls Martínez MC, Ramírez-Orellana A. Health Policies Based on Patient Satisfaction: A Bibliometric Study. *Healthcare*. 2021; 9(11):1520. https://doi.org/10.3390/healthcare9111520

Abstract

Healthcare decision-makers increasingly face a changing and ever-evolving landscape, forcing them to formulate public policies based on the results from different scientific investigations. This article evaluates the field of research on patient satisfaction as a basis for health policies. The analysis was carried out with a sample of 621 articles published between 2000 and 2020 in the Scopus database. The world's largest producer and research co-operator on patient satisfaction and health policy was the United States. However, the most prolific authors, institutions, and journals are of British origin. Regarding the themes, we find that, in economic and management matters, scientific production is scarce. To study the evolution of keywords, we divided the study period into two periods of an equal number of years. In both sub-periods, the keyword "Human" stands out. In the second sub-period, the word "Perception" stands out, which indicates the current attention paid to the patient's opinion.

Keywords: Patient Satisfaction; Health Policy; Health System; Scopus; Bibliometric Analysis; Research Trends

2.1. INTRODUCTION

The vision of the health system quality has evolved over time and no longer includes merely scientific-technical concepts [1] but also perceived quality, that is, the difference between what the clients (patients) expect and perceive [2,3]. It is not enough to meet the needs of patients to achieve their satisfaction, but it will also be necessary to meet their expectations [4,5]. In the middle of the last century, Koos (1954) and Donabedian (1966) were pioneers in measuring health care results based on patient satisfaction. At present, there is still no standardised method to measure satisfaction. On the contrary, the existing bibliography considers different perspectives and methodologies [8–11]. In addition, it is believed that patient satisfaction encompasses various dimensions such as technique, functionality, infrastructure, interaction, atmosphere, and services [12,13].

Measuring satisfaction means comparing patients' needs and expectations of medical care with their own experience [14]. The purpose of evaluating patient

satisfaction is to identify points for improvement by identifying those needs or expectations of patients that have not yet been satisfied [15,16]. Therefore, identifying the strengths and weaknesses of the performance of health services based on the patient's expectations will be an effective tool for the management and formulation of public policies [17].

The three basic expectation models that have been formulated are the contrast model, the assimilation model, and the assimilation-contrast model. The first assesses the discrepancy between patient expectations and the health system's performance [18]. The second understands that when there are differences between expectations and reality, the consumer (patient in the healthcare system) adjusts their expectations to reality. Namely, the patient tends to decrease dissonance to maintain coherence between multiple cognitions [19]. Finally, there is an "acceptance circle" in the assimilation-contrast model when the differences are within the acceptable limits. It is assimilated when it is within limits, but when it exceeds them, the contrast theory applies [20].

Patient-centred care primarily implies that the patient is respected and understood [21]. Harvey Picker pioneered the study of patient-centred care, and his institute became the first to collect information on user perceptions of the healthcare system [22]. In Western Europe and North America, it is already a fact that patients play an active role in health services planning and development [23]. This involvement leads to better health outcomes because of its effect on patient satisfaction [4,24] and the health system's quality [25–27].

The European Commission created the ECHIs, which are health indicators of the European Union whose objective is to obtain comparable and reliable data to contribute to the production of policies. The data emanating from these indicators will answer the appropriate health policies to apply [28].

On the other hand, politics denotes power and conflict between the parties involved, called stakeholders [29,30]. It also includes the strategies used to solve this problem [31]. Health policies will have a direct impact on the experience of patients.

The stakeholders of the health system can be synthesised into three groups. First, health care providers are made up of health professionals such as doctors, nurses, etc. This group will claim the best health outcomes regardless of cost. Second, State health policymakers and their professional health advisors and researchers strive for an efficient health system. Some authors even believe that this group ignored or repressed research in response [32] to pressures generated by budgets, electoral campaigns, social crises, among others [33]. Lastly, the patients have repressed their interests because they are underrepresented in policy formulation [34].

A study conducted in Sweden revealed that most patients do not accept resource constraints regarding healthcare [35]. This fact will generate greater disagreements.

The World Health Report 2000 [1] indicates that the main goals of the health system are good health, equity of financial contribution, and capacity to respond to the expectations of the population. For all these reasons, this work aims to analyse all scientific production on patient satisfaction with the health system, which is the basis for determining public policies. Later, in 2015, the 2030 Agenda was adopted by United Nations, where it committed the signatory countries to promote global health [36]. Although this objective is expressly detailed in "Goal 3", the reality is that it is a cross-cutting issue throughout the Agenda [37].

The importance of applying good health policies lies in the fact that it influences the quality of life of the current population and conditions future possibilities. From the health point of view, it can affect the population's life expectancy [38,39], and from the economic point of view, it can affect the number of people working in the labour force [40]. In other words, the population's health status will significantly impact the robustness of the country's economy. Quality health care available to the majority of the country's population is essential for the country's growth as this will allow a balance between birth and death rates and a low incidence of diseases [41].

Seen from another point of view, the extension of the life expectancy of the people, and the improvement of their quality of life, could be an inconvenience

for the health system of a country that offers its population universal access to medical care [29,42,43]. We highlight the importance of agents understanding political processes and implementing good health policies since they will be the ones who can contribute to the continuous improvement of the services provided [44,45]. The latter, taking as a premise that patient satisfaction is a strong indicator of the quality of health services [14,24,46–49].

In recent years, the countries' spending on health matters increased more than the increase in the gross domestic product (GDP) in most countries that belong to the Organization for Economic Cooperation and Development (OECD) [29,43]. Developed countries, on average, allocate between 8% and 10% of their GDP to finance health [50]. However, for example, Spain reduced its healthcare budget after the 2008 crisis by approximately 14% [51]. The key will then be to improve the population health with the minimum use of possible resources, that is, being efficient, understanding that quality and efficiency are not disjunctive concepts.

This paper offers a review of the literature regarding the public politics formulation based on patient satisfaction. A bibliometric analysis was carried out starting from a sample of 971 documents that, after selecting only the articles from 2000 onwards (excluding the year 2021 for not being complete), was reduced to 621 articles. With this research, we were able to study the evolution of knowledge on the subject in question and the most prolific authors and the most solid collaborations between countries, among others.

The OECD defined bibliometric as a tool to analyse the state of literature and technology with a certain degree of specialisation [52]. Bibliometric studies that refer to the health system can be observed in the bibliography, but not those that specifically treat patient satisfaction as the basis for public policy formulations.

A previous investigation revealed that Europe contributes approximately one-third of the world's scientific production related to public health [53]. Instead, we can find bibliometric studies that deal with articles that evaluate the quality of health services [54] or the existing institutional commitment in health organisations [55]. There are also bibliometric articles on health economics [56]

or even the particular effect of telemedicine on patient satisfaction [57], or the study of scientific activity on a specific disease [58]. Our study goes further since its objective is to study the scientific production on patient satisfaction as a basis for formulating public policies.

The objective of the health system will be to improve the health of the population, to which policymakers will need to analyse patients' perceptions of it [59]. Scientific results constitute an input capable of transforming reality and/or solving problems [60]. Furthermore, it is indisputable that the product of health research must incorporate political content. The latter is because, although science can find significant findings on improving the population's health, it will be the political actors who will be able to translate them into real-life [45]. Accordingly, scientists are increasingly required to demonstrate the politically relevant benefits of their findings [33,61].

The rest of the article is organised as follows: The data and methodology are presented in Section 2. Section 3 shows the results, and the discussion is presented in Section 4.

2.2. MATERIALS AND METHODS

This research uses bibliometric to study and analyse scientific activity in the health policy formulation field based on patient satisfaction. Bibliometrics is a sub-discipline within the information sciences that studies the collective behaviour of facts in the informational-documentary field [62]. Based on mathematical and statistical techniques, bibliometric studies different aspects of scientific activity [63,64]. This methodology can be used to analyse different elements such as the international dimension of the research, the relationship between different units of analysis, and co-authorship analysis [65]. In other words, it will analyse both activity indicators, structural indicators, and impact indicators [66]. Methodologically, we could assimilate scientific production with a company's production that must evaluate its inputs and results [65].

Currently, there are different online bibliographic databases, but they do not cover the scientific field in the same way [65]. The central databases are Scopus

and Web of Science (WoS). Scopus was chosen for this work because it covers a broader set of journals [67]. Indeed, 84% of WoS articles are in Scopus [68].

The investigation was divided into four steps: (1) the definition of the field of study and the database to be used, (2) research criteria adjustment, (3) codification of recovered material, and (4) analysis of the results and discussion. Figure 1 describes the methodology followed for the selection and processing of the information.

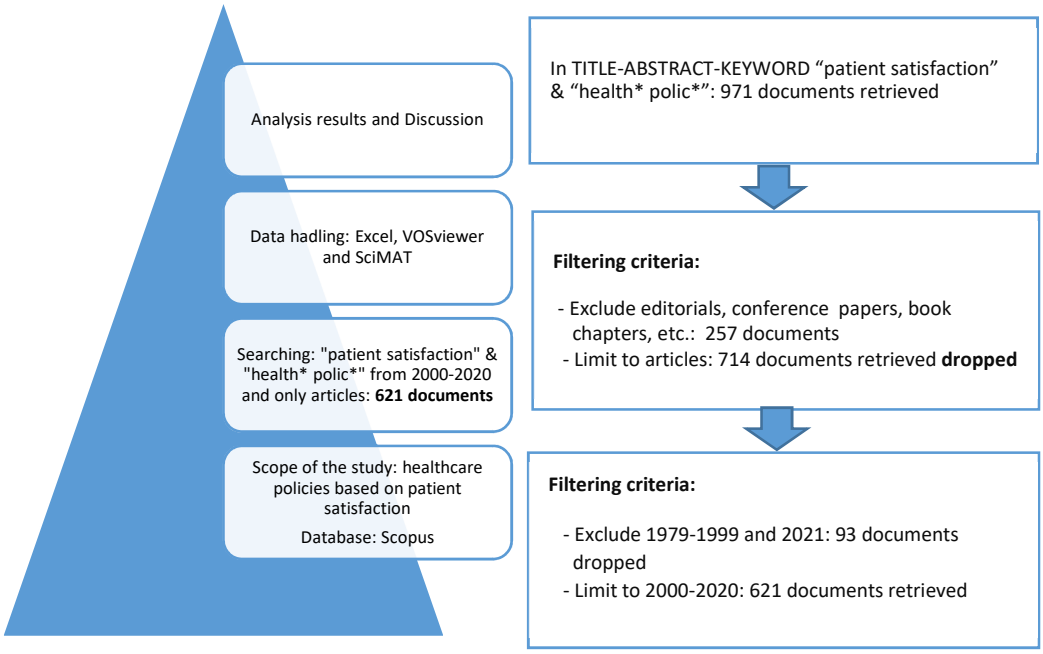

Figure 1. The methodology followed in the selection and processing of information.

As mentioned above, and as expressed in the article's title, our objective was to analyse the existing literature on the formulation of health policies based on patient satisfaction. Public managers are faced with investment choices due to limited budgets and increasing costs due to technology and an ageing population caused by longer life expectancy. On the other hand, patient satisfaction is increasingly used to assess the quality of the healthcare system. Consequently, the following parameters were used to retrieve the search: TITLE-ABSTRACT-KEYWORD ("patient satisfaction" & "health* policy*"), and 971 documents were obtained. The investigation was carried out in April 2021, and the study period was from 2000 to 2020. Considering that health policies have

to face different challenges than in the past, with a larger and older population, advances in costly means of therapy and diagnosis, increasing quality demands from the patient, etc., we decided to focus the study on the current era. The year 2021 was not included to be able to compare entire years. This time restriction narrowed the search to 714 documents. In addition, we limit the study to scientific articles, excluding reviews, conference papers, book chapters, etc., since they tend to have repeated content, while articles present the research novelties. We excluded the documents that did not meet the agreed criteria, and, finally, we followed the analysis with 621 articles.

The data were managed with excel, VOSviewer and SciMAT. On the one hand, VOSViewer software allows graphical representations of the data and its relationships, favouring the interpretation and understanding of the information [69–71]. On the other hand, SciMAT is a tool used to analyse scientific maps in a longitudinal framework that allows measuring the centrality and density of each research topic using strategic diagrams [71]. Different authors have already used this tool in areas such as tourism [72,73], sustainability [74,75], business [76], education [77,78], among others, which the intention of finding associations and new research trends.

Strategy diagrams measure two dimensions: density and centrality. Centrality is defined as the degree of the interaction of different research topics, and density is the internal strength value of the research topic object of study [74]. Those themes with a high density and centrality will be called motor themes. The opposites will be called emerging or disappeared themes because they are marginal and underdeveloped themes. Although they are well developed internally, those isolated from other issues will be peripheral [71]. Finally, the basic, general, and transversal topics are those topics that are important for the scientific field but that are not well developed [69]. In addition, it can include a third dimension in the diagram, which is displayed in the volume of the sphere and could represent different bibliometric indicators (number of citations, number of documents and h-index). Two periods were determined to carry out the analysis, the first period of initial development (2000 to 2010) and a second period for the last ten years (2011 to 2020) to study trends within the study area. For each period analysed, using the SciMAT tool, two strategic maps

were constructed, through the measures of centrality and density, using the methodology proposed by Cobo et al. (2012).

2.3. RESULTS

In order to suggest or encourage future lines of research, to determine which areas are sufficiently investigated and which require greater penetration, it is necessary to investigate the scientific production of the researchers. It can also be helpful to study each line of research based on a country, an author or even a specific institution.

We will divide this section of the article into a first part that will evaluate the evolution of scientific production in terms of published articles, productive countries, and the number of citations per article, among others. The second part will evaluate the content of scientific production to define topics that should promote further research. Table 1 shows a summary of the data used to carry out the bibliometric study extracted from Scopus. These data are divided into two groups defined according to a period of 10 years each.

Table 1. Summary of data.

Year	A	AU	AU/A	C	TC	TC/A	TC/AU
2000-2010	232	819	3.53	50	6455	27.82	7.88
2011-2020	389	1884	4.84	77	5267	13.54	2.80
Total period	621	2672	4.30	84	11722	18.88	4.39

A: number of articles; AU: number of authors; AU/A: number of authors by article; C: number of countries; TC: total citations in the articles; TC/A: total citations per article; TC/AU: total citations per author. Source: own elaboration.

2.3.1. DESCRIPTIVE ANALYSIS

2.3.1.1. Evolution of scientific production

The 621 articles that make up the sample selected were published between 2000 and 2020. Figure 2 shows that Patient Satisfaction and Health Policy (PS & HP) has had an increasing global trend of scientific production.

Despite the growing trend, two very pronounced decreases can be observed in 2017 and 2020. This latest decrease occurs immediately after the number of

publications climbs to its peak in 2019. Therefore, the decline may be caused by the COVID 19 Health Crisis, and it is likely to be an isolated event.

A total of 2,672 authors wrote all the articles included in the sample. We can see that 62.64% of the total has been published during the last ten years, so we can deduce that it is an emerging issue. The citations reached their peak in 2011 with 1059.

With respect to the number of citations, it can be observed that those years with the highest number of citations correspond to those with the highest scientific production. In the articles corresponding to the last six years, the number of citations decreases ostensibly. We must think that not enough time has elapsed since their publication for their influence to be effective in subsequent research.

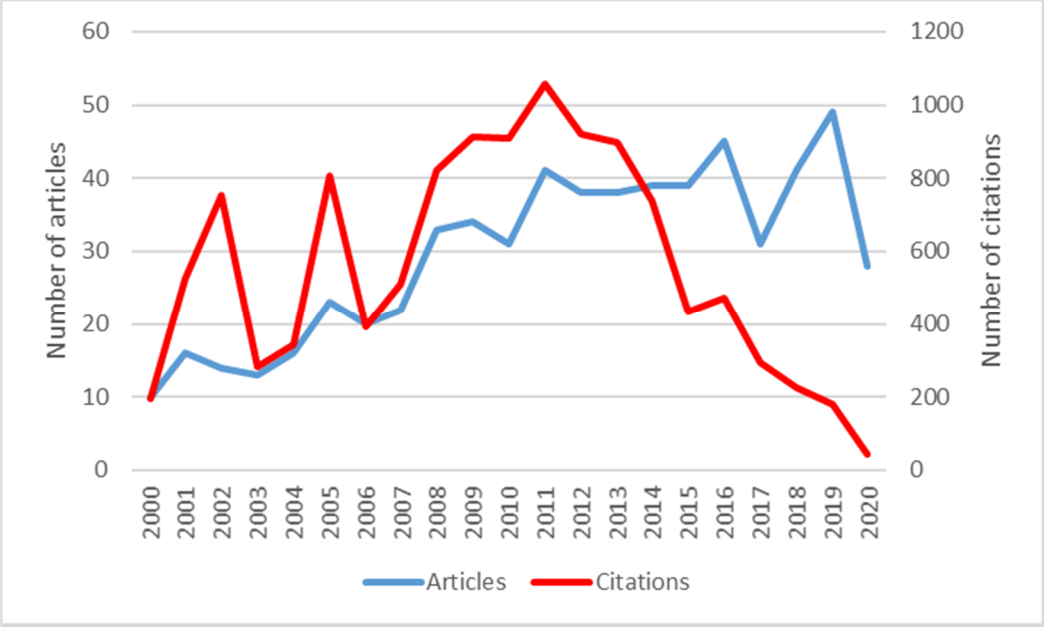

Figure 2. Evolution over time of published articles and total citations.

2.3.1.2. Distribution of scientific production

Figure 3 shows the main areas on which Scopus classifies scientific production on PS & HP. The medicine theme prevails widely over the rest with 62.71%. Far behind, with 8.51% and 7.91%, are nursing and social sciences, respectively. The rest of the defined themes have less than 4% each. As we can see, the subject is mainly approached with merely medical criteria and not from an

economic or investment management point of view, areas that as a whole do not reach 3%.

Table 2 displays the 11 most productive PS & HP journals. These journals published 20.13% (125 of 621) of the total number of articles included in this study, which shows that scientific activity in PS & HP is distributed in a large number of journals. The first four journals produced 55.2% of the top 11, and these journals were Social Science and Medicine; BMC Health Services Research; Health Policy and BMJ Open, in order of productivity.

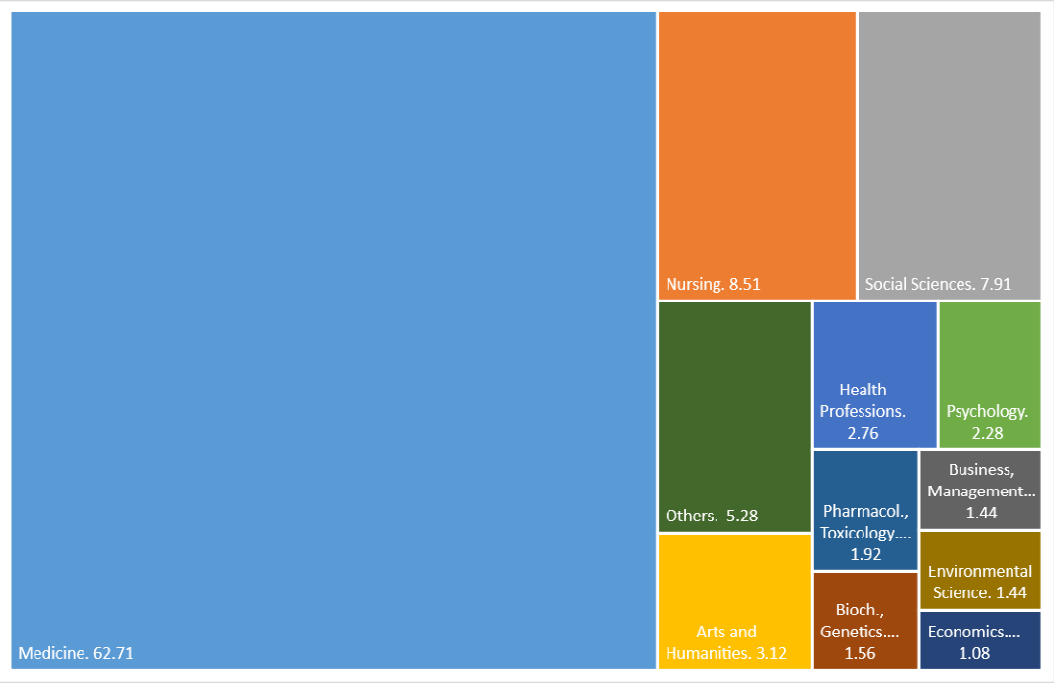

Figure 3. Documents by subject area (percentage).

Table 2 exhibits other bibliometric indicators such as the average number of citations per year since the 1st published article, the average citation by paper, the year corresponding to the first published article, the year corresponding to the last published article, the Scimago Journal Rank (Quartile in 2019), and the h-index.

It is worth noting that the first journal in the ranking, with 19 articles, generated 644 citations, while the second in the ranking with only one fewer article generated 228 fewer citations than the first. The journal with the most citations is Social Science and Medicine. However, concerning the average number of citations per article, Health Affairs leads with 53 citations per

article. Far behind is the leader in scientific productivity, with 33.89 citations per article.

An important point to highlight is that none of the journals included in the top 11 has scientific activity in this area in all the years analysed, the average being 15.54 years. To reduce the effect of the number of years of publication, the average citation per year was calculated from the first year of publication, where Social Science and Medicine maintain the head with 40.25 citations per year, followed by BMC Health Services Research with 29.71, and in third place is Health Affairs with 21.20.

Table 2. The top 11 most productive journals on PS & HP from 2000-2020.

Journal	A	C	TC	TC/A	1st A	Last A	TC/Y	SJR(Q)	h-index
Social Science and Medicine	19	U.K.	644	33.89	2005	2020	40.25	1.944(Q1)	15
BMC Health Services Research	18	U.K.	416	23.11	2006	2020	29.71	0.995(Q1)	11
Health Policy	18	Ireland	294	16.33	2001	2019	14.70	1.097(Q1)	9
BMJ Open	14	U.K.	76	5.43	2015	2020	12.67	1.247(Q1)	5
Health Policy and Planning	9	U.K.	161	17.89	2005	2019	10.06	1.620(Q1)	6
Int. Journal of Environmental Research and Public Health	9	Switzerland	42	4.67	2015	2020	7.00	0.739(Q2)	5
Int. Journal of Health Planning and Management	9	U.K.	37	4.11	2006	2020	2.47	0.537(Q2)	4
Health Affairs	8	U.S.	424	53.00	2001	2016	21.20	3.766(Q1)	8
British Journal of General Practice	7	U.K.	63	9.00	2004	2019	3.71	0.938(Q1)	6
Health Services Research	7	U.K.	105	15.00	2001	2019	5.25	1.623(Q1)	5
Int. Journal of Health Care Quality Assurance	7	U.K.	180	25.71	2000	2018	8.57	0.340(Q2)	8

A: number of articles; C: country; TC: total citations; TC/A: total citations by article; 1st A: year corresponding to first published article; Last A: year corresponding to last published article; TC/Y: average number of citations per year since the 1st published article; SJR(Q): Scimago Journal Rank (Quartile in 2019); h-index: Hirsch in this topic. Source: own elaboration.

Regarding the h-index, Social Science and Medicine stands out widely from the rest with an h-index of 15. BMC Health Services Research follows it with 11 and Health Policy with 9. The fourth place is shared by Health Affairs and the

International Journal of Health Care Quality Assurance with an h-index of 8. Regarding the quartile of the SJR indicator, 8 of the 11 journals are in quartile 1, which means that patient satisfaction as the basis for decision-making is an appealing topic for high-impact journals.

A noteworthy fact is that 8 of the 11 journals included in the top 11 are from the United Kingdom, which means that this country is interested in researching patient satisfaction to formulate health policies. The rests are two European (one of Irish origin and one of Swiss origin) and one American.

2.3.1.3. Countries, Institutions, authors and papers

Figure 4 illustrates a map of the countries that produce PS & HP articles, and Table 3 shows the data of the 11 most productive countries. It can be seen that most of the published articles are concentrated in the United States and the United Kingdom, with 185 and 144 published articles, respectively, which implies that authors from these two countries published 52.97% of PS & HP articles. This analysis must remember that a publication may represent more than one country because the authors' affiliation institutions represent the publishing countries.

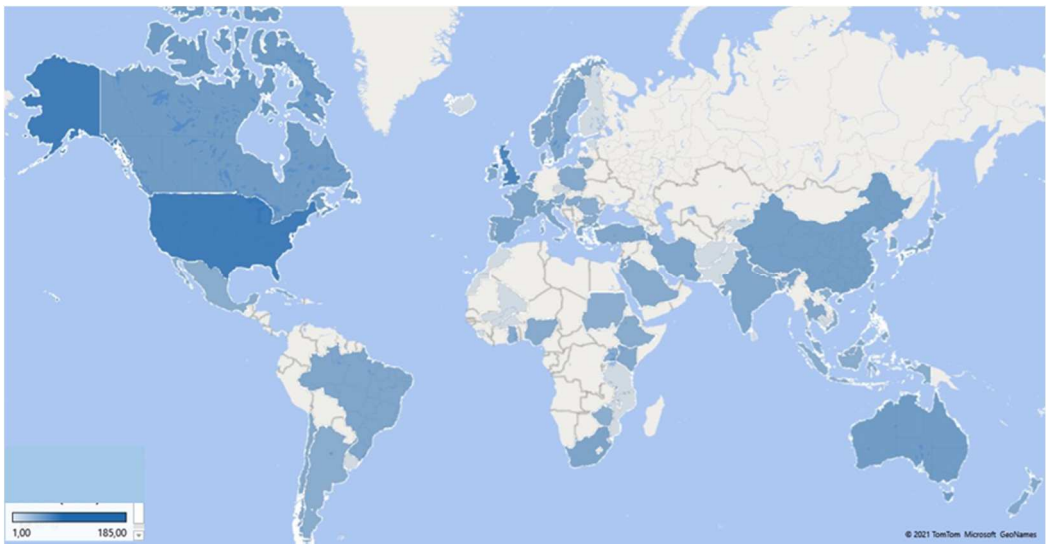

Figure 4. Worldwide publications on PS & HP.

It is followed by English-speaking countries or countries with a very high English proficiency according to the EF English Proficiency Index 2020 [79]: Canada with 43 articles, Australia with 42, and Germany with 40. This fact is not surprising

because the report above indicates that English proficiency is related to the Global Talent Competitiveness Index, which measures a country's ability to attract, develop, and retain talented people and invest in research and development. The importance of the English language in the scientific field dates back to the Industrial Revolution since those who promoted this movement used this language because it is their mother tongue (British and American). Consequently, those who wanted to know about the advances only had as an alternative to learn the Anglo-Saxon language [80]. According to the United Nations report [81], the United States, United Kingdom, and Germany are among the ten countries with the highest investment in research and development.

Table 3. The top 11 most productive countries on PS & HP research.

