School of Business and Management

Levels of resources mobilization characterizing overperforming health systems: Evidence from the OECD countries

By

Blondy Kayembe Mulumba, MD

Dissertation submitted for the degree of Master of Business Administration – Health Management (MBA – HM)

Supervised by Dr Kinga Lowrie

November 2021

Abstract

Background: In the quest of improving the performance of their respective health systems, decision-makers need to be provided with relevant evidence to make informed decisions. Yet, there is a lack of evidence regarding the determinants of overperformance and the absence of new approaches in analyzing data.

Objective: This study aims to identify levels of mobilized resources that characterize overperforming health systems within the Organization for Economic Cooperation and Development (OECD).

Methodology: For this cross-sectional study, data were extracted from the OECD 2018 health data set. Through *t test* and *z test*, means and proportions were estimated to compare resources between the overperforming and the underperforming countries. Then, using *Khi-square test*, further analyses were carried out to estimate odds ratios so as to investigate the association between high levels of health resources and the overperformance of health systems.

Results: Data from 37 OECD countries were analyzed and revealed that overperforming health systems are significantly characterized by high levels of both health expenditure as percentage of GDP (9.38% vs 7.49%, $p = 0.020$) and physician density (3.75 vs 3.03, $p = 0.028$), compared to the underperforming group. With the associative approach, similar results were found, supporting that overperformance is achieved with high levels of health expenditure (OR = 10.63, 95% CI: 1.87-60.25) and physician density (OR = 5.42, 95% CI: 0.98-29.92). High levels of hospital bed density and the application of compulsory public schemes were found not to be the characteristic features of overperforming health systems.

Conclusion and implications: This study provides decision-makers with evidence that chances of making a health system overperforming, compared with its OECD peers, are increased when the levels of both health expenditure as percentage of GDP and physician density overpass the Organizational average.

Key words: Health systems, performance, health resources, health status, OECD

Acknowledgements

Glory and praises to God, the Almighty through whom this dissertation has been made possible. As Colossians 3:17 (new international version) says, “And whatever you do, whether in word or deed, do it all in the name of the Lord Jesus, giving thanks to God the father through him”.

I would like to express my gratefulness those who sacrificed their valuable time to contribute to the completion of this master’s dissertation. I refer especially to Dr Kinga Lowrie to whom I address many thanks for guidance and valuable feedbacks throughout this research project. My gratitude is evenly expressed towards Dr Marios Kantaris and Priscille Pana for proofreading this project and providing me with useful comments to improve its quality.

I am equally grateful to my brothers James Mulumba and Moses Mulumba, and sisters Philomène Mulumba, Aminata Mulumba, and Beatrice Mulumba who always believe in me and provide me with support and encouragements to achieve more.

Special thanks to my brother Ntambue Mulumba, my sister-in-law Patricia Mulumba, my nephew Jonathan Mulumba, and my niece Mercy Mulumba for surrounding me with love, affection, support, and humor which allowed me to stay physically, mentally, and socially healthy so as to be able to successfully complete this project.

Care and attention are two blessings to which I have been permanently exposed throughout this project, owing to Marie-Agathe Bamuamba. Thank you for being present all the time.

Lastly, but not the least, I solemnly dedicate this master’s dissertation to my parents, namely Joseph Mulumba and Véronique Mushiya, who have deployed indescribable efforts to see me achieve this goal. May they find, through this completed work, the vocalization of my gratitude.

Table of contents

List of tables

List of figures

List of abbreviations

DALY	: Disability-adjusted Life Years
GDP	: Gross Domestic Product
HSP	: Health System Performance
IMR	: Infant Mortality Rate
LEB	: Life Expectancy at Birth
MMR	: Maternal Mortality Rate
OECD	: Organization for Economic Cooperation and Development
SPSS	: Statistical Package for Social Sciences
UHC	: Universal Health Coverage
USA	: United States of America
WHO	: World Health Organization
YLL	: Years of Life Lost

Chapter 1: Introduction

1 Introduction

1.1 Problem statement

The health system plays a core role in the well-being of populations. It comprises, as conceived by Murray and Frenk (2000) and Pineault (2012), all stakeholders, organizations, rules, and material resources whose prime intent is to maintain or improve population health. So said, it is noteworthy highlighting that health systems are assigned the fundamental goal of improving the health of populations they serve (Murray & Frenk, 2000). Henceforth, the performance of a given health system, loosely speaking, can be summarized in achieving a better health for people under its jurisdiction.

Making people healthier depends, among other things, on the features of the health system. These health system features may refer to the level of available resources (high vs. low), the way they are structured, or the nature of implemented processes (Donabedian, 2005). Health resources are variable and include human resources such as physicians; physical resources such as hospital beds; financial resources such health expenditure as percentage of gross domestic product (GDP); and organizational resources such as the prevailing form of insurance schemes (compulsory vs voluntary). The amount or the type of resources mobilized is one of features defining a country's health system profile and therefore determining its performance (Anell & Willis, 2000; Pineault, 2012).

Actually, the performance of health systems is the epicenter of vigorous debates in the current era as resources are increasingly scarce (Kumah *et al*., 2020; Pourreza *et al*., 2017). For tangible results need to be drawn from rising health expenditure, extensive efforts are being relentlessly made by health decision-makers, managers, governmental agencies, community organizations, and various stakeholders from all over the globe to improve the health of their populations, as a fundamental goal of the health system (Amiri & Solankallio-Vahteri, 2019).

Evidence shows that even countries with large economies, such as member countries of the Organization for Economic Cooperation and Development (OECD), are displaying different profiles in terms of health systems performance (HSP) and resources mobilization (Boz, Sur, and Söyük, 2016; OECD, 2019). Some are performing over the OECD average

(overperforming health systems), whereas others perform below the average (underperforming health systems) in terms of health outcomes (Gauld et al., 2014; OECD, 2019). Consequently, decision-makers from countries with underperforming health systems need to mobilize resources to a level that improves their performance. Prior to such a decision, they are to be supplied with the appropriate information in terms of the levels of resources characterizing overperforming health systems, for them to be able to make evidence-based and value-added decisions.

Nevertheless, the appropriate level of health resources characterizing an overperforming health system is still controversial, not fully understood and lacks unanimity. In fact, studies that examined this problem came up with inconclusive findings. That is the case, for instance, with Nixon and Ulmann (2006) who argue that a higher health expenditure is associated with a higher performance of the health system, whereas Schlosser (2018) supports that higher health expenditure may lead to lower performance of the health system, pointing the United States as illustrative example. Likewise, the OECD (2019) reports that Japan, for example, only mobilized 2.4 physicians per 1,000 population, but achieved a life expectancy at birth of 84.2 years, compared to Lithuania with 75.6 years as life expectancy at birth, while mobilizing 4.6 physicians per 1,000 population, whether approximatively twofold physician density of Japan.

