

Department of Business and Management

Chair: Health Care Management

**DIFFERENCES BETWEEN PUBLIC AND PRIVATE HOSPITALS:
QUALITY OF CARE AND DIGITAL HEALTH**

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Introduction

Healthcare is an essential component of human existence. The promotion of healthcare reduces the human and financial costs that could be incurred by employers, individuals, medical facilities, families, communities, insurance companies, and, of course, the government by focusing on prevention. A failure to promote healthcare can cripple an economy significantly. As a result, health care facilities are utilised to diagnose, manage, and treat illnesses. There are two types of medical facilities: public and private hospitals. The manner in which they intertwine within a healthcare system is crucial for the efficient delivery of healthcare services.

This paper aims to analyse how private and public hospitals operate and determine whether private hospitals can outperform public hospitals in terms of quality of care and digital health.

This work is divided into three chapters. In the first chapter, the American, German, and Italian healthcare systems will be analysed. Indeed, these three systems are vastly dissimilar, and because of their characteristics, the way that private and public hospitals operate and their relative importance are also quite distinct.

Using the existing literature, the second chapter will examine the differences in quality of care between public and private providers in countries such as the United States, France, England, Denmark, Germany, and Italy. The discussion will then shift to digital health and its primary implications, as well as the current state of digital health tools adoption in Europe and the United States. The chapter will conclude with an examination of the differences between public and private providers in the application of digital health in various nations.

The third chapter will focus on Italy. Following an overview of the quality of care and digital health situation in the country, several indicators will be analysed to determine differences in quality of care between public and private hospitals. The focus will then shift to the Lazio region based on a comparison between the private University hospital Campus Bio-Medico and the public Umberto I hospital. Finally, the digital health differences between public and private hospitals in Italy will be examined.

1 THE ROLE OF PUBLIC AND PRIVATE HOSPITALS IN THE MAIN HEALTHCARE SYSTEMS

In industrialised nations, primarily three healthcare systems were developed in the 20th century. In the United States, the system was founded on a combination of private insurance and public financing through Medicare and Medicaid, with no formal controls on the delivery of care. In Germany, social security plans dominated through a network of sickness funds providing insurance and largely governing delivery of care independently of the government. In Italy, healthcare is primarily administered and funded by the government and the market forces are reduced. These three healthcare systems are the subject of the first chapter, in which each system will be analysed from an insurance perspective and in terms of which types of hospitals are most prevalent, in order to gain a better understanding of the situation in each country and the trends regarding hospitals over time.

Health care services are offered by a variety of institutions, although hospitals are the primary providers. In accordance with their ownership, hospitals can be either private or public. They seek the same objective, which is the provision of health care services, but their characteristics are vastly distinct. Private hospitals are administered and financed by an individual or group. The owners are responsible for the day-to-day operations of the hospital, including compliance, management of funds, human resources, and equipment. Private hospitals have gained popularity despite their expense due to the high quality of services they offer in terms of shorter waiting times and individualised care. Due of the high price of their treatments, these hospitals attract wealthy clientele. Private hospitals allocate funds for sophisticated advertising, but public hospitals do not. This is where a portion of their higher fees go, to cover expenses such as advertising and marketing. Private hospitals can be classified as either for-profit or non-profit. Investors own profit-making hospitals. In contrast to hospitals that are not-for-profit, these facilities seek profits for their shareholders. These for-profit facilities are typically among the nation's highest-charging hospitals. Non-profit hospitals qualify as charities and are therefore exempt from paying property tax, state and federal income tax, and sales tax. In exchange for their tax-exempt status, non-profit hospitals are required to reinvest any surplus funds into their surrounding communities. In spite of this, non-profit hospitals are routinely scrutinised by healthcare policymakers who are concerned about whether and how the facilities contribute to their communities in a way that justifies the generous tax exemptions they receive.

The state entirely manages and finances public hospitals. Due to budget restrictions, the quality of services provided to patients tends to decline. Due to the low doctor-to-patient ratio, customised care may not be as efficient in public hospitals as it is in private hospitals. Therefore, these facilities attract

less affluent individuals or those with restrictive insurance. Due to the low cost of treatments, public hospitals attract a high number of patients, resulting in lengthy wait times. Because they are partially or wholly supported by a public municipality, public hospitals are extremely adaptable and accept nearly all insurance types.

1.1 U.S. healthcare system

The U.S. healthcare system is a combination of public and private, for-profit and non-profit insurers and health care providers. The federal government provides funding for public insurance programmes such as Medicare, Medicaid, the Children's Health Insurance Program and Veterans Health Administration. The federal government has only a negligible role in directly owning and supplying providers and it is not involved in healthcare planning. The U.S. Department of Health and Human Services is the primary federal agency responsible for health care services. States manage and pay for local coverage and the safety net. According to federal regulations, the states cofund and administer their Children's Health Insurance Program and Medicaid programmes. States determine eligibility requirements, patient cost-sharing requirements, and a substantial portion of the benefit package. In addition, they assist with the financing of health insurance for state employees, oversee private insurance, and licence health professionals. In addition to Medicaid, some states manage health insurance for low-income residents. In contrast to the majority of nations, which have large networks of both publicly funded and privately-run healthcare facilities, almost all clinics and hospitals in the United States are privately operated. In 2020, 19.7 % of the annual GDP was spent on healthcare by the United States. In 2020, the cost of health care in the United States rose 9.7 percent to \$4.1 trillion, or \$12,530 per person. This expansion is a result of the Covid-19 pandemic. Since patients within each category are clinically similar and are expected to utilise the same level of hospital resources, the U.S. healthcare system established the DRG system in 1982 to determine how much Medicare pays the hospital for each product.

1.1.1 Health insurance

In the United States, there is no universal health insurance coverage. It was estimated that in 2020, 91.4% of the population would be covered, leaving 28 million uninsured. As a result of the government's massive intervention in the field, the percentage of uninsured individuals has steadily

decreased. The state's interventions brought the percentage down from 13.3 % in 2013 to 8.6% in 2020¹.

Principal among the public insurance programmes are Medicare, Medicaid, the Children's Health Insurance Program and the Veterans Health Administration. Medicare guarantees the right to health care for all individuals aged 65 and older. Medicaid provides health coverage for low-income adults, children, pregnant women, the elderly, and individuals with disabilities. The Children's Health Insurance Program is a health insurance programme for low-income children whose families earn too much to qualify for Medicaid but cannot afford private insurance. Veterans Health Administration is the component of the United States Department of Veterans Affairs responsible for implementing the VA health programme through a nationalised health service in the United States, providing veterans with health care and ancillary health services. The public health programmes have gradually expanded over the years, allowing more individuals to qualify for participation. The Affordable Care Act, also known as Obamacare, represents the greatest expansion of the federal government's role in financing health care. The Affordable Care Act (ACA) established "shared responsibility" among government, employers, and individuals to guarantee that every American has access to affordable, high-quality health insurance. The law, enacted in 2010 and implemented in 2014, requires that every citizen have a health insurance and it managed to gain 20 million coverage, reducing the share of uninsured adults aged 19 to 64 from 20% in 2010 to 12% in 2018². The purpose of the Affordable Care Act was to intervene in both the public and private sectors. On the public side, the act expanded Medicaid eligibility with federal subsidies. Medicare (18.4 %) and Medicaid (17.8 %) reached significant shares among the subtypes of public health insurance coverage. The ACA also impacted the private sector by establishing HealthCare.gov, a federal marketplace for purchasing individual primary health insurance through private plans, and by providing premium subsidies for private marketplace coverage. The number of people with public coverage increased as a result of these actions, but the country's continued reliance on private health insurance was unaffected. In fact, in 2020, 66.5 % of Americans had private health insurance, compared to 34.8 % who had public insurance. The majority of private insurance (54.4%) is employer-sponsored and a smaller portion (10.5 %) of private insurance is purchased by individuals from for-profit and not-for-profit carriers³. Most employers outsource the administration of benefits to private health plans. The majority of employer plans cover

¹ U.S. Census Bureau, Current Population Survey, 2018 Annual Social and Economic Supplement Bridge File and 2014 to 2021 Annual Social and Economic Supplement (CPS ASEC).

² S. R. Collins, H. K. Bhupal, and M. M. Doty, Health Insurance Coverage Eight Years After the ACA: Fewer Uninsured Americans and Shorter Coverage Gaps, But More Underinsured (Commonwealth Fund, Feb. 2019).

³ U.S. Census Bureau, Health Insurance Coverage in the United States: 2020, September 2021

employees and their dependents, and the vast majority offer a selection of plans. Typically, both employers and employees contribute to premiums; rarely are premiums entirely covered by the employer.

The predominance of the private sector in the United States is not coincidental, but rather indicative of a country that has based its health sector on the private, as a similar situation exists for hospitals.

1.1.2 Hospitals

The country has 6,093 hospitals, and the majority of hospitals are located in urban areas: about 3,000 of the U.S.'s hospital facilities are within major metropolitan areas with only about 2,500 serving the country's vast rural areas. However, while in-depth specialised care for diseases such as cancer is often concentrated in a few large urban hospital networks, emergency care is readily accessible in even the least populous regions of this vast country. Public hospitals in the United States are located particularly in urban areas. As in other nations, U.S. public healthcare facilities are frequently more congested than private hospitals, resulting in longer wait times. The overall building investment for health care in the United States, which reached 49.83 billion dollars in May 2020, is evidence that the country's hospitals are huge, profitable, and expenditure heavy. To make this statistic more accessible, it is helpful to compare it to Europe, where expenditures reached 25.7 billion in 2022.⁴ Because of this, American hospitals are able to provide comprehensive care and have the equipment and people to diagnose and treat any medical issue for any patient that arrives at any time, hence even public hospitals in the United States have high treatment expenses. There is a cost associated with the widespread availability of high-quality medical treatment in the United States. In 2022, there are 5,139 community hospitals in the United States, of which 19 % are government-owned, 24 % are for-profit, and 57 % are non-profit. In addition, there are 207 federal hospitals, 635 non-federal psychiatric hospitals, and 112 hospitals of other categories⁵. Therefore, there are 6,093 hospitals in all⁶.

Private equity is a phenomenon that affects American hospitals. Private equity firms are corporations that invest in privately held companies. While many organisations engage in start-ups and small enterprises, an increasing number are supporting the healthcare sector. Private equity firms frequently acquire faltering healthcare systems or hospitals. Typically, they intervene when a hospital is failing to make a profit, when complying with rules is challenging, when a practise owner is retiring, or when

⁴ U.S. Census Bureau, Total Construction Spending: Health Care in the United States, retrieved from FRED, Federal Reserve Bank of St. Louis

⁵ Other hospitals include Non-federal long term care hospitals and hospital units within an institution such as a prison hospital or school infirmary.

⁶ AHA Hospital Statistics, 2022 edition

a hospital offers an innovative service or product but requires financial assistance. Since 2015, investments in healthcare have more than tripled. In fact, private equity investments in the healthcare industry surged from \$23.1 billion in 2015 to \$79.9 billion in 2019. As a result, private equity firms already own approximately 25% of hospitals in the United States, a percentage that is projected to continue to rise. Over the past two decades, private equity firms' involvement in the healthcare sector has expanded significantly. There were 42 private equity acquisitions of hospitals or hospital systems between 2003 and 2017. This impacted 282 hospitals in 36 states. According to projections, healthcare expenditures will climb by 5.5% annually through 2027⁷.

1.2 German healthcare system

The German healthcare system, which dates to the 1880s and is the oldest in Europe, is a dual public-private system. This dual system is funded by both statutory health insurance, known as *Gesetzliche Krankenversicherung*, and private health insurance, known as *Private Krankenversicherung*. Notable about the German health care system is the distribution of decision-making authority among federal and state governments, as well as self-regulatory organisations of payers and providers. The German federal government has broad regulatory authority over health care but is not directly involved in care delivery. Which services will be covered by sickness funds is determined by the Federal Joint Committee, which is overseen by the Federal Ministry of Health. To the greatest extent possible, coverage decisions are supported by evidence from comparative effectiveness reviews and health technology (benefit-risk) assessments. The Federal Joint Committee also establishes quality measures for providers and regulates ambulatory care capacity using population-to-physician ratios that are based on patient needs. The 16 state governments play a significant administrative role as well. State governments determine hospital capacity and finance hospital investments. In addition, states oversee public health services. The German healthcare expenditures are among the highest in Europe. In 2020, 13.1% of its yearly GDP was allocated to healthcare expenditures. The entire cost of health care is 441 billion euros. Annual healthcare expenditures in Germany are only €5,298 per citizen. Due to the Covid-19 pandemic, these numbers are significantly higher than in 2019. In fact, compared to 2019, total health expenditures increased by 26.8 billion euros.⁸

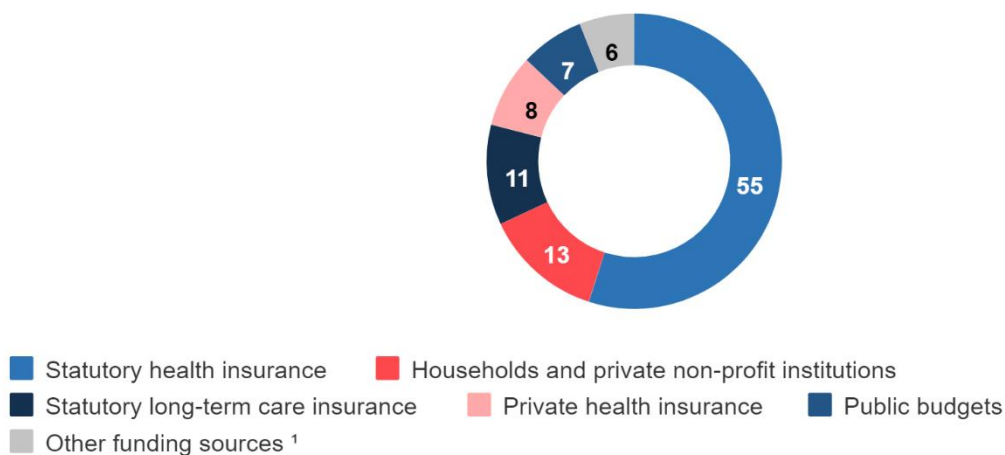
⁷ Offodile, II, A. C. (2021). Private equity investments in healthcare: An overview of hospital and health system leveraged buyouts, 2003–2017

⁸ Destatis, Health expenditure

1.2.1 German health insurance

Universal health coverage occurred in 2007, when all citizens and permanent residents were required to carry either statutory or private health insurance. The current system provides comprehensive coverage for the entire population, as well as generous benefits. Health insurance is provided by two subsystems: statutory health insurance (SHI), which consists of competing, non-profit, non-governmental health insurance plans known as sickness funds, and private health insurance. In contrast to many other nations, sickness funds, private health insurers, and long-term care insurers all utilise the same providers. Therefore, hospitals and physicians treat all patients irrespective of whether they have SHI or private insurance.

Fig. 1.1 Health expenditure by funding, 2020



Differences may occur due to rounding. 1 statutory pension insurance, statutory accident insurance, employers

Source: Destatis, 2022

As previously stated, total health expenditures comprised 13.1% of GDP in 2020. 73 % of these health expenditures were publicly funded, and the majority of these expenditures (55 % of the total) went toward SHI. Approximately 88 % of the population is covered by sickness funds, and 11 % by private insurance. In January 2019 there were 110 sickness funds. Employed citizens earning less than EUR 60,750 per year are required to have SHI coverage. Individuals whose gross wages exceed the threshold, as well as self-employed individuals formerly covered by SHI, have the option of remaining in the publicly financed scheme or purchasing private health insurance. Sickness funds are funded by mandatory wage contributions levied as a percentage of gross wages, up to a predetermined maximum.