Country	A	TC	TC/A	1st A	Last A	TC/Y	h-index
United States	185	3478	18.80	2000	2020	165.62	30
United Kingdom	144	3787	26.30	2000	2020	180.33	33
Canada	43	1386	32.23	2000	2020	66.00	18
Australia	42	762	18.14	2000	2020	36.29	16
Germany	40	884	22.10	2003	2020	49.11	18
China	30	454	15.13	2008	2020	34.92	11
Netherlands	27	837	31.00	2000	2020	39.86	19
Spain	18	190	10.56	2009	2020	15.83	9
France	15	233	15.53	2003	2017	12.94	8
South Africa	15	236	15.73	2005	2019	14.75	9
Sweden	15	245	16.33	2000	2018	11.67	10

A: number of articles; TC: total citations; TC/A: total citations by article; 1st A: year corresponding to first published article; Last A: year corresponding to last published article; TC/Y: average number of citations per year since the 1st published article; h-index: Hirsch in this topic. Source: Own elaboration.

Analysing the total number of citations, the United States ahead follows the United Kingdom and Canada. On the other hand, if the analysis is based on the number of citations per article, Canada is the first, followed by the Netherlands, United Kingdom, and Germany. The number of citations evaluates the scientific quality for which these countries are considered most useful for

science. A point to highlight is that countries such as Spain and China began scientific production on this subject 9 and 8 years later than the countries that lead the ranking, so it is expected that the number of citations will start to grow with the passing weather. By considering the h-index, the names of the leading countries are the same. In first place is the United Kingdom, second place the United States, third place the Netherlands, and Canada and Germany share fourth place.

In the ranking of the 11 most productive countries, only five were productive during the 20 years studied. A relevant piece of information that can signify the diversity and growth of research on PS & HP is that countries are on all continents. The United States and Canada represent America; Europe is represented by the United Kingdom, Germany, Netherland, Spain, France, and Sweden; Oceania accounts for Australia; China for Asia; and South Africa for Africa.

On the other hand, Figure 5 represents a co-authorship network based on international collaboration between countries with at least three articles published on PS & HP. The volume of the circles varies depending on the number of articles published. The colour corresponds to a cluster that encompasses each of the groups of countries. Twelve different groups can be observed.

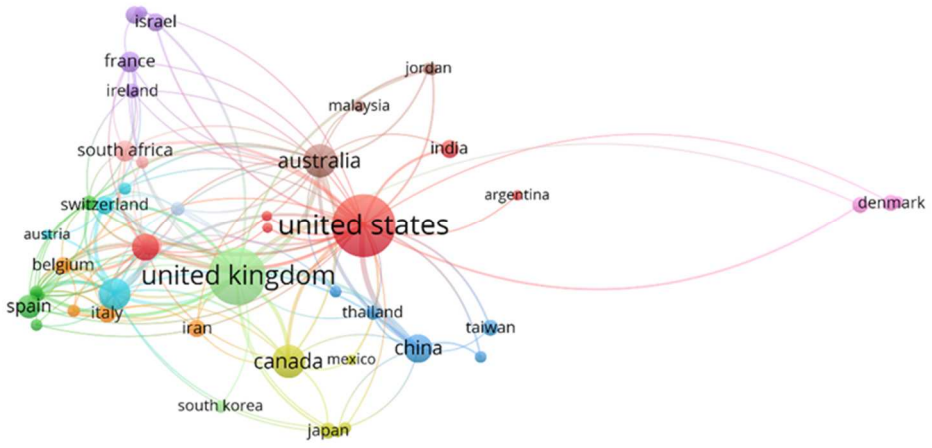

Figure 5. Network of cooperation based co-authorship between countries.

The United States led the red cluster, representing a robust collaborative link with Argentina, Ethiopia, India, the Netherlands, and the Philippines. Spain heads the dark green group, and its major collaborating countries are all from the European continent (Bulgaria, Greece, Hungary, Norway, and Poland). China fronted the blue cluster, whose collaborators are from the same continent: Bangladesh, Hong Kong, Taiwan, and Thailand. For its part, the yellow cluster has representatives from the American continent (Canada and Mexico), the Asian (Indonesia and Japan) and the African (Nigeria). The dark purple group represents co-authorship from Brazil, France, Ireland, Israel and Portugal.

On the other hand, the light blue comprises Austria, Chile, Germany, and Switzerland. Likewise, Belgium, Iran, Italy, and Slovenia are grouped in orange. In addition, the brown group is led by Australia, Joran, Malaysia, and Saudi Arabia. The light purple cluster, headed by Denmark, also includes Ghana and Turkey. The countries associated with salmon colour are Kenya, South Africa, and Sweeden. The light blue, orange and brown groups are composed of co-authors representing four countries each; the light purple and salmon cluster by three countries, the light green by two countries and the last set only by New Zealand.

Table 4 shows the ten countries that have contributed the most to scientific production through collaboration with other countries. The United States leads the ranking with 89 collaborations. China, the United Kingdom, Australia, and Canada are the countries that have collaborated the most with the United States in scientific production. Moreover, the country closest to the United States regarding the number of collaborators is the United Kingdom (85). The rest of the countries have much smaller collaborations: Germany (58), Australia (47), Netherlands (38), and China (34). The last four positions in the top 10 have between 23 and 21 collaborators each. The United Kingdom is listed as a contributor to all countries in the top 10. The United States as well, except for Belgium. The latter has a considerable number of citations, 373 for only nine published papers.

Table 4. Top 10 most cooperative countries and main collaborators.

Country	A	C	NC	Main Collaborators
U.S.	183	3296	89	China, U.K., Australia, Canada
U.K.	144	3865	85	Australia, U.S., Canada, China
Germany	39	879	58	Netherlands, U.K., Switzerland, U.S.
Australia	42	762	47	UK, US, China
Netherlands	27	826	38	Germany, U.S., Belgium, UK.
China	30	454	34	U.S., Australia, U.K., Germany
Canada	42	1212	23	U.S., U.K., Germany, Australia
Belgium	9	373	22	Netherlands, U.K., South Africa
Norway	7	127	22	U.K., Germany, Australia, U.S.
Switzerland	11	112	21	Germany, U.K., Australia, US.

A: number of articles, C: number of citations, NC: number of collaborations. Source: Own elaboration.

2.3.1.4. Productivity of the Most Prolific Authors

Table 5 shows the 17 most relevant authors in the scientific literature on PS & HP. These authors represent thirteen academic institutions. The main characteristics include the number of articles, total citations, total citations by article, the year corresponding to the first published article, the year corresponding to the last published article, the average number of citations per year since the first published article, and the h-index, all of them displayed in the table.

Considering the number of articles published and the h-index, we can divide the authors into two groups. The first, comprising the two authors with six published articles and an h-index of 6. The second group, consisting of the remaining 15 authors, with three published articles each and an h-index of 3. Of the 17 authors, ten are of European origin, and six are from the United Kingdom. The authors of Israeli origin who participate in this ranking are five. These authors have three articles published in the period analysed with 28 citations by authorship, which is possible because they are co-authors in the three scientific productions. Two authors only represent the American continent.

Table 5. The top 17 most productive authors on PS & HP research.

Author	A	TC	TC/A	1st A	Last A	TC/Y	h-index	Country	Affiliation
Bower, P.	6	296	49.33	2006	2014	19.73	6	U.K.	University of Manchester
Roland, M	6	270	45.00	2006	2014	18.00	6	U.K.	University of Cambridge
Balicer, R.D.	3	28	9.33	2016	2019	5.60	3	Israel	Clalit Research Institute
Blendon, R.J.	3	258	86.00	2001	2014	12.90	3	U.S.	Harvard School of Public Health
Cheraghi-Sohi, S.	3	160	53.33	2006	2008	10.67	3	U.K.	University of Manchester
Davidovitch, N.	3	28	9.33	2016	2019	5.60	3	Israel	Ben-Gurion University of the Negev
Ernstmann, N.	3	44	14.67	2011	2014	4.40	3	Germany	Institute for Medical Sociology
Greenfield, G.	3	28	9.33	2016	2019	5.60	3	U.K.	Imperial College London
Hekselman, I.	3	28	9.33	2016	2019	5.60	3	Israel	Clalit Mushlam Health Insurance
Kringos, D.S.	3	157	52.33	2011	2016	15.70	3	Netherlands	University of Amsterdam
Mead, N.	3	179	59.67	2000	2007	8.52	3	U.K.	University of Manchester
Pfaff, H.	3	44	14.67	2011	2014	4.40	3	Germany	University of Cologne
Pliskin, J.S.	3	28	9.33	2016	2019	5.60	3	Israel	Ben-Gurion University of the Negev
Ryan, M.	3	61	20.33	2006	2014	4.07	3	U.K.	University of Aberdeen
Shi, L.	3	60	20.00	2008	2015	4.62	3	U.S.	Johns Hopkins University
Shmueli, L.	3	28	9.33	2016	2019	5.60	3	Israel	Ben-Gurion University of the Negev
Strech, D.	3	102	34.00	2010	2018	9.27	3	Germany	Berlin Institute of Health

A: number of articles; TC: total citations; TC/A: total citations by article; 1st A: year corresponding to first published article; Last A: year corresponding to last published article; TC/Y: average number of citations per year since the 1st published article; h-index: Hirsch in this topic. Source: Own elaboration.

None of the authors of this ranking published during 2020, while 6 of the 17 published the last one in 2019. In 2016, six of the 17 authors listed in table 5 published their first article on PS & HP; and 15 of these authors published in the second part of the period analysed (2010-2020), which indicates that this line of research is booming.

The two most prolific authors are Bower, P. and Roland, M., affiliated with the University of Manchester and Cambridge, respectively. Both authors are from

the United Kingdom. They have six published articles, an h-index of 6, their first publication in 2006 and their last in 2014. Bower, P. surpasses Roland, M in the number of citations. The most popular work of both was "The GP patient survey for use in primary care in the national health service in the UK-development and psychometric characteristics," published in 2009 and cited 94 times. This paper is one of the five articles that share authorship. These authors are also ranked first and second if we analyse the average number of citations per year since the first publication and the total number of citations.

The ranking is primarily led by Blendon, R.J. (86) regarding the number of citations per article with only three published papers. Far behind are Mead, N. (59.67), Cheraghi-Sohi, S. (53.33) and Kringos, D.S. (52.33). The latter also with only three articles published.

Authors with more than 100 citations began publishing on PS & HP in the first half of the period under review, except for Kringos D.S., which began publishing in 2011 and has 157 citations.

Figure 6, made with the VOSviewer tool, represents the collaboration network among the principal authors. Close authors within the diagram are particularly collaborative, and the bubble size indicates the author's relevance within the collaboration network. Only authors with works cited at least ten times have been taken into account. Four main collaborative groups have been found. The blue group is the only one with authors considered the most productive in this study (Bower, P. and Roland, M.). The country of the affiliate institution seems to determine the collaboration. The red cluster is made up of 11 authors belonging to institutions in the Netherlands. In the other three groups, all authors were affiliated with institutions of British origin.

The red circle comprises Bahrs, O., Bensing, J.M., Deveugele, M., Gask, L., Leiva, F., Messerli, V., Oppizzi, I., Peltenburg, M., Perez A., Van den Brink-Muinen, A., and Verhaak, P.F.M. The green circle includes ten authors: Burt J., Blakeman, T., Hann, M. Kennedy, A., Protheroe, J., Reeves, D., Richardson, G., Rick, J., Rowe, K., and Small, N. On the other hand, the blue cluster comprises Abel G. together with Bower, P., Campbell, J., Elliott, M., Nissen,

S., Paddison, C., Roland, M., and Smith, P. Finally, the fourth cluster, in yellow colour, is formed by Mcdonals, R., Mead, N., and Whalley, D.

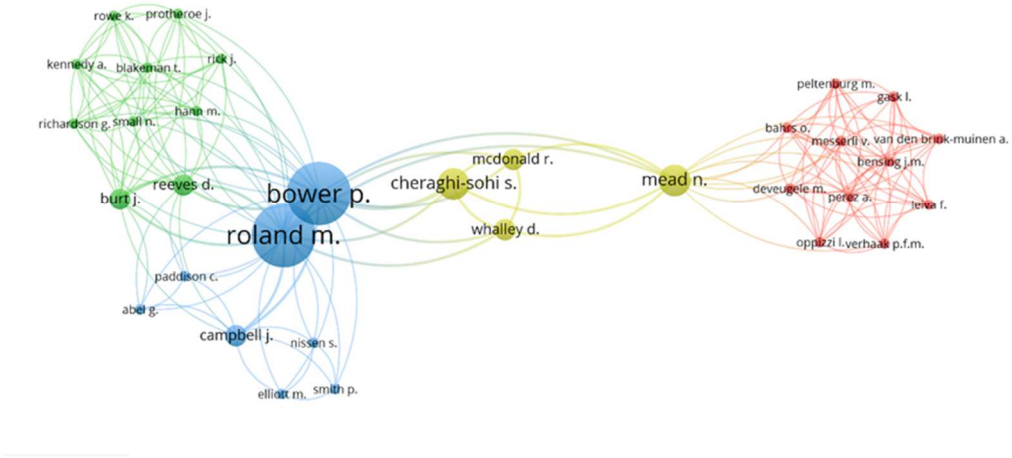

Figure 6. Network of cooperation based on co-authorship of the prominent authors.

2.3.1.5. Identification of the Main Research Institutions

Table 6 displays the 13 most productive PS & HP research institutions from 2000 to 2020, concentrated in 4 countries. It is worth noting that 61.54% are British. The United States and Canada have 15.385% each, and Israel has 7.69%. The table shows the data related to the citations and the first and last years of publication for each institution.

The University of Manchester is the institution that leads the ranking with 14 articles and an h-index of 11. Three of the authors we previously named like the most prolific belong to this University, accounting for 6 of the 14 articles published by this institution. Although it has a better h-index, it shares the number of articles with the London School of Hygiene & Tropical Medicine. It does not have better values than the other institutions concerning the rest of the parameters. The number of citations per article is 38.71, and the number of citations from the first year of publication is 27.10.

By considering the number of citations or the number of citations since the first year of publication, the leader in the ranking is the London School of Hygiene & Tropical Medicine. On the other hand, if the analysis is carried out from the

number of citations per article, the leader is Imperial College London, with 62.58, the institution to which the eighth-most prolific author belongs (see Table 5).

Except for Harvard Medical School, which was first published in 2012, the institutions included in the ranking published in both analysis periods. Moreover, it is accurate to announce that 7 of the 13 published their last article on PS & HP in 2019. The University of Oxford and Harvard T.H. Chan School of Public Health are the institutions with the most extended history of research on public politics based on patient satisfaction.

London School of Hygiene & Tropical Medicine and Harvard T.H. Chan School of Public Health share second place in the h-index with a value of 9.

Table 6. The top 13 most productive institutions on PS & HP research.

Institution	Country	A	TC	TC/A	1st A	Last A	TC/Y	h-index
The University of Manchester	U.K.	14	542	38.71	2001	2016	27.10	11
London School of Hygiene & Tropical Medicine	U.K.	14	770	55.00	2002	2018	40.53	9
University of Toronto	Canada	13	483	37.15	2003	2019	26.83	8
Imperial College London	U.K.	12	751	62.58	2002	2019	39.53	8
University of Oxford	U.K.	10	89	8.90	2001	2019	4.45	6
Harvard T.H. Chan School of Public Health	US.	10	387	38.70	2001	2019	19.35	9
Harvard Medical School	U:S.	8	194	24.25	2012	2019	21.56	6
King's College London	U.K.	8	100	12.50	2001	2018	5.00	7
University College London	U.K.	8	150	18.75	2008	2019	11.54	5
University of Calgary	Canada	7	79	11.29	2002	2018	4.16	4
London School of Economics and Political Science	U.K.	7	256	36.57	2008	2015	19.69	6
University of Aberdeen	U.K.	7	179	25.57	2006	2016	11.93	6
Ben-Gurion University of the Negev	Israel	7	57	8.14	2005	2019	3.56	5

A: number of articles; TC: total citations; TC/A: total citations by article; 1st A: year corresponding to first published article; Last A: year corresponding to last published article; TC/Y: average number of citations per year since the 1st published article; h-index: Hirsch in this topic. Source: Own elaboration.

2.3.1.6. Identification of the Most Cited Articles

Table 7 shows the 11 most cited titles during the analysed period, which is a relevant analysis as it reflects the most influential and popular titles in the scientific community. The year of publication, its authors, the total number of citations, and the average number of citations per year since its publication are indicated for each of them.

Table 7. The top 11 most cited articles on PS & HP research.

Title	Author/s	Journal	TC	Year	TC/Year
Systematic review of involving patients in the planning and development of health care	Crawford M.J., Rutter D., Manley C., Weaver T., Bhui K., Fulop N., Tyrer P.	British Medical Journal	600	2002	31.58
European patients' views on the responsiveness of health systems and healthcare providers	Coulter A., Jenkinson C.	European Journal of Public Health	214	2005	13.38
The use of patient-reported outcomes (PRO) within comparative effectiveness research: Implications for clinical practice and health care policy	Ahmed S., Berzon R.A., Revicki D.A., Lenderking W.R., Moinpour C.M., Basch E., Reeve B.B., Wu A.W.	Medical Care	172	2012	19.11
Client satisfaction and quality of health care in rural Bangladesh	Aldana J.M., Piechulek H., Al-Sabir A.	Bulletin of the World Health Organization	153	2001	7.65
Public trust in physicians - US medicine in international perspective	Blendon R.J., Benson J.M., Hero JO.	New England Journal of Medicine	143	2014	20.43
Cannabis for therapeutic purposes: Patient characteristics, access, and reasons for use	Walsh Z., Callaway R., Belle-Isle L., Capler R., Kay R., Lucas P., Holtzman S.	International Journal of Drug Policy	143	2013	17.88
New federal policy initiatives to boost health literacy can help the nation move beyond the cycle of costly 'crisis care	Koh H.K., Berwick D.M., Clancy C.M., Baur C., Brach C., Harris L.M., Zerhusen E.G.	Health Affairs	143	2012	15.89
Subjective unmet need and utilisation of health care services in Canada: What are the equity implications?	Allin S., Grignon M., Le Grand J.	Social Science and Medicine	136	2010	12.36
Private healthcare quality: Applying a SERVQUAL model	Butt MM, de Run EC.	International Journal of Health Care Quality Assurance	124	2010	11.27
What do patients and the public want from primary care?	Coulter A.	BMJ	122	2005	7.63
Provider continuity in family medicine: does it make a difference for total health care costs?	De Maeseneer J.M., De Prins L., Gosset C., Heyerick J.	Annals of family medicine	122	2003	6.78

TC: total citations; TC/Year: average number of citations per year since the article was published. Source: Own elaboration.

The success of the article "Systematic review of involving patients in the planning and development of health care" [23] is resounding, whether we analyse it from the point of view of the total number of citations (600) or if we analyse it as citations per year (31,58). It is followed in the ranking by "European patients' [82] views on the responsiveness of health systems and healthcare providers", although with a 65% lower number approximately (214 citations).

It should be noted that Blendon R.J, identified in Table 5 as one of the most prolific authors, is the author of one of the articles included in Table 7 within the ranking of the most cited. Its title is "Public trust in physicians - US medicine in international perspective" [83], and it corresponds to a publication from 2014 that has the highest number of citations per year (20.43) after the leading article. The rest of the articles in this Top 11 are not by authors considered more prolific.

An important fact that reveals the quality of the articles written by the author Coulter A. is that his only two articles published on PS & HP during the study period are among the most cited. One of these was the one previously identified as the second most cited. The other is in tenth place with 122 citations [84].

2.3.2. CONTENT ANALYSIS

As indicated above, we divide the analysis period into two subgroups of 10 years each. The objective is to carry out a better analysis of the research evolution [65,85]. Considering it logical that research can change its study objectives over a period of 20 years and show an evolution, dividing the time horizon considered can give us a perspective of the researchers' interest. The first period includes a total of 232 articles, while the second comprises 389.

Figure 7 exhibits the strategic diagram of the first sub-period (2000-2010). It illustrates four clearly defined motor keywords: "Human", "Outcomes", "Physician", and "Ambulatory Care", which, during this first period, were well developed and, therefore, were relevant in the research on PS & HP. Besides, two keywords are at the limit of being considered a motor keyword: "Patients",

whose density is not enough, and "Minority Groups" have a lower centrality than necessary to be regarded as proper motor keywords. These, also called driving themes, are in the upper right quadrant, and they represent themes extensively developed and essential to shaping the scientific field [70].

The position of "Physician" is not surprising since most studies analyse patient satisfaction from a medical or nursing perspective, such as clinical preventive services [86], the communication skills of doctors [87], technical quality [88,89], among others. In turn, all these aspects significantly influence the "Outcomes" obtained [90].

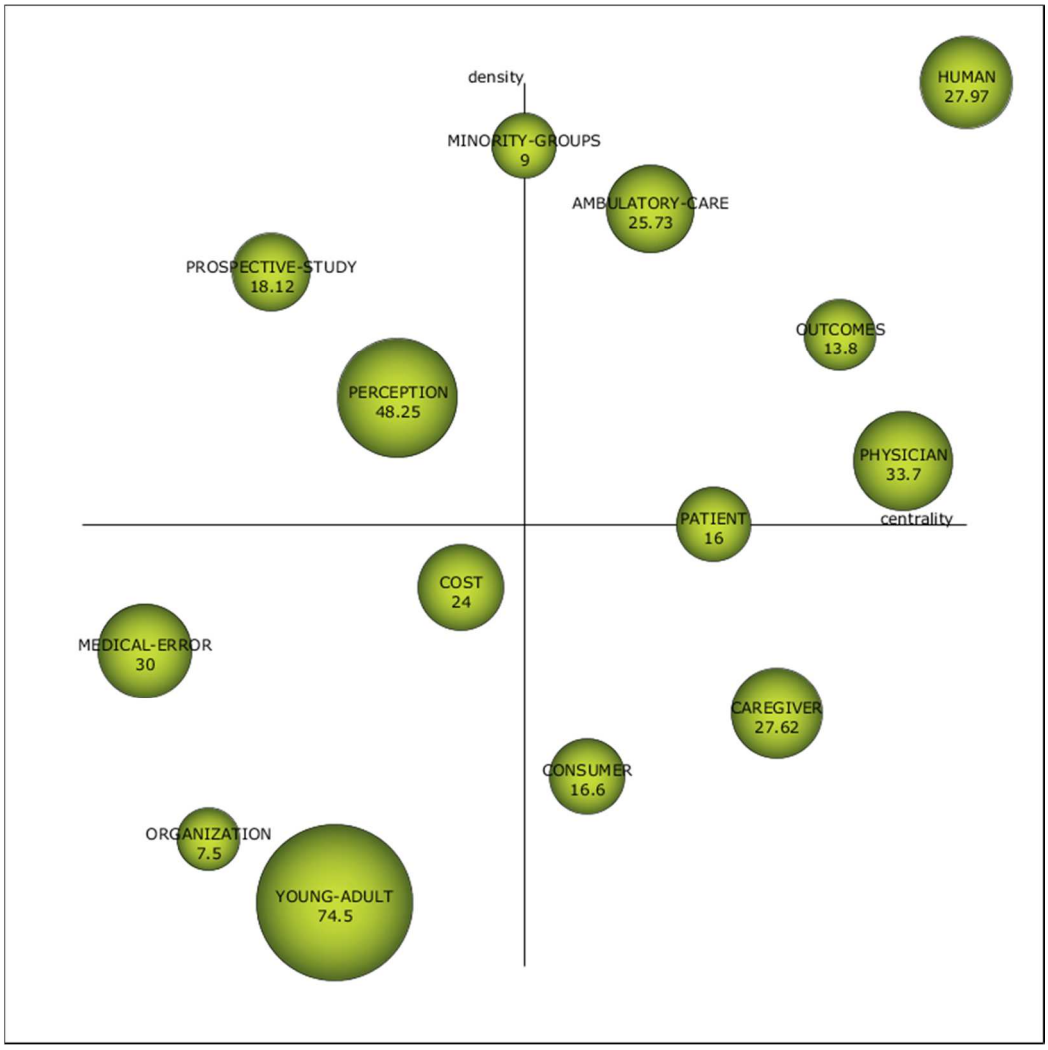

Figure 7. Strategic diagram of keywords based on documents-average citation from 2000-2010. Source: own elaboration.

For its part, "Human" has total density and centrality, so we could affirm that it is a mature topic broadly connected with the rest of the keywords [91].

Another topic considered motor is "Ambulatory Care", which has received particular attention by various authors [89,92–94].

In the reverse sector of the diagram, we find emerging or decaying keywords: "Medical Error", "Organization"," Young Adult", and "Cost", which are not the focus of current research, nor are they mature [95]. The subdivision of the period will allow us to observe if these issues acquire a better position or, on the contrary, end up disappearing.

Moreover, two basic themes, "Consumer" and "Caregiver", and two peripheral themes, "Prospective Study" and "Perception", were also identified. Words located in the upper left quadrant are not currently receiving attention but are potential research areas [96].

We can highlight the role of "Perception", which is not yet sufficiently linked to the other research topics on PS & HP, although it is a highly developed topic.

The sphere's size represents the number of citations per article, which is also indicated on each label. Table 8 complements Figure 7, showing the h-index, density, and centrality of the keywords.

The h-index of these keywords is led by two motor themes, "Human" with a 39 and "Physician" with 17. The third place is shared, with an h-index of 7, a motor keyword ("Ambulatory-care"), and a basic one ("Caregiver"), which is logical since it deals with general or cross-cutting issues in the scientific field.

Figure 8 shows the strategic diagram of the second sub-period (2010-2020). It can be seen that the number of keywords multiplied. New appear as "Intensive Care", "Feasibility Study" and "Aid". The authors identify points for improvement of public policies in different aspects of intensive care. On the one hand, Kasparian N.A. seeks to develop better practices in pediatric intensive care [97]. On the other hand, Gunchan P. studied the relationship between discharges against medical advice and the quality of public policies [98].

We can also find numerous feasibility studies within the bibliography that find relevant data for public policymakers [99–102].

"Human" continues to be a motor keyword with total centrality and 10% less density compared to the first period. "Cost" goes from being an emergent keyword to a motor keyword.

Table 8. The characteristic of the strategic diagram topics from 2000 to 2010.

Topics	Documents	h-Index	Citations	Centrality	Density
Human	193	39	5399	1.00	1.00
Minority-groups	2	2	18	0.5	0.93
Outcomes	5	4	69	0.86	0.71
Ambulatory-care	11	7	283	0.64	0.86
Prospective-study	8	6	145	0.21	0.79
Perception	4	4	193	0.36	0.64
Cost	5	5	120	0.43	0.43
Caregiver	8	7	221	0.79	0.29
Physician	27	17	910	0.93	0.57
Patient	9	5	144	0.71	0.50
Consumer	5	4	83	0.57	0.21
Organization	2	1	15	0.14	0.14
Young-adult	2	2	149	0.29	0.07
Medical-error	1	1	30	0.07	0.36

Source: own elaboration.

For its part, "Perception" went from being a topic with high density and low centrality to becoming a basic topic, a keyword with high centrality and low density. Although the clients' perception has been studied since the 1950s [6,7], the economic crisis of 2008 [29,51,103,104] may have been a turning point in research on the perception of patients linked to the cost of health care.

For the other three topics in the emerging or declining quadrant in the first period, we can confirm they were declining keywords since they disappeared in the second period.