These premises raise two main concerns. First of all, only few studies have addressed the issue regarding the HSP among the OECD countries (Gauld *et al*., 2014; Hagenaars *et al*., 2018; Hosseini-Jebeli *et al*., 2019). Secondly, most of those studies have been focusing on one approach, that of correlating health resources to health outcomes. Yet, the parcel of characteristics of overperforming countries in terms of levels of resources is suffering from minimal academic attention. As only few studies have addressed this issue, consensus being lower about the current evidence and little being known about what characterizes overperforming health systems, some extra efforts are still needed to explore the topic.

1.2 Research questions

Based on the aforementioned premises, the following research questions emerged and were worth further investigation:

1. Which of the OECD countries have overperforming health systems?
2. Are those overperforming health systems, among the OECD countries, characterized by high levels of health resources?

1.3 Research aim and objectives

The study aimed to identify the levels of resources that characterize overperforming health systems among the OECD countries. To achieve this aim, the study intended to:

1. Describe the levels of resources mobilization amid the OECD health systems
2. Portray overperforming health systems among the OECD countries
3. Identify levels of resources mobilized by the OECD overperforming health systems

1.4 Research contribution

After answering these questions and achieving these objectives, my study will contribute to the current knowledge in that it adopts a different approach, that of identifying levels to which overperforming health systems mobilize their health resources (financial, human, physical, and organizational). By so doing, the study results will provide useful evidence that decision-makers from underperforming countries can use to make informed decisions in their quest of improving the performance of their respective health systems. This is important because, in this current era whereby time is precious and effective decisions need to be made promptly, decision-makers from underperforming countries are to learn from their peers who are outperforming.

1.5 Report outline

In addition to this first introductive chapter, the report comprises four other chapters. The second chapter, devoted to the literature review, defines key concepts, and provides evidence from existing works to define the theorical framework. It is followed by the third chapter, namely methodology, which describes the processes and techniques applied to carry out the research. Then comes the research findings, representing the fourth chapter, where results from data analyses are disclosed. Finally, the fifth chapter, devoted to the discussion, compares my findings with those from other researchers. It then unveils limitations and strengths of the study, a conclusion and some recommendations. The lists of references and appendices are provided at the end of the report.

Chapter 2: Literature review

2 Literature review

2.1 Defining health system and its performance

Searching the literature regarding the performance of health systems requires an adequate understanding of two concepts, namely health system and health system performance. A health system is a set of "resources, actors and institutions related to financing, regulation, and provision of health actions" (Murray & Frenk, 2000, p.718). Authors refer to a health action as a set of activities primarily aiming at improving or maintaining health, should it be a preventive or curative action.

The 2000 world health report in relation with the improvement of health systems, published by the World Health Organization (WHO, 2000), has revolutionized this field of study, as it provides a famous framework that points out three intrinsic goals that any health system must pursue. They refer to population health improvement, responsiveness, and fairness in financial distribution. The report puts an emphasis on the improvement of population health as a core goal to be considered in assessing the performance of any health system. On the other hand, Donabedian (2005) developed a framework to help understand the mechanism by which a health system can supply people with high-quality healthcare. As for the author, to achieve its goals, a health system must acquire necessary resources, which need to be arranged in a given way (structures) and utilized appropriately (processes). Both frameworks may be considered complementary to each other as the later emphasizes the resources required for a health system to attain its goals, and the former highlights the types of goals a health system is expected to achieve.

Therefore, the fact of defining structures and processes governing the provision of health services makes the health system a full-standing health determinant. In fact, the Ottawa Charter, resulting from the First International Conference on Health Promotion held in Ottawa in 1986, recognizes the health system of a country as one of major factors influencing people's health (WHO, 2012). In other words, the health of a particular population in a given country depends, among other things, on the levels of mobilized resources, such hospital bed density, physician density, and so forth (Hosokawa *et al*., 2020). That said, the amount and the type of

resources mobilized by health authorities in a given country characterize its health system and determine its performance.

According to Smith *et al*. (2008), the concept of performance refers to the degree at which a set of results are achieved, in relation with a set of predetermined key objectives. Evenly, the performance of a health system implies the acquisition of required resources and the fulfilment of fixed objectives (Vainieri *et al*., 2019). Said otherwise, a health system is said to be performant when it improves the health of populations it serves, which is its ultimate goal, as underpinned by the WHO's model (WHO, 2000). Murray and Frenk (2000, p.718) support this perspective when arguing that "the defining goal for the health system is to improve the health of the population; if health systems did not contribute to improved health, we would choose not to have them".

Referring to these premises, many can agree that the performance of a health system is determined by the levels to which resources are mobilized, on the one hand and measured by the population health status, on the other hand. Hence throughout this report, unless indicated otherwise, the concept of performance refers to better health status. That being said, the performance of a health system can be assessed by numerous indicators, among which life expectancy at birth (LEB), maternal mortality rate (MMR), infant mortality rate (IMR), life lost years (LLY), and so forth (Pourreza *et al*., 2017; Smith *et al*., 2008; WHO, 2000). To improve these indicators, and HSP accordingly, health authorities may act, among other things, on the levels of health resources, characterizing their health systems.

2.2 Strategy of the literature search

This review has been conducted to investigate evidence on the association between high levels of health resources and high levels of health systems performance. To that end, several online engines were explored, including PubMed, Google Scholar, EMBase, Google research, Emerald, and SAGE. Search strings were formulated as following: (health resources) AND (health outcomes OR health improvement OR health status); (health expenditure OR health spending OR health financing) AND (life expectancy OR mortality rates); (physician density OR number of physicians) AND (life expectancy OR mortality rates); (hospital bed density OR number of hospital beds) AND (life expectancy OR mortality rates); and (compulsory schemes OR public schemes) AND (life expectancy OR mortality rates).

The review was conducted from August 16 through September 3, 2021, targeting peer-reviewed papers, experts' works, and books related to the issue under investigation, as inclusion criteria. A total of 48 published works were retrieved. After applying the inclusion criteria, only 16 papers were selected for consideration.

2.3 Evidence from the literature

The literature review reveals that numerous studies have been devoted, in the last decades, to exploring ways to improve the performance of health systems across the globe. They explored the influence of health resources on the attempt to achieve better health status of people. Albeit bearing the same objective, these studies varied in terms of locations (different countries), scope of study (in-country vs cross-country studies), economic level of countries (developed vs developing countries), approaches used (comparisons vs description), types of data analysis (multidimensional scaling analysis vs panel data analysis), health system resources (human resources vs health expenditure), health status indicators (life expectancy vs mortality rates), and conclusions (association vs no association). Talking about conclusions, authors are divided in their position regarding the topic. Some support the association between high levels of health resources and HSP, whilst others do not share the same perspective.

2.3.1 Health expenditure and HSP

The financial resources, an essential asset in the running of any health system, have been found to be positively associated with better health by a considerable number of authors. In other words, the higher the health expenditure, the higher the performance of the health system. Duba, Berry, Jang, and Baughn (2018) have examined the relationship between high levels of healthcare expenditures as a percentage of GDP and high levels of life expectancy at birth, across 210 countries, with data collected within a period ranging from 1995 through 2014. Authors found that the association between health expenditures and life expectancy at birth is positive and statistically significant. The study has, as strengths, the control for such confounding factors as proportion of people in urban regions, proportion of primary level completion, the received amount of the foreign aid, agriculture value added, level of sanitation, and Carbon Dioxide (CO_2) emissions per capita, albeit it mixed developed and developing countries in the same pool.