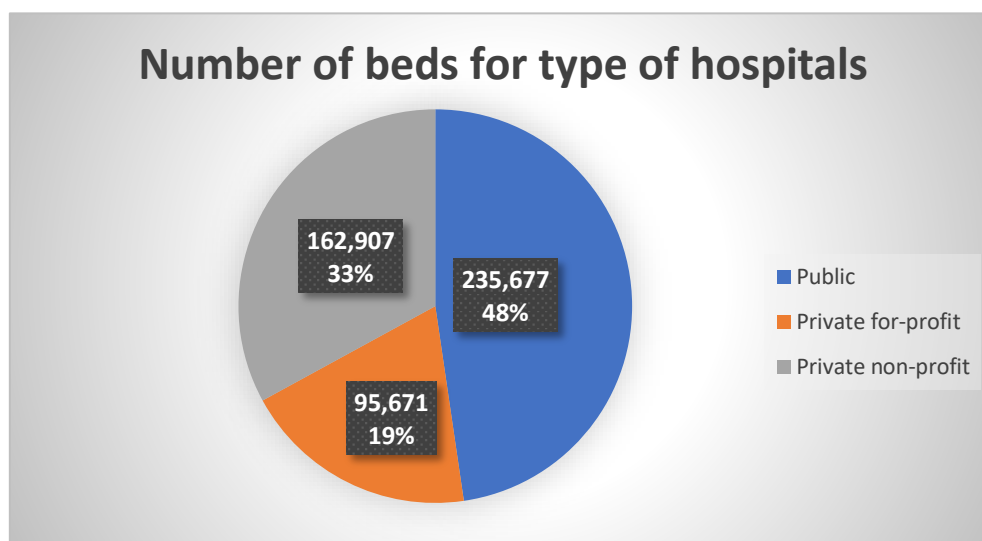
Private health insurance represented 8% of total health expenditures. This includes coverage purchased by individuals who are exempt from or able to opt out of SHI (such as those with higher incomes) as well as supplemental policies purchased by sickness fund enrollees. In 2017, 8.75 million people had supplemental private health insurance coverage. In June 2018, Germany had 41 private health insurance options, of which 25 were for-profit. Private insurance plays a mixed complementary and supplementary role for sickness fund enrollees, covering minor benefits not covered by SHI, such as dental co-payments and private hospital rooms. The Federal Financial Supervisory Authority and the Ministry of Health regulate private health insurance to ensure that insureds do not face significant premium increases as they age and are not overburdened by premiums if their income decreases. The federal government determines provider fees for substitutive, complementary, and supplementary private insurance through a fee schedule. These fees are typically greater than SHI fees. Government subsidies for private insurance do not exist.

1.2.2 German hospitals

In Germany there are 1.914 hospitals. Hospitals are mainly private but are highly regulated. Public hospitals are 545 which represent just the 28% of the total. The remaining 72% of hospitals are private which are divided in 724 (38%) for-profit hospitals and 645 (34%) non-profit hospitals. Towards the tendency in the most advanced countries, in Germany number of hospitals has reduced during the years, indeed they reduced of 20% from 1991 in which there were 2.411 hospitals⁹.

⁹ Destatis, 2019

Fig.1.2 Number of beds for type of hospitals



Source: Destatis, 2019

As showed from the Fig.1.2 private hospitals are much smaller than public hospitals in terms of number of beds. Indeed public hospitals make up the 48% of the total 494.255 beds available. Private not-for-profits account for 33% while private for profit for the 19%. As for hospitals, also the number of beds has reduced, indeed in 1991 there were almost 666.000 beds.

In recent years, the number of private, for-profit hospitals has increased. Since the early 1990s, the number of private for-profit hospitals has steadily increased, resulting in the emergence of a handful of major private hospital corporations. In 1991, 46 % of hospitals were public; by 2006, this percentage had fallen to 34,1%, and by 2019, it had fallen to 28%. In contrast, the proportion of hospitals with a private for-profit owner increased from 14.8% to 27.8% and reached 38% over the same time period. The proportion of private hospitals that are not-for-profit remained relatively stable. Already, more than 50% of the remaining public hospitals have converted to private law institutions. Private hospital companies primarily acquired small hospitals until the late 1990s. Still, nearly half of the beds and nearly 58 % of the staff are located in public hospitals, compared to only 12 % in private for-profit hospitals¹⁰. However, since 2000, an increasing number of larger hospitals have been privatised. The largest privatisations to date were the 2005 acquisition of the State-owned Hospitals Hamburg (LBK Hamburg) and the 2006 privatisation of the university clinic in Marburg-Giessen. Regarding the latter, it was the first time a university hospital was privatised, establishing Germany as Europe's privatisation pioneer. This has nearly brought the proportion of private for-profit hospitals

¹⁰ Nils Böhlke und Thorsten Schulten, The Privatisation of Hospitals in Germany: Lowering Confidence of Germans in Their Hospitals?, HealthManagement, Volume 10, Issue 4 / 2008

with available beds to U.S. levels. In the majority of other nations, privatisation trends are limited to the outsourcing of specific services or the formation of Public-Private Partnerships (PPP), whereas the purchase of entire hospitals remains an exception. Only France has a traditionally larger for-profit hospital sector. There are numerous causes for the wave of hospital privatisations in Germany. This development is primarily motivated by fundamental changes to the hospital funding system. In fact, hospitals have been supported by the so-called dual financing system since the early 1970s. Investments are expected to be covered by the German Federal States, while operational costs are funded by health insurance contributions. In order to maintain stable health insurance contribution rates, the funding system has undergone extensive reforms since the 1990s. This includes the introduction of budgets for operating costs and the implementation of a system for case-based lump sums. This so-called DRG System (Diagnosis Related Grouping) changed the financing for certain diagnoses from daily rates to lump sums. The restructuring of the funding system has placed hospitals under tremendous financial strain. According to the RWI Economic Institute's 2008 hospital rating report, more than one-third of hospitals experienced budget deficits in 2008. Hospital privatisations appear to be the only way out of this financial quagmire for many municipalities.

However, the lack of investment by the Federal States provides the greatest impetus to privatisation. According to the German Hospital Association, the total has reached 50 billion euros. In 1984, hospitals received 2,6 % of the nation's gross domestic product; by 2004, that figure had dropped to 1,3 %. The investments in hospitals were among the lowest in Europe. Indeed, the dual system of hospital financing, which was based on federal government capital investments and public and private insurers covering operating expenses, failed. In consultation with regional hospital associations, physicians, and insurance funds, state governments-imposed hospital planning requirements. Consequently, it is hoped that privatisations will assist in bridging this substantial investment gap.

1.3 Italian health care system

In countries such as Italy, United Kingdom and Nordic countries healthcare is considered as a fundamental right of citizens and the government is fully responsible for healthcare planning.

Italy's health care system is a regionally based national health service (Sistema Sanitario Nazionale – SSN) that provides universal coverage free of charge at the point of service. Italy's National Health Service automatically covers all citizens and legal foreign residents. The central government collects corporate and value-added tax revenues and distributes them to regional governments, which are

responsible for providing care. The majority of residents receive free primary care, hospitalisation, and health screenings. Other benefits mandated by law include maternity care, specialty care, home care, hospice care, preventive medicine, and pharmaceuticals. Co-payments are required for specialty visits, procedures, and certain outpatient drugs. Italian NHS is a universalistic system which is founded on pillars like solidarity, equal access, equal distribution on resources independently from geographical location and human dignity. Organization and delivery of health services are decentralised, and the system is structured on three tiers:

- National
- Regional
- Local

At the national level, the Ministry of Health, on behalf of the National Government, establishes the fundamental principles and objectives of the health system, determines the core benefit package of nationally guaranteed health services (the so-called LEAs), allocates funds to the regions, and oversees the NHS. Several government agencies support the Ministry of Health and assist the government in making decisions regarding health care policies. All objectives, goals, and activities are defined in the National Health Plan, which is based on the regional health departments' proposals.

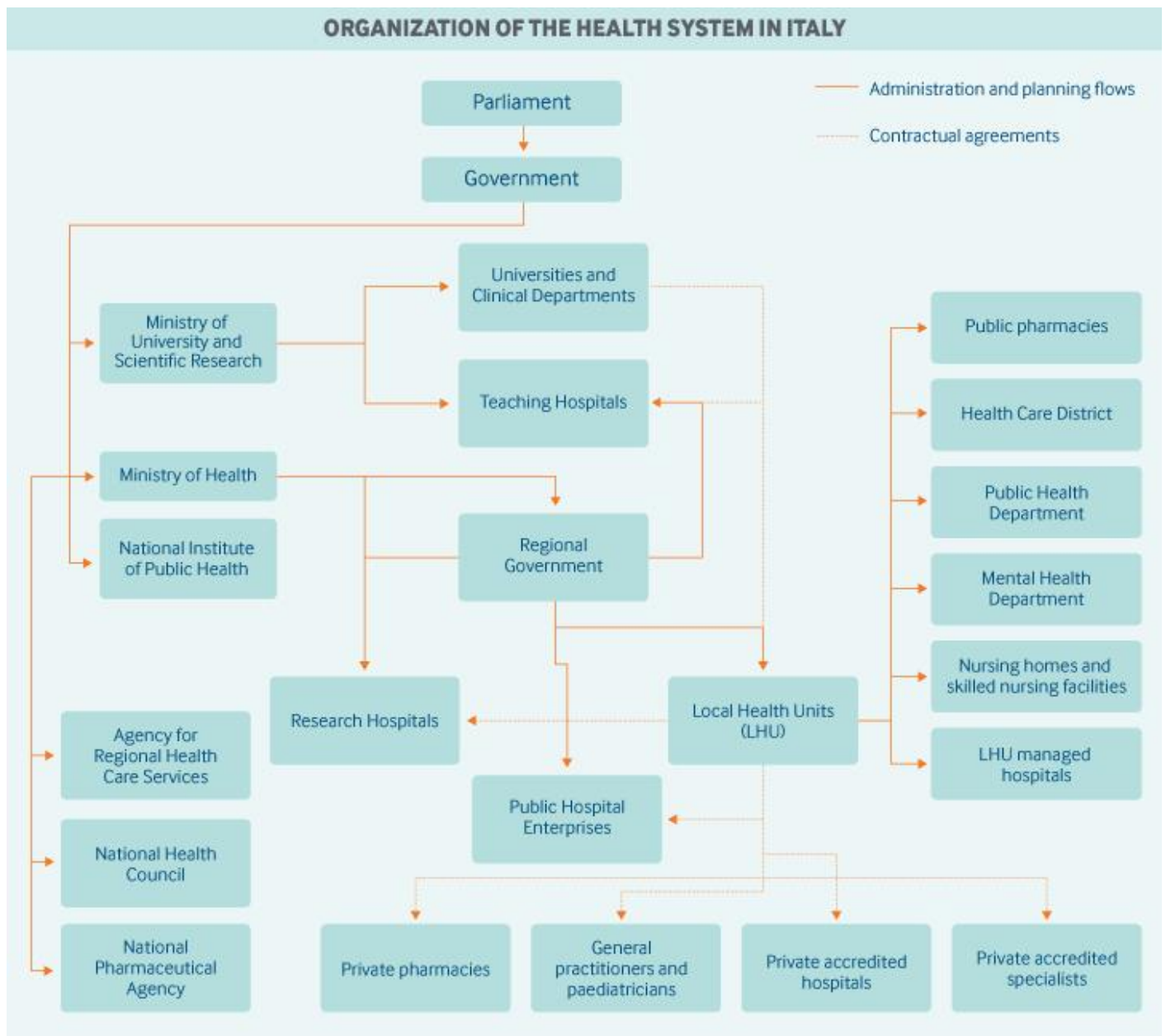
At the regional level, regions are responsible for ensuring the general objectives and fundamental principles of the national health care system through specialised health departments. In the State-Regions Conference, 19 regions and 2 autonomous provinces share planning and financing responsibilities with the central government and are solely responsible for providing public health and health-care services. Regional autonomy in determining the macro structure of their health systems is substantial. They define the criteria for authorising and accrediting public and private health-care providers as well as monitoring the quality of care. Regional strategic planning must be formalised in the regional health plan, which includes details such as the distribution of beds in secondary, emergency, and long-term care, hospital size and location, and health and social care integration.

At the local level, geographically based Local Health Authorities provide public health, community health services, and primary care directly to a defined population, as well as secondary and specialised care directly or through either public hospitals or accredited private providers. Each LHA's territory is subdivided into Districts, which are the institutional level that directly controls the provision of public health and primary care services, as well as socially related health services. The regional department of health appoints a general manager for each Local Health Authority based on professional qualifications and technical expertise. He is accountable for ensuring the LHA's sound

financial performance and achieving the goals outlined in the regional health plan and local planning process.

In 2019, Italy spent 8.7 % of its GDP on health care, or 2.525 euros per person. The pandemic increased health expenditures as a percentage of GDP to 9.7 % in 2020. Regional variations in Italy's public healthcare expenditures are pronounced. In 2020, the regions with the highest public healthcare expenditures were Lombardy (21.1 billion euros) and Lazio (11.6 billion euros), while Molise (680 million euros) and Aosta Valley had the lowest expenditures (287 million euros).

Fig.1.3 - Organization of the Italian healthcare system



Source: A. Donatini, Emilia Romagna Regional Health Authority, 2014

1.3.1 Health Insurance

Italy's National Health Service (Servizio Sanitario Nazionale, or SSN) was established by law in 1978 and provides universal coverage. The SSN is automatically assigned to all citizens and legal permanent residents.

The public system is primarily financed by two mechanisms:

- A national corporate tax that is redistributed back to the regions. Typically, corporate tax allocations are proportional to a region's contributions. There are substantial interregional differences in the corporate tax base, resulting in financing disparities.

- A fixed percentage of the national value-added tax revenue collected by the central government and redistributed to regions with insufficient resources to provide essential services.