Table 9 complements Figure 8 by indicating the degree of density and centrality, h-index, and the number of documents and citations for each keyword. In this second period, the keyword with the best h-index continues to

be "Human" with 30. It is followed by the keyword "Perception", which denotes the importance given to the evaluation of the patients' opinion. Another keyword that emerges and reveals this to us is "Patient Survey" (keyword that goes hand in hand with "Perception" since it is a method to know it), which is in the peripheral quadrant at the limit with the quadrant of motor keywords. Table 9 shows relevant data for these terms; for example, "Perception" occurred in 25 papers and had 299 citations.

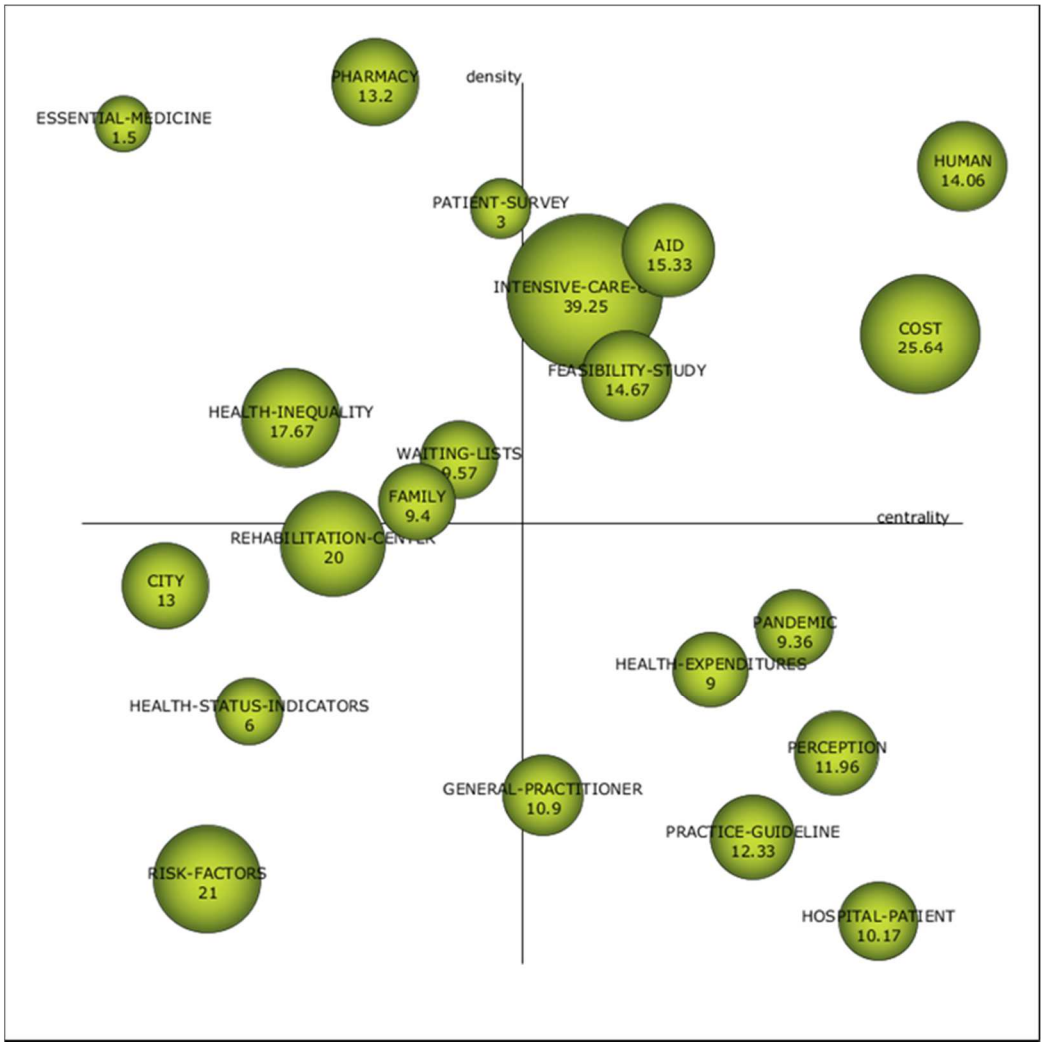

Figure 8. Strategic diagram of keywords based on documents-average citation from 2011-2020. Source: Own elaboration.

Besides "Perception", we also observe the entry of the word "Pandemic" to the quadrant of basic keywords, a product of the health crisis of covid-19. Some investigations are related to the advance in telemedicine that the Covid-19 forced [105,106].

Table 9. The characteristic of the strategic diagram topics from 2011 to 2020.

Topics	Documents	h-Index	Citations	Centrality	Density
Human	301	30	4232	1.00	0.90
Pharmacy	5	3	66	0.33	1.00
Aid	3	3	46	0.67	0.81
Patient-survey	4	3	12	0.48	0.86
Intensive-care-unit	4	3	157	0.57	0.76
Feasibility-study	9	5	132	0.62	0.67
Family	5	4	47	0.38	0.52
Cost	11	7	282	0.95	0.71
Waiting-lists	7	4	67	0.43	0.57
Pandemic	11	6	103	0.81	0.38
Perception	25	10	299	0.86	0.24
General-practitioner	10	6	109	0.52	0.19
Practice-guideline	12	7	148	0.76	0.14
Health-expenditures	4	4	36	0.71	0.33
Hospital-patient	6	4	61	0.90	0.05
Health-inequality	3	3	53	0.24	0.62
Rehabilitation-center	2	2	40	0.29	0.48
City	2	2	26	0.10	0.43
Health-status-indicators	2	2	12	0.19	0.29
Essential-medicine	2	1	3	0.05	0.95
Risk-factors	1	1	21	0.14	0.10

Source: own elaboration.

The rest of the keywords in the lower right quadrant are compound words. "Health-Patient", "Practice-Guideline", and "Health-Expenditures" have a high centrality, which reveals the importance of these issues in the general development of public health policies based on patient satisfaction. Finally, "General Practitioner" has a medium centrality, to the limit of becoming an emerging theme.

We found four emerging themes, that is, themes with low centrality and low density. They are "Risk-Factors", "Health-Status-Indicators", "City", and “Rehabilitation-Center". None of them was found in the first period.

Finally, we highlight keywords with a high density that were highly developed independently in the scientific field analysed. They are "Pharmacy", "Essential-Medicine", "Health Inequality", "Waiting-List", "Family", and, the one already named, "Patient-Survey".

Figure 9 shows the evolution of keywords within the PS & HP research field, complementing the study of trends. For the analysis, only those words that appeared at least 40 times were taken. Blue indicates older terms used in literature. Instead, the yellow colour represents terms that appeared more recently in the field of research under analysis.

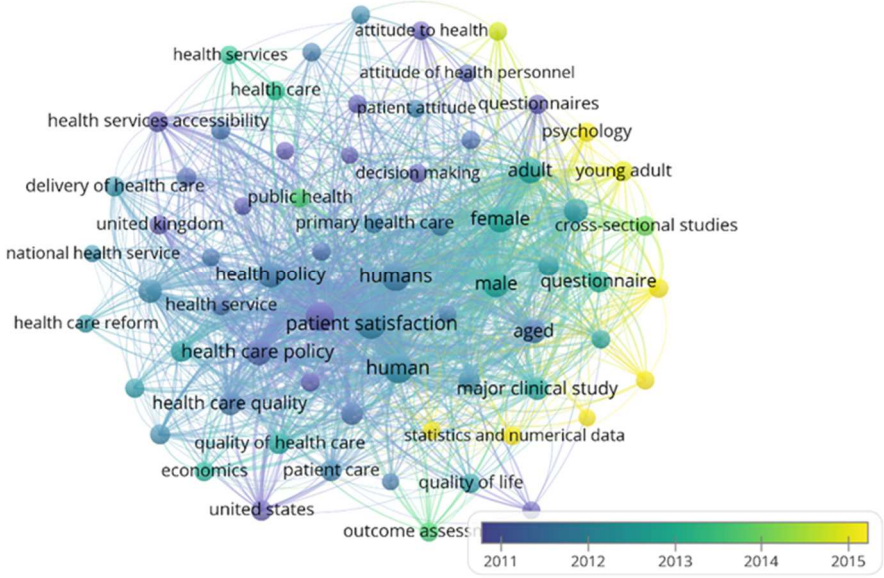

Figure 9. Evolution of leading keywords network based on co-occurrence (1954-2020). Own elaboration.

During 2011 the articles were more related to patient satisfaction, health care quality, health care policy, and health services accessibility. During 2012, many keywords coincide with the previous year, such as the health care quality and public health policies. These words constitute a cluster that includes other keywords such as "National Health Service" or "Health care reform".

In 2013, cross-sectional studies appeared as well as studies with gender distinction and the outcomes assessment. In 2014, psychological aspects were incorporated into the evaluation of patient satisfaction to formulate public policies. In addition, the studies begin to be with statistical methodologies and numerical data.

2.4. DISCUSSION

The objective of this study was to analyse research activity in the field of patient satisfaction as a basis for the formulation of public policies. We study the temporal evolution of the theme from the point of view of keywords and the number of publications found. The most prolific authors and journals, collaborative relationships between countries, and scientific distribution were also analysed. Using the Scopus database, a sample of 621 articles published between 2000 and 2020 was obtained.

Although we could find that the first published articles were published in 1979 [107,108], scientific production on this subject began to flourish after 2000. Less than 11% of the total articles published correspond to the 1979-1999 period, which shows the interest generated after this time. This fact could be connected with the generation of the European Community Health Indicators (ECHI) that the European Union created to measure, among other things, the satisfaction of patients with the health system. The first part of the ECHI ended in 2001 [109]. The ECHI indicators arise to gather the information that is not easy to obtain but useful for generating public policies [109,110].

Another turning point can be considered the financial crisis of 2008. After that year, there was 73.10% of the total scientific production on PS & HP. The 2008 financial crisis caused a decrease in health budgets [51], so the study of satisfaction in these contexts became attractive. Analysis of patient satisfaction before and after the crisis is helpful to contribute to the formulation of public policies that improve the quality of the health system [111]. For example, considering that the length of stay is the primary determinant of the cost of hospitalisation, analyses will be carried out to reduce this stay without reducing the quality of care [112].

The main subject area is Medicine, followed by Nursing and Social Sciences, which is logical because health policy and patient satisfaction are framed within these large study groups. However, patient satisfaction from the point of view of health investment management and the application of resources is not widely covered. The following data can prove this: The business management area covers only 1.44% and the economic area 1.08%.

The two most productive authors are British and have six articles each. Bower P. belonging to the University of Manchester, is in the first place, and Roland M, a member of the University of Cambridge, is second. These two authors are also leaders in the number of citations. However, the statehood belonging to the Harvard School of Public Health, Blendon R.J, is the author with the vastest experience (13 years) and the highest value of citations per article (86). In this field of research, the most proliferating institution with the most significant impact is the University of Manchester, with 14 published articles and an h-index of 11. However, the institution with the highest number of citations is the London School of Hygiene & Tropical Medicine. The Imperial College London detents the highest number of citations per article.

In order of importance, the five most productive countries are the United States, United Kingdom, Canada, Australia, and Germany. All of them, except Canada, are also included in the list of the five most cooperative. The United States leads the position of both rankings with 185 articles published and 89 collaborations. On the contrary, the United Kingdom has the best quality measured according to the number of citations received, with an h-index of 33.

This study improves research on PS & HP because it allows us to visualise the state of scientific production and, above all, with the evolution of keywords to identify possible future avenues of research. In this sense, we determined that the five most important topics studied in the current literature are: Intensive Care Unit, Cost, Aid, Feasibility-study, and Human.

On the other hand, the strategic diagram allowed us to identify four emerging or decadent themes (Risk Factors, Rehabilitation Center, City and, Health Status Indicators). For the study of the keywords, the period analysed was divided into two. However, in both sub-periods, the engine keyword with the

highest h-index is the same: Human. Also, this keyword use leads in the number of documents, being 193 in the first ten years of study and 301 in the last ten years, which is logical because it is a global and generic issue. Perception is a theme that grew between the first period (4 documents) and the second period (25 papers). This contribution is relevant to the research since we can see that the patient's perception of perceived health services is increasingly considered when deciding what investments, expenses, and practices to carry out.

Of the five most productive journals, four are of British nationality. The first place is Social Science and Medicine, and the second is BMC Health Services Research, with 19 and 18 published articles, respectively. It was to be expected to find journals that deal with the subject of health in general terms. For this reason, other bibliometric studies on health services also find them among the most prolific [113]. In third place is an Irish journal that surpasses the previous ones in trajectory, being its first publication in 2001 and its last in 2019. Eight of the eleven most productive journals in 2019 belonged to quartile 1 in the Scimago Journal Rank (JCR).

Although no bibliometric studies were found on the formulation of public policies based on the patients' satisfaction in the health system, an analysis of scientific production was found on closely related topics, such as the quality of the health system [54], the application of marketing to public services [114].

This article aims to show which institutions, authors, and countries produce science in the field of public policy formulation subject to patient satisfaction. The use of marketing concepts, such as satisfaction, is reaching a certain maturity in the public sector, and more specifically, in health [114]. The ultimate goal is for policymakers to bring down the scientists' concepts to reality to make better decisions that positively impact the population's quality of life.

This research has some limitations. The Scopus database was used. Although most of the articles in the WoS database are in Scopus, it would be interesting to develop this analysis based on WoS, to verify that the results obtained are similar. A bibliometric study on sustainability and public health that compares both databases found that Scopus until 2013 was the leader in the volume of

articles. Still, from 2013 to 2017, the concentration was similar in both databases [115]. WoS performs a comprehensive content filter based on citation data, posting standards, and expert judgment [68].

On the other hand, Google Scholar is advancing in quality, so conducting a study on this platform would also be interesting. Google Scholar is limited to publications in scientific journals and includes communications and presentations to congresses, theses, seminars, and other academic works that can profoundly contribute to the field studied [116]. Another future research could be to focus only on public policies solely focused on the financing of health services or their quality. In addition, a timed H-index study could be carried out to verify that the authors considered to be the most prolific continue to be so today or their H-index, calculated traditionally, is high as a consequence of successful but old publications [117].

2.5. CONCLUSIONS

We carried out a bibliometric study based on 621 articles from the Scopus database on PS & HP published between 2000 and 2020. The study revealed that the scientific production on the subject was not significant in terms of quantity in previous years. However, from the year 2000, production began to accelerate. We estimate the latter to be due to the appearance of the ECHI indicators. Then, starting in 2010, a greater preoccupation can be observed in studying the perception of patients.

We believe that researchers must understand the political processes in health matters. At the same time, politicians have to communicate with researchers since it will be the only way scientific discoveries can be applied in real life and improve the population's health and quality of life.

Finally, we want to underline that two potent tools have been used, such as VOSviewer and SciMAT. In the bibliography, it can be observed that, in general, it only uses a single bibliometric tool.

2.6. REFERENCES

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CHAPTER 3:
HEALTH INVESTMENT MANAGEMENT AND HEALTHCARE QUALITY IN THE PUBLIC SYSTEM: A GENDER PERSPECTIVE

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Chapter 3: Health Investment Management and Healthcare Quality in the Public System: A Gender Perspective

Abstract

The aim of this empirical research was to provide useful information for health system managers on the costs and investments involved in improving the quality of the National Health Service (NHS) based on patient assessments and from a gender perspective, i.e., without assuming that the perceived experience is identical for men and women. A cross-sectional study of 31 variables was applied using partial least squares structural equation modeling (PLS-SEM) as a research tool. The data were obtained from the Spanish Ministry of Health, Consumption, and Social Welfare for the entire Spanish territory between 2005 and 2018. The influence of expenditure, resource allocation, and mortality was hypothesized with regard to patient satisfaction according to disconfirmation theory. Patient satisfaction reflects clinical effectiveness, and therefore is a measure of health system quality. The results show that women are more sensitive to public investment in health than men, i.e., an increase in the level of spending and resources increases satisfaction more in women. In both sexes, the level of expenditure has a direct influence on patient satisfaction, and therefore on the quality of the healthcare system. It is important to increase spending on primary care, especially on specialized medical care and diagnostic equipment. However, reducing the use of drugs in favor of alternative treatments or therapies is considered to be positive. Likewise, spending has an impact on available resources, and these, in turn, have a positive influence on the level of use and a negative impact on mortality. Resources, especially healthcare staff, nuclear magnetic resonance equipment, and the number of posts in day hospitals, increase patients' positive perception of the NHS.

Keywords: national health service; healthcare quality; patient satisfaction; health policy; gender perspective; partial least squares structural equation modelling (PLS-SEM).

3.1. INTRODUCTION

Health is an essential issue in all countries and a complex concept due to its multidimensional nature. Regardless of the socioeconomic level, in many countries, the National Health Service (NHS) guarantees access to health

services, thus ensuring equal treatment for all citizens. This contributes to the construction of a prosperous society. Indeed, when the life expectancy of citizens is longer and their health improves, the productive system becomes more efficient, resulting in a stronger economy. This, in turn, will allow an increase in healthcare spending, which will lead to improvements in the health and quality of life of citizens [1]. Consequently, administrations and authorities contribute to achieving continuous improvement in the service provided [2]. According to the World Health Organization (WHO), periodic review of the NHS contributes to improving its performance, which is a fundamental aspect of any society [3]. In this sense, and given that the aim is to enhance citizens' quality of life, patient evaluation is a key factor in the analysis of healthcare system quality [4].

World economies at all times work to be efficient. Especially in Spain, budgetary restrictions are becoming more frequent, therefore, making efficient use of state resources is one of the most salient points to be addressed [3]. The economic recession of 2008 generated budget cuts in all social services, including the health system. In 2012, the state reduced the health budget by approximately 14% [5]. That, along with the increasing demand for health service in quantity and quality, is why it is even more critical to manage the available resources [6]. The industry, in general, is increasingly customer-oriented. It is important to understand that learning about customer satisfaction is a key to business success [7–9]. In the particular case of healthcare, special attention is paid to the patient's experience throughout the process (admission, investigation, examination, treatment, discharge, and monitoring) [10,11]. It is essential to emphasize not only needs but also patients' expectations [12,13]. Many times, citizens do not pay much attention to certain public services (e.g., adequate road lighting, cleanliness of public sidewalks, etc.). However, this does not usually happen with the health system, since quality of life is at stake, and even life itself. Even customers in that type of service are more intolerant of the quality service [14].

The National Health System is an international benchmark in terms of universality, accessibility, and effectiveness [15]. According to Numbeo [16], Spain climbed up on the Health Care Index by Country 2019, rising from seventh

to sixth place worldwide, while maintaining third place at the European level. The Health Care Index estimates the overall quality of the health care system, health care professionals, equipment, staff, doctors, and cost, among other factors.

In Spain, there is a public health system. The state guarantees access to health services regardless of the socioeconomic level of people who inhabit the country. This allows equal treatment for all. It contributes to the construction of a prosperous society, where citizens' life expectancy is raised, and at the same time improves economic efficiency [1].

System feedback, focusing on patients, provides information for decision-making and health system improvement [17,18]. Often, the management of health centers focuses on professionals (doctors, nurses, and staff) and not on patients [19]. Nevertheless, considering information on users' evaluations is a competitive advantage [8]. Incorporating patients' opinions into management to obtain the modus operandi that improves service provision in the medium or long term [12,20,21] makes the healthcare system more responsive to patient needs. That is, considering patients' complaints allows for system improvement [22].

Therefore, to continue offering quality service (effective and efficient), managers need to allocate costs adequately (investing in hospital beds is not the same as investing in day hospital posts, specialist physicians, or family physicians, etc.), which requires an optimal application of management strategies in line with proposed objectives [9,23]. The public budget allocated to healthcare puts a limit on the expenses it incurs to continue providing quality service. However, previous studies indicated that quality and efficiency are not mutually exclusive. It is possible to reallocate resources without compromising satisfaction [24] and the quality of healthcare services [25]. In conclusion, the main challenge facing the health system is to provide social welfare with limited and often scarce resources, especially in times of budget adjustments resulting from economic crises.

Koos [26] and Donabedian [27], in 1954 and 1966, respectively, were pioneers in considering patient feedback as a measure of healthcare outcomes. Later, in

1982, Gronroos first suggested the concept of perceived service quality [28], in terms of patient satisfaction being identified with clinical effectiveness. In fact, this was adopted by the European Foundation Quality Management (EFQM) and the International Organization for Standardization (ISO) [20]. Collecting and analyzing health system data provides information on the aspects that need to be strengthened in order to increase satisfaction, and thus the quality of the health system. This information is necessary in order to adopt the appropriate measures and establish the correct strategies [18,20,21,29–32]. With proper quality management, the system can be more efficient; that is, it can have more quality at the lowest possible cost [33].

Assessing the satisfaction of a service such as healthcare is complex because it has certain characteristics that make it special. Namely, it is a necessary service that cannot be avoided, and patients have to give up their privacy to the medical staff [34]. Previous studies have shown that patient outcomes are improved, and therefore patients are more satisfied, when they are informed about their options and actively participate in the selection of treatments to be applied in agreement with physicians [6,12]. The literature states that it is an overly complex service [14,35] in which, in addition to other factors, wrong practice poses significant risk to patient health [36]. Evaluating the system's quality through patient satisfaction will highlight existing deficiencies, and, in this way, they can be corrected to reduce future risks [13].

The concept of patient satisfaction is complex [11,37] and can be understood as the difference between the patient's expectations and the actual outcome of the healthcare service [4,29,38–40]. In short, patient satisfaction is considered a crucial indicator to measure the quality of the service provided [6,30,31,41]. Patient satisfaction can only be improved when the organization knows its needs and expectations, for which it is essential to apply complete quality control and management.

Most of the patient satisfaction studies developed so far were aimed at providing information to healthcare staff (mainly doctors and nurses) on their behavior and relationships with patients (communication, privacy, treatment by and professionalism of the medical staff, received information,

etc.)[3,6,17,42]. However, the aim of this study was to provide useful information for health system managers on the costs and investments involved in improving NHS quality based on the assessment of users (patients) and from a gender perspective, i.e., without assuming that the perceived experience is identical for men and women.

The remainder of this paper is organized as follows. The next section contains a review of the literature and the hypotheses established. The second section shows the research methodology. The third section presents the results of the research. Finally, the last section discusses the results achieved and presents the conclusions.

3.1.1. LITERATURE BACKGROUND AND HYPOTHESES

Customer (or patient, in the healthcare system) satisfaction is a complex concept that has been the subject of numerous debates in the fields of marketing, psychology, and even philosophy. However, it is not the purpose of this paper to analyze the different conceptions of the term [43].

Satisfaction can be conceived as the result of cognitive information processing, i.e., a comparison of expectations with the perceived performance of the service. This is what in psychology is called disconfirmation theory, a paradigm that has dominated the consumer satisfaction literature since its origins in the early 1970s [44]. Confirmation of expectations occurs when the outcome of the service matches what was initially expected. On the other hand, negative disconfirmation occurs when the result obtained is less than expected, giving rise to dissatisfaction, while positive disconfirmation occurs when the result exceeds initial expectations, causing a feeling of satisfaction [45].

There are two methods for applying this theory [46]. The first, called the inferred method, involves computing the difference between the expectation of performance and the perception of the result obtained. The second, known as the direct method, involves direct measurement of the discrepancy between expectation and perception, with the respondent directly determining the magnitude of the difference. Generally, as in this study, the direct method is used. The EFQM model considers that patient satisfaction represents 20% of the

total value of healthcare system quality [38]. Therefore, patients' opinions represent a main driver of NHS quality.

Satisfaction is a highly subjective concept, thus there is no standardized method to measure patient satisfaction [23,43] and its measurement presents difficulties [37,43]. The importance of patient satisfaction research is that high satisfaction is associated with better clinical outcomes [47] and thus system quality. Some authors state that it may be a "cause–effect" relationship because satisfied patients may be more adherent to treatment and thus achieve better clinical outcomes [48]. For example, Chia confirmed that patient participation in the process of diagnosis and the degree of patient involvement in healthcare decision-making are associated with patient satisfaction [49].

Previous literature indicated that patient satisfaction is related to the development of specific personal skills involving respectful treatment [3], the physician's behaviors, generating a relationship in the context of education, empathy, courtesy, and respect [10], and the motivation and competence of health professionals [2]. However, such variables are not the subject of our study since they are not related to health spending and investment policies.

We found no evidence of a solid previous literature on studies of patient satisfaction with the NHS differentiated by sex. Nor is there any theory on which to base the different behavior of men and women in relation to the variables analyzed in this work on an individualized basis. Therefore, in this sense, the analysis developed is exploratory and it is only possible to establish a general hypothesis to test a different assessment in men and women. In the future, and based on the results obtained, specific behavioral hypotheses can be established for each variable analyzed.

The relationship between expenditure and satisfaction is positive and significant [3,20,50]. Law 14/1986 granted to the autonomous communities competence in terms of healthcare, and according to the health account system in Spain, health expenditure represented 9.1% of gross domestic product (GDP) in 2016. If we distinguish by autonomous communities, we can see that communities with high per capita health expenditure (Basque Country, Principado de Asturias, and Extremadura) have high satisfaction. On the other

hand, communities with lower per capita health expenditure (Andalusia, Madrid, and the Balearic Islands) have lower satisfaction [51]. The expenditure budget applies to direct consumption in a certain period and investments (e.g., in medical facilities and equipment). Therefore, it is reasonable that higher spending will result in greater available resources. Based on the above literature and arguments, we can state the following two hypotheses:

Hypothesis 1 (H1). *Expenditures positively influence patient satisfaction.*

Hypothesis 2 (H2). *Expenditures positively influence resource volume*.

Resource allocation is intimately linked with efficiency [33] and is therefore an important variable to analyze, mainly due to its characteristic of being limited. If we obtain information about resource allocation and the measures to take for optimal use, the healthcare system's overall performance can improve [52]. The previous literature agrees that, for high patient satisfaction, it is necessary to have a healthcare system with adequate infrastructure and medical equipment [9,25,40]; qualified and expert doctors, nurses, and staff; diagnostic facilities and ambulance services [29]; and laboratory services [23]. Kamra et al. [33] revealed the relationship between patient satisfaction and aspects like infrastructure, interpersonal relations, and environmental and functional factors. Handayani's research was based on the relationship between patient satisfaction and six dimensions: tangibles, responsiveness, reliability, assurance, empathy, and professionals [34]. Some studies confirm the logical assertion that the volume of available resources directly affects the level of use of health services. It stands to reason that, if users have more resources at their disposal, they will use the system more frequently [53]. Therefore, we propose the next hypotheses:

Hypothesis 3 (H3). *Resource volume positively influences patient satisfaction.*

Hypothesis 4 (H4). *Resource volume positively influences the extent of use*.