At the other end of the continuum, authors are standing for different evidence. In fact, some other studies that explored the topic under consideration emitted the conclusion of no significant association between high levels of health expenditure and higher performance of

the health systems. This has been observed with Leu (1986), Hitiris and Posnett (1992), and Barlow and Vissandiee (1999), as cited in Duba *et al*. (2018), who fail in documenting a clear correlation between high healthcare expenditures and measurement of a longer life span. As for these authors, health expenditure does not influence positively the performance of a health system. Contrariwise, it may even trigger a reverse effect on health outcomes.

2.3.2 Human resources and HSP

The labor force is an essential input in any productive system, and the health system does not make the exception. Physicians are one of critical categories of health labor force without which the ultimate goal of the health system, that of improving population health, cannot be achieved (Castillo-Laborde, 2011). In primary care, for example, physicians are helpful and vital in coping with an array of health issues within a country, ranging from health promotion and disease prevention through disease rehabilitation and palliative care.

Thus, health workers, especially physicians, represent a core input determining the performance of a given health system. Alike health expenditure, many authors have found a positive association between physician density and HSP. Amongst them, Hosseini-Jebeli, Hadian and Souresrafil (2019) who investigated the association between health inputs such as physician density and health outcomes such as life expectancy and mortality rates to assess physician density as a determinant of HSP. The study was designed as a panel dataset analysis of 26 OECD member countries and used mortality rates and life expectancy to estimate a generalized method of moment (GMM) regression model. A 12-year period was considered to carry out the analysis. Their findings point out negative and statistically significant correlations between physician density and crude rate of death. Evenly, authors note significantly positive correlations between physician density and life expectancy at birth. Authors considered data from economically similar countries, which implies an economic homogeneity and controls for income level disparities across countries.

Yet on the same topic, opposite evidence emerged as well. Cochrane and co-workers (1978) found an adverse influence of physician density on infant and perinatal mortality rates and referred to as doctor anomality; Kim and Moody (1992) disclosed the absence of a significant association between physician density and infant mortality rate; and Hertz and colleagues (1994) did not evidence any effect of physician density on infant and maternal mortality rates, (cited in Anand and Bärnighausen, 2004).

2.3.3 Physical resources and HSP

In addition to financial and human resources, material or physical resources are evenly to consider as performance determinant for health systems. Hospital bed density or number of hospital beds is commonly referred to as an indicator of health physical resources. The scientific literature does not provide much evidence pertaining to a significantly positive association between hospital bed density and life expectancy or mortality rate as HSP indicators. Some studies that explored this question revealed no association. One of them, conducted by Hosseini-Jebeli and colleagues (2019) investigated the relationship between healthcare resources and health outcomes among the OECD countries. A more detailed description of their research has been mentioned previously. In sum, authors concluded that life expectancy is not correlated with the hospital bed density.

2.3.4 Organizational resources and HSP

Organizational resources represent the ways in which available human, financial, and material resources are organized within a system (Thompson *et al*., 2015). As such, health organizational resources refer to the ways health resources are organized within the health system. This organizational structure of resources is likely to impact the performance of the whole health system. For instance, human resources may be organized or structured into primary, secondary, and tertiary levels of healthcare. As for the financial resources, organizational resources may refer, among other things, to the healthcare financing modalities, such as free-of-charge services, insurance-funded payments, and out-of-pocket payments.

The way people pay to access healthcare (compulsory public health insurance schemes vs private voluntary health insurance schemes vs out-of-pocket payments), as an organizational resource, constitutes a determinant of HSP (Hagenaars *et al*., 2018; Tang *et al*., 2019). Compulsory and government schemes are the highest level of organizational resources through which people can better access healthcare, with equity in financial distribution, compared to other payment modalities (Hagenaars *et al*., 2018). They have been found to be associated with better health status of the population.

In fact, Woolhandler and Himmelstein (2017) have studied the influence of the lack of health insurance on mortality rates through a literature review of studies conducted in the United States. This review included a various type of studies, such as observational and quasi-experimental studies. They concluded that the evidence they assess reinforces conclusions according which health insurance has a reverse influence on mortality, as an array of papers

evidenced that the lack of health insurance shortens life span. Seen as such, a compulsory scheme is likely to decrease the lake of health insurance, lengthen life span, and thus improve the performance of health systems. Same conclusions have been emitted by Erlangga, Suhrcke, Ali, and Bloor (2019) who conducted a similar literature review for studies realized in low- and middle-income countries. They found a positive association between public and compulsory schemes and health status of recipients.

2.4 Critical analysis and contribution

The literature reveals that only a few studies have tried to investigate the topic about the improvement of health systems' performance among countries with large economies such as the OECD countries. Yet, many other authors investigated avenues towards improving the performance of health systems. Nonetheless, they did so either at a national level (Hosokawa *et al*., 2020; Woolhandler & Himmelstein, 2017) or across developing countries (Erlangga *et al*., 2019) or by mixing developed and developing countries (Duba *et al*., 2018; Owusu *et al*., 2021). As one can notice, not only these scarce existing cross-country and OECD-related studies have provided inconclusive results but have they neither varied their approaches in investigating this issue. The comparison of HSP among the OECD countries, as an approach of research, has been used in an overwhelming number of available papers, such as Duba *et al*. (2018), Hagenaars *et al*. (2018), and Owusu *et al*. (2021).

It can be noticed that less efforts have been made to approach the issue under investigation differently. Without doubt any, this approach helps portray and classify the OECD countries according to their HSP. However, it has the drawback of not pointing out levels of resources exclusively typifying the overperforming countries. In fact, many can agree, for example, that higher health expenditure improves health outcome, but not all countries that are spending higher on health have overperforming health systems within the region (OECD, 2019; Schlosser, 2018). It is true that approaches must be similar to allow comparability amongst different studies, but equally true it is that variety of approaches may be useful in providing new conclusions and enlightenments.

That said, the contribution of my study relies on investigating the problem under a different approach. It consists of identifying the levels to which the OECD overperforming health systems mobilize resources to achieve that performance, the aim being to provide underperforming countries with useful insights for their quest of reforming and improving their health systems. This may be, to my knowledge, the first time ever that such an approach has

been attempted in exploring the performance of health systems among the OECD countries. Despite their difference in terms of approach, my findings showed off some complementarity vis-à-vis existing evidence as they all intend to contribute to improving the performance of health systems.

2.5 Research hypotheses

Considering the available evidence from the scientific literature, the study was conducted to verify the four following research hypotheses within the OECD:

1. Countries that spend higher levels of their GDP on healthcare have the most performant health systems.
2. Overperforming health systems are characterized by higher levels of physician density.
3. Hospital bed density is of higher levels amongst overperforming health systems.
4. The compulsory public schemes, as the prevailing form of health insurance, characterize overperforming health systems.

2.6 Conceptual framework

Based on all the premises mentioned above, I have drawn a conceptual framework (Figure 1), adapted from Donabedian (2005) and illustrating the way by which health resources determine the performance of health systems.