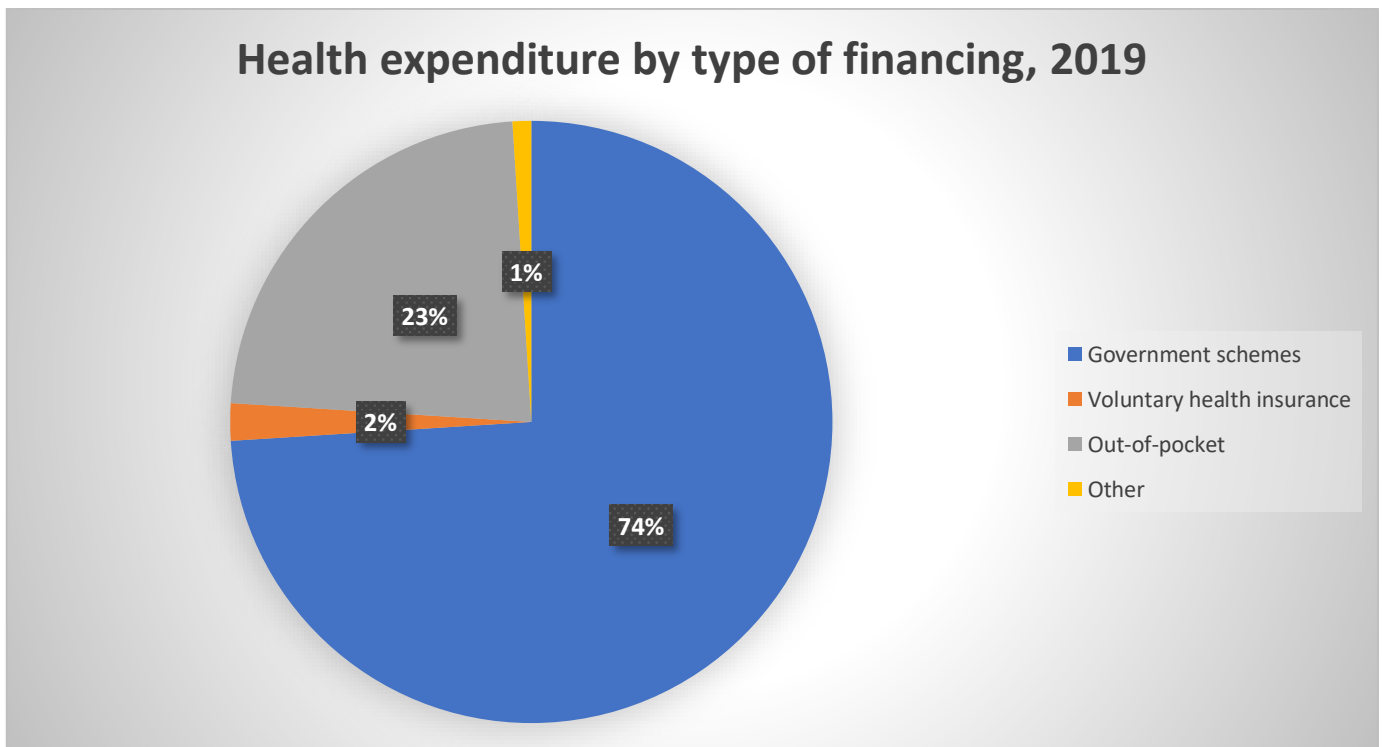
The regions are permitted to generate their own additional revenue, resulting in further disparities in interregional financing. Indeed, regions are responsible for the organisation and funding of healthcare services. They are also responsible for the collection of resources to support these services. If regions have a deficit, they must find new revenues through local taxation, which explains why taxation varies across regions. 80 percent of the regional budget in Italy is allocated to healthcare. All regions are required to provide the same benefit package and service quality. In principle, regions collect resources solely and directly, a system known as fiscal federalism, but due to differences between regions, they cannot cover health-care expenditures with their own tax revenues. To compensate for these disparities, the remainder of the budget is comprised of central transfers or transfers between regions that are centrally planned.

Since the SSN does not permit individuals to opt out of the system and seek only private care, there is no substitute insurance. However, complementary and additional private health insurance play a limited role in the health system. About 23% of the population has some form of voluntary health insurance, which covers services excluded from SSN essential benefits, provides a higher level of comfort and privacy in hospital facilities, and increases the number of public and private providers. Some private health insurance policies include coverage for co-payments for privately rendered services or daily compensation during hospitalisation. Complementary insurance (insurance for co-payments) is favoured by tax benefits over voluntary supplementary insurance (which covers the cost of health care services not included in the essential benefits package). From 2012 to 2019, annual spending on private healthcare in Italy increased by approximately 16 %. In fact, after beginning in 2012 at 34.4 billion euros, private health expenditures reached 40.5 billion euros in 2019. In contrast, private healthcare expenditures fell to 38.1 billion euros in 2020.

There are two types of private health insurance:

- Corporate, where companies cover employees and sometimes their families.
- Non corporate, where individuals purchase coverage for themselves or their families. For-profit and not-for-profit organisations offer either collective or individual policies. Mutual insurance organisations, corporate and collective funds organised by employers or professional associations for their employees or members, and mutual insurance organisations make up the market. The majority of insured individuals are covered by non-profits.

Fig.1.4 - Health expenditure by type of financing



Source: OECD Health Statistics 2021

As shown in Fig.1.4, the proportion of public spending to total health expenditures in 2019 was 74%. The remaining expenditures result from households' direct out-of-pocket payments (23 %). The role of voluntary health insurance is marginal (2 %). The remaining 1% comes from non-governmental organisations, employers, non-resident schemes, and unknown schemes.

In an effort to control costs, Italy adopted the DRG system in 1995, replacing the previous cost-based reimbursement system.

1.3.2 Hospitals

In addition to regionalization and the DRG system, Legislative Decree No. 502/1992 introduced corporatization and a quasi-market. Corporatization refers to the fact that LHAs are managed as private corporations and have organisational, managerial, administrative, and technical independence. Large hospitals have been separated from LHAs and transformed into hospital trusts as a result of corporatization. AOs provide highly specialised hospital care at the tertiary level (both inpatient and outpatient). A divisional organisational structure, the existence of at least three highly specialised clinical units, a complete accident and emergency department with an intensive care unit, and a particularly complex case mix are requirements for AO status. The Legislative Decree No. 229/1999

has granted greater autonomy to general managers, which primarily manifests as the authority to define a hospital's mission and objectives through a three-year strategic plan, in accordance with the recommendations of the regional health plan. In the Teaching Hospital Trusts Network, there is a subset of AOs whose health care delivery is augmented by research and teaching activities. The other significant innovation is the separation of sellers and buyers, known as the quasi-market. The goal is to create a sort of competition between AOs, directly managed hospitals, and private accredited hospitals in order to increase patient quality and reduce costs. The competition exists because patients are free to choose their hospital and the LHA reimburses hospitals that provide services.

There are a total of 1004 hospitals within Italy's national healthcare system. They are decreasing as there were 1049 hospitals in 2015. The number of hospitals is comprised of 516 public hospitals (51.4% of the total) and 488 accredited private hospitals (48.6 %). There are also 61 private hospitals that are not accredited. There are also 26 AOs among the 516 public hospitals. In the public sector, hospitals (-7 %) and directly managed hospitals (-6.3%) have decreased the most, followed by university-affiliated hospitals (-5.6%); overall, public and comparable healthcare institutions experienced a gradual decline over the period analysed. In the field of accredited hospitals, there is also a gradual trend of contraction, with their presence in the Italian hospital landscape decreasing from 501 units in 2015 to 488 units in 2020. The analysis of public/private relations in the regions reveals in which territorial areas there is a greater prevalence of the public and where there continues to be a "quasi-mixed system" equilibrium between the two components. Basilicata, Sardinia, the Autonomous Province of Bolzano, Friuli Venezia Giulia, Umbria, Abruzzo, Tuscany, and the Autonomous Province of Trento have the highest concentration of public facilities. In contrast, the confirmation of a quasi-mixed system (with a more balanced typology of institutions) is most prevalent in Puglia, the Aosta Valley, Sicily, and Calabria. 63.8 % of public facilities consist of hospitals managed directly by Local Health Authorities, 10.3 % of hospitals, and 25.9 % of other types of public hospitals. The S.S.N. has approximately 235,000 beds for ordinary hospitalisation, of which 20.2% are in privately accredited structures, 11,343 places for day hospital that are almost entirely public (89.2%), and 8,703 places for day surgery that have a high public prevalence (77.6 %). Nationally, 4.3 beds are available for every 1,000 residents, with 3.7 beds per 1,000 residents devoted to acute care activities. At the territorial level, the indicator is distributed rather unevenly. There is substantial regional variation in the number of beds for rehabilitation and long-term care at the national level, which is 0.6 per 1,000 people¹¹. With the exception of Lazio, a reality in which the

¹¹ Annuario Statistico del Servizio Sanitario Nazionale, anno 2020

conformation of a true mixed system is also evident in terms of the number of beds, in the rest in the country, the territorial distribution sees a more or less marked prevalence of public structures.

There are very old infrastructures in Italy, so the NHS is now focusing on new technologies and infrastructure renovation. In the past five years, Italy has reduced investments in costly infrastructures and even halted some projects as a result of cost-cutting measures. As a result of the pandemic, which made Italy the first country in Europe to be affected, the health sector has undergone drastic cost reductions. While this has helped reduce waste, the number of beds and availability of certain services have been drastically reduced. To reverse this trend and alter the paradigm governing the maintenance of public health facilities in Italy, three primary actions are required: the renovation of existing buildings, the construction of new health facilities, and the implementation of digital technologies necessary to respond to future emergencies. A solid "foundation" for the hospital construction industry will ensure not only the proper number of beds, but also the safety of receiving patients. Realistically evaluating the numbers, the required effort will be significant and must be accompanied by a substantial financial endowment of approximately €25 billion. This is what will be required to renew the Italian healthcare system and close the gap with more modern and efficient global models. There is a distinct "before" and "after" the most recent Italian government interventions in healthcare. Several allocations and emergency projects were initiated prior to the eradication of the Covid-19 virus. The government approved a €1.1 billion investment to bolster local care plans, reorganise the hospital network, increase staff, and create new intensive care beds as the contagion exploded. In the 2020 national budget, the first allocations for healthcare facility construction were made. Two billion euros (over a period of 15 years) were allocated for the adaptation of hospitals to fire regulation standards, anti-earthquake measures, and technological advancements. In addition to the funds allocated from the national budget, the "Cura" (Care) decree allocated an additional €1.4 billion to hospitals fighting on the Covid-19 frontlines. Priorities included enhancing their intensive and sub-intensive care units, modernising their emergency rooms, and facilitating the purchase of new ambulances for the transportation of sick patients.

The government has focused on the future of the health care system in recent months, aiming to restructure the investment plan for Next Generation EU funds, reserving a substantial portion for healthcare construction. The *Missione Salute* ("Health Mission") section of the Italian Recovery Plan (PNRR) calls for an investment of €15.63 billion in the country's national healthcare system. In addition to community health services and telemedicine, the Draghi government will allocate €7 billion for hospital development. In the battle against future obstacles, "proximity medicine" will

become a strategic weapon. Therefore, 1,288 *Case della Comunità* (Community Homes) will be built by 2026. It is anticipated that €2 billion will be invested in these medical intervention centres. An additional €1 billion will be invested in the construction and activation of 381 *Ospedali della Comunità* (Community Hospitals) by the middle of 2026. These are short-stay healthcare facilities for non-life-threatening conditions.

In order to meet the rising demand for beds, numerous regions in Italy require the construction of new facilities. In response, the hospital Monopoli-Fasano is currently being built in Apulia. The project aims to build a hospital with 299 beds and nine operating rooms. Currently under construction, the hospital will provide immediate relief to the region's 236,000-person healthcare demand. The Recovery Plan allots an additional €8.63 billion for education, in addition to spending on healthcare facilities. Existing healthcare facilities are made more sustainable and secure through digitalization and maintenance initiatives. The Ministry of Health has identified 116 urgent projects to assist Italian hospitals in meeting earthquake-resistance standards.

Each of the three depicted healthcare systems has characteristics that make it difficult to apply them to other nations. Indeed, healthcare is viewed as a private good in the United States, and the individual determines the utility and scale preference. In the German healthcare system, healthcare is a market good that is regulated by the government, so it is viewed as both a social welfare instrument and an investment with mixed rationales. Moreover, in the Italian healthcare system, healthcare is a public good and a citizen right. In this instance, government dictates availability and options. This structure is reflected in the types of hospitals present in each country, with 76 % of community hospitals in the United States being private, 72 % of hospitals in Germany being private, and 48.6 % of hospitals in Italy being private.

As you will see in the following chapter, the intertwining of public and private hospitals generates different outcomes and performance in terms of care quality and digital health.

2 DIFFERENCES IN QUALITY OF CARE AND DIGITAL HEALTH BETWEEN PUBLIC AND PRIVATE HOSPITALS

It is currently unknown whether private hospitals outperform public hospitals in the different health systems, so the aim of the chapter is to analyse public and private hospitals under two variables which are also strictly correlated: quality of care and digital health. Concerning the quality of care, the literature centred on the disparate performances of public and private hospitals in terms of mortality rates, readmission rates, and the outcomes of specific operations. The chapter will then focus on digital health, including an analysis of what digital health is and its primary implications, as well as an examination of its situation in Europe and the United States. The global situation regarding digital health in the leading nations will then be evaluated. Through a thorough examination of the existing literature, it will be possible to gain a better understanding of the differences between the public and private sectors and whether the private sector can clearly outperform the public sector.

The dual system, which includes both public and private hospitals in the delivery of health care, has always been highly controversial due to concerns that the two types of hospitals cannot provide uniformly high-quality services to patients. Particularly debated is the role of the private sector in the health care system. Under competitive pressure and favourable conditions, private hospitals could theoretically perform better than public hospitals. This is due to the fact that private hospitals have unrestricted budgets, and as a direct result, they are known for providing quality service in which patients receive individualised care and attention, and do not have to wait long periods to be seen because the number of patients per doctor is low. In addition, the common perception in the NHS versus private healthcare debate is that if you pay for medical care, then you will have a superior treatment. Due to the unrestricted budget also the use of technology in private hospitals could be superior with obvious advantages for patients in terms of digital health.

During the preceding decades, a trend toward privatisation was observed throughout Europe. At the same time in the last two decades several healthcare reforms have been implemented in European countries mostly aimed at rationalising the use and provision of hospital care, improving its quality and appropriateness and reducing its costs. Almost all health systems in the European Union now contract both public and private providers, also countries with National Health Services. Even though they perform a different function, private providers are an integral part of the National Health Service. In essence, the private sector - accredited and non-accredited - is not an antagonist to public health. In contrast, if public health is strengthened and well-organized, it will benefit from a functioning system as a whole. Public and private are two faces of the same health system and the collaboration

between public health and private health is the key to the proper functioning of a system which, guaranteeing the universality of assistance, also protects the possibility for those who believe it to obtain services of different quality.

2.1 Differences between public and private hospitals in the quality of care

A crucial factor in determining whether policymakers should engage private providers is the extent to which their quality exceeds or falls short of that of public providers. Economic theory offers contradictory forecasts as to whether private hospitals are superior or inferior to public hospitals in terms of quality. Literature has identified various mechanisms that operate in opposite directions. Private hospitals may sacrifice quality in order to generate a greater financial surplus because they have a greater incentive to maximise profits. In addition, private providers may have a greater financial incentive to avoid treating expensive patients, which could result in skewed quality measures in favour of private providers. On the other hand, precisely because they are more profit-driven, they have a stronger incentive to compete for demand by increasing quality if demand is elastic enough. In addition, public hospitals could attract workers with a stronger preference for quality who are more motivated. Consequently, this topic's results are contradictory, making it challenging to reach a conclusion.

The subsequent studies are structured according to the Donabedian model and rely on at least one of Donabedian's parameters. The following three parameters can be used to assess the quality of health care:

- a) **Structure:** this term refers to the characteristics of administrators and health professionals, the tools and resources available to them, as well as their physical and organisational operating environments. The concept of structure encompasses the human, material, and monetary resources required for the delivery of health care. The structure includes hospital, medical, and nursing staff organisation.
- b) **Process:** consists of the product, the performances, their timeliness and suitability in relation to intervention decisions, the level of implementation, and the use of resources.
- c) **Outcome:** alterations in health conditions as a result of health interventions. In the field of disease prevention, the result is a decrease in disease incidence.