Quality of life is related to physical and psychological aspects, and therefore the risk of mortality [54]. For its part, the quality of the health system directly affects the mortality and quality of life of citizens [25,55]. In this sense, for example, the availability of resources, such as physicians and nurses, will reduce mortality [56–58]. Some studies verified that patients with a high risk of

mortality are more satisfied than those with a lower risk of mortality [59,60]. The latter could be due to patients' necessary dependence on the health system [60]. Other research found a weak relationship between health condition and satisfaction [48,61]. However, in general, studies have found a negative relationship between mortality and patient satisfaction [62–64]. Consequently, we establish the following hypotheses:

Hypothesis 5 (H5). *Resource volume negatively influences mortality.*

Hypothesis 6 (H6). *Mortality level negatively influences patient satisfaction.*

With regard to GDP and distinguishing between autonomous communities, a 2016 study revealed that, in communities with a high GDP per capita, citizens have a better perception of satisfaction [20]. The macroeconomic variable GDP per capita is a good indicator of satisfaction, being a positive relationship [65]. It is more possible for the most productive countries to have a population satisfied with healthcare [50]. High public expenditure on more sophisticated sanitary facilities or the latest equipment may generate greater user satisfaction [65]. Hence, we propose the following hypothesis:

Hypothesis 7 (H7). *GDP volume positively influences patient satisfaction.*

When a variable interferes between two related variables, a mediating relationship is established. Specifically, this implies that a change in the independent variable results in a change in the mediating variable, which, in turn, changes the dependent variable. Analyzing the intensity of the relationships of the mediating variable with the other two variables makes it possible to justify the mechanisms underlying the cause–effect relationship between an independent and a dependent variable [66]. Considering the previously hypothesized relationships and mediation models from the literature [53], we make the following mediation hypotheses:

Hypothesis 8 (H8). *Resource volume mediates the relationship between expenditure and patient satisfaction.*

Hypothesis 9 (H9). *Mortality level mediates the relationship between resource volume and patient satisfaction.*

Patient characteristics (age, gender, and social and economic status) affect the perception of health service provider quality, and therefore satisfaction [21,55,67]. The complexity of measuring patient satisfaction, mentioned above, is amplified by demographic heterogeneity [36].

The elevated role of doctors in the health system is indisputable. According to another study, we can observe higher satisfaction with family doctors than specialist doctors [68]. This may be due to more personal and closer relationships with family doctors than specialists [59]. In the doctor's primary health, confidence, and security significantly influence patient satisfaction, and women are the most satisfied [12,67]. That distinction by gender is not significant with specialist doctors, indicated by a study of non-clinical factors [3]. Chang relates satisfaction with three elements: structure, process, and outcomes. In terms of process, it is observed that women are more satisfied than men, while, with the other two points, the difference between the sexes is not significant [69]. Valls and Parra [70] studied patient satisfaction with primary care doctors distinguishing by gender and found differences between men and women. Social role theory suggests that women are different from men in their nurturing (education) rather than their nature [71], and this could lead to an unequal perception of healthcare services. Based on previous studies and arguments, we state the last hypothesis of this empirical research:

Hypothesis 10 (H10). *Satisfaction of men and women is not configured in the same way.*

3.2. MATERIALS AND METHODS

3.2.1. SAMPLE AND DATA COLECCTION

The Spanish Ministry of Health, Consumption and Social Welfare publishes on its website the so-called Key Indicators of the National Health System, known as INCLASS. These key indicators are an attempt to provide a picture of the health status of the population (mortality), the determinants of health (behavioral factors and living conditions), the response of the health system to the population's needs (indicators that depend on the system: resources, level of use, expenditure and quality, as measured by patient satisfaction with

healthcare received), and sociodemographic information (economic level). The conceptual model on which they are based is the one exemplified by the European Core Health Indicators (ECHI), formerly known as the European Community Health Indicators, which resulted from long-term cooperation between EU countries and the European Commission.

Therefore, we used secondary data, since they were obtained from the ministry's official database. Information on expenditure, resources, level of use, and mortality is known to the public administration that manages the NHS. GDP data were obtained from the Spanish National Institute of Statistics. Finally, data on patient satisfaction provided by the Spanish Ministry of Health came from a survey called the Health Barometer, carried out by the National Institute of Statistics [72]. Three satisfaction variables were measured using a Likert scale ranging from 1 [very dissatisfied) to 10 (totally satisfied). According to officially published information, the data were obtained through direct surveys of citizens, but we do not know the specific procedure or the number of respondents. We worked with the information contained in the database, which corresponds to average values by autonomous community, differentiating by sex.

Spain comprises 17 autonomous communities plus the autonomous cities of Ceuta and Melilla, and the data reflect the annual average of indicators for each territorial unit. The study considered data from the period 2005–2018, except 2014, since there were no data for one of the variables: degree of satisfaction with the knowledge of the history and monitoring of health problems by family doctors and pediatricians. Moreover, we excluded from the study the autonomous cities, since there were no data on expenditure variables, which were fundamental to the study. Therefore, the final sample comprised 221 observations (17 autonomous communities over 13 years) for each study, i.e., 221 observations for men and 221 observations for women.

According to the statistical program G*Power (v. 3.1.9.6, Kiel, Germany), we calculated the necessary size of the sample [73] by considering a significance level of 0.05 and an effect size f2 of 0.15. We needed a sample of 114 observations for a statistical power of 0.8, which is the minimum power

demanded in social and behavioral research. Even for statistical power of 0.95, the required sample of 166 observations is less than the 221 used here. Therefore, our sample was appropriate.

3.2.2. MEASUREMENT VARIABLES

We considered all variables as composites and a set of indicators to integrate each composite or construct as a dimension of it [74]. Constructs are usually not one-dimensional but require several indicators to represent different facets [75]. Thus, removing an indicator from the measurement model alters the meaning of the construct [76]. In principle, the model does not impose any assumptions on the correlations between the indicators. Table 1 summarizes the composites and their indicators.

The final construct (dependent variable), patient satisfaction, was estimated in mode A, since indicators should be highly correlated, based on the idea that the construct causes covariation of the indicators [66]. We considered 3 indicators of patient satisfaction, measured on a Likert scale, ranging from 1 (least satisfied) to 10 (most satisfied): first, the degree of satisfaction with the functioning of the public health system, in general (PS1); second, the degree of satisfaction with the knowledge of the history and monitoring of health problems by family doctors and pediatricians (PS2); and third, the degree of satisfaction with the information received at specialists offices about health problems (PS3).

It should be noted that the quality of healthcare services is usually identified by patient satisfaction, and patients demand more information about their diagnosis and participate in deciding on the most appropriate treatment. Moreover, the results of a specific management policy can be measured through the evolution of patient satisfaction. Hence, its importance in resource management.

The representative constructs of expenses, resources, extent of use, and mortality were estimated in mode B, in which case the indicators were not expected to be strongly correlated. This mode indicates a causal relationship between the indicators and the construct.

Table 1. Composites and descriptions of indicators.

Composite	Indicators	Description
Patient satisfaction (mode A)	PS1	Degree of satisfaction with functioning of public health system
	PS2	Degree of satisfaction with knowledge of history and monitoring of health problems by family doctors and pediatricians
	PS3	Degree of satisfaction with information received at specialists' offices about health problems
Expenses (mode B)	EX1	Public health expenditure managed by autonomous community per protected inhabitant
	EX2	Percentage of spending on specialized care services
	EX3	Percentage of spending on primary care
	EX4	Percentage of spending dedicated to concerts
	EX5	Percentage of spending on intermediate consumption
	EX6	Percentage of public health expenditure on staff remuneration for training of residents
	EX7	Percentage of pharmacy spending
Resources (mode B)	RE1	Medical personnel in specialized care per 1000 inhabitants
	RE2	Primary care medical staff per 1000 people assigned
	RE3	Skilled care nurses per 1000 inhabitants
	RE4	Primary care nurses per 1000 people assigned
	RE5	Running hospital beds per 1000 inhabitants
	RE6	Day hospital posts per 1000 inhabitants
	RE7	Operating theaters per 100,000 inhabitants
	RE8	Operating computed tomography (CT) equipment per 100,000 inhabitants
	RE9	Nuclear magnetic resonance (NMR) per 100,000 inhabitants
Extent of use (mode B)	EU1	Frequency of specialized attention consultations per 1000 inhabitants/year
	EU2	Frequency of hospital admissions per 1000 inhabitants/year
	EU3	Number of days of average hospital stay
	EU4	Surgical intervention rate per 1000 inhabitants/year
	EU5	Outpatient surgery percentage
	EU6	CT usage rate per 1000 inhabitants/year
	EU7	NMR usage rate per 1000 inhabitants/year
Mortality (mode B)	MO1	Age-adjusted mortality rate for Alzheimer's disease per 100,000 inhabitants
	MO2	Age-adjusted death rate from cancer per 100,000 inhabitants
	MO3	Age-adjusted mortality rate for diabetes mellitus per 100,000 inhabitants
	MO4	Age-adjusted death rate from cerebrovascular disease per 100,000 inhabitants
Economic driver	ED1	Gross domestic product (GDP) per capita

PS: Patient Satisfaction, EX: Expenses, RE: Resources, EU: Extent of use; MO: Mortality, ED: Economic driver.

Expenses are different across the country, since, in Spain, health management competencies are transferred to the autonomous communities; that is, they do not belong to the central government. Therefore, the level of expenditure and distribution of funds are not the same throughout the country. It is necessary to consider that the amount of expenditure influences the possibility to provide quality service. Public budgets are limited, especially in times of crisis like the present, while resource needs are increasing with growing technology, an aging population, and the diseases that come with economic development, with the stresses of daily life and environmental pollution. The 7 indicators of expenses include public health expenditure managed by the autonomous communities per protected inhabitant (EX1) and the percentage of this amount corresponding to the different expenditure items: specialty care services (EX2), primary care (EX3), concerts (outsourced expenses) (EX4), intermediate

consumption (EX5), staff remuneration for the training of residents (EX6), and pharmacy spending (EX7).

Resources in each autonomous community depend not only on current spending but also on past spending. In other words, the policies applied in the past influence the possibilities of the present. There are nine indicators that make up the resource composite: for every 1000 inhabitants, medical personnel in specialized care (RE1), primary care medical staff (RE2), skilled care nurses (RE3), primary care nurses (RE4), running hospital beds (RE5), and day hospital posts (RE5) and for every 100,000 inhabitants, operating theaters (RE7), operating computed tomography (CT) (RE8), and nuclear magnetic resonance (NMR) (RE9).

In turn, the volume of available resources can determine the level of use of these resources by citizens. The study considered 7 indicators representative of the extent of use: for every 1000 inhabitants, the frequency of specialized attention consultations (EU1), frequency of hospital admissions (EU2), surgical intervention rate (EU4), CT usage rate (EU6), and NMR usage rate (EU7), as well as the number of days of an average hospital stay (EU3) and the outpatient surgery percentage (EU5).

It is logical to think, a priori, that the level of available health resources will influence mortality, and will also be a determining factor in patient satisfaction. Given the impossibility of contemplating all the possible causes of death, the construct was built with 4 of the most important ones dependent on the NHS: for every 100,000 inhabitants, the age-adjusted mortality rate for Alzheimer's disease (MO1), cancer (MO2), diabetes mellitus (MO3), and cerebrovascular disease (MO4).

Finally, we used a control variable, the economic driver, measured as gross domestic product (GDP) per capita, considering its influence on patient satisfaction.

The conceptual model represented in Figure 1 shows the relationships between the variables considered, reflecting the hypotheses given above.

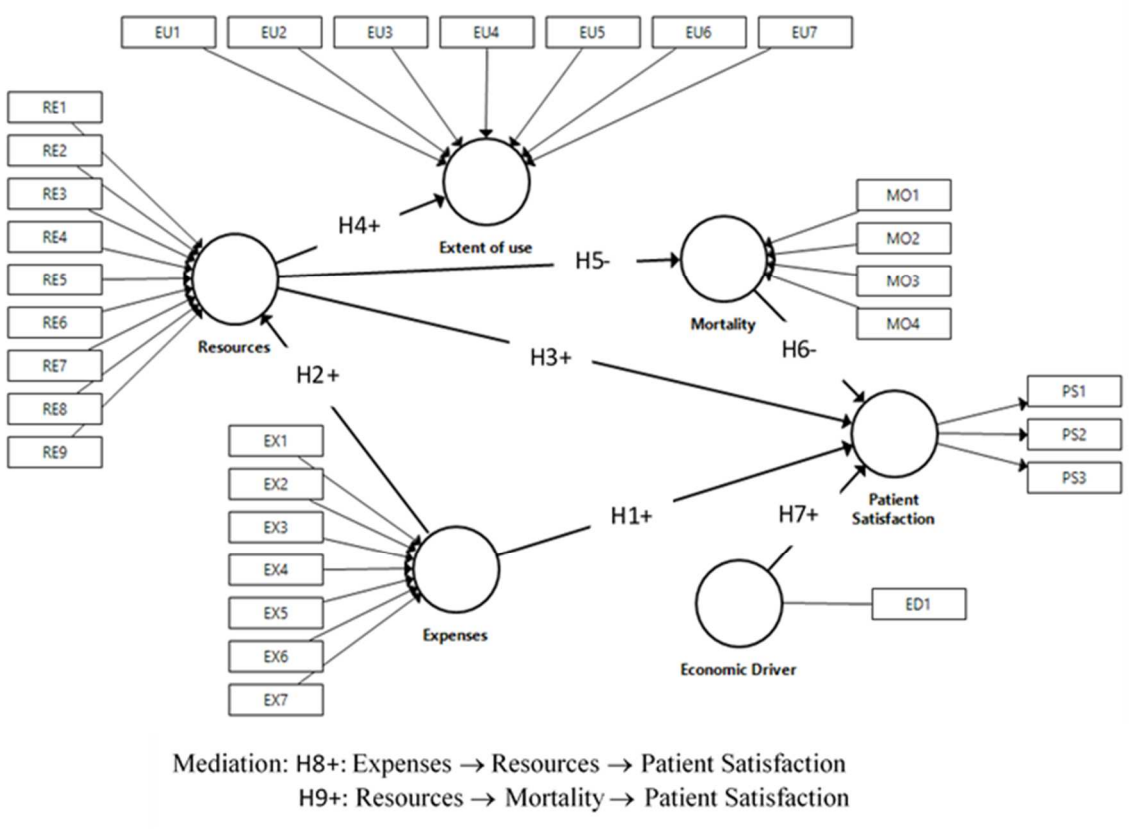

Figure 1. Research model and hypotheses. PS: Patient Satisfaction, EX: Expenses, RE: Resources, EU: Extent of use; MO: Mortality, ED: Economic driver.

3.2.3. DATA ANALYSIS

The technique chosen to assess the proposed research model was partial least squares structural equation modelling (PLS-SEM), which can test the relationship between the structural model constructs and the measurement model indicators. The statistical program used to perform the study was SmartPLS (v. 3.3.2.) [77], which also allowed implementing multi-group analysis (MGA) and the required measurement invariance of composite models (MICOM) to test the possible differences between men and women. MGA applies nonparametric SEM techniques [76,78–80]. PLS does not presuppose that the data should have a normal distribution. Instead, it uses a nonparametric bootstrap procedure to test the significance of the model's coefficients [81] by

extracting a high number of samples to replace the original sample. We created 5000 samples in this study [82].

First, the measurement model for the reflective construct (mode A) is assessed by analyzing the reliability of each indicator and the reliability, convergent validity, and discriminant validity of the construct. In the case of formative constructs (mode B), the multi-collinearity among indicators and the relevance and significance of the weight of each indicator were analyzed.

Second, the structural model was evaluated by analyzing the collinearity of the previous constructions, the sign, magnitude, and significance of the path coefficients, the coefficient of determination, the size of the effects, and, applying the blindfolding procedure, the predictive relevance of the model within the sample [83].

3.3. RESULTS

According to the steps described in the above section, this section presents the developed study results. First, Table 2 shows the descriptive statistics of the indicators for the two considered samples, men and women. We can observe that expenses and resources are the same in both samples since there is no difference by gender. However, the extent of use is different in practice for men and women, but, in this study, the data discriminate only in the case of average hospital stay (higher in men) and outpatient surgery percentage (higher in women). However, mortality and patient satisfaction are different by gender.

Concerning mortality, average mortality from cancer, diabetes, and cerebrovascular disease is higher in men, while average mortality from Alzheimer's is higher in women. The most remarkable difference by gender is cancer, for which average mortality is more than double in men than in women. In terms of satisfaction indicators, the differences by gender are small. However, on average, women are more satisfied with family doctors and men with specialist doctors and the NHS as a whole.

Table 2. Descriptive statistics.

Construct and Associated Indicators	Men		Women	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**
Patient satisfaction (PS)				
PS1	6.572	0.439	6.533	0.461
PS2	7.365	0.424	7.481	0.402
PS3	7.293	0.425	7.275	0.442
Expenses (EX)				
EX1	1415.785	167.139	1415.785	167.139
EX2	58.902	4.901	58.902	4.901
EX3	13.969	1.748	13.969	1.748
EX4	7.314	5.210	7.314	5.210
EX5	22.867	4.437	22.867	4.437
EX6	3.235	0.908	3.235	0.908
EX7	18.546	3.034	18.546	3.034
Resources (RE)				
RE1	1.698	0.221	1.698	0.221
RE2	0.778	0.106	0.778	0.106
RE3	2.931	0.446	2.931	0.446
RE4	0.661	0.108	0.661	0.108
RE5	2.497	0.457	2.497	0.457
RE6	0.274	0.128	0.274	0.128
RE7	6.438	1.016	6.438	1.016
RE8	1.136	0.260	1.136	0.260
RE9	0.558	0.224	0.558	0.224
Extent of use (EU)				
EU1	1619.646	244.892	1619.646	244.892
EU2	91.937	15.430	91.937	15.430
EU3	7.897	0.976	6.600	0.703
EU4	69.709	14.584	69.709	14.584
EU5	39.609	8.462	41.537	8.251
EU6	72.408	17.468	72.408	17.468
EU7	28.395	14.788	28.395	14.788
Mortality (MO)				
MO1	9.477	2.407	12.645	3.127
MO2	213.869	20.038	100.495	6.233
MO3	12.611	6.219	10.081	5.540
MO4	36.937	9.981	28.790	8.318
Economic driver (ED)				
ED1	22.987	4.578	22.987	4.578

3.3.1. MEASUREMENT MODEL

3.3.1.1. Composite Mode A

The composite measurement model in mode A (patient satisfaction) requires validation of individual item reliability, construct reliability, convergent validity, and discriminant validity (see Table 3).

The individual reliability of items is examined through the simple load or correlation with its construct, which has to be greater than 0.707 [84]. Effectively, panel A shows that indicators PS1, PS2, and PS3 exceed the required value in both samples, men and women.

Table 3. Assessment of measurement model. Estimated constructs in mode A.

(A) Outer Loadings								
Indicator			**Men**			**Women**		
PS1			0.881			0.883		
PS2			0.901			0.899		
PS3			0.867			0.876		
(B) Construct Reliability and Average Variance Extracted								
Composite	**Cronbach's Alpha**		**Dijkstra–Henseler's Rho**		**Composite Reliability (CR)**		**AVE**	
Variable	Men	Women	Men	Women	Men	Women	Men	Women
Patient satisfaction	0.860	0.864	0.874	0.875	0.914	0.916	0.780	0.785
(C) Discriminant Validity (Fornell–Larcker Criterion)								
Group		**Variable**	**DE**	**EX**	**MO**	**RE**	**PS**	**EU**
Men		DE	1.000					
		EX	0.305	n.a.				
		MO	−0.459	−0.700	n.a.			
		RE	0.309	0.778	−0.781	n.a.		
		PS	0.185	0.598	−0.505	0.618	**0.883**	
		EU	0.311	0.580	−0.692	0.818	0.447	
Women		DE	1					
		EX	0.339	n.a.				
		MO	−0.551	−0.703	n.a.			
		RE	0.351	0.768	−0.775	n.a.		
		PS	0.131	0.566	−0.454	0.580	**0.886**	
		EU	0.337	0.535	−0.656	0.809	0.395	
(D) Discriminant Validity (HTMT Criterion)								
PS → DE	**Original Sample**		**Sample Mean**		**CI Lo2.5%**		**CI Hi97.5%**	
Men	0.193		0.208		0.129		0.275	
Women	0.140		0.162		0.083		0.182	

AVE: Average Variance Extracted. PS: Patient Satisfaction. DE: Economic Driver. HTMT: Heterotrait-Monotrait. CI Lo and CI Hi: Confidence Interval, Low and High, respectively. In the mode A composite, the amount of variance that a construct captures from its indicators must be greater than the variance that the construct shares with other constructs.

Construct reliability describes the rigor with which the indicators measure the same construct. It is measured by Cronbach's alpha, Dijkstra–Henseler's rho, and composite reliability, which must be greater than 0.7 but less than 0.95 [85,86]. Panel B shows the values for the two studies, all of which are within the correct range. Convergent validity describes the degree to which a construct converges in explaining the variation of its indicators [83], and is measured by the average variance extracted (AVE), which has to be greater than or equal to 0.5 [87]. The patient satisfaction construct explained 78% of the variance of the assigned indicators for men and 78.5% for women.

The Fornell–Larcker criterion and the Heterotrait–Monotrait ratio (HTMT) allow us to verify the discriminant validity, which describes to what extent the patient satisfaction construct is empirically different from the other constructs of the structural model. According to the Fornell–Larcker criterion, for the reflective construct, the square root of the AVE (in bold) must be greater than the correlations between patient satisfaction and other constructs (in the horizontal and vertical lines) [78]. Both analyses met this requirement, as shown in panel C. Finally, the HTMT ratio exceeds the Fornell–Larcker criterion to detect the lack of discriminant validity [76]. This ratio has to be lower than 0.85, and neither 0.9 nor 1 should be in the confidence interval [2.5–97.5]. Panel D shows the correction of the patient satisfaction construct in the proposed model.

3.3.1.2. Composite Mode B

The composite measurement model in mode B requires us to analyze the existence of possible collinearity between indicators, as well as the significance and relevance of outer weights.

In the context of PLS-SEM, there are problems of collinearity when the variance inflation factor (VIF) is equal to or greater than 5 [82], although some authors suggest a maximum value of 3.3 [88]. In this study, the value was always under the maximum of 5 for both men and women, as can be seen in Table 4 (estimated constructs in mode B for men) and Table 5 (estimated constructs in

mode B for women). Therefore, we can say that there are no severe problems of collinearity.

Table 4. Assessment of measurement model. Estimated constructs in mode B for men.

Variables	VIF	Weights	*t*	CI 2.5%	CI 97.5%	Loadings
Expenses						
EX1	1.385	0.542 ***	7.265	0.395	0.686	0.731 ***
EX2	3.559	0.282 ***	2.797	0.094	0.491	0.604 ***
EX3	1.292	0.202 ***	3.073	0.068	0.327	0.073 ‡
EX4	1.363	−0.126 **	2.292	−0.233	−0.018	−0.156 **
EX5	2.536	0.038 ‡	0.371	−0.189	0.223	0.552 ***
EX6	1.610	0.293 ***	3.867	0.157	0.454	0.456 ***
EX7	2.316	−0.323 ***	3.637	−0.494	−0.143	−0.754 ***
Resources						
RE1	4.345	0.311 ***	3.556	0.155	0.502	0.799 ***
RE2	3.704	0.109 ‡	1.426	−0.036	0.264	0.304 ***
RE3	3.604	0.191 **	2.451	0.044	0.354	0.723 ***
RE4	4.674	0.151 *	1.646	−0.028	0.331	0.358 ***
RE5	1.797	−0.488 ***	6.725	−0.626	−0.341	0.162 *
RE6	1.831	0.254 ***	5.309	0.171	0.362	0.703 ***
RE7	3.412	0.226 ***	2.828	0.074	0.386	0.733 ***
RE8	2.734	−0.018 ‡	0.278	−0.149	0.098	0.636 ***
RE9	2.210	0.337 ***	4.938	0.211	0.479	0.807 ***
Extent of use						
EU1	1.751	0.518 ***	6.545	0.364	0.665	0.808 ***
EU2	2.487	−0.103 ‡	0.837	−0.353	0.129	0.511 ***
EU3	2.521	−0.350 ***	3.566	−0.535	−0.152	−0.538 ***
EU4	3.226	0.005 ‡	0.049	−0.171	0.240	0.667***
EU5	1.619	−0.014 ‡	0.188	−0.163	0.132	0.323 ***
EU6	3.039	0.433 ***	4.880	0.270	0.619	0.809 ***
EU7	3.222	0.123 ‡	1.324	−0.056	0.313	0.782 ***
Mortality						
MO1	1.162	−0.194 **	2.457	−0.347	−0.038	−0.028
MO2	1.694	−0.016 ‡	0.152	−0.232	0.187	0.772 ***
MO3	1.018	0.619 ***	7.125	0.438	0.771	0.636 ***
MO4	1.648	0.784 ***	9.966	0.638	0.947	0.777 ***

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$; ‡, not significant. Significance, t-statistic, and 95% bias-corrected confidence interval performed by bootstrapping procedure with 5000 replications. VIF, variance inflation factor.

Table 5. Assessment of measurement model. Estimated constructs in mode B for women.

Variables	VIF	Weights	*t*	CI 2.5%	CI 97.5%	Loadings
Expenses						
EX1	1.385	0.579 ***	7.947	0.435	0.721	0.755 ***
EX2	3.559	0.323 ***	3.010	0.118	0.542	0.601 ***
EX3	1.292	0.196 ***	2.838	0.057	0.329	0.075 ‡
EX4	1.363	−0.094 ‡	1.444	−0.223	0.030	−0.100
EX5	2.536	−0.046 ‡	0.391	−0.296	0.167	0.489 ***
EX6	1.610	0.285 ***	3.648	0.149	0.453	0.411 ***
EX7	2.316	−0.323 ***	3.526	−0.497	−0.143	−0.773 ***
Resources						
RE1	4.345	0.323 ***	4.063	0.185	0.503	0.839 ***
RE2	3.704	0.027 ‡	0.337	−0.137	0.179	0.299 ***
RE3	3.604	0.217 ***	2.687	0.070	0.378	0.767 ***
RE4	4.674	0.204*	1.947	0.009	0.415	0.385 ***
RE5	1.797	−0.380 ***	5.368	−0.516	−0.239	0.254 ***
RE6	1.831	0.267 ***	5.528	0.182	0.374	0.731 ***
RE7	3.412	0.222 ***	2.568	0.063	0.403	0.750 ***
RE8	2.734	−0.072 ‡	1.063	−0.220	0.052	0.633 ***
RE9	2.210	0.315 ***	4.152	0.171	0.466	0.816 ***
Extent of use						
EU1	1.743	0.438 ***	5.549	0.293	0.587	0.826 ***
EU2	2.288	0.068 ‡	0.617	−0.159	0.293	0.593 ***
EU3	1.785	−0.077 ‡	0.823	−0.251	0.112	−0.211 **
EU4	3.189	0.172 ‡	1.405	−0.053	0.418	0.724 ***
EU5	1.708	−0.037 ‡	0.488	−0.118	0.180	0.465 ***
EU6	3.021	0.323 ***	3.489	0.146	0.510	0.818 ***
EU7	3.088	0.220 **	2.299	0.044	0.423	0.792 ***
Mortality						
MO1	1.082	−0.139 *	1.835	−0.282	0.013	−0.102
MO2	1.208	−0.006 ‡	0.076	−0.170	0.153	0.313 ***
MO3	1.161	0.608 ***	7.420	0.446	0.758	0.749 ***
MO4	1.058	0.671 ***	11.369	0.558	0.785	0.794 ***

* p < 0.10; ** p < 0.05; *** p < 0.01; ‡, not significant. Significance, t statistic, and 95% bias-corrected confidence interval performed by bootstrapping procedure with 5000 replications. VIF: variance inflation factor.