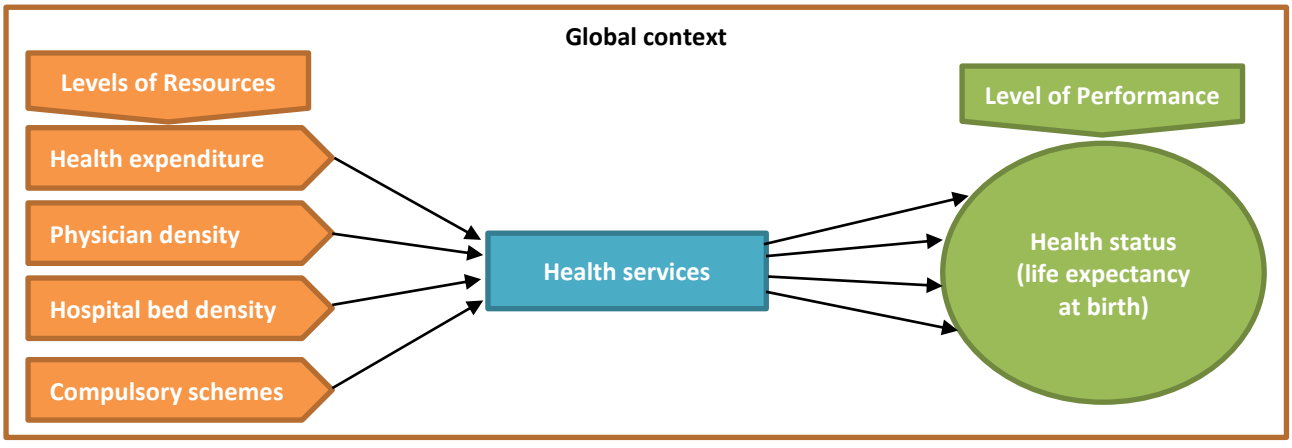

Figure 1. Health systems performance framework

Chapter 3: Research methodology

3 Research methodology

3.1 Type of study

The aim of this research was to identify the levels of resources that characterize the OECD overperforming health systems. To that end, the study combined two different approaches, namely the comparison and the association approaches. They were both useful in answering the research questions and achieving its objectives, since the former served to compare levels of mobilized resources between underperforming and overperforming countries, whereas the latter allowed to examine the association between high levels of resources and overperforming health systems.

Considering the nature of data collected and statistical analyses performed, this stands as a quantitative study. It was the type of study that fitted to address the research questions and objectives, given the need for measurable data and statistical analyses (Polit and Beck, 2017). Furthermore, since these data were extracted from an existing external dataset, this study was a quantitative secondary research. Such a choice of secondary analysis was made because that kind of data allowed the study to save time and energy, as it would demand a lot to go through for one to travel to, and collect health data from, all member countries of the OECD.

3.2 Data extraction

Data were drawn from the OECD 2018 health data set which is accessible on the website of the Organization (OECD, 2021). Those are publicly available data, collected by the Organization from all member countries. Two reasons motivated the choice of the OECD countries as sample for the research. Firstly, those countries have a number of similarities (mostly economically), thus comparable, since the Organization sets an ensemble of requirements with which a country must comply before adhering. Secondly, as supported by Hagenaars et al. (2018), the OECD possesses health data sets with the highest level of details at international level.

Data were extracted from the 2018 data set since it was, by the time of this study, the latest year with complete data. The organization counted for 37 countries as officially adhered members. Given the research concerned the whole organization, all member countries were

included to form the study sample. No data request, prior to data extraction, was required since those are publicly available data whose secondary analyses do not require any approval (OECD, 2019).

3.3 Variables and measures

The research intends to investigate levels of resources mobilized by the health systems that are overperforming with the OECD region. Considering the drawn conceptual framework (Figure 1), this study comprises two types of variables, which are independent (health resources) and dependent (performance) variables. Appendix A provides a thorough description of all the variables.

As addressed previously, the performance of health systems, which is the dependent variable, is defined in terms of the population health status and is measured by an array of indicators. Life expectancy at birth (LEB) has been chosen as indicator of the HSP in this study because it is the most used indicator in the assessment of populations health (Nixon and Ulmann, 2006) and thus, allows the comparability between studies.

LEB is a continuous variable, measured in number of years. It represents the average number of years a person at birth can be expected to live, assuming that age-specific mortality levels remain constant (OECD, 2008). Nonetheless, on the basis of the research hypotheses, it was transformed into a categorical variable, allowing to form two categories of health systems, i.e., those whose LEB was above the OECD average (overperforming health systems) and those whose LEB was equal or lower than the OECD average (underperforming health systems). The rational is that countries whose LEB surpassed the Organizational average were outperforming and needed to be explored to bring out their characteristics in terms of levels of resources.

Health resources, as independent variables characterizing and influencing the HSP, are numerous, but mainly grouped into four categories, which are financial, human, material, and organizational resources (Donabedian, 2005; Smith et al., 2008). To be specific and concise in this query, and referring to the literature review, each category of resources was measured by one indicator, forming a set of four independent variables, including respectively health expenditure as percentage of GDP, physician density, hospital bed density, and compulsory public schemes.

The measures of these independent variables varied according to the use of either comparative or associative approach. In the comparative approach, continuous variables, namely health expenditure as percentage of GDP, physician density, and hospital bed density, were respectively measured in percentage, physicians per 1,000 population, and hospital beds per 1,000 population. The only categorical variable, compulsory public schemes, was measured in binary modality (yes vs. no).

In the associative approach, continuous variables were transformed into categorical ones. That was needed for the study to investigate the association between high levels of resources and the overperformance. Health expenditure as percentage of GDP was categorized, yielding two categories of health systems, i.e., high spenders (whose health expenditure as percentage of GDP is above the OECD average) and low spenders (spending below or as much as the OECD average). The same procedure of categorization was applied for physician density and hospital bed density, the OECD average still being used as a demarcation line. For the physician density, countries were divided into those with high levels of physicians (physician density above the OECD average) and those with low levels of physicians (physician density equal or below the OECD average). Hospital bed density, on the other end, categorized countries into high levels of hospital beds (hospital bed density above the OECD average) versus low levels of hospital beds (hospital bed density equal or below the OECD average).

Compulsory public scheme was already a categorical variable in nature. It divided countries into those that apply it as a prevailing form of healthcare payment (health systems where compulsory public schemes are predominant) versus those applying prevailingly other forms of payment (health systems where compulsory public schemes are not predominant).

3.4 Statistical analyses

Descriptive statistics were first run to describe health systems in terms of health resources mobilization. As a cross-sectional study, means and proportions were estimated to compare the difference of resources mobilization between the overperforming and underperforming health systems. The significance of differences found was tested using *t test* for means and *z test* for proportions.

In order to investigate the consistency of results and thus ensure their internal validity (Polit and Beck, 2017), further analyses were conducted to examine the association between high levels of resources and overperformance of health systems, through the estimation of odds

ratios (OR) and their confidence intervals (CI) using *Khi-square test*. The level of significance for all tests that were carried out was set at 5%. After extraction, data were saved under Excel format, and all analyses were performed using the software SPSS 26.0 (IBM corp., USA).