2.1.1 United States

Four studies have been examined to determine the differences between public and private hospitals in the United States.

The review conducted by Eggleston et al. (2008) indicates that, for the United States, the analysis of the relationship between hospital ownership and adverse patient outcomes varies systematically based on the data source, time period, and region covered by a study¹².

According to research conducted by Picone et al. (2002), the temporary decline in hospital quality in the United States was caused by the transition from public to private ownership. There is no decrease in quality when hospitals are transferred from public to private ownership, indicating that the result of the change in ownership from public to private is not an artefact of the conversion, but rather the ownership status itself. There was a significant decline in employment and wages-salaries at the time of the conversion, which was partially reversed three years later. One reason is that the new administration was initially tasked with increasing the profitability of the hospital. This was accomplished primarily through the reduction of labour inputs, especially highly skilled labour. As soon as the decline in performance became apparent, management reduced its efforts. This scenario involves the pursuit of profit and education¹³.

In the United States, hospitals that converted from non-profit to for-profit status experienced an increase in mortality, as concluded by Shen (2002). Private ownership has a negative effect on patient health outcomes. Specifically, private for-profit hospitals have mortality and/or complication rates that are at least 1 percentage point higher than non-profit hospitals, and the results are consistent across all specifications. Public hospitals also have a 2% higher incidence of adverse outcomes than non-profit hospitals. Additionally, the incidence of adverse outcomes increases by 1.7%–2.2%, which corresponds to increases of 9% and 7% in 30-day and 1-year mortality rates, respectively, when a non-profit hospital converts to profit ownership. However, the patient outcomes of public and for-profit hospitals that convert to non-profit status or public and for-profit hospitals that convert to public status change very little. Both the staff-to-bed ratio and the nurse-to-bed ratio must be blamed for the decline in quality of care in for-profit facilities. In addition, the newly converted private hospitals reduce the number of bypass surgeries and discontinue their in-house cardiac and emergency services. All of these variables may contribute to the rising incidence of negative outcomes following a takeover

¹² Eggleston K, Shen YC, Lau J, Schmid CH, Chan J. Hospital ownership and quality of care: what explains the different results in the literature? *Health Econ.* 2008

¹³ Picone, G., Shin-Yi, C., Sloan, F., Are for-profit hospital conversions harmful to patients and to Medicare? *RAND Journal of Economics*, 2002

for profit. The number of hospitals that converted to private status steadily increased over time. Profit-seeking hospitals are frequently perceived as profit maximizers, which raises the question of whether profit is achieved at the expense of quality. For this reason, researchers have feared that the increasing frequency of non-profit to for-profit conversions over the past decade will result in a decline in patient care. This analysis demonstrates that this concern is well-founded, at least with regard to patient health outcomes¹⁴.

Gupta et al. (2021) conducted an additional study for the United States that examines nursing homes and private equity investments. Nursing homes are a useful setting due to their exceptionally high levels of for-profit ownership and government subsidies, as well as their extensive private equity investments. It has been observed that in private equity facilities, the 90-day mortality rate for short-stay Medicare patients rises by approximately 10%, while the cost to taxpayers rises by 11%. In addition, there is evidence of a decline in the availability of nurses per patient and in measures of compliance with Medicare's care standards¹⁵.

2.1.2 France

There have been three studies conducted to determine the differences between public and private providers in France.

According to Milcent (2005), public hospitals and private non-profit hospitals in France have comparable AMI mortality rates. Private hospitals with a profit motive have a lower AMI mortality rate. During the period under study, public and private non-profit hospitals were paid from a global budget, while the revenue of public hospitals was determined administratively on a historical basis. Private for-profit hospitals were paid on a fee-for-service basis. Since the 2004-2008 implementation of French hospital payment reforms, financial incentives for both public and for-profit hospitals have changed. No longer subject to a global budget, public hospitals are now compensated based on the diagnosis-related group (DRG) of stays. Similarly, for-profit hospitals have adopted this system, although their DRG-based fees vary. Being admitted to a for-profit hospital has two consequences: a lower risk of death and greater uncertainty about the hospital's quality, where quality is measured by the probability of death at any given moment. The public sector has more homogeneous hospitals than the private sector. These results indicate that increasing the ability to adopt innovative procedures would improve the quality of care by ensuring that hospitals provide uniformly high-quality care. In

¹⁴ Shen, Y.C., The effect of hospital ownership choice on patient outcomes after treatment for acute myocardial infarction. *Journal of Health Economics*, 2002

¹⁵ Gupta A., Gupta A., Howell S.T., Yannelis C., Does private equity investment in healthcare benefit patients? Evidence from nursing homes, 2021

establishing the budget constraint, the regulator must keep in mind that it may have an impact on the public sector's capacity for innovative procedures and, consequently, the quality of care. The investment in innovative procedures varies depending on the reimbursement system. Private hospitals have the potential to benefit from innovative procedures, whereas public hospitals do not. Consequently, if innovative procedures affect the long-term mortality rate, so could the reimbursement system. AMI mortality is used as the outcome variable in the literature on the quality of health care and the behaviour of hospitals in various forms. Innovative procedures are a key factor in explaining the high quality of care in for-profit hospitals. Moreover, when holding constant the use of innovative procedures and case-mix, the mortality rate in for-profit hospitals is higher than in public hospitals¹⁶.

Gobillon et al. (2016) and Gusmano et al. (2015) found that the private sector in France consistently performed worse than the public sector. Gobillon discovered that mortality rates for patients admitted for heart attacks and older than 35 vary by hospital type. Compared to private hospitals, mortality rates are lower in public hospitals. In fact, when innovative procedures and case mix are held constant, the mortality rate in private hospitals is higher than in public hospitals. A counterfactual analysis reveals that the probability of death at 7 days for patients admitted to public hospitals would be 1.8 percentage points lower if they were treated as if they were in for-profit hospitals¹⁷. The study by Gusmano et al. (2015) examines rehospitalization rates, which is an indicator of declining quality, that vary among French hospitals. Private hospitals have higher rates of 30-day, all-cause readmissions for elderly patients than public hospitals¹⁸.

2.1.3 England

There have been three major studies conducted to determine the differences between public and private providers in England.

According to Moscelli et al. (2018), private hospitals in England have comparable quality to public hospitals, as measured by emergency readmission rates for elective treatments. There are significant quality differences between public and private hospitals for certain types of care. For instance, public

¹⁶ Milcent, C., Hospital ownership, reimbursement systems and mortality rates, *Health Economics*, 2005

¹⁷ Gobillon L, Milcent C. Evaluating the effect of ownership status on hospital quality: The key role of innovative procedures. *Ann Econ Stat/Annales d'Economie et de Statistique*. 2016

¹⁸ Gusmano M, Rodwin V, Weisz D, Cottenet J, Quantin C. Comparison of rehospitalization rates in France and the United States. *J Health Serv Res Policy*. 2015

providers have a higher overall quality for non-diagnostic treatments, whereas private providers perform better overall for diagnostic treatments¹⁹.

In England, Pérotin et al. (2013) investigated whether hospital ownership influences the quality reported by patients. According to the authors, the differences in quality levels between the private and public sectors are primarily attributable to patient characteristics, patient selection into public or private hospitals, and unobserved and specific hospital characteristics, as opposed to hospital ownership²⁰.

In England, Chard et al. (2011) compared the outcomes of elective surgery between private and public providers. Private hospital patients are typically healthier and have less severe primary conditions. In terms of symptom severity, health-related quality of life, and postoperative complications, patients who underwent a hip or knee replacement, for instance, had better outcomes. While there were no significant differences between the outcomes reported by patients following hernia repair and varicose vein surgery, there was no difference between the two procedures. There is a higher rate of reoperation after varicose vein surgery in patients treated at public hospitals, but this may be due to a difference in operative management (multistage approach as opposed to a single intervention) rather than a difference in the quality of care²¹.

2.1.4 Denmark

The differences between public and private providers in Denmark have been the subject of three major studies.

Solborg Bjerrum (2015) conducted a study on the quality of elective surgeries performed in public and private hospitals in Denmark. Patients who underwent cataract surgery in public or private eye clinics or hospitals between 2002 and 2010 were included in the study. Patients who undergo cataract surgery in public hospitals have a mortality rate that is 62% higher than those who undergo the procedure in private hospitals or clinics. Since the results indicate that patients who undergo cataract surgery in public hospitals are less healthy than those who undergo cataract surgery in private hospitals or clinics, the potential explanation may lie in patient selection²².

¹⁹ Moscelli, G., Gravelle, H., Siciliani, L., Gutacker, N., The effect of hospital ownership on quality of care: evidence from England, *Journal of Economic Behaviour and Organization*, 2018

²⁰ Perotin, V., Zamora, B., Reeves, R., Bartlett, W., Allen, P., Does hospital ownership affect patient experience? An investigation into public-private sector differences in England, *Journal of Health Economics*, 2013

²¹ Chard, J., et al., Outcomes of elective surgery undertaken in the independent sector treatment centres and NHS providers in England: audit of patient outcomes in surgery, *British Medical Journal*, 2011

²² Bjerrum S., Quality Assessment of Cataract Surgery in Denmark, *Journal of Clinical & Experimental Ophthalmology*, 2015

From 2004 to 2012, Solborg Bjerrum et al. (2013) examined the risk of postoperative endophthalmitis (PE) following cataract surgery in public and private hospitals in Denmark. The results demonstrated that the PE risk in public hospitals is 0.36 per 1000 operations and in private hospitals it is 0.73 per 1000 operations. There was homogeneity in PE risk among public hospital eye departments ($p = 0.6$), but there was heterogeneity among private hospitals ($p = 0.0001$). Six out of twenty-eight private hospitals or clinics had a higher PE risk than public hospitals²³.

Bogh Andersen and Jakobsen (2010) investigated in a third study conducted in Denmark how ownership of hip clinics affects professional behaviour, treatment quality, and patient satisfaction. Private hospitals optimise non-clinical factors such as waiting time significantly more than public hospitals, and they have fewer patients prone to complications. However, clinical procedures in the two types of hospitals are very similar. Private hospitals do not achieve superior clinical outcomes, but patient satisfaction is higher in these facilities²⁴.

2.1.5 Germany

Tiemann and Schreyögg (2009) analysed hospital mortality rates in Germany. They discovered that private hospitals had lower mortality rates than public hospitals. Publicly enforced transparency on quality indicators may be one of the possible explanations for this finding, as it appears to have prompted for-profit hospitals to place comparatively more emphasis on these issues²⁵.

2.1.6 Italy

Five studies were reviewed to determine the distinctions between public and private hospitals in Italy.

In Italy, Louis et al. (2008) analysed the appropriateness of admissions in a study. Although the number of inappropriate admissions decreased from 2001 to 2005, private hospitals have consistently had more inappropriate admissions than public hospitals in all years. Private hospitals in six Italian regions had a lower rate of antenatal screening compliance among pregnant women²⁶.

In Italy, Quercioli et al. (2013) investigated the relationship between public and private hospital expenditures on preventable mortality. Increases in public spending on health care were associated with a greater decline in preventable mortality. However, no such positive effects were found in

²³ Bjerrum S., Kiilgaard J.F., Mikkelsen K.L., La Cour M., Outsourced cataract surgery and postoperative endophthalmitis, *Acta Ophthalmologica*, 2013

²⁴ Andersen L.B., Jakobsen M., Does Ownership Matter for the Provision of Professionalized Services? Hip Operations at Publicly and Privately Owned Clinics in Denmark, *Public Administration*, 2010

²⁵ Tiemann O, Schreyögg J. Effects of ownership on hospital efficiency in Germany. *BUR-Bus Res.* 2009

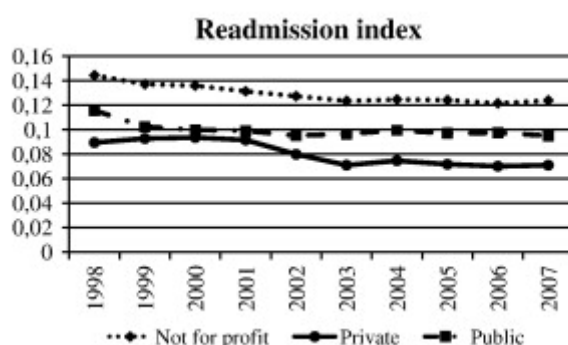
²⁶ Louis D, Taroni F, Melotti R, et al. Increasing appropriateness of hospital admissions in the Emilia-Romagna region of Italy. *J Health Serv Res Policy.* 2008

relation to private health care expenditure increases. This suggests that increases in spending on private health care services may impede the public sector's ability to reduce avoidable mortality²⁷.

The study by Moscone et al. (2012) examines the results of Italian hospitals in terms of readmissions and finds that patients in private hospitals are less likely to be readmitted and less likely to die within 30 days after discharge, although the impact of the latter was found to be significantly lower²⁸.

Berta et al. (2010) analysed the readmission rates of hospitals in Italy based on their ownership structure. Non-profit hospitals have a higher rate of readmissions than public hospitals, as shown in the graph below, whereas private for-profit hospitals have extremely low readmission indices²⁹.

Fig. 2.1 – Readmission rates



Source: The effects of upcoding, cream skinning and readmissions on the Italian hospitals efficiency: A population-based investigation, 2010

Moscone et al. (2018) analysed whether public and private hospitals differ in quality in Lombardy, where public and private providers compete for publicly-funded patients under a fixed-price DRG payment system. Using a large sample in 2012–2014, it was determined that, with few exceptions, the elective and emergency quality of public and private providers is comparable. The only exceptions are AMI, for which private providers have a lower mortality risk, and hip replacement, for which private providers have a higher readmission risk³⁰.

²⁷ Quercioli C, Messina G, Basu S, McKee M, Nante N, Stuckler D. The effect of healthcare delivery privatisation on avoidable mortality: longitudinal cross-regional results from Italy, 1993–2003. *J Epidemiol Community Health*. 2013

²⁸ Moscone F, Tosetti E, Vittadini G. Social interaction in patients' hospital choice: evidence from Italy. *J R Stat Soc A Stat Soc*. 2012

²⁹ Berta, P., Callea, G., Martini, G., Vittadini, G., The effects of upcoding, cream skinning and readmissions on the Italian hospitals efficiency: A population-based investigation, *Economic Modelling*, 2010

³⁰ Moscone F., Siciliani L., Tosetti E., Vittadini G., Do Public and Private Hospitals differ in Quality? Evidence from Italy, 2020

Clearly, the results of these studies do not point in a single direction. Indeed, countries have varying results, but even within a single nation, the outcomes vary considerably. Private hospitals may perform better on observable quality outcomes, such as mortality and readmission rates in Germany and Italy. Private hospitals in France specialise in specific elective procedures. As a result of such specialisations, one might expect private hospitals to have better outcomes, but in France, the findings overwhelmingly favour public hospitals. This raises questions about the benefits of private hospital specialisation.