The weights provide information on the contribution of each indicator to its respective construct. When the weight is not significant if the loading was significant, the indicator should be kept in the formative measurement model. Therefore, all indicators in the sample of men met the requirement to remain in the model. On the contrary, if the loading is low (less than 0.1) and not significant, the indicator should be removed [89]. In the case of women, indicator EX4 was just within the limit. However, we decided to keep it for comparative purposes to perform the MGA later.

The value and sign of the weights inform us about the contribution of indicators to the construct. Indicators with higher weights have more influence on the construct, and therefore on patient satisfaction. For example, public health expenditure per protected inhabitant (EX1) was the most influential on the expenses construct (0.579). Also remarkable is the negative sign of the indicator representing pharmacy spending (−0.323). We can interpret the rest of the indicators similarly.

3.3.2. STRUCTURAL MODEL

In the second step, we assessed the structural model for the two groups. Table 6 and Figure 2 shows the results for men, and Table 7 and Figure 3 for women, which are similar.

Once it was proven that there were no collinearity problems, we analyzed the sign, magnitude (between +1 and –1, since these are standardized values), and statistical significance of the path coefficients. A two-tailed test was used in the bootstrapping to determine significance [90].

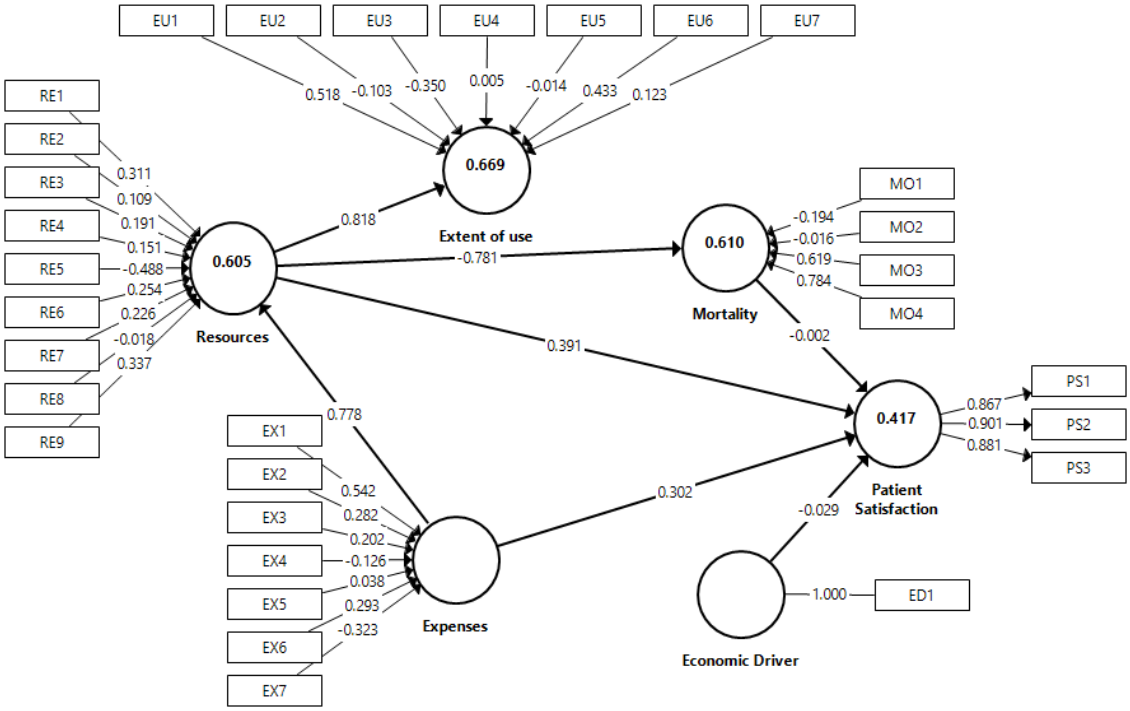

Figure 2. Whole model results for men.

Table 6. Assessment of the structural model for men.

(A) Direct Effects						
Effects	**Path**	***t***	**CI 2.5%**	**CI 97.5%**	f^2	**VIF**
ED→PS	−0.029 ‡	0.560	−0.130	0.070	0.001	1.278
EX→PS	0.302 ***	3.109	0.101	0.488	0.058	2.684
RE→PS	0.391 ***	3.829	0.181	0.583	0.074	3.102
MO→PS	−0.002 ‡	0.016	−0.205	0.197	0	3.539
			R^2 = 0.417; Q^2 = 0.306			
EX→RE	0.778 ***	31.679	0.714	0.816	1.535	1
			R^2 = 0.605; Q^2 = 0.212			
RE→EU	0.818 ***	33.768	0.757	0.857	2.022	1
			R^2 = 0.669; Q^2 = 0.289			
RE→MO	−0.781 ***	32.697	−0.821	−0.724	1.566	1
			R^2 = 0.610; Q^2 = 0.203			
(B) Specific Indirect Effects						
Effects	**Path**	***t***	**CI 2.5%**	**CI 97.5%**		
EX→RE→MO	−0.608 ***	19.574	−0.658	-0.531		
RE→MO→PS	0.001 ‡	0.016	−0.155	0.163		
EX→RE→MO→PS	−0.001 ‡	0.016	−0.531	0.129		
EX→RE→PS	0.304 ***	3.811	0.137	0.451		
EX→RE→EU	0.636 ***	21.679	0.564	0.683		
Panel C. Total Indirect Effects						
EX→MO	−0.608 ***	19.574	−0.658	−0.531		
EX→PS	0.305 ***	3.842	0.132	0.448		
EX→EU	0.636 ***	21.679	0.564	0.683		
RE→PS	0.001 ‡	0.016	−0.155	0.163		

** p < 0.05; *** p < 0.01; ‡, not significant. Significance, t statistic, and 95% bias-corrected confidence interval performed by bootstrapping procedure with 5000 replications. VIF: variance inflation factor.

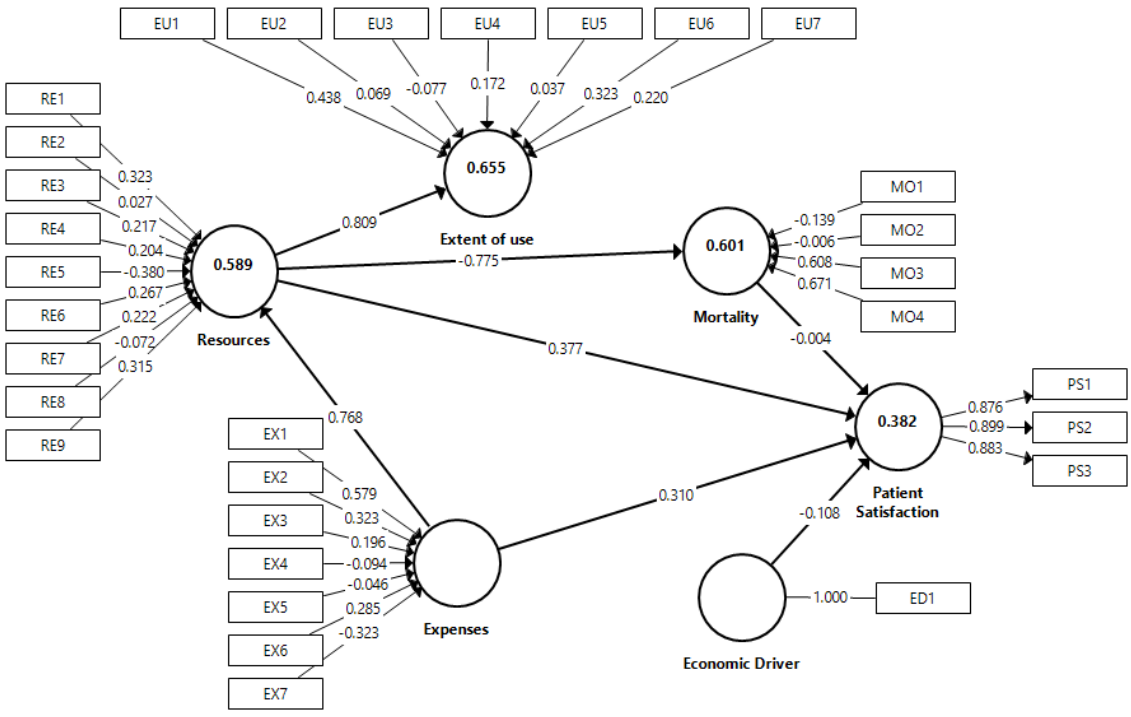

Figure 3. Whole model results for women.

Table 7. Assessment of the structural model for women.

(A) Direct Effects (Path Coefficients)						
Effects	**Path**	***t***	**CI 2.5%**	**CI 97.5%**	f^2	**VIF**
ED→PS	−.108 *	1.746	−0.227	0.016	0.013	1.467
EX→PS	0.310 ***	2.803	0.078	0.514	0.059	2.621
RE→PS	0.377 ***	3.512	0.157	0.579	0.068	3.367
MO→PS	−0.004 ‡	0.031	−0.243	0.234	0	3.521
			R^2 = 0.382; Q^2 = 0.282			
EX→RE	0.768 ***	30.480	0.700	0.806	1.434	1
			R^2 = 0.589; Q^2 = 0.215			
RE→EU	0.809 ***	33.118	0.745	0.846	1.894	1
			R^2 = 0.655; Q^2 = 0.287			
RE→MO	−0.775 ***	32.131	−0.817	–0.721	1.503	1
			R^2 = 0.601; Q^2 = 0.192			
(B) Specific Indirect Effects						
Effects	**Path**	**t**	**CI 2.5%**	**CI 97.5%**		
EX→RE→MO	−0.595 ***	19.476	−0.645	−0.522		
RE→MO→PS	0.003 ‡	0.031	−0.181	0.191		
EX→RE→MO→PS	−0.002 ‡	0.030	−0.142	0.149		
EX→RE→PS	0.289 ***	3.534	0.117	0.442		
EX→RE→EU	0.621 ***	21.257	0.548	0.666		
(C) Total Indirect Effects						
EX→MO	−0.595 ***	19.476	−0.645	−0.522		
EX→PS	0.291 ***	3.436	0.107	0.443		
EX→EU	0.621 ***	21.257	0.548	0.666		
RE→PS	0.003 ‡	0.031	−0.181	0.191		

* p < 0.10; *** p < 0.01; ‡, not significant. Significance, t-statistic, and 95% bias-corrected confidence interval performed by bootstrapping procedure with 5000 replications. VIF: variance inflation factor.

Once it was proven that there were no collinearity problems, we analyzed the sign, magnitude (between +1 and –1, since these are standardized values), and statistical significance of the path coefficients. A two-tailed test was used in the bootstrapping to determine significance [90].

The results indicated that the economic driver (GDP), our control variable, had no significant effects on patient satisfaction for men (p = 0.580), but a negative effect, with a 90% significance level, for women (p = 0.080). Therefore, H7 was not supported in the sample of men and was weakly supported in the sample of women.

Expenses and resources had a positive and significant effect on patient satisfaction in both samples (p = 0.001 and 0.000, respectively, for men, and p = 0.005 and 0.000, respectively, for women). Thus, H1 and H3 were supported. Moreover, expenses also showed a positive and significant effect on resources (p = 0.000 for men and women), supporting H2. Therefore, H8 is supported since

both the direct and indirect effects of expenses on patient satisfaction are significant and have the same sign, causing complementary mediation [91].

Resources had a negative and significant effect on mortality (p = 0.000 for men and women), supporting H5. On the contrary, mortality showed no significant effect on patient satisfaction (p = 0.987 for men and 0.975 for women), so H6 was not confirmed, and, consequently, the mediation effect represented by H9 was also not supported.

Furthermore, resources showed a positive and significant effect on the extent of use (p = 0.000 for men and women), confirming H4.

The coefficient of determination R2 is a measure of the explanatory capacity of the model. It represents the amount of variance of a construct explained by previous predictive constructs. Its value ranges between 0 and 1, so the higher it is, the more predictive capacity the model has for that construct. The results of the proposed model in the two samples are moderated [66], a little higher in the case of men. Specifically, in the sample of men, the value of R2 is 0.417, 0.605, 0.669, and 0.610 for patient satisfaction, resources, extent of use, and mortality, respectively; in the sample of women, the values are 0.382, 0.589, 0.655, and 0.601, respectively.

Effect size, determined by f2, is the degree to which an exogenous construct helps to explain a given endogenous construct in terms of R2. If f2 is less than or equal to 0.02, there is no effect [66], which happens for the economic driver (GDP) and mortality over patient satisfaction; hence, the path is not significant. When f2 is between 0.02 and 0.15, the effect is small, resulting in expenses and resources over patient satisfaction (0.058 and 0.074, respectively for men, and 0.059 and 0.068, respectively, for women). There are no moderate effects in the study because there are no f2 values between 0.15 and 0.35. However, there are three large effects in which f2 exceeds 0.35: expenses on resources (1.535 for men and 1.434 for women), resources on the extent of use (2.022 for men and 1.894 for women), and resources on mortality (1.566 for men and 1.503 for women). Therefore, the results are similar in both samples.

The Stone–Geisser test (Q2) measures the predictive relevance of reflective dependent constructs, in this study, the construct representing patient

satisfaction. It is not a measure of prediction outside the sample, but indicates the extent to which the proposed model can predict the original observed values [92]. It uses a procedure called blindfolding, which consists of estimating the parameters by omitting part of the data of a given construct and then estimating the omitted data using the mean and the parameters of the previously estimated model [83]. Q2 values between 0.25 and 0.5, as in the case of the analyzed samples (0.306 for men and 0.282 for women), indicate average predictive relevance.

3.3.3. MULTIGROUP ANALYSIS (MGA)

To analyze the significant differences between men and women in the proposed model, we performed MGA. This procedure requires prior application of measurement invariance of composite models (MICOM), by using a permutation test [76,93].

MICOM involves a three-step process: configuration invariance, compositional invariance, and equality of mean and variance of composites. Configuration invariance ensures that the compounds are specified equally in both groups. Since we used the same indicators in the two measurement models, we treated the data equally, and the algorithm was equally configured. Table 8 shows the results of the two remaining steps.

Table 8. Results of invariance measurement testing using permutation.

Construct	Configuration Invariance (Same Algorithms for Both Groups)	Compositional Invariance		Partial Measurement Invariance Established	Equal Mean Assessment				Equal Variance Assessment				Full Measurement Invariance Established
		Correlation Original	5%		Difference	CI 2.5%	CI 97.5%	Equal	Difference	CI 2.5%	CI 97.5%	Equal	
DE	Yes	1.000	1.000	Yes		−0.212	0.212			−0.226	0.219		
EX	Yes	0.996	0.952	Yes		−0.267	0.261			−0.281	0.282		
MO	Yes	0.998	0.941	Yes	0.087	−0.199	0.171	Yes	-0.013	−0.320	0.297	Yes	Yes
RE	Yes	0.993	0.972	Yes		−0.178	0.201			−0.254	0.238		
PS	Yes	1.000	0.999	Yes	−0.069	−0.180	0.191	Yes	-0.024	−0.246	0.256	Yes	Yes
EU	Yes	0.961	0.952	Yes	−0.127	−0.176	0.193	Yes	0.048	−0.239	0.243	Yes	Yes

CI: Confidence Interval

Compositional invariance was achieved, since the original correlation was greater than or equal to 5% and all p-values are higher than 0.05 (p-values have not been reported for simplicity), assuring that the composites were formed in the same way in the two groups analyzed. Finally, the equality of mean and

variance of composites was verified, since all differences were within the confidence interval (equally, all p-values were higher than 0.05); therefore, there is complete measurement invariance, and it is possible to apply MGA.

Table 9 shows the results of Henseler's multi-group analysis [80] to assess if the differences between path coefficients in the samples of men and women are significantly different.

Table 9. Henseler's multi-group analysis (MGA).

Relationship	Men	Women	Difference	*p*-Value	Significant
Panel A. Direct Effects (Path Coefficients)					
ED→PS	−0.029	−0.108	0.079	0.319	No
EX→PS	0.302	0.310	−0.008 *	0.951	Yes
RE→PS	0.391	0.377	0.014	0.931	No
MO→PS	−0.002	−0.004	0.002 *	0.991	Yes
EX→RE	0.778	0.768	0.011	0.765	No
RE→EU	0.818	0.809	0.009	0.797	No
RE→MO	−0.781	−0.775	−0.006	0.850	No
Panel B. Specific Indirect Effects					
EX→RE→MO	−0.608	−0.595	−0.013	0.763	No
RE→MO→PS	0.001	0.003	−0.002 *	0.991	Yes
EX→RE→MO→PS	0.001	0.002	−0.001 *	0.992	Yes
EX→RE→PS	0.304	0.289	0.015	0.903	No
EX→RE→EU	0.636	0.621	0.016	0.711	No

Note: Difference is men vs. women. In Henseler's MGA method, p-value lower than 0.05 or higher than 0.95 indicates significant differences at 5% level between specific path coefficients across two groups. * $p < 0.05$ or >0.95.

This procedure is based on bootstrapping, and, when the p-value is lower than 0.05 or higher than 0.95, the path coefficients are different at the 5% significance level. H10 states that satisfaction is configured differently by men and women, but it does not establish what form the difference takes. Therefore, a two-tailed test was applied. The direct and indirect effects of expenses on patient satisfaction are significantly higher for women than men (p-value = 0.951 for the direct effect and 0.992 for the indirect effect), which

indicates that women value spending more when judging health system quality. In terms of available resources, their indirect effect, through mortality, on health system quality is significantly higher for women than for men (p-value = 0.991). Finally, women also value more, in a significant way, the influence of mortality on patient satisfaction (p-value = 0.991). In this case, the difference is positive, but, as the paths are negative, the lower the mortality rate, the more the health system quality is valued by women than men.

3.4. DISCUSSION

After analyzing 31 variables to evaluate their influence on patient satisfaction in Spain, we found relevant information. Data were obtained from the Spanish Ministry of Health, Consumption and Social Welfare for the entire Spanish territory between 2005 and 2018, except 2014. The applied technique was partial least squares structural equation modeling (PLS-SEM). A positive relationship between the constructs of expenditure and volume of resources and patient satisfaction was confirmed, as well as the influence of resource allocation on the extent of use. However, the levels of mortality analyzed (Alzheimer's, cancer, diabetes, and cerebrovascular disease) did not influence the perception of healthcare system quality. GDP was also not relevant. Regarding indicators, public health expenditure, spending on primary and specialist care services, expenses for training of resident doctors, the number of NMR machines, day hospital posts, operating theaters, skilled and primary care nurses, and specialized and primary care doctors, and Alzheimer's mortality rate had a positive and significant influence on patient satisfaction in both study groups. In contrast, pharmacy spending, subcontracts with private healthcare system (concerts), running hospital beds, diabetes, and cerebrovascular mortality negatively influenced patient satisfaction in both groups.

The empirical analysis can provide healthcare managers with adequate information for decision-making and help to improve health system quality, which is decisive in the current context, characterized by extreme competition, globalization, and increasing demand.

Most of the previous patient satisfaction research was aimed at improving the practice of medical and nursing staff [3,6,17,42]. Thus, this study's variables refer mainly to the direction of investment and budgeting of expenses. Research on resource management and strategic direction is scarce, and even more so when referring to studies distinguished by gender [59,94]. In our investigation, we found that, overall, women are more sensitive than men to the volume of expenditures and resources invested by the public administration. In other words, women are more sensitive to improvements in the quality of the healthcare system resulting from greater financial resources.

In line with previous literature, we found that men and women value family and specialist doctors more than the health system as a whole [53,68,69]. In contrast, women are more satisfied with family doctors and men with specialist doctors. Although Morales`s study indicated that greater satisfaction was observed with family doctors than specialist doctors [68], we can now affirm that it is not always this way; it depends on the sex of the patient.

This study analyzed the influence of volume resources, expenditures, and mortality on patient satisfaction. Moreover, it analyzed the relationship between resource allocation and the degree of use of the Spanish health system. The control variable introduced in the model was the economic driver, represented by GPD per capita. The model explained the latent variable patient satisfaction by 41.7% for the sample of men and 38.2% for the sample of women. Expenses and resource constructs had a positive and significant influence on patient satisfaction, while mortality had no significant effect.

Regarding resource allocation, previous studies emphasized that patient satisfaction increases with investment in technological equipment, infrastructure [9,25,40], and qualified doctors [29]. In line with those findings, we show that citizens perceive the quality of the healthcare system as higher when the number of healthcare personnel (doctors and nurses) increases, and place higher value on those who provide specialized care than those who provide primary care. Likewise, a greater number of operating rooms and NMR machines increase satisfaction. Paradoxically, the same does not happen with CT machines. That may be because the correct reallocation of resources does

not harm service quality, and therefore does not harm satisfaction. However, a positive sign was observed for the number of day hospital posts and a negative sign for the number of hospital beds, in line with the study by Xesfingi and Vozikis [95]. This indicates that people prefer (when the severity of the disease or surgery allows it) to be cared for in an outpatient rather than in inpatient setting. A previous study indicated that there was a positive relationship between ambulatory surgery and patient satisfaction [59]. Men's and women's behavior is similar.

For the expenditures' construct, the indicator with the most positive weight was public health expenditure per inhabitant. With regard to the distribution of expenditures, patients value above all spending on specialized care, including on resident physicians, i.e., specialty physicians in training. Spending on primary care is also positively valued. Conversely, pharmacy spending showed a negative relationship with patient satisfaction in both study groups. That is contrary to Fenton's study, where drug prescriptions and satisfaction had a positive influence [60]. However, it is in line with previous studies [53,59]. In this respect, Pascoe [96] found that medication expenditure was satisfactory only for patients over 65 years of age. This means that the younger population prefers other types of treatment or more natural therapies instead of traditional medication. The Spanish heath system has the authority to resort to the private sector when there are insufficient public resources to meet the demand. This outsourcing process is known as a concert. Regarding the expenditure dedicated to concerts, the influence is negative and only significant for men. This indicates that the population prefers to be treated in public rather than private hospitals.

Regarding mortality and its cases, the results showed that cancer mortality did not have a significant influence on satisfaction. However, Alzheimer`s mortality is valued positively. This may be because caregivers of people with advanced dementia, who are unable to communicate or move, are relieved when they die. Another interpretation could be that since it is a disease without a cure, it does not depend on the quality of the health system's services, or it is a death associated with old age.

On the other hand, diabetes and cardiovascular mortality negatively influence patient satisfaction. This means that citizens understand that an advanced healthcare system should provide the necessary care to control the progression of these diseases and avoid a fatal outcome. A previous study indicated that women reported a significantly higher impact of diabetes on quality of life and more restlessness regarding this issue than men [97]. However, we did not find significant differences by gender regarding the influence of diabetes mortality on patient satisfaction. That could be due to the significant and positive impact of the degree of disease control in determining health-related quality of life [97]. It is also essential that people with diabetes receive integral care to prevent other diseases associated with it [98]. However, our research concluded that variation in the mortality construct had a more significant influence on satisfaction when the group analyzed was women. Historically, cardiovascular disease has been associated with older adults, but this pattern has changed in recent times, and it is increasingly common for young adults to die from this disease. A more modern health system, emphasizing prevention and detection, treatment, and control, would be valued by the population [99].

The contribution of resource allocation to determining the extent of use was related, first, with frequency of specialist consultation and then CT equipment usage, for both men and women. An economic recession has direct consequences to health, increasing restricted budgets, lengthening waiting times for treatment (due to lack of equipment), and increasing medical consultations with specialists (due to lack of personnel). Furthermore, the relationship between resource allocation and mortality is significant and positive. Previous studies indicated that it is possible to reduce spending, increase income, and, at the same time, improve mortality rates [100]

As mentioned above, the control variable was represented by GDP per capita, which had a negative effect on satisfaction, but not significant, for men and was at a less than 10% significance level for women. The negative relationship implies that people with higher income are more demanding with the healthcare system. The previous literature is mixed, since some studies found a significant and positive relationship [65,67], others a negative relationship [1], and still others no relationship [53].

Per capita health expenditure in Spain is below the European Union average, even though social inequalities are less pronounced than in many countries on the continent [101]. The Spanish health system is not homogeneous throughout its territory, since, as mentioned above, healthcare competencies are transferred to the autonomous communities, which is reflected in the efficiency of public health services. The ultimate goal of a health system is to improve citizens' health and quality of life, but political, social, cultural, and economic issues inevitably have an influence. Conducting a proper management analysis of intrinsic and perceived quality helps managers and institutions to meet their objectives [100].

A quality healthcare system will require prioritizing investment in primary care and, above all, specialized care. It will need to invest in hiring a large number of doctors and nurses, as well as doctors in training. It will also need to have high-level equipment, such as NMR machines. Day hospital positions should be prioritized over the number of hospital beds. It is necessary to expand the capacity to care for patients in the public system and not refer them to private hospitals. Drug prescriptions should be reduced, and patients should be given the option to use alternative therapies, especially younger patients.

Numerous international studies deal with the subject of patient satisfaction, although most of them examine indicators of behavior and suitability of the doctor. Studies on resource management are scarce in Spain, mainly due to the lack of data [63,74]. In this empirical study, the patient satisfaction construct explained 78.5% of the variance in the case of women and 78% in men. The rest of the variance could be explained by variables not considered in the model, such as patient participation in the diagnostic process [49], the regularity with which patients are monitored [11], and physicians behaving with courtesy and respect [23], among others. We consider it convenient to expand the research carried out by influencing variables such as life expectancy at birth and infant mortality. It would also be useful to study the influence of educational level, geographic region, and poverty rate. Therefore, the main limitation of the study is the availability of data. Including additional variables, such as those mentioned above, as well as having all patient responses, not just the averages for each autonomous community per year, would undoubtedly allow us to

obtain stronger results and conclusions. Many satisfaction studies are conducted in specific hospitals. However, we are convinced that studies such as this one, carried out at the national level, are necessary. For this, researchers need transparency in public information, i.e., publicly available data.

3.5. CONCLUSIONS

The evident growing need for accurate and integral information to fulfill organizational objectives (support strategic planning and control) makes the usefulness of this research unquestionable. As we were able to confirm, any decision having to do with resource allocation and expenditure within the health system directly affects patient satisfaction. An ex-post analysis was carried out using reliable data extracted from the Spanish Ministry of Health, Consumption, and Social Welfare using the structural equation modelling approach.

This study shows that the level of expenditure has a direct influence on patient satisfaction, and therefore on the quality of the healthcare system. It is important to increase spending on primary care, but especially on specialized medical care and diagnostic equipment. In addition, reducing the use of drugs in favor of alternative treatments or therapies is considered to be positive. Likewise, spending has an impact on available resources and these, in turn, have a positive influence on the level of use and a negative impact on mortality. Resources, especially healthcare staff, NRM equipment, and the number of posts in day hospitals, increase patients' perception of the NHS.