3.5 Ethical considerations

Considering the nature of data that were analyzed, as stressed previously (i.e., data not involving human or animal participation, public availability, and no authorization required before secondary analyses), no ethical approval was required to pursuit this research.

Chapter 4: Research findings

4 Research findings

The study aimed to identify the levels of resources mobilized by overperforming health systems amongst the member countries of the OECD. To that end, data pertaining to 37 OECD member countries were drawn from the Organization's 2018 health data set for secondary analyses.

Descriptive statistics of different variables are presented in Table 1 and Figure 2. In Table 2, continuous variables are portrayed along with their minimum, maximum, and mean values. With a mean value (OECD average) of 80.74 years, life expectancy at birth, as an indicator of the HSP, has varied in 2018 between 74.9 years in Latvian and 84.2 years in Japan. On the other hand, health resources, as characteristics of health systems, differed within the Organization. The minimal and maximal values of health expenditure as the share of GDP were 4.2% in Turkey and 16,9% in United States respectively, for an OECD average of 8.77%. Physician density ranged from 1.88 and 6.1 per 1,000 population respectively in Turkey and Greece, with 3.52 per 1,000 population as mean density. Finally, hospital bed density was minimal at 0.98 in Mexico and maximal at 12.98 in Japan, for the mean of 4.53 hospital beds per 1,000 population. An overview of this table can already make one notice that countries with lesser or higher resources are not necessarily the least or the most performant, justifying the stated research problem.

Compulsory public schemes were implemented as the predominant form of health insurance within 24 out of 37 health systems, whether 65% of the OECD countries. This information is well-portrayed in Figure 2.

Table 1. Descriptive statistics of continuous variables

Variables	Minimum		Maximum		Mean	SD
	Value	Country	Value	Country	(OECD average)	
Life expectancy at birth (years)	74.90	Latvia	84.20	Japan	80.74	2.61
Health expenditure as % of GDP (%)	4.20	Turkey	16.90	United States	8.77	2.36
Physician density (per 1,000 people)	1.88	Turkey	6.10	Greece	3.52	0.93
Hospital bed density (per 1,000 people)	0.98	Mexico	12.98	Japan	4.53	2.63

Abbreviations: SD, Standard Deviation, GDP, Gross Domestic Product.

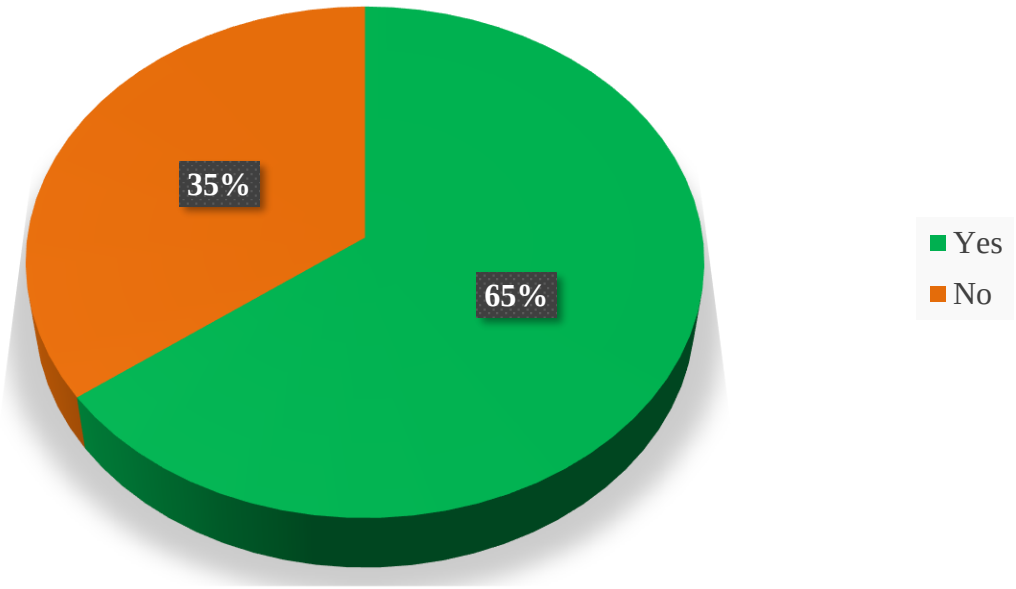

Figure 2. The application of compulsory public schemes amid the OECD countries

Figure 3 provides a more detailed and comprehensive information on life expectancy at birth among the OECD countries. The OECD average, represented by the red bar, splits the graph into two parts, with two extremities made of Japan and Latvian, respectively the most and least performant countries. The left-side of the graph represents the overperforming health systems (i.e., health systems whose LEB is higher than the OECD average). In a gradually descending way, it can be read from the graph that Japan, Switzerland, Spain, Italy, Iceland, Israel, Australia, France, Norway, Korea, Sweden, Luxembourg, Ireland, Canada, Greece, Netherlands, Austria, Finland, New Zealand, Belgium, Slovenia, Portugal, United Kingdom, Denmark, and Germany are the 25 OECD countries (67,6%) with overperforming health systems. The right-side of the graph, made of Chile, Czech Republic, United States, Estonia, Turkey, Poland, Slovak Republic, Colombia, Hungary, Lithuania, Mexico, and Latvia, unveils the underperforming health systems within the Organization.

A cross-sectional analysis of data was carried out to evaluate the difference of study variables between the two categories of health systems, namely overperforming and underperforming health systems. First of all, to verify whether the performance significantly varies between the two groups, the mean of LEB was computed for each group for comparison. Results in Table 2 reveal that LEB is significantly 4,91 years higher (95% CI: 4.07,5.76; $p < 0.000$) in the overperforming group compared to the underperforming group. Afterwards, means or proportions of independent variables were estimated for comparisons between the two groups. Overperforming health systems spent significantly higher portion of their GDP on healthcare than did the underperforming group (9.38% vs 7.49%, $p = 0.020$). Evenly, the overperforming group was characterized by a significantly higher physician density, compared with the underperforming group (3.75 vs 3.03, $p = 0.028$).

However, there was no statistically significant difference between the two groups in terms of hospital bed density (4.59 vs 4.40, $p = 0.842$) and predominant application of compulsory public schemes (72% vs 50%, $p = 0.189$). It can therefore be said that overperforming health systems are characterized by two features, namely high levels of health expenditure as percentage of GDP and high levels of physician density.