2.2 Digital health

Digital health is the use of digital innovations and technologies for health-related purposes such as wellness, assistance, care, and drug delivery. Digital health technologies have the potential to significantly enhance the efficacy of health systems, both in terms of care delivery and system administration as a whole. Digital health can increase the health system's economic viability and expand population access to care. In other instances, entire economic sectors have been transformed by information and communication technologies. For many years, health systems have made efforts to facilitate and promote their use. Realizing the potential of digital tools in health care, however, has proven to be a lengthy, arduous, and complicated endeavour with mixed results. While there are numerous examples of digital health innovations that have improved accessibility, quality, or efficiency, their widespread adoption in practise has been persistently challenging. Many of the greatest obstacles to adoption have not been technical in nature, but rather stem from difficulties in implementing changes to larger health and care processes. Inadequate investment, absence of a supportive and clear legal framework governing their use, health professionals' concerns over their use, gaps in planning and support for implementation, and insufficient leadership have all played crucial roles in inhibiting adoption in some nations. In spite of this, the unique challenges posed by COVID-19 have generated new needs and a new willingness to adopt digital health technologies, resulting in an acceleration of their use during the pandemic. Supporting communication and monitoring, the continued provision of health services, and the transition from pandemic-related restrictions, digital health tools have become an integral component of global pandemic responses. The COVID-19 pandemic has accelerated digitalization by at least a decade, in addition to disrupting healthcare and causing radical shifts in delivery models. This digital transformation will significantly shape the future of healthcare. Digital healthcare solutions have the potential to reduce health disparities and improve the well-being of citizens if they are purposefully designed and cost-

effectively implemented. The focus of digital health is on technologies such as electronic health records, e-prescriptions, and telehealth. Electronic health records are crucial because the successful implementation of this technology enables different systems to work together and gives all health care providers, public and private, access to a patient's clinical history. E-prescriptions are the electronic equivalent of paper prescriptions and are accessible via a link in an electronic message on a digital device. Using tools such as remote video consultations, telehealth includes the remote provision of care to patients in remote areas or the remote monitoring of patients with chronic conditions.

The accelerating development of mobile devices has enabled the emergence of new potential health applications for mobile devices (the so called mHealth). Whereas the initial emphasis of eHealth was on technologies within and specific to the health system, the concept of mHealth emphasised the potential of mobile phones and mobile applications to provide new services and empower individuals. mHealth's functionalities include:

- Support for clinical diagnosis.
- Enhancing clinical outcomes utilising existing treatment pathways
- Independent digital therapies
- Offering instruction.

Recent digital health applications include new sources and types of big data and technologies. Similarly to how the rise of mobile technologies has introduced a new dimension to eHealth, the emergence of new data sources, such as genomics, has enabled yet another dimension to be added to eHealth. As health systems and society as a whole have become increasingly digitised, huge increases in the volume, velocity, and variety of data have resulted; this phenomenon is known as "big data." To analyse this data, new data-driven tools, such as machine learning, as well as computerised tools, such as robot-assisted surgery, and in some cases automation, have emerged.

2.2.1 Digital Health in Europe

Prior to the COVID-19 pandemic, there was a large disparity across Europe in terms of digital health area and country-specific policy and strategy development. 70% of WHO Europe reporting countries had an eHealth policy or strategy in place in 2015, but only 27% have one for telehealth³¹. The Nordic countries are reportedly further along than other regions in developing digital health policies and strategies. In addition, regulatory frameworks for digital health contain numerous gaps. 43% of

³¹ World Health Organization (WHO), Global eHealth survey, 2015

reporting countries had policies or legislation defining the medical jurisdiction, liability, or reimbursement of eHealth services; 53% had no legislation allowing individuals access to their electronic health records; and 13% had policies regulating the use of big data in the health sector. In addition, only eleven reporting countries had a national authority to regulate the quality, safety, and dependability of mobile health devices and software. In addition, while 69% of countries in the WHO European region had legislation governing the use of electronic health records, this ranged from nearly 90% in European Union Member States to less than 30% in Commonwealth of Independent States and Central Asian Republics Health Information Network countries³².

Prior to COVID-19, the degree of adoption of digital health varied by application type and country. While 83% of responding WHO Europe Member States reported using teleradiology and 81% reported using social media for health promotion campaigns, only 59% had a national electronic health record system in place. In 22 Member States, a government-sponsored mHealth programme was present. In a cross-country comparison that attempted to take into account some of these factors, Estonia was ranked as the top performer among 17 OECD countries in terms of the use of digital health in practise, followed by Denmark, Israel, Canada, and Spain; Belgium, France, Germany, and Poland were ranked as some of the less developed countries on this indicator³³. Many years of effort have been devoted to facilitating and promoting the use of digital health tools.

However, implementation and adoption of these tools in many nations of the region have been generally sluggish, and significant untapped potential remains. Individual, organisational, and system obstacles exist in the implementation of digital health technologies; they are not primarily technical. Despite the fact that eHealth systems involve technical challenges in developing the necessary technologies, it has become evident that the challenges of adopting these systems in practise have not been solely or, in many instances, even primarily technical. Adopting e-health technologies is not as simple as integrating a new technological solution into existing procedures. Introducing new technologies necessitates alterations to broader health and care processes, and the costs and benefits of such alterations are not uniformly distributed. For instance, the transition to electronic record keeping necessitates additional data entry effort from clinical staff, particularly nurses, resulting in system-wide benefits primarily felt by managers, administrators, and payers. Despite the fact that the technological aspect of digital health is vital and constantly evolving, putting it into practise is a challenge that necessitates the participation and support of all relevant stakeholders, just like any other

³² WHO/Euro 2016

³³ Thiel R et al. (2018). #SmartHealthSystems: International comparison of digital strategies. Bertelsmann Stiftung

significant system change. There are barriers to the adoption of digital health at the system, organisation, and professional and patient levels, and action is required at all of these levels to support the implementation of digital health. Digital health systems have evolved dramatically in terms of their potential and usability, including as a result of substantial investment through national and international programmes, such as the European Union's eHealth programmes. To make effective use of eHealth at the individual, organisational, and system levels, it is essential to be aware of the broader challenges. Policy can only directly influence a subset of the factors that influence the implementation of digital health.

2.2.2 Digital health in the United States

The digital revolution in healthcare in the United States is advancing steadily, propelled by federal government regulations and financial incentives, technological advancements, and the imperatives of enhancing treatment efficacy and reducing cost and economic impact. Obama changed the face of healthcare with the passage of the Health Information Technology for Economic and Clinical Health (HITECH) Act in 2009. The law provided financial incentives for providers to implement health information technologies and monetary sanctions for those who did not. In 2008, according to the Office of the National Coordinator for Health Information Technology, only 9% of hospitals and 17% of physicians utilised an electronic health record (EHR). This proportion increased to 96% of hospitals and 78% of physician offices by 2015. In late 2020, the U.S. Department of Health and Human Services (HHS) proposed changes to HIPAA's privacy and security standards that would hinder a patient's ability to access personal health information and impede the healthcare industry's transition to value-based care, a model centred on the value and quality of care.

The U.S. digital health market was valued at USD 66.5 billion in 2021 and is anticipated to expand at a compound annual growth rate of 26.9% between 2022 and 2030. The supportive environment for digital healthcare services and enhanced internet connectivity to deliver remote healthcare services via digital channels are expected to drive market growth over the forecast period. In addition, rising smartphone usage in the United States has prompted manufacturers to invest in and capitalise on their industry's growth opportunities. In 2021, the Office of the National Coordinator for Health Information Technology of the U.S. Department of Health and Human Services invested USD 73 million to collect COVID-19 data and strengthen the public health IT workforce in underrepresented communities. In addition, the healthcare community has demonstrated a substantial demand for telemedicine and telehealth over the past few years. Additionally, the persistent lockdowns and travel bans caused by the COVID-19 pandemic contributed to the widespread adoption of telehealth

services. Due to the COVID-19 pandemic, the adoption rate of telemedicine has increased from 11% in February 2020 to 28% in April 2020 to 32% and 35% in June 2020 and July 2020, respectively³⁴. Moreover, the digital technology giants present in the United States, such as Google, IBM, and Apple, are continuously focusing on the development of solutions to improve the virtual healthcare experience with enhanced data security features, which also contributes to the growth of the market. In the coming years, the rising number of mobile subscriptions and smartphone penetration are anticipated to stimulate market expansion. eMarketer reports that smartphone penetration has increased from 76% in 2016 to 88% in 2021. Increasing smartphone adoption drives the use of mHealth applications and services in the United States. Due to the increased adoption of digital healthcare platforms to provide remote care for geriatric individuals and patients with chronic diseases, the telehealth care segment dominated the market in 2021 with the highest revenue share of more than 37%. In addition, due to the COVID-19 pandemic, investments in telehealth care platforms have skyrocketed, which has further fueled the segment's growth. Increasing internet penetration and the rising number of smartphone users create a favourable environment for telehealth adoption, which is expected to fuel the segment's growth over the next few years. Regulatory changes that favour reimbursement of telemedicine and telehealth services will also contribute to the segment's expansion. The segment is also anticipated to record the highest CAGR during the forecast period due to the rising trend of using digital platforms, such as telehealth and telecare services, to manage the health conditions of elderly or vulnerable populations. The benefits of telehealth care facilities, such as remote patient care and management, disease transmission risk reduction, and reduced care costs, are also expected to drive segment growth over the forecast period. In addition, increasing telehealth product development activities, rising R&D investments, and rising start-up funding are anticipated to contribute to the growth of the segment³⁵.

2.3 Differences between public and private hospitals in digital health

2.3.1 England

The English National Health Service has only partially exploited the potential of eHealth. Many hospitals in England still lack comprehensive electronic patient record systems, and community health services are even further behind in their digitalization. The UK National Health Service announced

³⁴ CivicScience survey, 2021

³⁵ U.S. Digital Health Market Size, Share & Trends Analysis Report By Technology (Tele-healthcare, mHealth, Healthcare Analytics), By Component (Services, Software), And Segment Forecasts, 2022 - 2030

on 10 July 2019 that Amazon had been awarded a contract to provide virtual health care to NHS patients. This is part of a trend in which health information technologies are driving the expansion of health-care privatisation in Brazil, Canada, India, Macedonia, the United States, and numerous other countries. The NHS's agreement with Amazon follows an earlier contract with Babylon, a London-based company that is diverting a large number of NHS patients from receiving care in traditional physician's offices to receiving NHS-funded virtualised care delivered via Babylon's "GP at Hand" suite of proprietary digital technologies. With the arrival of Covid-19 in the United Kingdom at the beginning of 2020, however, the healthcare sector faced an urgent need for digital innovation, which led to the adoption of new rules and regulations within the sector. The National Health Service and private hospitals quickly adopted advanced technologies that would have taken years to implement otherwise. In less than one year, remote work platforms, electronic health record configurations, telemedicine, and other technologies have become the norm. Last year, hospital overcrowding posed a significant challenge, prompting the adoption of telemedicine solutions for appointments that do not require physical presence. Telemedicine's potential is undeniable, and its capabilities are expected to increase following its successful implementation in hospitals across the country over the past year. It has been confirmed that face-to-face medical consultations in the United Kingdom dropped from over 70% before the pandemic to just 23% within weeks. After the successful implementation of telemedicine in the UK's National Health Service and private hospitals, this innovation is likely to endure. As organisations and hospitals continue to transition to a more technological sector, limitations such as providing patients with the necessary equipment, such as wearable health monitoring devices, must still be addressed. However, for the majority of routine medical issues, telemedicine remains the safest and most efficient method for both parties to undergo general check-ups and appointments.

Although public and private hospitals are adopting eHealth tools in a similar manner, the diffusion of telemedicine is not uniform between public and private hospitals. Indeed, the Care Quality Commission, the regulator of private healthcare providers in the United Kingdom, had particular concerns with telemedicine for a long time, including lack of access to patients' records, identification of the patient and their key characteristics (gender, sex, and weight), and healthcare not being provided in real time and via text. As a result, private hospitals have been slower to adopt digital tools than public hospitals, and it is only due to pandemic needs that they have reached parity with the public sector.

2.3.2 United States

In the United States, where health care is primarily privately financed and delivered, digital health technologies are frequently created to support profit-driven health care models. The Veteran's Administration is the largest publicly funded health-care service in the United States, with a budget of \$90 billion and nearly 30 million patients enrolled. In 2017, the VA abandoned VistA, its custom-designed, publicly funded open source software electronic health record system, and signed a \$10 billion contract with software giant Cerner to implement a new system meant to synchronise the VA's digital health systems with those of the Pentagon, which largely relies on private healthcare contractors to provide healthcare to US military personnel. The International Finance Corporation (IFC), a World Bank agency that is the largest multilateral investor in private health care in emerging markets, provides strong international support for the US Government's support for commercially marketed digital health technologies that are integrated with health-care privatisation strategies. This inclination toward the privatisation of health care is manifest in the adoption of digital tools by both public and private hospitals. Medicare has extremely limited coverage and reimbursement for telemedicine services. Medicare provides coverage to U.S. seniors aged 65 and older, as well as certain individuals with qualifying disabilities. Medicare covers less than 10% of the U.S. population, but accounts for more than a quarter of all medical expenditures. Medicare coverage rules are frequently followed by state Medicaid programmes, which cover low-income and disabled individuals, as well as by many private commercial insurance plans. Despite the Medicare Program's coverage limitations, state Medicaid programmes and private payers have expanded telehealth coverage. Medicare coverage of telehealth is not free, even when it is available. Medicare typically covers 80% of the cost of a service, with the beneficiary responsible for the remaining 20%. Telehealth is partially covered by other federal programmes, including the Veterans Benefit Administration and a number of Medicare Advantage plans. Medicare Advantage plans are offered to Medicare beneficiaries for additional premium payments by private commercial insurance plans that receive capitated payments from the Medicare Program to provide care for enrolled beneficiaries. Private commercial insurance plans might also cover telehealth services. Certain states have enacted telehealth parity laws mandating that licenced insurers cover telehealth services to the same extent as in-person services. Innovations in digital health from the private sector are essential for providing high-quality healthcare. Nevertheless, many promising health information technology (HIT) solutions are not adopted and utilised by Medicaid patients and other vulnerable populations, nor are they implemented in care settings where a significant proportion of these patients receive care. This "digital divide" will only widen if nothing is done.

The COVID-19 pandemic has compelled many hospital systems to implement telehealth to provide routine outpatient care and intensive care unit (ICU) services without exposing patients to the virus. However, according to a 2018 survey conducted by the American Hospital Association, only about half of hospitals in the United States have telemedicine systems in place. These hospitals tended to be large, non-profit, private teaching hospitals. 756 (26.8%) of the hospitals with ICUs reported tele-ICU capabilities. These hospitals tended to be private non-profit institutions, as opposed to those without telehealth ICUs³⁶.

Electronic health records are another tool for analysing the adoption of digital health instruments in public and private hospitals in the United States (EHRs). According to survey results from the American Hospital Association Information Technology Supplement, private non-profit hospitals have the highest adoption rate of comprehensive EHR (46.8%), followed by public hospitals (29.5%) and private hospitals with a profit (23.8%). The rate of basic EHR adoption is highest in private for-profit hospitals (58.1%), followed by public hospitals (45.7%) and private not-for-profit hospitals (35.5%). In the category of less-than-basic EHRs, public hospitals have the highest adoption rate (24.8%), followed by private for-profit hospitals (18.1%) and private not-for-profit hospitals (17.8%). As a result, it is clear from this survey that private hospitals have a higher level of adoption for both comprehensive and basic EHRs. This reflects the structure of the US healthcare system, which is more private-oriented³⁷.