Regarding gender, and apart from differences in specific variables, in general terms, women are more sensitive to public investment in health than men.

3.6. REFERENCES

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Chapter 3: Health Investment Management and Healthcare Quality in the Public System: A Gender Perspective

CHAPTER 4:
USING THE PLS-SEM MODEL WITH HIGHER-ORDER CONSTRUCTS TO STUDY THE EFFECT OF HEALTH SYSTEM PERFORMANCE AND SUSTAINABILITY ON HEALTH-DISEASE STATUS IN SPAIN

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Chapter 4: Using the PLS-SEM Model with Higher Order Constructs to Study the Effect of Health System Performance and Sustainability on the Health-Disease Status in Spain

Abstract: This article aims to provide information to public agencies and policymakers on the determinants of health systems and their relationships that influence citizens' health–disease status. A total of 61 indicators for each of 17 Spanish autonomous communities were collected from the Spanish Ministry of Health, Social Services, and Equality between 2008 and 2017. The applied technique was partial least squares structural equation modeling (PLS-SEM). Concerning health–disease status, an influence of sustainability and performance on the health system was hypothesized. The findings revealed that health system sustainability had a negative effect on health–disease status, measured in terms of disease incidence. However, the relationship between health system performance and health–disease status is positive. Furthermore, health system performance mediates the relationship between sustainability and health–disease status. According to our study, if we consider the opposite poles that make up the definition of health–disease status (well-being and disease), this concept is defined more by the incidence of the negative aspect.

4.1. INTRODUCTION

All countries seek to grow economically. Undoubtedly, this is reflected in improvements in the standard of the population's living. For its part, the population's health plays a fundamental role in its economic prosperity [1]. Health has a direct impact on the economy and economic growth [2]. Both the prevention of diseases and their treatment are necessary to reduce disease burden [3]. These activities will be directed by a health system for which the government is responsible [4]. The government will need tools to continuously evaluate and monitor the health system if its objective is for it to work properly [4,5]. Inadequate or inefficient health expenditure could slow down the economic growth of the entire country [1]. Having quality information when making decisions about health policies improves health, well-being, and patient satisfaction [5]. At the organizational level, one of the inputs for improving the health care system's efficiency, effectiveness, and equity is the health information systems. The use of health information systems leads to achieving administrative efficiency, maximizing the value of resources as an outcome [6]. Managing all the data that health workers routinely record enables gathering

information on vital statistics, public health programs, reportable diseases, and mortality. The purpose of the health information system is to promote the development of an information culture where those responsible for health use information operatively for optimal planning and decision-making to provide health services based on knowledge [7].

According to the World Health Organization (WHO), "Health is a state of complete physical, mental and social well-being, and not only the absence of diseases or illnesses" [8]. The measurement of health–disease status can be performed from the perspective of diagnostic morbidity (based on empirical data on diseases in the population) or from the perceived morbidity's perspective (based on self-perception of health–disease status [9]. Self-perception of the state of health is not the same in both sexes.

All health systems aim to improve citizens' health [10–15], respond to patient expectations and equitably distribute the financial burden [12,16,17]. It is essential to know the needs in each region of the country and allocate resources accordingly in order to improve health–disease status [9]. For its part, responsiveness is a crucial element in patient satisfaction [15] and includes several concepts, such as confidentiality, autonomy, prompt attention, access to social support networks, among others [6,16]. Finally, when discussing an equitable distribution of the financial burden, we refer to the fact that each household should pay the health system somewhat based, to a certain degree, on their income [4,18]. We can also refer to equity in terms of provision of the service, which aims to benefit each user based on their particular needs [6,19].

A quality health system will provide an excellent service when and where patients require it [20]. If the system malfunctions (poorly managed, poorly structured, ineffective, or poorly structured financially), it will not deliver its full potential, its costs will rise, and health outcomes will worsen [6]. In other words, it will not be able to fulfill its ultimate goal. For this reason, it is vitally important to manage these systems and evaluate their performance [21]. Periodically carrying out an efficiency analysis is a productive tool to investigate the potential of improvement in a hospital’s resource use [22,23].

Nevertheless, the contemporary approach to measuring performance includes a cost analysis of services and quality and patient satisfaction [24].

For its part, the measurement and evaluation of patient satisfaction are considered key points to work on if what is intended is the continuous improvement of the health system and its consequent excellence [20,21]. Patients' opinions are among of the main elements with which satisfaction is measured [22]. This feedback will serve as the basis for analyzing the health system and working towards its improvement [23,25,26]. Maintaining an excellent healthcare system has never been cheap. Furthermore, updating based on continuous technological advances nowadays requires even more effort than ensuring the system works efficiently. Managing quality will improve the quality of the services provided and reduce costs [10,26].

Today, companies worldwide are concerned with reporting on their sustainability. Through the sustainability reports, corporations explain their planning in economic, environmental, and social aspects [27]. When we speak of health system sustainability, we refer to the management of resources and expenses that are carried out and the degree to which the health system's use is capable of meeting current needs without compromising the satisfaction of future needs [13,28]. It will be necessary to maintain the best possible cost-effectiveness ratio to meet this criterion. In other words, resources should be allocated to those interventions that provide the maximum improvement in health per monetary unit [3,22]. Additionally, for the organization to be sustainable over time, the quality of the service's premise must exist [29]. The difficulty in measuring quality, in these terms, is that we have to look to the future and design a service that meets the needs of tomorrow [29].

On many occasions, health indicators are used to strategically direct resources and expenses [5]. When these indicators are comparable between countries, relevant and significant data can be extracted to improve them and identify good and bad practices [30]. Public health indicators contribute to transparency and good governance [31]. For example, in Europe, the ECHI (European Community Heath Indicator) is used, which functions as a hub of information and notifications on health at the European level [5].

The WHO established that governments have to guarantee the availability of health services to their citizens [6] in order to improve health status, meet patient expectations, and comply with the financial equity criteria [12]. One of the factors that most influence patient satisfaction is the health system's ability to comply with clinical requirements. The latter depend on the facilities' availability, for example, to provide laboratory reports on time, and the required blood group's availability [26].

As we have already indicated, improving health is the main objective of the entire health system, but this should not be limited to physical diseases or symptoms. It is crucial that we extend ourselves to evaluating and treating depressive symptoms [31]. Moreover, those responsible should not be limited solely to the clinical aspects. For example, good management and administration of the health system will also improve society's health [32].

Previous research has studied the performance and sustainability of the health system. However, it is not common to find studies on their effect on the population's health as a complete health system, designed in the form of a nomological network and integrated by different explaining subsystems of the health-disease status of citizens. Some studies use individual variables as isolated pieces with influence on a single non-latent dependent variable [33]. In this vein, we have not found investigations that use higher-order complex latent variables defined by several dimensions. Our study contributes to defining the boundaries of the health system, highlighting the importance of the sustainability and performance subsystems as drivers of the levels of well-being, morbidity, and mortality of the population, that is, of the health-disease status. Moreover, we provide those responsible for managing the health system with information on the efficient and effective use of resources that does not compromise future needs and affect the population's health–disease status. In addition, our model offers policymakers information on the determining variables of the health system and the correlations between them to serve as an instrument for effective decision-making. The rest of the article is structured as follow: First, we carry out the literature review and pose the hypotheses. Secondly, we describe the research methodology and, after, the

results are gathered and presented. Finally, we discuss the principal findings of the research and the conclusions.

4.1.1. LITERATURE BACKGROUND AND HYPOTHESES

The economic development of a country depends on many factors, and one of them is the health of its inhabitants. A healthy population will always be more productive. To achieve this task, it will be essential that the country has an effective and efficient health system [30,34]. Thus, the countries should develop programs and policies to protect and improve the population's health [35], and reduce inequalities in health access [5]. In this sense, studying the quality–price ratio is increasingly crucial [18]. In Europe, health systems face increasing costs, as the population is aging and, therefore, making greater use of them [14,30]: The elderly are using the health care system more frequently, and that the medical treatments they use are more expensive [36]. Innovations in health are imminent to ensure a healthy life [14,37]. Nevertheless, this is also costly and complex due to the system's dynamism [14].

The ultimate goal should be to promote and improve the population's quality of life [14], minimizing the risk of mortality [14,38]. Then, the health system's improvement will increase the population's quality of life and, therefore, reduce the mortality rate [39,40]. Mortality and morbidity ratios are used to measure the health–disease status of the population [12]. Both are associated with physical and psychological states [38,41]. The mortality rate is lower in women, which generates a higher incidence of morbidity [3,36]. A study on Spanish citizens' health status determined that neither in-hospital mortality nor morbidity are significant factors in establishing perceived health status [9]. The life expectancy of women is higher than that of men [3,42]. The difference in life expectancy between men and women can be influenced by male sex exposure to risk factors or occupational risk, or other risky behaviors [3]. Otherwise, people who suffer from a chronic illness have a negative self-perception of their health [43]. Furthermore, it is the female sex who is prone to chronic diseases [42]. Women tend to self-perceive worse than men [9].

The expected result of good health system management is the long-term well-being of the patient. However, these results depend not only on the provision

of a good-quality health service but also the characteristics of the patient [44]. For example, maternity in adolescence increases morbidity and mortality in women and their children, since they are usually born with medical complications [45].

It is expected that the government will take the necessary measures to offer the population quality and sustainable health services. How health services are provided will affect the health status of the population [30,46]. On the one hand, quality can be measured according to different pillars, such as safety, patient satisfaction, effectiveness, and pertinence. On the other hand, sustainability can be studied according to the health system's level of use, allocations of resources, and volume of expenses.

A safe health system manages risks to minimize incidents [34,47], for example, evaluating the effectiveness of new medical treatments and medicines [33]. These factors can be measured by the number of hospital infections and the rate of adverse drug reactions. One of the dimensions of healthcare quality is safety [37,48,49], which is related to efficiency since fewer interventions are less expensive. The literature indicates that safe care can be provided with minimal waste of resources [34]. Regarding this issue, the WHO emphasizes the need to understand healthcare complexity to ensure patients' safety [13]. The characteristics of the patient directly influence safety. The higher the complications, the lower the security. The factors that influence risk exposure are age, disease burden, and gender [34].

A patient satisfied with the medical attention received will pay more attention to the treatments and recommendations that the health personnel indicate, and consequently, they will have better health results [50,51]. On the contrary, a dissatisfied patient will not adhere to the recommendations of health professionals. Hence, resources will be wasted, medical care productivity will decrease, and morbidity and mortality rates will increase [52]. From another perspective, we could say that the patient's satisfaction affects their life expectancy, and this relationship is strong [10]. Today, people are more demanding about the services they received. To achieve their satisfaction, it will be necessary for healthcare to be "patient-oriented", that

is, depending on the individual needs of each patient [51,53]. Additionally, previous studies indicate that when the patients are allowed to participate in medical treatment decisions, they are more satisfied [20,54,55]. Other factors that influence a patient's satisfaction are confidence in the health's professionals [23,26,29,55,56], the physician's behavior [26,29,32,55,56], and the degree of patient follow-up [29,57]. In their study, Ricci-Cabello et al., found that those patients who had a pleasant experience in medical care reported better self-perceived health [51].

The health system's ineffectiveness can be measured by the readmission rate to hospitals, which causes higher costs for the system and more anguish to the patient [58]. Repeated hospitalization could alert to a failure in the quality of the health system [48]. There must be a balance between a hasty medical discharge and a prolonged hospital stay due to not yet solving the patient's problem. This could increase the probability of contracting other diseases as a result of staying in the hospital, such as nosocomial diseases, infections, and pressure ulcers [59]. Low self-perceived health states are associated with a higher risk of readmission [58]. Moreover, when patients are depressed during hospitalization, the risk of being readmitted increases [38]. Previous research found that hospitals with a longer average length of stay are less efficient [18,48].

Pertinence could be associated with equity in the provision of services. Equity in providing services means that each patient is cared for according to their needs at the right time [6]. When the health system can provide adequate care at the right time, this prevents an increase in the severity of diseases and saves possible future expenses [34].

Previous studies indicate that higher-income countries show better efficiency rates, and others reach ambiguous conclusions [30]. Higher per capita health spending is directly reflected in the efficiency of health systems [18]. Healthcare effectiveness can be defined as the health system's ability to achieve maximum expected results without increasing unexpected results [30].

Previously, the term "sustainability" referred only to environmental factors. Today, it is studied with a multidimensional approach. In the health's area, the health system will be sustainable when it takes care of the well-being of patients, health professionals, and the entire community, preserving resources [28]. In other words, we must provide the best possible health service to improve the patient's health status, with the lowest waste of resources possible [13,34]. Budget cuts in health matters are increasingly frequent [14,55,56], so it is increasingly important to focus on sustainability, that is, to offer services of excellence while being efficient in the use of resources and the application of expenses [30,35,60].

A sustainable health system must focus on prevention [35]. In the European Union, the leading cause of death is cardiovascular diseases whose risk factors (smoking, high body mass index, lack of physical activity, and blood pressure) are highly preventable [61]. When people do not take preventive measures (low cost – high value), they will only rely on emergency services (high price – less effective results) [46]. Previous research found that countries with higher healthcare expenditure per capita have more efficient hospitals [18]. On the other hand, others indicate that efficiency is not defined by the volume of resources assigned to health [2,14].

This research's principal objective is to examine the influence of the health system performance and health system sustainability on health–disease status. After a careful review of the literature, we formulated the following hypotheses:

Hypothesis 1 (H1): Health system sustainability influences health–disease status.

Hypothesis 2 (H2): Health system performance influences health–disease status.

Hypothesis 3 (H3): Health system sustainability influences health system performance.

Hypothesis 4 (H4): Health system performance mediates the relationship between health system sustainability and health–disease status.

The theoretical model that we propose in Figure 1 relates the following three latent variables or constructs:

- Health system sustainability.
- Health system performance.
- Health–disease status.

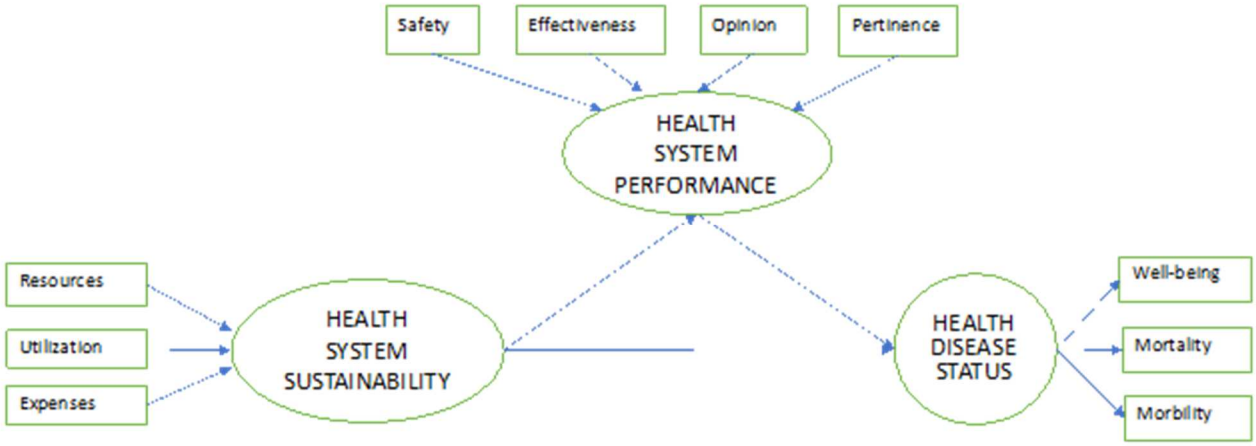

Figure 1. The theoretical model of the health–disease status in Spain.

4.2. RESEARCH METHODOLOGY

In this section, we present the results of applying the algorithm of partial structural equations of higher-order constructs as an efficient solution for evaluating the health–disease status model in Spain.

4.2.1. PLS-SEM ANALYSIS

PLS-SEM analysis come from two statistical traditions: linear regression and factor analysis. PLS-SEM models use theoretical concepts in the form of constructs or latent variables, such as unobserved variables, which are measured through its indicators, data, or manifest variables [62]. Wold [63] was the author developer of the PLS-SEM algorithm whose objective is to minimize the residual variances of the endogenous variable to be explained [64]. The basic PLS algorithm applies a two-stage method. In the first stage, the constructs' scores are iteratively estimated through a four-step procedure. The second stage computes the final estimates of coefficients (outer weights, loadings, and path

coefficients) using the ordinary least squares method for each partial regression model [65].

The evaluation of a traditional PLS-SEM model required firstly specifying the measurement model and secondly evaluating the structural model where the hypotheses are tested. In our case, there were two types of measurement relationships between indicators/items and constructs: reflective and formative [66]. Depending on the direction of the causal relationship between the latent variable and its indicators, a series of different criteria were verified according to the reflective or formative model (for more details, see i.e., [67–69]). Thus, in the case of reflective models the causal relationship goes from the latent variable to the indicators and in formative models the opposite. Reflective or A-mode models were assessed using four criteria: Individual item reliability, construct reliability, convergent validity, and discriminant validity; while the formative models or in mode B evaluated using the criteria of multicollinearity between items. With the specification of the measurement scale, it is possible to verify that the relationships among indicators and their constructs were valid and reliable, regardless of the measurement mode used. Once determined that the measure was valid and reliable, the structural analysis of the model was carried out. PLS-SEM used various criteria for structural validation, such as coefficients of determination (R^2), size of effects (f^2), or predictive validity (Q^2). The analysis of composites in PLS-SEM allows the calculation of latent variable scores as an exact linear combination of the indicators, which can be used to aggregate higher-order constructs [64,70]. Apart from being able to estimate mediation and moderation effects with multiple latent variables, PLS-SEM analysis allows analyzing of models with lower-order constructs -LOC- and higher-order constructs -HOC-.

When using PLS composites, we consider the LOC as a mediator or aggregator between the indicators or dimensions, that is, latent variable scores of the LOCs that constitute the HOC [71,72]. Therefore, we can build more parsimonious models [73] by grouping the relationships of sets of variables that make joint theoretical sense [74] and can be interpreted as a unit without losing the effect of each one of them separately. This is especially relevant as the number of variables increases, the correlation between them, and/or the sample size

decreases. In such circumstances, multiple regression models without SEM can be strongly affected by net suppression conditions between variables with a high correlation between them [75]. In our particular case, the constructs that we wanted to examine were fairly complex and different from those first-order components in which constructs located on the same plane or level are considered. In this sense, constructs can be designed according to higher-order components (HOC). This type of models frequently requires higher-order structures to be examining, including various levels of components [68,76]. For example, the health system's quality represented by the health system performance construct in our model can be specified based on multiple abstraction grades. Mainly, quality can be constituted by various first-order components that separately identify numerous quality features. These may include safety and patient satisfaction through patient opinions, effectiveness, or relevance in the healthcare context. These first-order components or lower order components (LOC) make up the second-order component or higher-order components (HOC) of the quality of the system (health system performance), which presents a greater degree of abstraction.

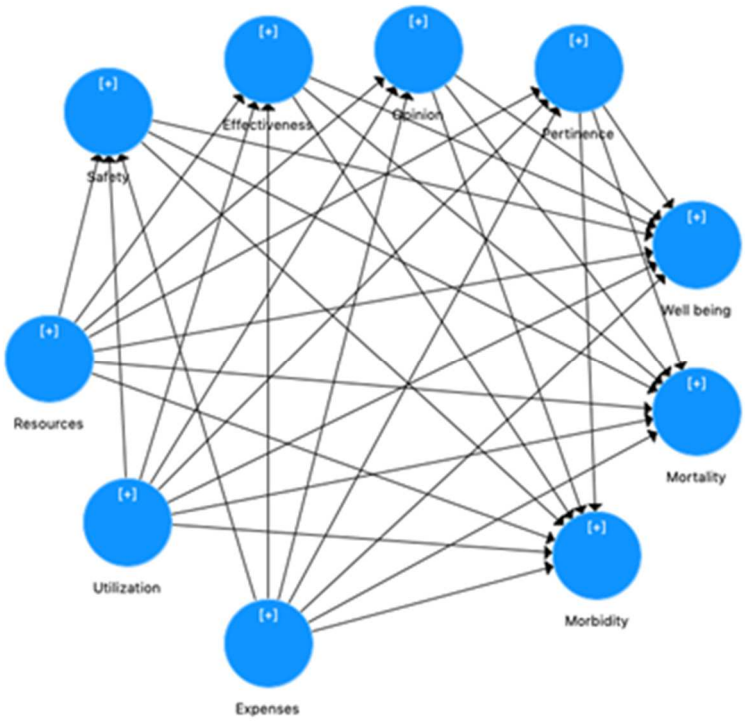

Figure 2. The first step: Lower order components' measurement model.

Rather than modeling quality attributes as drivers of overall respondent quality in a unique level latent variable (see Figure 2), the higher-order model entails combining the lower order constructs into a single multidimensional construct. This modeling procedure conduces to greater theoretical parsimoniousness and decreases the model's complexity, as shown in Figure 3.

Researchers can choose between different approaches to identify the higher-order construct, with alternative approaches to repeated and two-step indicators being the most commonly used in the literature [77]. This work chose the two-step disjoint approach because it shows a better recovery of path parameters [78]. The disjointed approach was initially only based on evaluating the lower-order components' measurement model. These were directly related to all other constructs with which the higher-order construct is theoretically related (see Figure 2). That is, in this first step, we verified compliance with the criteria related to the measurement model of the PLS-SEM algorithm for the lower order constructs. Thus, in the case of constructs in mode A, the criteria tested were individual item reliability, construct reliability, convergent validity, and discriminant validity; while for B-mode constructs, multicollinearity was verified [67]. During these checks, those eliminations of items that did not meet the criteria were made, subsequently providing the scores of the lower-order constructs. The scores' construct values were then saved on, but only those of the lower-order constructs: In our case, the scores of the LOC effectiveness, safety, opinions, and pertinence to build the HOC health system’s performance; resources, utilization, and expenses to form the HOC health system’s sustainability; and the LOC well-being, mortality, and morbidity for the HOC health–disease status. In stage two, these scores are used as indicators to measure the corresponding higher-order construct. Therefore, we apply the PLS-SEM algorithm again in this second step, but exclusively for higher-order constructs with their lower-order dimensions as indicators. In this second step, the PLS-SEM algorithm was fully developed to evaluate both the measurement model and the structural model [78]. The criteria applied to verify the structural model were the inner model variance inflation factor, path coefficients, coefficient of determination, effect sizes, and predictive relevance.

According to Law et al. [79], a construct is higher-order or multidimensional when referring to a set of different but related dimensions, which must be treated as a single theoretical concept. This construct should not be confused with the one-dimensional construct or those multiple variables that manifest a relationship with each other but correspond to more than one theoretical concept. Consequently, a multidimensional construct is conceptualized based on its dimensions and, therefore, does not exist separately. Higher-order constructs constitute a holistic representation of a very complex reality, and their modeling increases the variance explained by the proposed model [80]. In addition, they reduce the number of relationships of the path model as we can see in Figure 3, achieving greater model parsimony.

4.2.2. SPECIFICATION OF PLS-SEM MODEL

The specification of the higher-order model on the Spanish health–disease status required defining the set of HOC constructs and the set of indicators related to the lower-order constructs. In this vein, the dimensions included in the health system performance's higher-order construct were the following:

Effectiveness (LOC): Effectiveness in health care refers to the degree to which an intervention —service, process, procedure, diagnostic test, or treatment— produces the desired result. It includes the following indicators: "Birth children from less than 20 years women for every 100 births", "Incidence of tetanus per 100,000 inhabitants", "Incidence of hepatitis B per 100,000 inhabitants", "Incidence of mumps per 100,000 inhabitants".

Safety (LOC): This dimension refers to how the health system provides safe care and care to the patient. This involves minimizing the unnecessary risk of harm to the patient, which manifests itself in the absence of accidental injuries attributable to the provision of care or medical errors. Healthcare that promotes patient safety in the provision of care involves risk management; recording, analysis, and monitoring of incidents; and implementing solutions to minimize recurrence risk. This includes the following indicators: "Reporting rate of suspected serious adverse reactions to medicines", "Intrahospital mortality post-infarction per 100 highs from a heart attack", and "Lower member amputation rate in diabetic people". In fact, incident reporting and monitoring are measured with these three indicators.

Opinion or Patient Satisfaction (LOC): One of the critical components of quality is the system's responsiveness to patient preferences, attitudes, and expectations. Patient-centered care is defined as one that establishes a good interrelationship between professionals and patients to ensure that decisions made regarding their care process take into account their needs, desires, and preferences, ensuring that these patients have the necessary training and support for effective participation. In a health system whose social legitimacy rests on reliability, satisfaction, and trust, this is understood as a significant quality component to generate a positive experience for patients and the population in their contact with services. This includes indicators such as "Degree of satisfaction of citizens with the functioning of the public health system".

Pertinence (LOC): The degree to which users receive the care they need, with the best use of resources according to available scientific evidence and side effects, is less than the potential benefits. This includes the following indicators: "Laparoscopic cholecystectomy", "Conservative breast cancer surgery", and “Hip fracture patients with surgery in the first 48 hours”.

On the other hand, the dimensions included in the health system sustainability’s higher-order construct were the following:

Expenses (LOC): Disbursement of goods and services intended to preserve, maintain, recover or improve the population's health level. This includes indicators such as "Percentage of health expenditure on primary care", "Percentage of pharmacy expenditure", "Percentage of expenditure in specialized care", among others.

Utilization (LOC): Citizens take advantage of health services. This includes, among others, indicators such as "Frequentation in specialized care inquiries (% SNS)" or "Rates of surgical interventions (% SNS)".

Resources (LOC): High-quality healthcare requires the availability of sufficient resources to meet individual and population needs. The system's capacity refers to economic resources, infrastructure, equipment, human resources, medical devices, medicines, and health service technologies, including information and communication technologies. This includes, among others, indicators such as "Medical staff in specialized care for 1,000 inhabitants (% SNS)", "Nursing staff in

specialized care for 1,000 inhabitants (% SNS)", "Hospital beds in operation (% SNS)", and "Posts in day hospitals for 1,000 inhabitants (% SNS)".

Well-being (LOC): Health well-being is measured through life expectancy, which is the average number of years a given absolute or total population lives in a certain period. This includes, among others, indicators such as "Life expectancy at birth", and "Life expectancy at 65 years".

Mortality (LOC): This is the proportion of people who die from the total population over a period of time, usually expressed in as much as one thousand per year. This includes, among others, indicators such as "Age-adjusted mortality rate from ischemic heart disease per 100,000 inhabitants", "Age-adjusted mortality rate from the cerebrovascular disease per 100,000 inhabitants", and "Age-adjusted mortality rate from cancer per 100,000 inhabitants".

Table 1. Hierarchical Component of Study.

Lower order composites	Higher-order composites
Effectiveness Safety Opinion Pertinence	Health system performance
Expenses Utilization Resources	Health system sustainability
Well-being Mortality Morbidity	Health-disease status

Source: Own elaboration.