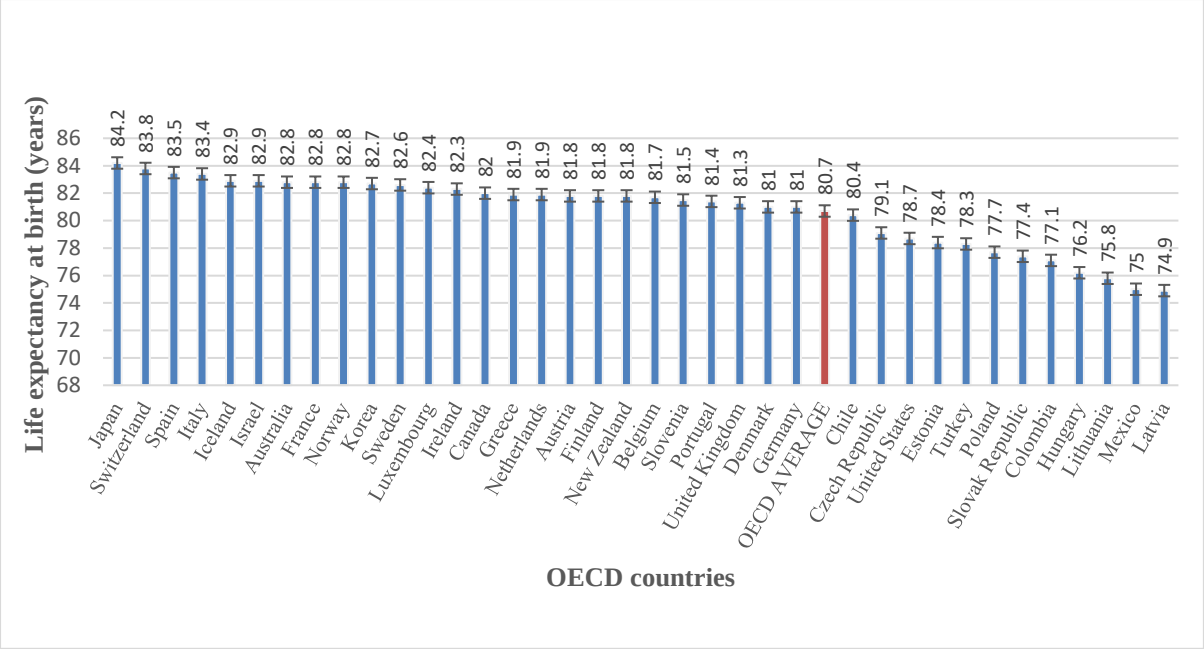

Figure 3. Distribution of life expectancy at birth by country

Table 2. Comparison of health resources between overperforming and underperforming health systems

Health resources	Mean or proportion		Mean or proportion difference [95% CI]	*p*-value[1]
	Overperforming health systems (n = 25)	Underperforming health systems (n = 12)		
Life expectancy at birth (years)[2]	82.33	77.42	4.91 [4.07,5.76]	0.000
Health expenditure as % of GDP (%)[2]	9.38	7.49	1.89 [0.31,3.47]	0.020
Physician density (per 1,000 population)[2]	3.75	3.03	0.72 [0.08,1.34]	0.028
Hospital bed density (per 1,000 population)[2]	4.59	4.40	0.19 [-1.71,2.09]	0.842
Compulsory public schemes (%)[3]	72.0	50.0	22.0 [-12.2,56.2]	0.189

Abbreviation: CI, Confidence Interval; GDP, Gross Domestic Product

[1]Values estimated using a test at 5% significance level

[2]Continuous variables with comparison in terms of means, using *t test*

[3]Categorical variable with comparison in terms of proportions, using *z test*

Table 3. Odds ratios and 95% confidence intervals of overperformance relative to the levels of health resources

	Health systems					
	Overperforming		Underperforming			
Health resources[2]	**n (25)**	**%**	**n (12)**	**%**	**OR[1]**	**95% CI**
Health expenditure as % of GDP						
Over the average	17	89.5	2	10.5	10.63	1.87;60.25
Average or lower[3]	8	44.4	10	55.6	1	
Physician density						
Over the average	13	86.7	2	13.3	5.42	0.98;29.92
Average or lower[3]	12	54.5	10	45.5	1	
Hospital bed density						
Over the average	7	50.0	7	50.0	0.28	0.07;1.18
Average or lower[3]	18	78.3	5	21.7	1	
Compulsory public schemes						
Yes	18	75.0	6	25.0	2.57	0.62;10.74
No[3]	7	53.8	6	46.2	1	

Abbreviations: OR, Odds Ratios; CI, Confidence Interval; GDP, Gross Domestic Product

[1]Values estimated using *Chi-square test* at 5% significance level

[2]Average refers to the OECD average for a given variable

[3]Set as the reference group

The study further explored the characterizing features of overperforming health systems, after categorizing independent variables into "over the OECD average" and "equal or below the OECD average". Table 3 depicts all the results, disclosing that odds of having an overperforming health system were significantly 10.63 (95% CI: 1.87,60.25) times higher among countries that spent over the OECD average percentage of GDP on healthcare, compared with countries that spent as much as or lower than the OECD average. Likewise, chances for health systems to be overperforming were 5.42 (95% CI: 0.98,29.92) times higher among countries with over-the-average physician density, relative to those whose physician density was equal or lower than the average.

Nonetheless, an adverse effect was noted between the overperformance and hospital bed density as chances of making a health system overperforming were 72% lesser among countries with over-the-average hospital bed density, compared to the other category of countries, without being statistically significant (OR = 0.28; 95% CI: 0.07,1.18). Finally, the probability for health systems to be overperforming was 2.57 higher in the group of countries applying the compulsory and government schemes as the prevailing form of health insurance; this association, however, was not statistically significant (95% CI: 0.62,10.74).

These statistical analyses have permitted the verification of the research hypotheses. In fact, considering evidence from the data analyses, the null hypotheses assuming the absence of association between high levels of health expenditure and physician density and health systems overperformance, relative to the first two formulated hypotheses (section 2.5), have been rejected. That said, the findings support that overperforming health systems are significantly characterized by over-the-average levels of both health expenditure as percentage of GDP and physician density. Nevertheless, the null hypotheses have been accepted for the last two formulated research hypotheses, supporting that overperforming health systems are characterized neither by high levels of hospital bed density, nor by the prevailing application of compulsory public schemes.

Chapter 5: Discussion

5 Discussion

Findings from this cross-sectional study showed that high levels of health expenditure as percentage of GDP and high levels of physician density were features characterizing overperforming health systems among the OECD countries. High hospital bed density and the application of compulsory public schemes as predominant form health insurance, however, were found not to be the characteristics of overperforming health systems. Interestingly, two different approaches applied in analyzing collected data, namely cross-sectional and association analyses, have yielded similar results. This is a value-added contribution of the present research.

5.1 Consistency of findings

The data analyses revealed that overperforming health systems are characterized by high levels of health expenditure as percentage of GDP. These results are similar to those found by other researchers. In fact, after examining the association between health expenditure and LEB, Duba et al. (2018), found a significantly positive relationship between the two variables. Likewise, Owusu et al. (2021) report a significantly negative influence of health expenditure on infant and maternal mortality rates. Equally, Nixon and Ulmann (2006) found that increases in health expenditure resulted in 2.6 and 2.8 years increase in male and female LEB.