The adoption of electronic health records (EHRs) and telehealth systems reveal a significant divide between public and private hospitals in the United States; from a digital health perspective, private hospitals are significantly more advanced.

2.3.3 France

Given that 81 start-ups were founded in France between 2010 and 2020, France is one of the most significant European markets for digital health. In 2019, HealthTech raised €1.8 billion in France alone. Until 2018, the public health system did not reimburse telemedicine, so telemedicine platform players had to address the private insurers, a market that is not as developed. In 2018, reimbursement for telemedicine became available through the public health system. With this strategy, France has placed a significant emphasis on digital health in its national strategy. In fact, the French government has established a €650 million investment programme to increase the digital readiness of the country's

³⁶ Snighda Jain et al. Availability of Telemedicine Services Across Hospitals in the United States in 2018: A Cross-sectional Study, 2020

³⁷ Adler-Milstein et al., Electronic health record adoption in US hospitals: the emergence of a digital “advanced use” divide, 2017

hospital network and accelerate the national health strategy. In fact, all doctors, regardless of whether they work in a public or private hospital, are able to provide telemedicine thanks to the government's extensive efforts. The French government has chosen to make digital consultations available to everyone, and this objective is achievable by ensuring that both public and private providers have the same level of digitalization.

2.3.4 Germany

The eHealth Law went into effect in Germany in 2015 and provided a roadmap for the implementation of digital health care applications. The framework and objectives established by the law have substantially accelerated the expansion of the E-Health industry. These changes to eHealth regulation have made the industry one of the most exciting for German start-ups. Implementation remained slow due to political differences and convoluted decision-making processes. In the German health care sector, telemedicine is gaining prominence. Historically, healthcare policies limited the use of telemedicine to follow-up consultations with physicians. Nevertheless, policies are currently being revised, and there is a growing trend of patients scheduling virtual consultations with physicians. New legislation encourages the introduction of electronic health records and e-prescription in an effort to improve the regulatory framework for the digitization of Germany's healthcare system and accelerate the expansion of its digital infrastructure. Recent research indicates that more than 90% of German general practitioners are now connected to the telematics infrastructure, the backbone of the German digital healthcare system.

The German healthcare market is characterised by intense competition and reimbursement difficulties. Minimal reimbursement for eHealth applications and solutions is a well-known barrier in the German eHealth sector, as is the dearth of IT funds in many German hospitals. Currently, only a few hundred of Germany's 379.000 physicians offer online consultations. The primary reason for this is that insurance companies do not pay enough for the service to be profitable. Despite this, the government intends to expand the scope and velocity of reimbursement for eHealth solutions. A recent announcement by the federal state of Baden-Württemberg that it will invest an additional ten million euros in 2019 to digitalize hospitals is another indication that Germany is investing more in its eHealth infrastructure.

The major public and private health insurance providers are currently working to provide their policyholders with electronic health records. Examining the availability of data in the German healthcare system reveals a similar problem. Only 64% of patient data in Germany is digitalized. While that appears to be a respectable number at first glance, when compared to neighbouring

countries, the magnitude of the problem becomes clear. Italy (79.5%), Netherlands (89.4%), Nordics (87.7%), Spain (80.8%), and Switzerland (68.9%) have significantly more digitised data than Germany. Only the United Kingdom (61.5%) has a lower proportion of digitalized patient records than Germany. However, it would be an oversimplification to conclude that Germany is not working to digitalize its hospitals based on these numbers, as numerous hospitals are conducting digitalisation pilots in a variety of hospital areas to validate quality, efficiency, and efficacy. Groups that own large private hospitals are investing in electronic health records, additional patient services, and ways to increase efficiency. This is in contrast to public hospitals, whose extremely limited IT budgets prevent them from making investments until it is demonstrated that a digital solution can save money while maintaining or improving quality. The issue is, of course, that the majority of solutions are costly to implement and do not offer a quick return on investment; rather, it may take years for them to result in cost savings. This issue will be partially resolved by new legislation that expedites the reimbursement process for innovative and digital solutions. However, it remains a potential obstacle. In contrast, private hospital groups, some of which are active throughout Europe, and university hospitals can invest more readily or conduct pilots to determine the value of a solution.

2.3.5 Italy

The spread of COVID-19 necessitated a greater reliance on telehealth services to comply with the Italian government's movement restrictions. The Italian Medicines Agency ("AIFA") adopted several measures to combat the COVID-19 pandemic, including the remote performance of certain clinical trial activities by healthcare professionals and third-party providers. In addition, the ISS issued guidelines for the delivery of telehealth services during the COVID-19 pandemic. The director of Italy's National Centre for Telehealth recently stated that 5G technology will present an excellent opportunity for the expansion of telehealth services. In Italy, no specific national laws regulate telehealth. Telemedicine is governed by the general Italian laws and regulations pertaining to healthcare services. Due to the lack of specific national regulations, telehealth services are utilised in private practise more frequently. The organisation of efficient telehealth services in the public sector would necessitate, among other things, rules aimed at establishing an adequate IT infrastructure among public hospitals/HCOs. However, there are examples of telehealth services in the public sector, although they are typically limited to specific regions. In this regard, the National Centre for Telehealth launched a number of initiatives to increase the use of telehealth services within the public health system. As much as possible, these services are subject to the same regulations as "traditional" healthcare services in Italy. Unlike telemedicine, the electronic health record (also known as Fascicolo

sanitario elettronico) is accessible to both public and private providers equally. The Electronic Health Record collects your clinical history by making available the information and documents generated by the National Health System by doctors and health professionals from various structures and by private health structures.

This chapter clarified the relationship between public and private hospitals in the two areas of interest: quality of care and digital health. Through a comprehensive analysis of the literature, it has been possible to determine that the quality of care results are inconsistent, as they depend on the factor considered and the country considered. In terms of digital health, the private sector has a general advantage over public hospitals, although in some countries the two types of providers are on par. The reason for these statistics is that public hospitals typically have limited budgets and are therefore unable to develop digital health tools effectively, resulting in a growing digital divide between public and private hospitals.

3 THE ITALIAN SCENARIO

This chapter will investigate the Italian health care system and compare public and private providers. In order to provide a clear picture of the situation, the first two paragraphs will provide an overview of the situation in Italy, with the first discussing the general quality of care in Italy and the second analysing the state of digital health in the country. The third paragraph will examine the differences in quality of care between public and private hospitals, as well as differences in the Lazio region. The final paragraph will discuss the differences in digital health between public and private hospitals, with an emphasis on the most significant innovation in each setting. The aim of the chapter is to understand if private hospitals can outperform public hospitals in order to be a valid alternative to the public health care.

Italy's national healthcare system consists of a total of 1004 hospitals, of which 516 are public hospitals (representing 51.4% of the total) and 488 are accredited private hospitals (representing 48.2% of the total). In addition, 61 private hospitals lack accreditation. There are also 26 AOs among the 516 public hospitals. All entities operating within the Italian National Health System must meet specific structural, technological, and organisational requirements in order to be included. If they adhere to these requirements, they are permitted to operate. To be authorised, health structures must possess the structural, technological, human, and organisational resources necessary for the effective and secure exercise of their activities (even in the absence of a possible request for institutional accreditation). For hospitals to receive accreditation, they must be licenced to provide health care on behalf of the SSN. Institutional accreditation is a prerequisite for private health facilities authorised to carry out health activities to be able to work on behalf of and at the expense of the national health system. Therefore, each private health facility must demonstrate that it satisfies certain quality requirements that permit voluntary accreditation, whereby the subject acquires the status of a subject suitable to operate on behalf of the National Health Service. There are more stringent quality criteria to adhere to than authorization requirements. The accreditation includes the requirements pertaining to the processes (organisational, informational, assistive) that promote a quality use (effectiveness, safety, efficiency, adequacy, humanization, etc.) of the resource mix specified in the procedure authorization. To obtain and maintain accreditation, the provider must meet the following criteria: applicant qualifications; general organisation and resources; quality of training offered and management of quality improvement; absence of conflict of interest. The validity of accreditation is five years from the date of the issuing decree. Some private hospitals choose not to pursue accreditation, but they still adhere to the authorization requirements. Due to this, they do not

participate in the Italian healthcare system. Private accredited providers provide NHS-funded ambulatory care, hospital treatment, and/or diagnostic services. They must enter into contracts with regional health departments and negotiate the provider's financing conditions and the maximum annual volume or mix of care. Due to this circumstance, both public and private health providers must adhere to minimum quality and technological standards. Despite these minimum standards, however, public and private providers provide varying levels of care quality and technological sophistication.

3.1 Quality of care in Italy

Italy has the second-highest life expectancy in Europe, despite significant regional, socioeconomic, and gender disparities. In general, the Italian health system is efficient and ensures good access to high-quality health services at relatively low costs, despite substantial regional disparities. Improving the coordination of health services for the growing segment of the population affected by chronic diseases and reducing inequalities in access to care are the primary challenges facing the Italian health system. In 2017, the life expectancy at birth in Italy was 83,1 years, ranking it second in the European Union behind Spain. Despite the fact that the gender gap in life expectancy has decreased since 2000, Italian men still live four years less than women on average. There are also significant socioeconomic and interregional disparities: less educated Italian men live on average 4.5 years less than their more educated counterparts, and people living in the wealthiest regions of the North live more than three years longer than those living in the less prosperous regions of the South. In 2017, Italy's per capita health expenditures of € 2,483 were 15% less than the EU average of € 2,883. In recent years, healthcare expenditures have begun to rise again, albeit at a slower rate than in most EU countries. In proportion to the remaining economic sectors, in 2020 health expenditure was 9.7% of GDP. About three-quarters of health care expenditures are financed by public funds, with the remainder borne primarily by patients. In 2017, public funds financed 74% of health expenditures, or 6.5% of GDP. Although the basic LEAs cover a vast array of services, non-reimbursable household expenses are relatively high (24%) and account for the vast majority of remaining health expenditures. Only about 2% of total health expenditures are covered by private health insurance. The Italian health system is primarily financed by revenues derived from general tax revenues, supplemented by those derived from regional income taxes on companies and individuals, and by the patient's share of the cost of health services (out-of-pocket). Regional variations in health care capacity and efficiency raise concerns regarding the ability of poorer or underperforming regions to provide high-quality health services without increasing regional taxes or the existing deficit. In recent years, however, the majority

of regions have managed to balance their health budgets through extremely stringent expenditure controls. In 2017, only seven of Italy's twenty regions (Abruzzo, Calabria, Campania, Lazio, Molise, Puglia, and Sicily) were subject to nationally supervised recovery plans, a decrease from 2007 levels. The Italian government approved a moderate expansion of the LEA in January 2017, with the intention of incorporating certain rare and chronic diseases, new diagnostic services, new vaccines, and newborn screening and care devices. Additionally, the new LEAs have implemented the long-awaited revision of the rates paid for the various services. However, the lack of national guidelines and budgetary constraints have resulted in varying levels of implementation across regions. As reported by the committee for the verification of the Essential Levels of Assistance (LEA committee), in 2017 five regions (Campania, Valle d'Aosta, Sardinia, Calabria, and the Autonomous Province of Bolzano) did not meet the national objectives and targets for service provision. After a 10% decline between 2011 and 2016, Italy has the second lowest rate of preventable mortality in the European Union, after Cyprus. The low preventable mortality rate is the result of reduced mortality rates from ischemic heart disease, lung cancer, accidental deaths, suicides, and alcohol-related diseases, which are well below EU averages as a result of a more restricted distribution of risk factors and a lower incidence of these health issues³⁸. In 2016, the number of deaths deemed potentially preventable through the use of health interventions was also one of the lowest in the EU, demonstrating the overall efficacy of the Italian health system in treating patients with life-threatening conditions. These positive results are attributable to relatively low mortality rates from ischemic heart disease, stroke, and colorectal cancer, which are significantly lower than the EU average, owing to the efficacy of treatments typically provided for these diseases. Later mortality rates demonstrate that the quality of acute hospital care for life-threatening conditions, such as acute myocardial infarction, has improved over the past decade and is now fully comparable to that of other EU countries. when hospitalised. In 2012, the National Outcomes Program (PNE) was launched, aimed at evaluating and supporting the improvement of procedures and clinical outcomes. The programme, administered by the National Agency for Regional Health Services (AGENAS), provides a national comparison of the effectiveness, safety, and quality of care provided by the NHS. On a regular basis, national and regional results are published on a website for use in audits and as feedback to improve clinical practises. The Italian population is generally in good health, and the country's life expectancy is second only to Spain's.

Italy's primary health care system is robust, allowing the country to meet the needs of an ageing population. Multiple regions are experimenting with new models of service delivery, with the

³⁸ European Commission (2019a), Country Report Italy 2019. 2019 European Semester. Brussels

establishment of territorial outpatient clinics and intermediate care facilities that lie between primary and hospital health care, thereby enhancing case management capacity and combining health care and social assistance services. Even though these initiatives seek to identify new models of care for patients with chronic diseases, the majority of these experimental projects have not yet been evaluated formally. On the level of health personnel, while the number of doctors and nurses per inhabitant has slightly increased over the past decade, concerns about a future shortage of personnel are growing as more than half of active doctors are over 55 years old. In recent years, the lack of internships and postgraduate specialisations, as well as good job opportunities for newly trained doctors, has hampered the training and hiring of new doctors, leading to the emigration of many medical graduates and young doctors. The scope of nursing practise remains constrained, and there are no role expansions to improve access to care and the professional advancement opportunities of nursing staff³⁹.

3.2 Digital health in Italy

On July 13, 2021, the European Council approved the final version of the RRP. The RRP is part of the EU Next Generation program (NGEU), namely the €750 billion package of which €222 billion has been allocated to Italy. Through the RRP, the Italian government intends to invest €15.63 billion in the healthcare sector. Specifically, it intends to invest more than €2 billion in healthcare digitalization. On December 15, 2021, the Interministerial Committee for Digital Transition attributed to the National Agency for Regional Health Services (AGENAS) the task of managing the implementation of the digitalization process at the national level. As part of the ministers' announced timeline, investors and operators in the Italian digital healthcare sector were presented with significant opportunities in healthcare data infrastructure, telemedicine platform, and telemedicine services. About the creation of healthcare data infrastructure within the first semester of 2022, the Ministry of Health, the Ministry of Economy and the Department for Digital Transition issued calls for tenders for the allocation of funds for the improvement of health data infrastructure. To this end, the RRP provides for the allocation of €1.67 billion for the strengthening of the national technological infrastructure for the collection and processing of healthcare data. In particular, the RRP envisages the improvement of electronic healthcare records through which citizens' health information is collected and made available to patients and healthcare professionals.

³⁹ OECD/European Observatory on Health Systems and Policies (2019), *Italia: Profilo della sanità 2019*,

The creation of a telemedicine platform to connect demand and supply of telemedicine services started in February 2022 through the creation of a public private partnership (PPP). Through the PPP, private entities will be invited to propose technological solutions, from which the Italian government will choose the one(s) that best meets its needs. The AGENAS collected expressions of interest starting from January 2022, after the publication of a public notice. For the creation of this platform, the RRP provides for a total investment of €20 million.

About telemedicine services the Italian government will distribute a total of €1 billion to Italian regions that activate telemedicine services through calls for tender to be launched by the summer of 2022.