Finally, the dimensions included in the health–disease status higher-order construct (HOC) were the following:

Morbidity (LOC): Morbidity is a sick state, disability, or poor health due to any cause. The term can refer to any form of disease or the extent that health condition affects the patient. This includes, among others, indicators such as "Incidence of tuberculosis per 100,000 inhabitants", "Incidence of new HIV diagnoses", and "Adjusted hospitalization rate for acute myocardial infarction per 10,000 inhabitants (SNS)."

Likewise, the definitions of the individual indicators with their corresponding lower-order constructs and their modes of measurement are shown in Table 2 below.

Table 2. Composites and description of indicators.

Composites	Indicators	Description
Effectiveness (Mode B)	EF1	Birth of children from women less than 20 years old for each 100 births
	EF2	Incidence of tetanus per 100,000 inhab.
	EF3	Incidence of hepatitis B per 100,000 inhab.
	EF4	Incidence of mumps per 100,000 inhab.
Safety (Mode B)	SA1	Rate of suspected severe adverse effects rate to medication notified per 1,000,000 inhab.
	SA2	Intrahospital mortality of post-heart attack for every 100 discharges per a heart attack
	SA3	Amputation's rate of the lower limb in diabetes patients
Opinion (Mode A)	O1	Level of satisfaction of citizens with the public health system
	O2*	Level of satisfaction of citizens with their historical knowledge and the tracking of their health condition by their family doctor and the pediatrician
	O3	Level of satisfaction of citizens with the information provided by their doctor about their health condition
Pertinence (Mode B)	PE1	Percentage of laparoscopic cholecystectomy
	PE2	Percentage of conservative breast cancer surgery
	PE3	Percentage of hip fracture patients with surgery in the first 48 hours
Expenses (Mode B)	EX1	Percentage of health expenditure in primary care
	EX2	Percentage of health expenditure in pharmacy
	EX3	Public health expenditure per covered population
	EX4*	Percentage of health expenditure in specialized care
	EX5	Percentage of health expenditure on salaries
	EX6	Percentage of health expenditure on intermediate consumption
	EX7*	Percentage of health expenditure on public–private contract
	EX8	Percentage of health expenditure on internship training
Utilization (Mode B)	U1	Consultation with specialists' doctor (% NHS)
	U2*	Hospitalizations (% NHS)
	U3	Surgical interventions (% NHS)
	U4*	CT utilization (% NHS)
	U5*	Use rate of nuclear magnetic resonance (% NHS)
	U6	Hemodialysis usage (% NHS)
	U7	Hemodynamic usage (%NHS)
Resources (Mode B)	RE1	Specialist doctors (% NHS)
	RE2*	Specialized nursing (% NHS)
	RE3	Beds in operation (% NHS)
	RE4	Day hospital places (% NHS)

	RE5*	Operating rooms (% NHS)
	RE6	CT equipment (% NHS)
	RE7*	Nuclear magnetic resonance equipment (% NHS)
	RE8	Hemodialysis equipment (% NHS)
	RE9	Hemodynamic equipment (% NHS)
Well-being (Mode A)	WB1	Life expectancy at birth
	WB2	Life expectancy at 65 years
	WB3	Healthy life years at birth
	WB4	Healthy life years at the age of 65 years
Mortality (Mode B)	MT1*	Ischemic heart disease mortality rate per 100,000 inhab.
	MT2	Cerebrovascular disease mortality rate per 100,000 inhab.
	MT3	Cancer mortality rate per 100,000 inhab.
	MT4	Chronic obstructive pulmonary disease mortality rate per 100,000 inhab.
	MT5	Pneumonia and influenza mortality rate per 100,000 inhab.
	MT6*	Chronic liver disease mortality rate per 100,000 inhab.
	MT7	Diabetes mellitus mortality rate per 100,000 inhab.
	MT8	Unintentional accidents mortality rate per 100,000 inhab.
	MT9	Suicide mortality rate per 100,000 inhab.
	MT10	Alzheimer's mortality rate per 100,000 inhab.
Morbidity (Mode B)	MB1	Tuberculosis incidence
	MB2	New HIV diagnosis
	MB3	Diabetes in adult population
	MB4	Acute myocardial infarction hospitalization per 10,000 inhab. (NHS only)
	MB5	Cerebrovascular disease hospitalization per 10,000 inhab. (NHS only)
	MB6	Chronic obstructive pulmonary disease hospitalization per 10,000 inhab. (NHS only)
	MB7	Diabetes mellitus hospitalization per 10,000 inhab. (NHS only)
	MB8	Hypertensive disease hospitalization per 10,000 inhab. (NHS only)
	MB9*	Congestive heart failure hospitalization per 10,000 inhab. (NHS only)
	MB10	Victims of traffic accidents
	MB11	Work accidents
	MB12	Frequency of work accidents

Source: Ministry of Health, Social Services, and Equality (MHSE), 2008–2017.

* These indicators were not included in latent variables due to the multicollinearity criteria of PLS-SEM or item reliability.

4.2.3. DATA AND SAMPLE

In the sample configuration, data from key indicators of Spain's national health system were used from 2008 to 2017. The model was tested with a secondary

dataset and used repeated cross-sectional data [81]. The Spanish Ministry of Health, Social Services and Equality (MHSE) has a statistical portal with information about each autonomous community's average national health system key indicators. Of the total of 19 autonomous communities existing in Spain, the lack of data from two of them (Ceuta and Melilla) led to them being excluded leaving the sample composed of 17 autonomous communities. Faul, Erdfelder, Buchner, and Lang [82] explain the minimum sample size required when we set an effect size f2 of 0.15 and a significance level of 0.05, using the statistical program G * Power. Our results show a minimum size of 103 observations for a statistical power of 0.8. Therefore, the minimum sample size required of 103 observations is less than the 165 used.

The selection of sets of indicators is a procedure used by different supra and international organizations that are beginning to use said sets of indicators or are in the process of preparing them. Among them, the European Commission works to obtain comparable information on health, the habits of the population related to health and diseases, and health systems. The objective of the Commission is to have an integrated system of indicators, common at the European level, whose work scheme is based on the ECHI (European Community Health Indicators) project. At the Spanish level, the country has a significantly developed of its health information systems, in order to obtain executive and multidimensional information. In Spain, this is known under the generic name of “key indicators of the SNS” which also serves as the basis for submitting the information to the ECHI project of the European Commission. The conceptual model of the European Core Health Indicators (ECHI) was adapted to the Spanish national health system's characteristics, which determined the relationships between the constructs. In this sense, Table 2 presents a summary of all the variables and indicators included in the model, their acronyms, and the data sources used.

The series of indicators used are grouped around their meaning and some indicators are both secondary and primary care and/or exclusive of one of the two types depending on the case. For example, the indicator “EX2—Percentage of health expenditure in pharmacy” includes the pharmaceutical expenses of

both hospitals and primary health centers. However, for example, the indicator "EX1—Percentage of health expenditure in primary care" is exclusive to primary care centers, while the indicator "U2—Hospitalizations (% NHS)" is exclusive to secondary care centers, that is, hospitals. This means that the key indicators of the SNS used in this work include both information from secondary care data and information from primary care data.

Concerning the higher-order construct (see Table 1) health–disease status, 24 items were used grouped into three theoretical dimensions: mortality, morbidity, and well-being [12]. To measure quality or health system performance (HS performance), we follow Cinaroglu and Baser's [10] recommendations. A scale of 13 items initially grouped into four dimensions was used: effectiveness, opinion, safety, and pertinence. Finally, health system sustainability (HS sustainability) was measured with the scale proposed by Valls Martínez and Ramírez-Orellana [47], consisting of 24 items grouped into three dimensions: utilization, resources, and expenses. The second-order HS performance and health–disease status constructs were mixed type [76], and according to the results of confirmatory tetrad analysis we considered the formative-formative type for HS sustainability.

4.3. ASSESSING PLS-SEM RESULTS

This section presents the results of applying the disjoint two-step method to our higher-order component model. Initially, at the first step, the PLS algorithm was per-formed to evaluate the lower-order composites' measurement model. The second step evaluated both the measurement model and the structural model of the higher-order composites. The evaluation of the measurement model allowed us to check the validity and reliability of the proposed scales, before proceeding to evaluate the structural model (see Figure 3).

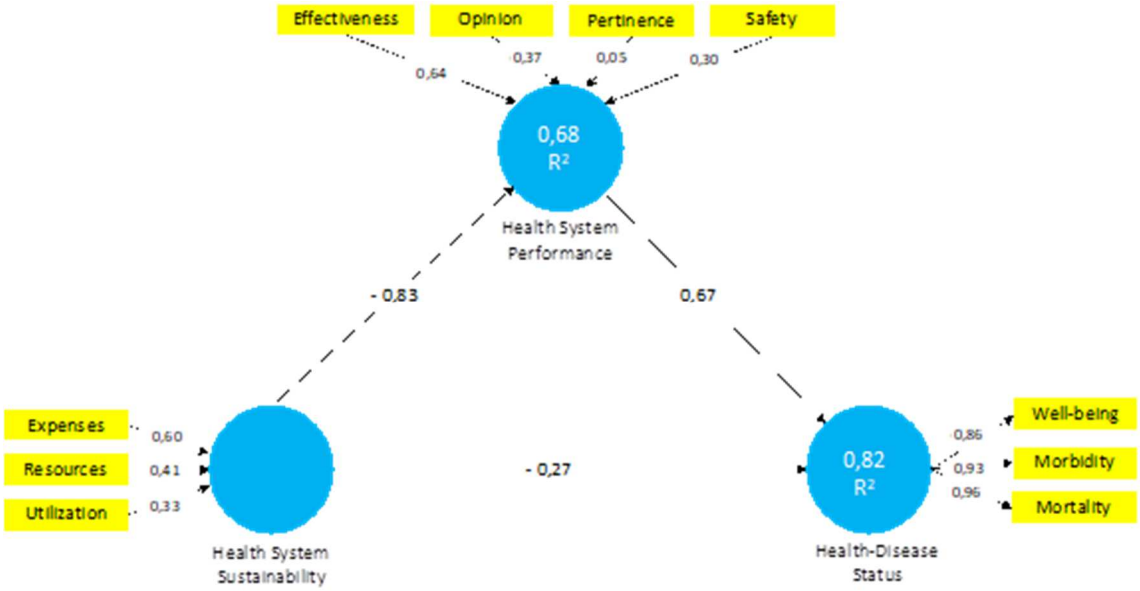

Figure 3. The second step: Higher-order composites' structural model. Health system sustainability, health system performance, and health-disease status are higher-order constructs (HOC).

4.3.1. EVALUATION OF LOC MEASUREMENT MODEL

The lower-order composites measurement model was evaluated concerning the four criteria identified to meet the said models' reliability and validity: Individual item reliability, construct reliability, convergent validity, and discriminant validity.

4.3.1.1. Reflective measurement model

- Individual item reliability LOC

According to the latent variables' specifications (see Table 2), only the opinion and well-being constructs were measured in mode A. Therefore, we refined those items with load values lower than the reference value of 0.707 [83]. According to this criterion, the second item of the Opinion composite (level of satisfaction of citizens with their historical knowledge and monitoring of their health status by the family doctor and pediatrician) was eliminated due to not exceeding the reference threshold.

- Construct Reliability LOC

The Cronbach alpha coefficient (α), the Dijkstra–Henseler (ρA) index, and the composite reliability statistics are calculated to check the construct reliability criterion [78]:

$$Cronbach's\ \alpha = \frac{N \cdot \bar{c}}{1 + (N-1) \cdot \bar{c}}$$

$$\rho_A := (\hat{w}'\hat{w})^2 \cdot \frac{\hat{w}'\left[S - diag(S)\right]\hat{w}}{\hat{w}'\left[\hat{w}\hat{w}'diag(\hat{w}\hat{w}')\right]\hat{w}'}$$

$$\rho_C = \frac{\left(\sum_{i=1}^{N} l_i\right)^2}{\left(\sum_{i=1}^{N} l_i\right)^2 + \sum_{i=1}^{N} \mathrm{var}(e_i)},$$

where N is the number of lower-order components ($i = 1,2,\ldots,N$); $\bar{c}$ is the average correlation between the lower-order components; $\hat{w}'$ is the higher-order constructs' estimated weight vector and the number of lower-order constructs is the dimension of $\hat{w}$; S is the empirical covariance matrix of the lower-order components; l_i is the loading of the lower-order component i in a particular higher-order construct; $\mathrm{var}(e_i)$ is the measurement error's variance of the lower-order component i.

All three indicators share the same benchmark threshold of 0.7 [84,85], and this was met for the sample data (see Table 3).

Table 3. Construct reliability LOC.

	Cronbach alpha	ρA	Composite reliability
Opinion	0.774	1.210	0.884
Well-being	0.841	0.878	0.890

Source: Own elaboration.

- Convergent validity LOC

The convergent validity of the model's constructs was verified by analyzing the average variance extracted (AVE) [78]:

$$\mathrm{AVE} = \frac{1}{N}\sum_{i=1}^{N} l_i^2 .$$

The AVE values in this study were 0.793 for opinion and 0.672 for well-being. These results are adequate as the values should be above 0.5, according to Hair et al. [67].

- Discriminant validity LOC

To close the LOC measurement analysis in mode A, the discriminant validity was verified through the HTMT ratio of the higher-order constructs Y_i and Y_j developed by Henseler, Ringle and Sarstedt [86]:

$$\mathrm{HTMT} = \frac{\dfrac{1}{K_i K_j}\sum_{g=1}^{K_i}\sum_{h=1}^{K_j} r_{ig,jh}}{\left(\dfrac{2}{K_i(K_i-1)}\sum_{g=1}^{K_i-1}\sum_{h=g+1}^{K_i} r_{ig,jh} \cdot \dfrac{2}{K_j(K_j-1)}\sum_{g=1}^{K_j-1}\sum_{h=g+1}^{K_j} r_{jg,jh}\right)},$$

where K_i (respectively K_j) is the number of lower-order constructs considered as indicators of the higher-order construct Y_i (respectively Y_j); is the correlations of the lower-order constructs within and across the higher-order constructs Y_i and Y_j. Observe that the numerator represents the average heterotrait–heteromethod correlation, and the denominator is the geometric mean of the average monotrait–heteromethod correlation of construct Y_i and the average monotrait–heteromethod correlation of construct Y_j.

The ratio should not exceed the threshold value of 0.85 or 0.90 [87]. In this study, the HTMT ratio had a value of 0.409, thus reaching discriminant validity.

Table 4. Fornell and Larcker criterion LOC.

	EF	EX	MB	MT	O	PE	RE	SA	U	W-B
EF	**n/a**									
EX	-0.537	**n/a**								
MB	0.854	-0.71	**n/a**							
MT	0.846	-0.635	0.873	**n/a**						
O	-0.271	0.364	-0.452	-0.369	**0.891**					
PE	-0.186	0.342	-0.136	-0.033	0.167	**n/a**				
RE	-0.548	0.421	-0.627	-0.555	0.614	0.141	**n/a**			
SA	0.578	-0.622	0.673	0.599	-0.188	-0.199	-0.422	**n/a**		
U	-0.405	0.112	-0.382	-0.465	0.341	-0.104	0.403	-0.252	**n/a**	
W-B	-0.657	0.543	-0.665	-0.761	0.367	0.110	0.519	-0.405	0.431	**0.820**

Source: Own elaboration.

The Fornell and Larcker [88] criterion was also used to measure discriminatory validity. This criterion explains that the amount of variance that a construct captures from its indicators (AVE) should be greater than the variance that such as construct shares with other constructs in the model (the squared correlation between the two constructs). To facilitate this assessment, the root square of the AVE of each latent variable should be greater than the correlations it has with the other latent variables in the model.

The values indicating that there is an adequate discriminatory validity according to the Fornell and Larcker criterion are shown in bold on the diagonal (see Table 4).

4.3.1.2. Formative measurement model

- Collinearity of mode B indicators LOC

As the measurement mode A models have been evaluated in the previous subsections, it is now necessary to assess the formative measurement models or mode B. To do this, within the two-step method in higher-order models, we examine the degree of collinearity of the indicators in mode B. If there is multicollinearity, we proceed to eliminate these items. For items EX4, EX7, U2, U4, U5, RE2, RE5, RE7, MT1, and MT6 (see Table 2), variance inflation factor (VIF) values equal to or greater than 5 were found, which indicated a multicollinearity problem, and they were eliminated from the model. The VIF of the *k-th* indicator is calculated as follows:

$$\mathrm{VIF}_k = \frac{1}{1 - R_k^2},$$

where R_k^2 is the explained variance of the *k-t*h regression. A high value of R_k^2 denotes that the variance of the *k-th* indicator can be explained by other items of the construct.

- Compute the LOC scores

Finally, the disjoint two-stage approach does not interpret the model estimates. According to the PLS algorithm, it proceeds to compute the lower-order constructs scores to use as new variables to measure the higher-order

construct in stage two. The lower order components are linked to all other constructs that the higher-order construct is theoretically related to, as shown in Figure 2. In evaluating the HOC model, these scores are used as indicators of the higher-order construct [78].

4.3.2. EVALUATION OF HOC MEASUREMENT MODEL

4.3.2.1. Reflective measurement model

- Individual item reliability HOC

The reflective indicators' individual reliability is valued by examining the factorial loads (λ) or simple correlations of the measures or indicators with their respective construct. The indicators are reliable if λ ≥ 0.707 [83]. Several researchers argue that this heuristic rule should not be as rigid in the early stages of scale development [64] and when scales apply to different contexts [89]

Table 5. Individual item reliability HOC.

	Morbidity	Mortality	Well-being
Health-disease Status	0.934	0.960	- 0.860*

Source: Own elaboration.

In the model, the values for loads conform to what is recommended (see Table 5); however, the health–disease status construct has a negative value for the well-being di-mension (−0.860). This value means that the condition is satisfied since the squared value of −0.86 is 0.74, so the variance is explained in 74%; therefore, it must maintain the well-being item.

- Construct Reliability HOC

The measurements are the Cronbach alpha coefficient (α), the ▫A index, and compo-site reliability.

Composite reliability is more appropriate than Cronbach alpha for PLS, as it does not assume that all indicators receive the same weight [84]. The value of 0.7 is suggested as an appropriate level for “modest” reliability in the early stages of research and a stricter 0.8 or 0.9 for more advanced research stages. Dijkstra–Henseler Index (▫A) was also evaluated and is considered to be a measure of consistent reliability [85].

Table 6. Construct reliability HOC.

	Cronbach alpha	ρ_A	Composite reliability
Health-disease Status	−0.876	0.926	0.696

Source: Own elaboration.

As shown in Table 6, the Dijkstra–Henseler Index (ρA) value meets the recommended threshold to conform with our evaluation. Dijkstra and Henseler [85] presented their index ρA as an exact and consistent measure of construct reliability since Cronbach's alpha is conservative in excess and composite reliability the opposite.

- Convergent validity HOC

Convergent validity implies that a set of indicators represents a single underlying construct, demonstrated by its one-dimensionality [90]. For average variance extracted (AVE) values, it is recommended that their values be equal to or greater than 0.50. In this case, the health–disease status with a 0.845 value of AVE is given validity.

- Discriminant validity HOC

Discriminant validity indicates the extent to which a given construct is different from other constructs. We measure it through the Fornell and Larcker criterion.

Table 7. Fornell and Larcker criterion HOC.

	Health-disease Status	HS Performance	HS Sustainability
Health-disease St.	**0.919**		
HS Performance	0.890	**n/a**	
HS Sustainability	-0.821	-0.826	**n/a**

Source: Own elaboration.

The values indicating that there is an adequate discriminatory validity according to the Fornell and Larcker criterion are shown in bold on the diagonal (see Table 7).

4.3.2.2. Formative measurement model

The measurement model for mode B composites (HS performance and HS sustainability) was evaluated in terms of collinearity between indicators, significance, and relevance of external weights.

First, discarding indicators was carried out when the indicator exceeded the variance impact factor (VIF > 5). As a result of this process, all the HOC indicators remained without collinearity.

Second, the relevance of weights was analyzed. Figure 3 shows the relevance of indicators within their construction.

Thus, for the latent higher-order HS performance, the most positively relevant dimensions were effectiveness and safety. Additionally, opinion has negative relevance, while pertinence lacked weight within the system's quality with a weight of 0.05, very close to zero.

For the HS sustainability higher-order variable measured through its dimensions, it was established that expenses are the most weighted dimension, followed by resources and, finally, utilization. All three dimensions bring positive relevance to the construct.

Finally, to evaluate the significance, we can start bootstrapping with 10,000 subsamples to check if the external weights are significantly different from zero, i.e., the minimum recommended by Hair, Ringle, and Sarstedt [91]. Since weights provide information on their contribution, they can be classified according to their respective composition [64]. Indicators with a non-significant weight but with significant loads of 0.50 or more were considered relevant [64]. Our results show that all the indicators' weights were significant, except pertinence (Table 8).

Table 8. Significance of weights.

	Original Sample	*t*	loadings	Lo95	Hi95
Health System Sustainability					
Expenses	0. 600***	9. 974	0. 810	[0. 479;	0. 714]
Resources	0. 413***	7. 978	0. 798	[0. 314;	0. 517]
Utilization	0. 328***	6. 194	0. 562	[0. 220;	0. 427]
Health System Performance					
Effectiveness	0. 639***	14. 307	0. 902	[0. 547;	0. 723]
Opinion	-0. 367***	7. 616	-0. 588	[-0. 459;	-0. 270]
Pertinence	0. 051^{ns}	1. 410	-0. 189	[-0. 018;	0. 122]
Safety	0. 298***	6. 267	0. 727	[0. 205;	0. 392]

*: p < 0.05; **p < 0.01; p < 0.001. Significance, t statistic, and 95% bias-corrected confidence interval performed by 10,000 replications bootstrapping procedure.

4.3.3. EVALUATION OF HOC STRUCTURAL MODEL

Once the measures of the constructs were verified to be appropriate, the structural model was assessed.

4.3.3.1. Evaluation of path coefficients

Path coefficients and their significance are reported in Table 9 and Figure 3, with their 10,000 bootstrap resampling levels. In addition, Table 9 shows that the VIF of the constructs ranged from 1.000 to 3.152, suggesting that collinearity is not a problem. This study also evaluates quality by verifying that the Q2 value is greater than 0.5, which shows a situation of high predictive relevance [67]. This suggests a good fit in model prediction.

Table 9. Full sample results.

	Path	*t*	*p*	Lo95	Hi95	f^2	VIF
Direct effects							
HSP→ HS	0.667***	14.413	0.000	0.577;	0.760	0.766	3.152
HSS→ HS	-0.821***	36.448	0.000	-0.864;	-0.775	0.125	3.152
R^2: 0.816; Q^2:0.672							
HSS→ HSP	-0.826***	35.197	0.000	-0.873;	-0.781	2.152	1.000
R^2:0.683							
Indirect effect						VAF	
HSS→ HSP → HS	-0.551***	13.219	0.000	-0.640	-0.475	67.31%	n/a

*: p < 0.05; **p < 0.01; p < 0.001. Significance, t statistic, and 95% bias-corrected confidence interval performed by 10,000 replication bootstrapping procedure. VIF: Inner model Variance Inflation Factor. VAF: Variance Accounted for.

Our results suggest that HS performance has a positive and significant impact on health–disease status at a level of 5%, so that the higher the quality of the system has the higher the health–disease status. Additionally, HS sustainability has a significant but negative impact on health–disease level, suggesting that the health system's higher sustainability lowers the rate of morbidity and mortality. Likewise, HS sustainability's influence on HS performance is negative and significant. In short, all model hypotheses that relate latent variables to each other are accepted (H1, H2, and H3).

We analyzed the mediation (H4) hypothesis, resulting in the indirect effects being significant [92]. The indirect effect of HS sustainability on health–disease status through HS performance was positive and significant (p-value 0.000), supporting H4 (Table 9). The direct effect was also significant, which indicated that the mediation effect was partial [93]; HS sustainability directly influenced on health–disease status (H1) and indirectly through HS performance. The value of the variance accounted for (VAF) indicated that the mediated ratio was 67.31% of HS sustainability's total effect on health–disease status (see the indirect effect in Table 9):

$$\text{VAF} = \frac{\text{indirect effect}}{\text{total effect}}.$$

4.3.3.2. Assentment of the coefficients of determination (R^2)

The coefficient of determination (R^2) represents a measure of predictive power. It indicates the amount of variance of a construct explained by the predictor variables of that endogenous construct in the model. R^2 values range from 0 to 1; the higher the value, the more predictive capacity the model has for that variable.

The values of R^2 should be high enough for the model to reach a minimum level of explanatory power. Falk and Miller [94] suggest at least ≥ 0.10; Chin [64] states that 0.67 is substantial, 0.33 is moderate, and 0.19 is weak.

The health–disease status constructs' predictive level with a value of 0.842 can be considered more than substantial (see Table 9). The HS performance constructs with a value equal to 0.680 are also more than substantial because it exceeds 67% and is close to 1 (see Table 9).

4.3.3.3. Review of effect sizes (f^2)

The effect sizes (f^2) value the degree to which an exogenous construct helps explain a certain endogenous construct in terms of R^2 [95]:

$$f^2 = \frac{R^2_{\text{included}} - R^2_{\text{excluded}}}{1 - R^2_{\text{included}}},$$

where R^2 is calculated including and excluding a specific predictor construct in the model.

A Cohen [95] heuristic rule for evaluating f^2 holds that: $0.02 \leq f^2 < 0.15$, is a small effect; $0.15 \leq f^2 < 0.35$ is a moderate effect; and $f^2 \geq 0.35$ is a large effect.

Table 10. Effect sizes (f^2) and *p-values*.

HS Performance -> Health-disease Status	0.766	0.000
HS Sustainability -> Health-disease Status	0.125	0.010
HS Sustainability -> HS Performance	2.152	0.000

Source: Own elaboration.

The results in Table 10 show that the effect between the exogenous construct HS sustainability and its contribution to the endogenous construct health-disease status (0.125) was small and significant, while with HS performance (2.152) had a large effect. In contrast, the HS performance construct with health–disease status, with a value of 0.766, had a significant and large effect.

4.4. DISCUSSION

The results of this study have important implications for hospital managers and policymakers. Healthcare officials and managers will have one more tool with which to establish the determinant factors for achieving their objective: to improve the population's health and quality of life. The findings revealed that health system sustainability had a negative effect on the health–disease status, measured in terms of mortality and morbidity rates. However, the relationship between health system performance and health–disease status is positive.

We analyzed 61 indicators belonging to lower-order components that define three higher-order components. Data were obtained from the Spanish Ministry of Health Social Services, and Equality for the entire Spanish territory, except Ceuta and Melilla, between 2008 and 2017. The applied technique was partial least squares structural equation modeling (PLS-SEM).

The health–disease status construct, composed of three lower-order components, was reflected in two components of disease incidence and mortality with loads in a positive sense; presenting the well-being dimension inverse correlation with the value of the construct. Therefore, the model was

further delimited by mortality and morbidity. In other words, the latent variable health–disease status, was defined more by incidences of diseases than by health status in a positive sense. For example, a previous study discovered that the mortality rate increases when the person suffers from heart disease or cancer and, on the other hand, when the patient is hospitalized through an emergency unit [60]. A previous study indicated that injured people have a higher Charlson Comorbidity Index (CCI) than non-injured people, i.e., pre-injury morbidity was higher [96].