High levels of physician density have been found to be a characteristic of overperforming health systems. My findings are consistent with those of other authors, such as Hosseini-Jebeli et al. (2019) who point out a statistically significant and negative correlation between the level of physician density and the crude rate of mortality among the OECD countries. Said otherwise, the higher the level of physician density, the lower the mortality rate. Similar results were found by Hosokawa et al. (2020) and Castillo-Laborde (2011) who report a statistically significant influence of physician density respectively on LEB and disability-adjusted life years (DALY). Nevertheless, findings from some previous studies support the absence of positive effect of physician density on the HSP (Cochrane et al., 1978; Kim and Moody, 1992; and Hertz et al., 1994; cited in Anand and Bärnighausen, 2004). This discordance of results may be owing to the difference of analyses approaches as the present research relied on comparing overperforming health systems to underperforming ones, instead

of exploring the correlation between physician density and health outcomes as done by these researchers.

The absence of association between high levels of hospital bed density and better health outcomes, evidenced in this study, has been equally reported by other authors. This is the case with Hosseini-Jebeli et al. (2019) who explored the issue and brought out the evidence of no correlation between hospital bed density and life expectancy. In other words, increases in hospital bed density do not improve the performance of a health system. The rationale underpinning this result can be the fact that oversupplying hospitals with beds may increase the risk of unnecessary hospitalizations and lengthened hospital stays, which will doubtlessly impact the performance of the corresponding health system (Hosseini-Jebeli et al., 2019).

The application of compulsory public schemes as a prevailing form of health insurance is found not to be a feature characterizing the overperforming health systems. This is discordant with findings from a systematic literature review conducted by Woolhandler and Himmelstein (2017). Authors support a reverse effect of public health insurance on mortality rates. Erlangga et al. (2019) evenly disclosed a significantly positive association between compulsory public schemes and health status. Factors underpinning this discordance may be related to the fact that the former study reviewed studies from only one country, and the latter used data from low- and middle-income countries. Moreover, the difficulty for the present study to evidence that significant association may be owing to the use of a small sample size.

5.2 Limitations

The first limitation of this study is related to its small sample size. In fact, the small sample of countries included in this study did not allow to control for confounding variables from the global context, as depicted by the conceptual framework (Figure 1). For instance, it is established that lifestyle, social, economic, and environmental factors have an effect on LEB (Nixon and Ulmann, 2006). Equally, due to a weak statistical power, some real effects may not have been detected.

Secondly, the information regarding the cause (health resources) and the effect (LEB) was collected at the same time. This could not permit to affirm that the LEB observed was the consequence of health resources mobilized by health systems, as the study could not specify which one precedes the other (Smith *et al*., 2018). Consequently, the study could only examine the relationship between the two variables, without establishing a causal association.

Lastly, like any other secondary studies, this desk-based research has the limitation of using data that have been collected for goals other than the one pursued by this study. Therefore, data on one variable (the application of compulsory/government schemes) were not provided in the main data set and had to be supplied by a different OECD data set.

5.3 Strengths

The genuine contribution of this study relies on its originality as it applied a new approach in examining the OCED health data in the quest of improving the performance of health systems among member countries. Actually, to my knowledge, this is the first time ever that a study has compared health resources levels between overperforming and underperforming health systems in order to reinforce or refute conclusions from previous studies regarding health resources mobilization and health systems performance. Moreover, the study has analyzed the most recent health data available from the OECD countries, providing up-to-date insights.

6 Conclusion and recommendations

6.1 Conclusion

Improving the performance of health systems remains a challenge for managers and decision-makers within the health sector. Albeit various studies focused on exploring the association between health resources and health improvement, inconclusive results emerged, not allowing health authorities to seamlessly seize the determinants of a health system overperformance. This study was thus assigned the aim of identifying resources levels characterizing overperforming health systems among the OECD countries.

Data were collected from the OECD 2018 health data set and analyzed using two different approaches to achieve the research aim. Health systems have been described in terms of resources mobilization and overperforming countries. The study evidenced that overperforming health systems are characterized by high levels of both health expenditure as percentage of GDP and physician density. High levels of hospital bed density and the application of compulsory public schemes were found not to be the characteristic features of overperforming health systems. These results were broadly congruent with previous studies in this research field. That being, the research's aim and objectives have been attained, questions addressed, and hypotheses tested.

The uniqueness of this research pertains to its approach in analyzing the OECD health data as it compared overperforming health systems with underperforming ones in terms of health resources mobilization. In addition, the study employed two different statistical approaches and came up with similar findings. It provides health decision-makers and managers from OECD countries, for the first time ever, with evidence that chances of making a health system overperforming, compared to its OECD peers, are increased when the levels of both health expenditure as percentage of GDP and physician density overpass the OECD average.

6.2 Recommendations

From a practical perspective, health policy makers should be cautious before applying evidence from this study in low- and middle-income settings as data that yielded them were issued from countries with large economies. On the other hand, countries with high-income levels, but non-member countries of the OECD, can consider these findings in their decision-making process as they are economically similar and able to mobilize such high levels of health

resources. It is equally noteworthy highlighting that the compulsory public schemes, as the prevailing form of healthcare payment, are largely applied in the quest of improving people's health, mostly in the quest of achieving a universal healthcare coverage (UHC). Therefore, its implementation should not be refuted only due to the absence of statistical significance found in this study.

Further research should consider addressing this study's limitations. Foremost, future studies may consider including a large number of countries in order to obtain a large sample size and thus increase the statistical power of the study. In so doing, confounding variables can be controlled for, and more generalizable evidence can be yielded. Secondly, further studies should consider the avenue of collecting primary data whose prime intention will be to examine the topic under consideration. This approach can make possible the investigation of a causal association as data on the cause (health resources) and the effect (HSP) can be collected at different periods of time. Finally, more studies should consider exploring in-depth the association between compulsory public schemes and HSP in a cross-countries level, for this topic suffers from academic attention.

References

Amiri, A., & Solankallio-Vahteri, T. (2019). Nurse staffing and life expectancy at birth and at 65 years old: Evidence from 35 OECD countries. *International journal of nursing sciences*, *6*(4), 362–370. https://doi.org/10.1016/j.ijnss.2019.07.001

Anand, S., & Bärnighausen, T. (2004). Human resources and health outcomes: cross-country econometric study. *Lancet (London, England)*, *364*(9445), 1603–1609. https://doi.org/10.1016/S0140-6736(04)17313-3

Anell, A., & Willis, M. (2000). International comparison of health care systems using resource profiles. *Bulletin of the World Health Organization*, *78*(6), 770-778.