In Italy the need for a more efficient National Health Service is quite imperative. Hence, it is interesting to see how digital technology fits in this framework, considering the resources allocated to foster digital healthcare and the perception of e-health among both professionals in the sector and patients. In the next few years, the expenditure on eHealth is expected to gradually increase. Most of the resources invested in this field are addressed to the digitalization of clinical departmental systems and the implementation of Electronic Health Record (Fascicolo Sanitario Elettronico). Nonetheless, the popularity of EHR among general practitioners and paediatricians is uneven throughout Italy, as some regions are still lagging. In 2021, fifteen regions are using their own regional electronic health record, while the others are still completing their development. On the contrary, it is common practice to use electronic instead of paper-based medical prescriptions. The use of health apps and medical wearables is not widespread yet, even though, there is a rising interest in apps that function as reminders. Pertaining to communication apps, the benefits they bring about are widely recognized among general practitioners, but less appreciated by the patient, who still prefers to communicate with doctors using more traditional means.

As regards remote health monitoring, roughly four Italian patients out of ten are willing to try telemedicine services. The greatest concern about the use of artificial intelligence for medical purposes remains the lack of human contact according to Italians, while timesaving and data accuracy are considered the best advantages. In recent years, Italy has certainly made progresses in implementing digital healthcare. People seem interested in embracing digital health solutions. However, the digitalization process is still ongoing and much more needs to be done to achieve tangible results in terms of efficiency. Currently, the main challenges to be tackled, other than the scarcity of economic resources, are the lack of skills and the scepticism towards digital methods, which is sometimes related to digital illiteracy.

Until 2019, the diffusion of Digital Health services in Italy was quite contained. The Covid-19 pandemic gave a consistent acceleration to the digitalization of healthcare. The health emergency has in fact proved to be the engine of change, especially since Digital Health solutions have often proved to be the only possibility of providing health services. If Digital Health was still taking important steps even before the crisis, it is estimated that the pandemic period has increased its spread by about 20-25%. According to research by ALTEMS - High School of Economics and Management of Health Systems - in the first year of the pandemic alone, companies in the Digital Health sector implemented about 250 Telemedicine initiatives. The most relevant fact, however, is that the pandemic emergency has served to change mentality. The digital transformation of medical services, which previously many professionals and patients approached with suspicion, is now greeted with great expectations.

One of the most recent reports on the state of the art of Digital Health in Italy is provided by the Digital Innovation in Health Observatory of the Milan Polytechnic⁴⁰. According to the report, 2020 saw a great advance in digitized medical services. If up to the pandemic, teleconsultation was for example used by 21% of specialist doctors and 12% of general practitioners, with the advent of restrictions it has gone to 47% of use by specialists and 39% for the GPs. Looking ahead, eight out of ten doctors plan to use it in the near future. There is also a sharp increase in the adoption of Televisita, which has gone from 10% of use to 40% for both categories of doctors (specialists and general practitioners). Two thirds of the doctors also stated that they wanted to adopt it on a permanent basis. Continuing with the analysis, in the period considered by the research, Telemonitoring went from a use of 13% for both categories of doctors to 28% for specialists and 43% for general practitioners. The forecast is that Telemonitoring will be used in the future by 64% of specialists and even by 82% of GPs. After familiarizing themselves with this type of services, professionals are therefore ready to integrate them into their work. According to medical specialists, thanks to Telemedicine it would be possible to remotely move about 20% of the check-ups of chronic patients, with great organizational and economic benefits. According to the same research, spending on digital health in 2020 in Italy reached the figure of about 1.5 billion euros, 1.2% of total public health expenditure. However, the digital evolution of healthcare is a process that must be "educated". One of the biggest obstacles to its success is the poor digital skills of professionals. According to the Observatory's research, 60% of specialists and GPs have sufficient basic digital skills, but only 4% of them have a good level of knowledge of professional digital services.

⁴⁰ Sanità Digitale oltre l'emergenza: più connessi per ripartire, 2021

Digital Health and Telemedicine have therefore become hot topics on the Italian political agenda. Public decision makers are understanding how crucial it is to renew the health system by ensuring continuity of care, even at home, and thus integrating the hospital and the local area. Digital Health services in Italy are experiencing a period of interesting development. New technologies have helped the health sector to adapt to the difficulties of the pandemic, reshaping its processes and methods of treatment. The present is therefore the right time to take a further leap forward. The historical, regulatory and technological context puts the health system in the ideal conditions to accelerate innovation. Not taking advantage of these great opportunities would be detrimental to health care and especially to citizens. Digital Health services must belong to the “new normal” of health, providing solutions to respond with quality, speed and personalization of care to people's health demands.

3.3 Differences in quality of care between public and private hospitals in Italy

One of the most debated topics regarding public and private hospitals is whether the two sectors can provide patients with comparable quality of care or whether the private sector can outperform the public sector due to the availability of more advanced technologies. In this regard, this paragraph will examine a series of indicators deemed relevant due to the number of cases to which they refer or the impact on the health of citizens that is particularly significant. To ensure the significance and homogeneity of the comparison, the "ADJ" results from the PNE, i.e., those resulting from the AGENAS-approved adjustment procedure for "raw" data, were utilised⁴¹. The "Risk adjustment" procedure uses correction coefficients of the raw data, taking into account various confounding factors, such as gender, age, and a series of comorbidities present in the hospitalisation episode under study and in hospitalizations that occurred in the two preceding years.

⁴¹ Agenas, Programma Nazionale Esiti 2020

Indicators	Number of cases processed					Average ADJ. outcomes		
	Total Italian cases	Public sector		Private sector		National mean	Private hospitals mean	P value
		Nr. of cases	%	Nr. of cases	%			
Valvuloplasty or replacement of the heart valve: mortality after 30 days.	43.658	23.230	53,21	20.428	46,79	2,27	1,98	0,0192
Coronary artery bypass graft: mortality after 30 days.	26.664	15.904	59,65	10.760	40,35	1,85	1,6	
Congestive heart failure: mortality after 30 days.	123.900	97.924	79,03	25.976	20,97	10,11	8,34	0
Congestive heart failure: readmissions after 30 days.	93.382	74.081	79,33	19.301	20,67	14,24	13,13	0
Acute myocardial infarction: mortality after 30 days.	85.875	76.351	88,91	9.524	11,09	7,82	7,64	
Acute Myocardial Infarction: % patients treated with PTCA within 2 days	85.875	76.305	88,86	9.570	11,14	51,32	60,26	0
Unruptured abdominal aorta aneurysm repair: mortality after 30 days.	17.007	13.079	76,9	3.928	23,1	1,53	1,42	
Arteriopathy lower limbs III ° and IV ° mortality at 6 months	9.120	6.527	71,57	2.593	28,43	13,15	9,83	0
Arteriopathy lower limbs III ° and IV ° degree revascularization at 6 months	7.820	5.502	70,36	2.318	29,64	17,45	16,05	
Arteriopathy lower limbs III ° and IV ° degree amputations at 6 months	7.820	5.494	70,26	2.326	29,74	4,56	3,54	0,034
Pulmonary embolism: mortality 30 days after hospitalization	19.073	16.875	88,48	2.198	11,52	8,88	10,74	0,0042
Pulmonary embolism: readmissions 30 days after admission	17.888	15.846	88,58	2.042	11,42	9,27	8,46	
Ischemic stroke: readmissions after 30 days	53.840	48.022	89,19	5.818	10,81	7,37	6,97	
Ischemic stroke: mortality at 30 days	57.733	51.550	89,29	6.183	10,71	9,72	6,9	0

Brain cancer: mortality at 30 days. from intervention of craniotomy	30.142	24.689	81,91	5.453	18,09	2,56	2,11	0,05
Laparoscopic cholecystectomy: post-operative hospital stay <3 days	63.897	44.283	69,3	19.614	30,7	80,48	85,15	0
Ordinary cholecystectomy: complications after 30 days	129.939	90.221	69,43	39.718	30,57	2,09	1,5	0
Non-varicose haemorrhage of the upper intestinal tract: mortality after 30 days	47.241	41.627	88,12	5.614	11,88	4,07	3,7	
Knee prosthesis: readmissions after 30 days	60.524	17.417	28,78	43.107	71,22	1,27	1,18	
Knee prosthesis: revision within 2 years of surgery	55.287	17.673	31,97	37.614	68,03	2,71	2,78	
Knee arthroscopy: reoperation within 6 months	98.693	34.602	35,06	64.091	64,94	0,99	0,98	
Hip replacement: readmissions after 30 days	79.785	43.854	54,97	35.931	45,03	3,51	2,85	0
Hip prosthesis: revision within 2 years of surgery	82.450	48.278	58,55	34.172	41,45	1,78	1,78	
Shoulder prosthesis: readmissions after 30 days	17.203	7.424	43,16	9.779	56,84	1,34	1,14	
Fracture of the femoral neck: mortality at 30 days	72.941	64.741	88,76	8.200	11,24	5,11	5,22	
Fracture of the femoral neck in over 65s: surgery within 2 days.	72.627	64.475	88,78	8.152	11,22	66,95	73,25	0
Tibia and fibula fracture: days to wait for surgery	11.163	9.761	87,44	1.402	12,56	3	2	0,0348

Proportion of deliveries with primary caesarean section	313.823	257.820	82,15	56.003	17,85	22,68	30	0
Caesarean delivery: complications during childbirth and the puerperium	253.139	191.727	75,74	61.412	24,26	1,24	0,57	0
Natural childbirth: complications during childbirth and the puerperium	503.556	418.831	83,17	84.725	16,83	0,61	0,47	0
Colon cancer surgery: mortality at 30 days	47.475	37.182	78,32	10.293	21,68	3,95	3,51	0,0358
Lung cancer surgery: mortality at 30 days	27.055	21.162	78,22	5.893	21,78	1,08	1,29	
Stomach cancer surgery: 30-day mortality	16.867	13.130	77,84	3.737	22,16	4,54	4,14	
Rectal cancer surgery: mortality at 30 days	16.766	12.271	73,19	4.495	26,81	1,39	1,23	
Prostate cancer surgery: readmissions at 30 days	17.249	11.517	66,77	5.732	33,23	4,59	4,52	
Kidney cancer surgery: 30-day mortality	31.444	24.019	76,39	7.425	23,61	0,87	0,51	0,0018
Pancreas cancer surgery: mortality at 30 days	7.162	5.299	73,99	1.863	26,01	3,82	2,84	0,0434
Liver cancer surgery: 30-day mortality	12.379	9.548	77,13	2.800	22,62	1,84	1,49	
Resection operations within 120 days breast cancer conservative intervention	36.791	26.663	72,47	10.128	27,53	6,2	5,06	0
COPD exacerbated: mortality at 30 days	73.684	60.523	82,14	13.161	17,86	9,69	6,04	0
COPD exacerbated: hospital admissions at 30 days	69.169	56.499	81,68	12.670	18,32	13,28	10,55	0

Chronic renal failure: mortality 30 days after admission	134.902	112.107	83,1	22.795	16,9	12,14	8,65	0
TOTAL # CASES	3.033.008	2.294.033	75,64	738.944	24,36			

The data indicate that private hospitals performed better than the national average (public + private) for 36 of the 42 analysed indicators; for 5 indicators, the national averages performed better; and for 1 indicator, the means were equal.

The cardiovascular clinical area includes 12 indicators that will be listed and analysed in the analysis.

- In the indicator “Valvuloplasty or replacement of the heart valve: mortality after 30 days” ADJ data for the private sector are available for 10 regions; in the remaining regions, no hospital has performed at least 50 interventions, the minimum number required by Agenas for calculating the ADJ outcome in the remaining regions, no hospitals have performed at least 50 interventions, the threshold set by Agenas for calculating the ADJ outcome. In seven of ten regions, the private sector produced better results than the public sector (only Emilia-Romagna, Puglia and Calabria recorded better results in the public sector). In the public sector, values range from 1.24 to 4.20, and in the private sector, they range from 1.02 to 3.85.
- The "Coronary Artery Bypass graft: mortality after 30 days" indicator is available for the private sector in ten regions; only in Calabria is the clinical outcome superior in the public sector. The difference in performance between the public sector and the private sector appears to be substantial; the dispersion of the value of the results across the Regions in the two sectors is quite comparable, with values ranging from 0.88 to 2.90 in the public sector and from 0.43 to 2.46 in the private sector.

- 15 regions have available ADJ data for the indicator "Congestive Heart Failure: mortality after 30 days" for private sector hospitals; 13 of these regions have better results than the public sector. Only Piedmont and Veneto have better public results. The difference between the averages of the public and private sectors appears to be significant (2.39 percentage points); for the public sector, the dispersion between regions ranges from a minimum of 8.40 to a maximum of 17.98 and for the private sector, from 3.68 to 12. In the public sector, regions with the highest volume of cases treated produce the best results; in the private sector, the opposite is true.
- For the indicator "Congestive heart failure: readmissions after 30 days," the disparities between the public and private sectors are smaller; the respective averages are 14.42 and 13.3. In eleven regions, the private sector performed better. Lazio and Veneto are the only two regions that perform better in the public sector.
- The number of regions for which ADJ data are available in the private sector for the indicator "Acute Myocardial Infarction: mortality after 30 days" is ten; the outcome is superior in five regions in the public sector and five regions in the private sector. Liguria, Emilia-Romagna, Puglia, Sicily, and Sardinia are the regions that achieve the best results in the public sector. The missing Regions did not process the minimum of 50 cases required for the private sector ADJ calculation. In the public sector, the dispersion between regions is quite contained (from a minimum of 6.94 to a maximum of 9.59 with a difference of 2.65 points), whereas in the private sector, despite the presence of a better national average, it ranges from 1.14 to the extremely dispersed value of Emilia R. (22.39), who has treated a small number of cases (72).
- In the "Acute Myocardial Infarction: % of patients treated with PTCA within 2 days" indicator, the percentage of patients treated with PTCA increased significantly in the public sector (+2.48 percentage points) compared to the previous year, while it decreased slightly in the private sector (-0.51 percentage points). In addition to this evidence, it should be noted that a Region's private sector unemployment rate is particularly low (22.38). As was noted last year, Puglia, which has a high rate of PTCA (71.07), also records a high rate of mortality in the private sector (10.55 compared to an average of 7.64 in the private sector). Only Lazio and Sicily outperformed the other eight analysed regions in the public sector.
- For the indicator "Unruptured abdominal aorta aneurysm repair: mortality after 30 days." private sector related ADJ data are available for nine regions. Consider that five regions in the private sector have treated a small number of cases (between 54 and 124). For this indicator, higher volumes of cases treated in both the public and private sectors indicate improved

outcomes. The four regions with the best public sector performance are Veneto, Lazio, Campania, and Sicily.