A positive relationship between the constructs of health system performance and health–disease status was confirmed. The most relevant dimensions were effectiveness and safety in this order, and lastly, pertinence with a non-significant influence. One of the most investigated components of effectiveness is the quality of the system, which, for example, can materialize in annual tests of hemoglobin A1C in diabetic patients and the use of aspirin in cases of myocardial infarction [6]. Moreover, opinion had a negative effect on performance. This clearly confirmed that patient satisfaction as an indicator of quality care [97]. Despite this, the patient being in a state of discomfort could not be the best criterion when evaluating the health system [98].

Moreover, health system sustainability negatively influenced health–disease status, which shows that increases in expenditures, resources and extent of use in the healthcare system improve the population's health, reducing mortality and morbidity or increasing well-being. The three dimensions analyzed have a positive influence on the formative construct. The weights inform us about the contribution of the indicators to the construct. The indicator with the most weight was expenses, followed by the allocation of resources, and lastly, the use and exploitation of health services by citizens. When public agencies provide an adequate allocation of resources is made according to the patients' needs, not only are effective, safe and timely results are offered—the efficiency of the system is improved [34]. It would be interesting for health systems to also invest their resources in prevention. For example, cardiovascular diseases, in many cases, and especially in young patients, are driven by behaviors that can be avoided, such as a sedentary lifestyle, smoking, poor diet, and alcohol

consumption [99]. In another way, the literature shows that between 25% and 40% of cardiovascular diseases are attributable to work-related stress. For this reason, health systems policymakers should also address issues related to occupational health psychology, not only for mental morbidity but also for other diseases that include the risk of death [41]. However, a study revealed that depression is a common factor in hospitalized patients, and when it is present, the risk of death after myocardial infarctions is higher [38]. On the other hand, hospital readmission is higher when it comes to cardiac patients [58].

Our research indicated that the health system's better performance would be reflected as a better health–disease status of the population, which is consistent with the bibliography, which considers that with greater effectiveness and safety in the health system, the patient will obtain the desired results in a safe way [30]. Moreover, according to another study, we can observe that efficiency showed a negative relationship with mortality rates because the treatment's efficiency allows better clinical results to be obtained [60]. Effectiveness is one of the health system's performance indicators and reflects the effect that its treatment and interventions have on the health–disease status of the population [10]. A study carried out with exclusive data from hospitals revealed that the most competent and efficient hospitals have lower mortality rates [60].

Maintaining a sustainable health system is the basis for improving people's health [2,28,34]. Hospitals that do not allocate their resources properly are more insecure, which means that they are more likely to have unwanted clinical evens [34]. In that sense, the authorities must improve the services' quality and deliver services effectively and professionally [32]. The results showed an inverse relationship between sustainability and health–disease status. In other words, better spending, resource allocation and use of the health system, lower the incidence of diseases, and improve health, which also explains the negative influence of sustainability on performance, since adequate management of resources and expenses will lead to a better-quality system. Tumors are the second leading cause of death in women worldwide. In this sense, the health system must promote and be able to attend on time the periodic controls that are required [42]. A previous study found that when it comes to diseases such

as diabetes or lung conditions, patients adhere less to treatments. Therefore, the health system administration should direct its efforts to persuade the population by communicating with and educating them about the need to control these diseases [52]. The direct and indirect effects of sustainability on health–disease status were confirmed. The mediating effect, through the performance construct, was 32.09% of the total effect.

A favorable health-disease status of the population will require decision-making by public authorities regarding the right laws of health in accordance with WHO. This will imply implementing an efficient financing system with sufficient budgetary allocation to stimulate the system's performance [18,19]. Thus, for example, spending on primary and specialized medicine are basic pillars, passing through the distribution of facilities that allow accessibility and use of the resources invested in the national health system [47]. All the budgetary allocation to cover expenses and resources must be done with balance regardless of whether the healthcare offer is public and/or public-private arrangements, as is the case in some Spanish regions. Hence the necessary regulation of private-public provider mix. Regarding health system performance, the authorities must effectively attend to the composition of essential services packages to reduce health incidents. Another important factor in performance is having a good management and information system that allows data to be available at an opportune moment to make decisions that may affect the health system [6].

In this empirical study, the created model predicts the population's health–disease status as 84.2%, which is considered more than substantial. On the other hand, the performance construct explained 68% of the variance.

Although our research model uses the Spanish Ministry of Health Social Service and Equality data to verify our hypotheses, there remain some limitations. One limitation was due to the phenomenon of the invisibility of data [1] related to social care arrangements. In addition, our results are based solely on the Spanish territory, which opens up the possibility that the findings are specific only to this country. Future research should be focused on other countries. Furthermore, differences in the patient's gender, educational level,

socioeconomic level, and other characteristics could yield interesting results in the future. Otherwise, future research could try to compare the performance of different secondary care centers, that is, hospitals, within the national territory in order to verify if there are differences between autonomous communities (since in Spain it is the autonomous communities who have health competence).

4.5. CONCLUSION

Using the structural equation modeling approach, we developed a health–disease status model. The research reveals that health system' administrators and government must pay their attention to continuously improving health system performance and health system sustainability to fulfill their ultimate goal, which is to enhance citizens' health-disease status.

The study's findings showed that patient health improves when the health system’s performance is excellent, effective and safe. Furthermore, patient health improves when the health system is sustainable over time, which implies that expenses, resources, and the use made of medical services are consistent with the needs of patients and do not compromise their future needs. Furthermore, health system performance mediates the relationship between sustainability and health–disease status. In other words, sustainability has a double effect (direct and indirect) on health–disease status.

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Chapter 4: Using the PLS-SEM Model with Higher Order Constructs to Study the Effect of Health System Performance and Sustainability on the Health-Disease Status in Spain

CHAPTER 5:
CONCLUSIONS

5.1. CONCLUSIONS

After analyzing the Scopus database on the scientific production of academic articles on patient satisfaction taken as the basis for the generation of public policies, we observed that there are at least two historical moments that influenced interest in it. In the first place, the economic and financial crisis of 2008, which had reduced public budgets in many countries. That brought with it the need to study the efficiency of health systems and patient satisfaction. Concerning this, we discovered that after this historical event, 73.10% of the total scientific production on PS & HP took place between the years 2000 and 2020. Second, the creation of the ECHI project in 2001. Its objective is to have an integrated system of health indicators at the European level. These indicators, including the patient's satisfaction in the health system, generate information comparable between countries. These are used as a basis for the formulation of public policies. In the bibliometric analysis carried out, we found that before the year 2000, less than 11% of the total articles were published.

For its part, it is to highlight that the analysis of public policies and patient satisfaction is not taking place within the economic, administrative, and strategic management field since these areas collect only 2.52% of scientific production.

The country that gave the greatest importance to this research topic, considering the number of scientific publications achieved and the number of collaborations as a measure, was the United States, followed by the United Kingdom. However, considering the number of citations in these countries, they rotate their first and second place.

In addition, the United Kingdom consecrates the two authors (Bower P. y Roland M.), the two journals ("Social Science and Medicine" and "BMC Health Services Research"), and the two universities (The University of Manchester and London School of Hygiene and Tropical Medicine) more proliferate. In addition, the article that obtained the most citations about PS & HP is of British origin. We can label this country as the nation that produces the best articles in terms of quality measured by the number of citations it receives. Amplifying, Bower P. and Roland M. are leaders in the number of citations.

Another interesting fact that was revealed is that the author with the most citations per article and with the most experience in the field of research (measured by the number of years elapsed from his first to the last article) is the American Blendon R.J., although its most recent publication dates from 2014.

For its part, the analysis of keywords and their temporal evolution plays a significant role in defining future lines of research. We must not fail to mention that the widely studied topics are: Intensive Care Unit, Cost, Aid, Feasibility-study, and Human. On the other hand, emerging or decadent words could also be identified: Risk Factors, Rehabilitation Center, City, and Health Status Indicator.

The word Human is the most named in both periods studied, which is reasonable due to the degree of generality of the concept. Perception is an issue that grew between the two analyzed sub-periods, which revealed that satisfaction analysis for public policies elaborations is inexorable for their success.

In this sense, we find in the literature studies on perception, and more specifically on patient satisfaction, aimed at improving medical, nursing, and health staff practices. Our study extended the limits by finding relationships between resource management and patient satisfaction and the consequent improvement in the population's health-disease status.

In the first place, the modeling, carried out using the PLS-SEM tool, included expense and resource constructs that had a positive and significant influence on the satisfaction level, women being more sensitive to it than men. However, the influence of mortality was not significant. GDP had a negative effect on satisfaction, which indicates that the population's demands on the health system resulted when the monetary value of the goods produced in the country also did.

Citizens perceive a better health system when expenses are allocated to increasing the qualified health personnel and their training, even more so when they are specialists. Women are the most satisfied when it comes to family doctors and men when it comes to specialists. The indicator named "Public health expenditure managed by autonomous community per protected

inhabitant" is the one that has the most weight in the construction of its construct.

Satisfaction also improves when resources are applied to increase the number of operating rooms and technological equipment such as NMR machines. Surprisingly, this does not happen with CT machines. The number of hospital beds did not positively affect satisfaction, neither for men nor for women, revealing that, when circumstances permit, patients prefer to recover from surgery or illness at home. The expense applied to concerts, that is, to the compensation paid to private hospitals for attending to citizens when public hospitals are saturated, has a negative and significant effect on men's satisfaction, not being significant for the population case of the female sex. Another expense that had a negative impact on satisfaction was that applied to a pharmacy, having such behavior in both study groups. The resource construct manages to explain 60.5% of the variance in the case of males and 58.9% in the female population.

Another of the constructs analyzed was mortality. The model proposed in the study explains 61% of mortality in the case of men and 60.1% in the case of women. Here, it could be observed that we found a negative or positive effect on satisfaction depending on the type of disease. The impact on satisfaction is negative when it comes to cardiovascular disease and diabetes. This result is reasonable since they are diseases that can be prevented and have a lot to do with sociocultural habits and economic circumstances, such as smoking, diet, physical activity, and stress, among others. The application of resources to educate the population and prevent it has a positive effect on the health-disease state of society.

On the other hand, the effect on satisfaction is positive when it comes to diseases such as Alzheimer's, which affects the elderly and is not curable. In the first case, we could say that the health system has failed in prevention. Even more so, when the occurrence of this type of disease in young adults increases over the years. In the second case, the health system can only support the patient and their family members, associating the disease only with old age. Even previous studies indicate that the families of patients with dementia

prefer to delay the transfer to nursing homes as much as possible, even if this implies anticipating the patient's death. And in many cases, they feel relief when the sick person dies.

Regarding cancer mortality, no significant influence on satisfaction was found. It may be because it is a disease of which there are many myths or rumours, but there are currently no studies that affirm the exact causes in most cases, so the health system cannot be assigned or rid of the responsibility.

For its part, the influence of spending, indirectly through resources, and the application of resources by itself on mortality is significant and negative. In other words, the higher the values of these variables, the lower the mortality rate.

The degree of use construct was influenced, indirectly through resources, by spending positively (the higher the spending, the higher the use). In the female and male groups, the influence is reflected in the frequency of access to specialist doctors, firstly, and secondly, the use of CT equipment. The percentage of outpatient surgery negatively influences the determination of the degree of use, while the number of surgical interventions does it positively. In both cases, the sense of influence is repeated in men and women, although it is not significant in either case.

The model made allowed to explain 41.7% of the satisfaction of men and 38.2% of women. Other studies reveal other indicators of satisfaction that could explain the rest of the variance.

Once these relevant data were obtained, it was necessary to study whether they had implications in the state of health disease. We again resorted to the PLS-SEM software, but this time creating a model of partial least squares structural equations where its constructs were of a higher order. That is, they are composed of other constructs of a lower order. This way of posing the model allows reducing its complexity.

The health-disease state construct is composed of lower-order constructs: Well-being, Mortality and Morbidity. That is explained more in a negative than positive sense. Namely, the model is defined to a greater extent by the

incidence of diseases. The created model manages to explain 84.2% of the variance.

A positive relationship between the performance construct and the health disease state was confirmed, with significant effectiveness and safety incidences. Opinion had a negative effect on performance, which corroborates that patient satisfaction is a clear indicator of the health system's quality. An effective system will provide the best service at the right time, with optimal security and therefore obtaining the desired results in the health-disease state of the population. The lower order Pertinence construct did not have a significant influence.

Sustainability negatively affects satisfaction, that is to say, that with higher volumes of expenses, application of resources, and degrees of use (in that order), the system manages to improve the health of the population, evidenced by lower mortality and morbidity rates. Those who do not allocate resources properly are more likely to suffer unintended clinical consequences. That has to do with the concept of opportunity cost, where resources are finite and must be assigned only to one alternative. On the other hand, the effect of sustainability on performance is negative. Namely, adequate management of resources and budget of expenses will guide a better sanitary quality. The mediating effect of sustainability, through the performance construct, on the state of health and disease of the population exceeds 30% of the total effect.

The importance of these investigations at the political level is not trivial since they will be of no use if only the new knowledge revealed is reflected on paper. Their use by public policymakers will be crucial if their objective is to improve the population's quality of life. The ultimate aim of this work is to provide relevant information for the formulation of public policies that positively impact the population's quality of life. More and more researchers must justify the impact of their work on the real-life of citizens.

On the other hand, we are aware that policymakers are often more influenced by ideologies than by what professionals and scientists advise.

Milton Friedman's Four Ways of Spending set out in his book "Free to Choose" justifies the use of patient feedback to determine how the state should use its

resources. Friedman indicates that the best way to spend is your money on yourself since you know what you want and how much effort you had to make to get that money. The second way of spending is to spend your money on others; in this case, you try to save the cost as much as possible without caring too much for what others are receiving. A third way is to spend the money of others in it by nature the human being will waste resources and care little about saving. The fourth way of spending corresponds to the state; it is the worst since it uses the money of others (the population) in others, which constitutes the most inefficient way of spending. The state collects money in a coercive manner and is assigned according to your preferences, beliefs or ideology. The way to democratize this resources allocations and the application of coercive spending is to focus on the opinion of citizens, in other words, on the perspective and expectations of patients. As we have seen, it will also positively affect the health system quality and the population's health as a whole.

Therefore, according to the opinion of the health system users, public policies should be more concerned with incorporating medical equipment and appropriate human resources. On the other hand, it should reduce spending on drugs, hospital stay and promote alternative medicine's use when possible.

When the use of resources, the application of expenses, and the use of the health system are carried out sustainably, it will positively affect the health of the population. Likewise, when the health system's performance is efficient, safe, and respectful of patients' opinions, the health-disease state of the people will also be positively affected.

It is important to note that the study carried out has certain limitations. In the first place, the bibliometric analysis was carried out with a database that was considered optimal because most of the WoS database articles are in Scopus. But it is a reality that both are world leaders in bibliographic reference databases, so a new investigation based on WoS would not be too much.

Concerning the models created to estimate patient satisfaction and the population's health-disease state, it is necessary to underline that they were fed with national data. It would be interesting to see whether or not these results can be extrapolated to other countries by analyzing international data.

When the global health crisis can be considered concluded in the world, it would be relevant to carry out a study of the years 2020 and beyond to discover changes in the perception of patients of the health system before and after the current global pandemic. Undoubtedly, Covid-19 will leave a mark on scientific activity on these issues. In this sense, we will surely see a greater production of academic studies. That is a line of research that must be deepened to make a statement from the previous sentence.

Finally, and considering that Spain delegates the competence in healthcare to the autonomous communities, future investigations should be broken down into each territorial entity to verify that the mobility and quality rights established in the National Constitution are not being violated.

ANEXO – CONGRESS CONTRIBUTION: MANAGEMENT OF HEALTH INVESTMENT AND HEALTH QUALITY IN THE PUBLIC SYSTEM. A GENDER PERSPECTIVE

Grasso, M. S., Martínez, M. del C. V., & Orellana, A. R. (2021). Management of health investment and health quality in the public system. A gender perspective. In Avances en educación, TIC e innovación: Aportaciones para la mejora empresarial y social (pp. 209–213). https://doi.org/DOI: 10.14679/1258

Anexo – Congress Contribution: Management of Health Investment and Health Quality in the Public System. A Gender Perspective

INTRODUCTION

Health is a fundamental aspect in all countries. For this reason, authorities must take care that the health system can provide quality service and promote its continuous improvement (Hussain et al., 2019). However, with budget constraints becoming more frequent, it will be necessary to make efficient use of resources. In Spain, healthcare is public. This fact means that its citizens have the right to make use of it in an equitable manner.

Healthcare must become increasingly customer-oriented to achieve success (Maesala & Paul, 2018). In this sense, it must understand and meet patients' needs and their expectations (Mira & Aranaz, 2000) with a responsive system, which considers complaints and claims. Obtaining data on patient experiences will allow studying quality management and, therefore, improving patient satisfaction (Ferreira, Raposo, & Tavares, 2020; Pérez-Romero, Gascón-Cánovas, Salmerón-Martínez, Parra-Hidalgo, & Monteagudo-Piqueras, 2017).

Managers, for their part, should implement optimal management strategies that align with the proposed objectives (Manzoor, Wei, Hussain, Asif, & Shah, 2019). Previous studies indicate that quality and efficiency are not mutually exclusive concepts, i.e., it is possible to reallocate resources without compromising the satisfaction and quality of the health system. Making efficient use of resources also keeps patients satisfied (Chang, Tseng, & Woodside, 2013).

The literature associates high patient satisfaction with better clinical outcomes (Huynh, Sweeny, & Miller, 2018), which could be due to the greater adherence to treatment of those patients who are satisfied with healthcare. The quality of the healthcare system, on the other hand, will have direct effects on the quality of life of citizens and mortality rate (Purcarea, Gheorghe, & Petrescu, 2013). Some previous studies found that those patients with a high degree of mortality were more satisfied with the health system; others found a weak relationship between health status and satisfaction.

On the other hand, satisfaction with the family doctor is higher than the specialist doctor (Morales et al., 2007). If we distinguish by gender, the literature found women to be more satisfied with the family doctor than

men(Mira & Aranaz, 2000), with no such distinction in the case of specialist doctors.

Previous studies indicated that the relationship between expenditure and satisfaction is positive and significant (Pérez-Romero et al., 2017). Those autonomous communities with higher per capita health expenditure have more satisfied inhabitants (Pérez-Romero et al., 2017). With the allocation of resources, there is also such a relationship, which can be confirmed by analyzing that different authors claim that, to achieve high patient satisfaction, health systems need to have adequate infrastructure and medical equipment (Purcarea et al., 2013), suitable professionals and optimal ambulance, diagnostic (Ferreira et al., 2020) and laboratory services (Manzoor et al., 2019).

Satisfaction is a key indicator of the quality of health systems, but it is usually studied from a purely medical perspective. This study aims to provide information to administrators and managers of health systems, assessing how expenditure budgets and resource allocation affect patient satisfaction, distinguishing the particularities between both sexes. Following a review of the literature, we hypothesize the following:

▫ **Hypothesis 1 (H1):** Expenses positively influence satisfaction.

▫ **Hypothesis 2 (H2):** Expenditure has a positive influence on the volume of resources.

▫ **Hypothesis 3 (H3):** The volume of resources positively influences satisfaction.

▫ **Hypothesis 4 (H4):** The volume of resources positively influences the level of use.

▫ **Hypothesis 5 (H5):** Resource volume negatively influences mortality.

▫ **Hypothesis 6 (H6):** Mortality level negatively influences satisfaction.

▫ **Hypothesis 7 (H7):** GDP size positively influences satisfaction.

▫ **Hypothesis 8 (H8):** Resource volume mediates the relationship between expenditure and patient satisfaction.

▫ Hypothesis 9 (H9): The level of mortality mediates the relationship between resource volume and patient satisfaction.

▫ **Hypothesis 10 (H10):** Satisfaction between men and women is not configured in the same way.

RESULTS

Welfare for the period 2005 to 2018, except for 2014 due to lack of data for that year. We obtained 221 observations for males and 221 for females, and the method used was partial least squares structural equation modeling (PLS-SEM).

The dependent variable (patient satisfaction) is estimated in mode A (reflective), where the construct causes the covariation of the indicators. This construct explains 78% of the variance of the indicators in the case of men and 78.5% in the case of women.

The Fornell-Larcker and HTMT tests were used to verify discriminant validity, i.e. that the construct in question is empirically different from the other constructs of the structural model.

Expenditure, resources and mortality are represented in mode B (formative). Collinearity problems were analyzed for both males and females, and it can be stated that there are no such problems.

The weights provide information on the contribution of each indicator to its respective construct. Those indicators with the highest weights will have the greatest influence on patient satisfaction. For example, public health expenditure per capita had the greatest impact on the expenditure of the construct, as did pharmaceutical expenditure, although the latter negatively.

Subsequently, the structural model was evaluated for both groups. Once it was verified that there were no collinearity problems, the sign, magnitude and statistical significance were analysed

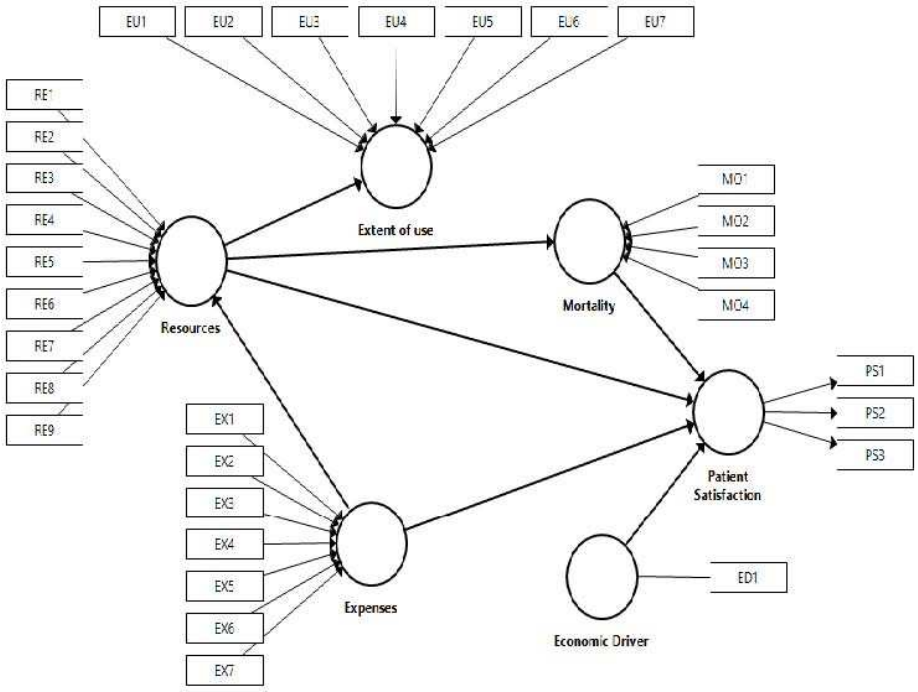
The control variable incorporated into the model was GDP per capita. Its influence on satisfaction for men was not significant, and for women, it was negative and insignificant. This fact leads us to reject H7 for the case of men. For the women's group, this hypothesis is weakly supported.

It could be verified that expenses and resources had a positive and significant effect on both men (p=0.001 and 0.000 respectively) and women (p=0.005 and 0.000 respectively). Therefore, H1 and H3 are accepted. In turn, the positive

and significant effect of expenditure on resources was also supported, which allows H2 to be confirmed. On the other hand, resources had a negative effect on mortality and a positive effect on the level of use in both study groups and a statistically significant manner; consequently, H5 and H4 are accepted.

In contrast, mortality was not shown to have a significant effect on patient satisfaction (p = 0.987 for men and 0.975 for women), so H6 is rejected. Concerning mediating effects, H9 was not confirmed. However, H8 was supported, as the direct and indirect effects of expenditures on patient satisfaction are significant and have the same sign.

Illustration 1. Research model and hypotheses



On the other hand, the determination of R2 indicates the explanatory capacity of the model. In the case of men, the model can explain 41.7% of satisfaction, and in the case of women, 38.2%. About the dependent constructs, the level of use is explained by 66.9% in the case of men and 65.5% in the case of women; mortality by 61% in the case of men and 60.1% in the case of women; and resources by 60.5% in the case of men and 58.9% in the case of women.

Finally, and in order to verify that satisfaction is configured differently in men and women, a Henseler multi-group analysis was carried out. This technique is based on bootstrapping and allowed us to confirm H10. Then, to establish the

direction of the relationship, a two-tailed test was applied. It is concluded that the direct and indirect effects of expenditure on patient satisfaction are significantly greater in women than in men (p=0.951 for the direct effect and p=0.992 for the indirect effect). Therefore, women value expenditure more when judging the quality of the health system. On the other hand, women also value more the influence of mortality on patient satisfaction.

CONCLUSIONS

After analyzing 31 variables, it was possible to obtain relevant and helpful information for health managers' decision-making regarding resource management and strategic direction.

We studied the relationship between the volume of resources, expenditure and mortality on patient satisfaction. We also analyzed the relationship between the allocation of resources and the degree of use of the Spanish Health System. The control variable introduced into the model was GDP per capita.

The relationship between the constructs volume of expenditure and resource allocation with patient satisfaction was confirmed, as was the influence of resource allocation on the degree of use. In contrast, the relationship between mortality and patient satisfaction was not significant. PBI was not relevant either.

The model explains the latent variable "Patient satisfaction" in 41.7% for men and 38.2% for women.

In reference to the allocation of resources, emphasis should be placed on investment in primary care and, fundamentally, on the availability of specialized physicians and diagnostic equipment. In contrast, the number of hospital beds has an inverse influence on the construct, which could be due to the increasing acceptance of outpatient treatment. These results behave similarly for both men and women.

The indicators of the "volume of expenditure" construct that most contribute to its formation are public expenditure on health per inhabitant, positively, and expenditure on drugs, negatively, in both study groups.

Overall, our research concluded that a variation in mortality had a more significant influence on satisfaction in the female group. The results showed that mortality due to cancer did not significantly influence satisfaction, while mortality due to Alzheimer's disease was positively valued. The latter could be due to the fact that it is a disease that has no cure and that is related to older people. No significant differences were found according to gender with respect to the influence of mortality due to diabetes on patient satisfaction, which was negative, as was the influence of mortality due to cardiovascular disease. We can interpret that the population considers that the health system is failing.

For both sexes, the frequency of attendance at consultations with specialists and the number of uses of computed tomography equipment are the indicators that, in first and second place, respectively, contribute to determining the degree of use. On the other hand, only for women does the level of use of magnetic resonance equipment have a positive influence, and only for men does the duration of hospitalization have a negative influence.

As could be seen, any decision that health agents make in relation to the allocation of resources and the application of expenses will influence patient satisfaction, which is why it is evident that quality information is necessary for the fulfillment of the objectives of health organizations.

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Anexo – Congress Contribution: Management of Health Investment and Health Quality in the Public System. A Gender Perspective

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