Boz, C., Sur, H., & Söyük, S. (2016). The Similarities and Differences: Analysis of OECD Countries in Terms of Health System Indicators. *ACU Sağlık Bil Derg, 3*, 154-164. Retrieved from http://journal.acibadem.edu.tr/en/download/article-file/1701573

Castillo-Laborde, C. (2011). Human resources for health and burden of disease: an econometric approach. *Human Resources for Health*, *9*, 4. https://doi.org/10.1186/1478-4491-9-4

Donabedian, A. (2005). Evaluating the quality of medical care. 1966. *The Milbank quarterly*, *83*(4), 691–729. https://doi.org/10.1111/j.1468-0009.2005.00397.x

Duba, J., Berry, J., Jang, A., & Baughn, M. (2018). The Effects of Health Care Expenditures as a Percentage of GDP on Life Expectancies. *Research in Applied Economics*, *10*(2), 50-65. https://doi.org/10.5296/rae.v10i2.12654

Erlangga, D., Suhrcke, M., Ali, S., & Bloor, K. (2019). The impact of public health insurance on health care utilization, financial protection and health status in low- and middle-income countries: A systematic review. *PLOS ONE*, *14*(8): e0219731. https://doi.org/10.1371/journal.pone.0219731

Gauld, R., Burgers, J., Dobrow, M., Minhas, R., Wendt, C., B. Cohen, A., & Luxford, K. (2014). Healthcare system performance improvement: A comparison of key policies in seven high-income countries. *Journal of Health Organization and Management*, *28*(1), 2-20. https://doi.org/10.1108/JHOM-03-2013-0057

Hagenaars, L. L., Klazinga, N. S., Mueller, M., Morgan, D. J., & Jeurissen, P. (2018). How and why do countries differ in their governance and financing-related administrative expenditure in health care? An analysis of OECD countries by health care system typology. *The International journal of health planning and management*, *33*(1), e263–e278. https://doi.org/10.1002/hpm.2458

Hosokawa, R., Ojima, T., Myojin, T., Aida, J., Kondo, K., & Kondo, N. (2020). Associations between Healthcare Resources and Health Life Expectancy: A Descriptive Study across Secondary Medical Areas in Japan. *International Journal of Environmental Research and Public Health, 17*, 6301-17. https://dx.doi.org/10.3390/ijerph17176301

Hosseini-Jebeli, S. S., Hadian, M., & Souresrafil, A. (2019). Study of health resource and health outcomes: Organization of economic corporation and development panel data analysis. *Journal of education and health promotion*, *8*, 70. https://doi.org/10.4103/jehp.jehp_101_18

Kumah, E., Ankomah, S. E., Fusheini, A., Sarpong, E. K., Anyimadu, E., Quist, A., & Koomson, B. (2020). Frameworks for health systems performance assessment: how comprehensive is Ghana's holistic assessment tool? *Global health research and policy*, *5*, 10. https://doi.org/10.1186/s41256-020-00139-2

Murray, C. J., & Frenk, J. (2000). A framework for assessing the performance of health systems. *Bulletin of the World Health Organization*, *78*(6), 717–731. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2560787/pdf/10916909.pdf

Nixon, J., & Ulmann, P. (2006). The relationship between health care expenditure and health outcomes. *The European Journal of Health Economics* 7, 7–18. https://doi.org/10.1007/s10198-005-0336-8

OECD. (2008). Glossary of statistical terms. Retrieved from http://www.oecd-ilibrary.org/glossaries

OECD. (2019). The 2019 health panorama: OECD indicators. OECD Editions, Paris. https://doi.org/10.1787/5f5b6833-fr

OECD. (2021). OECD Health Statistics (database). https://doi.org/10.1787/data-00540-en

Owusu, P. A., Sarkodie, S. A., & Pedersen, P. A. (2021). Relationship between mortality and health care expenditure: Sustainable assessment of health care system. *PLoS ONE, 16*(2): e0247413. https://doi.org/10.1371/journal.pone.0247413

Pineault, R. (2012). *Comprendre le système de santé pour mieux le gérer*. Montréal : Les Presses de l'Université de Montréal.

Polit, D. E., & Beck, C. T. (2017*). Nursing Research: Generating and Assessing Evidence for Nursing Practice*. (10th Ed.). USA, Philadelphia: Wolters Kluwer.

Pourreza, A., Alipour, V., Arabloo, J., Bayati, M., & Ahadinezhad, B. (2017). Health production and determinants of health systems performance in WHO Eastern Mediterranean Region. *Eastern Mediterranean health journal = La revue de sante de la Mediterranee orientale = al-Majallah al-sihhiyah li-sharq al-mutawassit*, *23*(5), 368–374. https://doi.org/10.26719/2017.23.5.368

Schlosser, B. (2018, January 1). Microeconomics – chapter 7: The Economics of Health Care – circa 2018 [Video file]. Retrieved from https://www.youtube.com/watch?v=gYa9MR5Bna0

Smith, P., Mossialos, E., & Papanicolas, I. (2008). Performance Measurement for Health System Improvement: Experiences, Challenges, and Prospects. Geneva: World Health Organization, WHO.

Smith, P., Mossialos, E., Papanicolas, I., & Leatherman, S. (2018). Performance Measurement for Health System Improvement: Experiences, Challenges, and Prospects. Geneva: World Health Organization, WHO.

Tang, D., Gao, X., & Coyte, P.C. (2019). The effects of compulsory health insurance on birth outcomes: evidence from China's UEBMI scheme. *BMC Health Services Research, 19***,** 779. https://doi.org/10.1186/s12913-019-4657-1

Thompson, A. A., Peteraf, M. A., Gamble, J. E., & Strickland, A. J. (2015). *Crafting and Executing Strategy: The quest for Competitive Advantage. Concepts and Reading*. (20th Ed.). USA: McGraw-Hill Education.

Vainieri, M., Ferrè, F., Giacomelli, G., & Nuti, S. (2019). Explaining performance in health care: How and when top management competencies make the difference. *Health care management review*, *44*(4), 306–317. https://doi.org/10.1097/HMR.0000000000000164

Woolhandler, S., & Himmelstein, U. D. (2017). The Relationship of Health Insurance and Mortality: Is Lack of Insurance Deadly? *Ann Intern Med, 167,* 424-431. doi:10.7326/M17-1403

World Health Organization, WHO. (2000). The World health report 2000: Health Systems: Improving Performance. Geneva: WHO. Retrieved from https://apps.who.int/iris/handle/10665/42281

World Health Organization, WHO. (2012). Ottawa Charter for Health Promotion. Geneva: WHO. Retrieved from https://apps.who.int/iris/rest/bitstreams/1152389/retrieve

Appendices

Appendix A – List and description of study variables

Variables	Definition	Role
Life expectancy at birth (years)	The average number of years a person at birth can be expected to live, assuming that age-specific mortality levels remain constant (a)	Dependent variable (indicator of a health system performance)
Health expenditure as % of GDP (%)	The portion of gross domestic product devoted to healthcare as health expenditure (a)	Independent variable (indicator of health financial resources)
Physician density (per 1,000 population)	The number of physicians who are actively practicing medicine in public and private institutions (full-time equivalents) (a)	Independent variable (indicator of health human resources)
Hospital bed density (per 1,000 population)	The number of available beds in all public and private inpatient institutions, including acute care, psychiatric care, and nursing homes (a)	Independent variable (indicator of health material resources)
Compulsory public schemes (yes or no)	Refers to a health system in which the prevailing health insurance schemes are compulsory and provided by a government agency or an outsourced agent (b)	Independent variable (indicator of health organizational resource)

(a) OECD. (2008). Glossary of statistical terms. Retrieved from http://www.oecd-ilibrary.org/glossaries
(b) OECD. (1999). Glossary of Insurance Policy Terms. https://doi.org/10.1787/9789264173217-en