- In the indicator "Arteriopathy of the lower limbs III and IV stage - mortality at 6 months," the volumes treated at the national level are quite low (just over 9,000 cases over a two-year period); however, the analysis of the outcomes appears appropriate given the high rates of mortality, revascularization, and limb amputation in nearly all regions, both public and private. No region, however, performs better in the public sector on average.
- Contrary to what is found for the mortality indicator, that of revascularizations records higher values in the private sector than in the public; in fact, only Calabria and Sicily recorded a better outcome, with a limited number of cases (respectively 47 and 109); in the public sector, Molise has not recorded any cases of revascularization.
- In the indicator "Arteriopathy lower limbs III and IV stage: amputations at 6 months," contrary to the previous indicator but consistent with the mortality index, the outcome relating to amputations is better in private hospitals in all regions except Calabria.
- For only eight regions are ADJ data for the indicator "Pulmonary embolism: mortality at 30 days after hospitalisation" available for the private sector, which has an overall significantly worse weighted average than the public sector. In fact, only Piedmont and Veneto achieve better results in the private sector, where there is a much greater dispersion of values. In the public sector, values range from a minimum of 7.56 to a maximum of 14.01, whereas in the private sector, values range from 6.94 to 28.00. However, it should be noted that, with the exception of Lombardy and Lazio, the private sector handles a very small number of cases.
- For the private sector indicator "Pulmonary embolism: readmissions 30 days after hospitalisation," there are only seven regions with ADJ data. The weighted averages of the two sectors are quite similar, whereas their medians are quite different; the median of the private sector, which is significantly lower, is influenced by the value of 0 recorded by two regions. Veneto Lazio and Puglia achieve the best public sector results.

Only "Arteriopathy lower limbs III and IV stage - revascularization at 6 months" and "Pulmonary embolism: mortality at 30 days after hospitalisation" of the 12 indicators analysed in the cardiovascular clinical area showed better results in the public sector, while the other 10 indicators clearly favour the private sector.

Regarding the cerebrovascular clinical area, three indicators are considered.

- In the indicator titled "Ischemic Stroke: readmissions after 30 days" the proportion of cases treated by the private sector is notably constrained. Four regions in the public sector (Lombardy, Lazio, Campania, and Sicily) and six regions in the private sector (Lombardy, Lazio, Campania, and Sicily) achieved better results (Piedmont, Veneto, Liguria, Molise, Puglia and Sardinia). The values are very similar; the respective weighted averages are 6.93 and 6.97.
- The same applies to the "Ischemic Stroke: mortality at 30 days" indicator as it pertains to the low percentage of cases treated by the private sector at the national level. Unlike the previous indicator, mortality rates in the private sector are lower in all regions. The weighted average for the public sector is 10.94 and for the private sector it is 6.90.
- Private sector outcomes for the indicator " brain cancer: mortality at 30 days from intervention of craniotomy" are only available for seven regions. The weighted averages of the two industries are not dissimilar. There are better results in the private sector for four regions (Lombardy, Emilia Romagna, Lazio, and Sicily) and in the public sector for two regions (Liguria and Puglia); no data are available for Molise in the public sector.

Only in the "Ischemic Stroke: readmissions after 30 days" indicator did the public sector perform better than the private sector among the three cerebrovascular clinical indicators.

Regarding the clinical area of the digestive tract, there are three indicators to consider.

- In both the public and private sectors, the "Laparoscopic Cholecystectomy: post-operative hospital stay <3 days " indicator has steadily improved over the years; between 2018 and 2019, the improvement was 2.36 percentage points in the public sector and 1.73 percentage points in the private sector. Given that only Friuli and Marche perform better in the public sector, the private sector proved to be significantly more efficient.
- In the indicator " Ordinary cholecystectomy: complications after 30 days" the private sector has a significantly better weighted average than the public sector. Similarly, for this indicator, volume does not always correlate with performance (see Lombardy in the public sector and Lazio and Lombardy in the private sector). Only Liguria achieves a better result among the public than the other 15 regions considered for this indicator.
- The threshold for calculating the "adj" outcome for the indicator " Non-varicose haemorrhage of the upper intestinal tract: mortality after 30 days" is 100 cases; as a result, data from only eight regions are available in the private sector. Only Lazio, Liguria, and Puglia achieve better

results in the private sector, where the proportion of cases treated by the private sector is notably low.

Considering that the private sector predominates in two of the three indicators under consideration, the three indicators reveal how the private sector is able to achieve better results than the public sector.

Regarding the clinical area of musculoskeletal health, seven indicators are considered.

- In the indicator "Knee prostheses: readmissions after 30 days," the proportion of cases treated in the private sector is substantial; in the 19 regions with "adjust" data, it exceeds 70 percent of the national total. The private sector's 15 regions with the best results. Lazio, Campania, Puglia, and the Autonomous Province of Trento are the only regions with better performance in the public sector.
- In eleven regions, the private sector performs worse on the "Knee prosthesis: revision within 2 years of surgery" indicator. The performance levels of the two knee replacement indicators differ significantly.
- There are no "adj" results for the indicator "Knee arthroscopy: reoperation within 6 months" for four regions. At the national level, the weighted averages are very close; however, in ten out of fifteen regions, the private sector performs better. Emilia-Romagna, Tuscany, Umbria, Marche, and Lazio are the five regions with the best public sector performance.
- In the indicator "Hip prostheses: readmissions after 30 days," the weighted averages of the public and private sectors diverge significantly, with the private sector's average being superior. Except for the autonomous province of Trento, the results are in fact better in all regions.
- The public sector has better results for the indicator "Hip replacement: revision within 2 years of surgery" in eleven regions, with a weighted average of 1.74 compared to the private sector's average of 1.78.
- In the data "Shoulder prostheses: readmissions after 30 days," the average results were better in the public sector in only three out of fifteen regions (Tuscany, Puglia, and Abruzzo); for two regions, "adj" results were not available (Liguria and Calabria).
- The weighted averages of the two sectors for the indicator "Fracture of the femoral neck: mortality at 30 days" are very similar; however, the dispersion of values is greater in the private sector, where it ranges from a minimum of 3.00 to a maximum of 7.60, whereas in the public sector the minimum is 3.92 and the maximum is 6.80.

- There have been significant improvements in the indicator "Fracture of femoral neck in over 65: surgery within 2 days" over the years; however, in the last year only the public sector improved (+0.80%), while the private sector recorded a slight decline (-0.44%). Noting that the national average for the private sector is 73.25 percent, it is important to note that in five out of nine regions, the value is less than 70 percent; therefore, there are still substantial opportunities for improvement. Only Campania and Puglia, out of the nine regions considered, are able to perform better in the public sector.

Only the indicators "Knee prosthesis: revision within 2 years of surgery" and "Hip prosthesis: revision within 2 years of surgery" have better weighted averages in the public sector than in the private sector out of the seven indicators considered for the musculoskeletal clinical area.

Regarding the perinatal clinical area, three indicators are considered.

- In the indicator " Proportion of deliveries with primary caesarean section " it is necessary to account for the variable of the minimum number of annual births required for hospital accreditation, for which the private sector has only nine regions. Only Liguria achieves better outcomes in the private sector than in the public sector. In contrast, the national weighted average of the private sector has improved significantly over the past three years, dropping from 35.7% in 2017 to 30.0% in 2019. In this context, the negative result of Campania is emphasised, which in 2019 recorded over 41% of primary caesarean sections, influencing the result of the entire private sector, given that it treats 29% of all private sector cases.
- In the indicator " Caesarean delivery: complications during childbirth and the puerperium" for the two-year period 2018/2019 at the national level, the private sector records a lower percentage of complications during childbirth and the puerperium compared to a higher percentage of caesarean sections. Significant data from Campania reveal a high rate of primary caesarean sections (over 41%) and a low rate of complications (0.38 compared to 0.89 at the national level). Compared to the private sector, only the Veneto is capable of achieving remarkable public sector results.
- In addition, the data for the indicator " Natural childbirth: complications during childbirth and the puerperium" pertain to the two-year period 2018-2019. There are six out of ten regions (Veneto, Friuli, Liguria, Lazio, Campania, and Sardinia) that obtain better results from their public hospitals. However, the weighted averages of the two sectors are very close, with the private sector having a slightly better weighted average (0.47 against 0.61 for the public).

However, it should be noted that that of the public sector is negatively impacted by the result in Lombardy, which has a significantly higher number of parties than the other regions.

Regarding the perinatal clinical area, the two sectors are very similar, and the prevalence of one sector versus the other depends heavily on the relevant indicator.

In the clinical area of Surgical Procedures - Malignant Tumour Interventions, nine indicators were considered.

- Out of 14 regions, four in the public sector (Veneto, Liguria, Puglia, and Sardinia) and ten in the private sector (Piedmont, Lombardy, Friuli Venezia Giulia, Marche, Lazio, Abruzzo, Molise, Campania, and Basilicata and Sicily) have the best results for the indicator " Colon cancer surgery: mortality at 30 days"; the weighted average However, the dispersion is substantial, with results ranging from 0 in Marche to 6.60 in Liguria. In the public sector, the Molise region records a highly dispersed value, but there are only a handful of "adj" cases (68).
- In only seven regions do private hospitals reach the 100-case threshold used by Agenas to calculate the "adj" outcome for the indicator " Lung cancer surgery: mortality at 30 days " At the national level, the weighted averages of the two sectors are very close; four regions (Lombardy, Veneto, Campania, and Puglia) have better results in the public sector, and three regions have better results in the private sector (Lazio, Abruzzo and Sicily).
- For the indicator "Stomach cancer surgery: mortality at 30 days," private hospitals treated more patients than the threshold of 50 established for calculating the ADJ figure in only four regions. In Lazio and Puglia, the public sector is more successful than the private sector; in the other two regions, the private sector is more successful (Lombardy and Sicily). The values are centred on the median and the averages are relatively close.
- In the indicator "Rectal cancer surgery: mortality at 30 days" there are six regions in which hospitals in the private sector have registered at least 50 cases for the calculation of the "adj" outcome. For the private sector, the weighted average of the regions considered is significantly higher. There is only one Lazio region with better public sector results. To maintain a low mortality rate, Lombardy's private sector treatment of over 35 percent of cases is decisive.
- The weighted averages of the two sectors for the indicator " Prostate cancer surgery: readmissions at 30 days" are comparable: 4.74 for the public sector and 4.51 for the private sector. Even in 2019, regions with a high volume of cases treated recorded worse-than-average outcomes, both in the public and private sectors; a deeper analysis revealed that within each region, there are significant disparities between public and private hospitals.

- In the indicator "Kidney cancer surgery: mortality at 30 days," the national weighted average of mortality in the private sector is half that of the public sector, with only two regions (Liguria and Puglia) out of nine achieving better outcomes than the private sector. In the private sector, three regions with a total of 400 cases treated reported zero results; this helps determine the mean.
- In the indicator "Pancreas cancer surgery: mortality at 30 days," "adj" outcomes are only available for four regions in the private sector. The private sector has a weighted average of 2.84 compared to 3.06 for the public sector.
- There are a total of six regions for which "adj" outcomes are available for the indicator " Liver cancer surgery: 30-day mortality". Four regions in the private sector (Piedmont, Lombardy, Lazio, and Sicily) have better outcomes than two regions in the public sector (Liguria and Puglia). Deepening the analysis at the level of individual hospitals, it was discovered that the treatment of cases in both sectors is significantly dispersed, with many hospitals treating only a handful of cases per year.
- 12 regions have "adj" results for the indicator " Resection operations within 120 days breast cancer conservative intervention" in the private sector. In ten regions, the private sector has a higher weighted average; only Piedmont and Veneto have higher values in the public sector.

Regarding the clinical area, surgical procedures on the nine indicators considered, the public sector achieves better results on average only for the two indicators "Stomach cancer surgery: mortality at 30 days" and "Lung cancer surgery: mortality at 30 days."

The last two indicators to be analysed pertain to the clinical area of Respiratory.

- Public sector outcomes for the indicator "Exacerbated COPD: mortality at 30 days" were superior in only 2 of 13 regions for which "adjust" outcomes were available (Liguria and Sardinia). Consequently, there is a substantial disparity between the national averages of the two industries.
- In the indicator "Exacerbated COPD: readmissions after 30 days," although the disparity between the public and private sectors is less pronounced than in the previous indicator, it continues to favour the private sector. In reality, only five regions (Piedmont, Veneto, Liguria, Sicily, and Sardinia) achieve better public sector results⁴².

⁴² RAPPORTO SULLA QUALITÀ DEGLI OUTCOMES CLINICI NEGLI OSPEDALI ITALIANI SU DATI PROGRAMMA NAZIONALE ESITI 2020

Similarly, the private sector dominates the public sector in the clinical field of respiratory medicine.

The result from this analysis tells that there is a huge predominance of the private sector over public hospitals in almost every clinical area.

3.3.1 Lazio Region

Over the last two decades, there has been increasing interest in the development and implementation of outcome and process indicators. Such indicators encourage accountability and improvements in the quality of health care services; they also guide accreditation and health care planning interventions. Public and private organizations, as well as research projects, have used different indicators for comparative evaluation of the performance of healthcare providers and professionals. Some have released their results to the public in the form of web-based reports that compare hospital quality. In Italy, national and regional outcome research programs have been conducted, but there has been no systematic comparison of outcomes at the national level. The Lazio Region started to conduct a Regional Outcome Evaluation Program, called P.Re.Val.E. P.Re.Val.E. is the most comprehensive comparative evaluation of regional healthcare outcomes and the only Italian study to publicly disclose performance data. P.Re.Val.E. aims to define and measure the outcomes of health interventions, measure the variability of outcome between structures and geographical areas, identify critical areas on which to implement programs to improve the quality of care, and monitor the progress of the quality of care over time. The Program has developed and monitors 70 outcome indicators, grouped into 9 clinical areas: cardiology, surgery, gastroenterology, orthopaedics, pulmonology, neurology, gynaecology / obstetrics, territorial care and oncology, taking into account the different characteristics and severity of patients for a correct comparison between hospitals or geographic areas. The P.Re.Val.E., together with some critical issues, also identifies many excellences and above all wants to be a tool for discussion, in the belief that the great health and professional skills present in the hospitals of Lazio will be able to use these results to enhance the great potential for improvement in a process of virtuous competition for efficacy and equity in health protection. Into P.Re.Val.E all hospitals are analysed and so it is possible to make a comparison between main hospitals in the region also in order to understand quality differences between private and public hospitals in the provision of care.

The Campus Bio-Medico University Hospital and the Umberto I Hospital, two of the most important hospitals in the Lazio region, were selected from the P.Re.Val.E portal in order to collect data for this study. They are a private hospital and a public hospital, respectively. The selection of the two hospitals was based on the high number of cases treated and the fact that they share a large number of indicators

for purposes of comparison. Regarding the selection of indicators, this was based on the indicators that allowed for an accurate comparison between the two hospitals. In reality, not all hospitals have the same indicators, as a certain number of cases must be treated in order to generate a statistic, or because the two hospitals do not necessarily have the same departments; for instance, the Campus Bio-Medico University Hospital lacked perinatal clinical area data⁴³.

INDICATORS	CAMPUS BIOMEDICO			UMBERTO I		
	N (n/N)	% ADJ	P	N(n/N)	% ADJ	P
Acute Myocardial Infarction: mortality after 30 days (access facility)	53	12.50	0.229	175	5.97	0.424
Acute Myocardial Infarction: mortality after 30 days (hospitalization facility)	67	16.66	0.016	184	6.21	0.490
Valvuloplasty or replacement of the heart valve: mortality after 30 days	371	1.78	0.520	141	1.40	0.417
Congestive heart failure: Mortality after 30 days	110	16.39	0.175	275	11.31	0.808
Congestive heart failure: readmissions after 30 days	105	20.43	0.061	254	14.38	0.875
Arteriopathy lower limbs III ° and IV ° degree revascularization at 6 months	40	12.47	0.494	28	7.12	0.216
Arteriopathy lower limbs III ° and IV ° mortality at 6 months	47	12.49	0.837	31	11.31	0.774
Valvuloplasty or heart valve replacement performed via the catheter route: mortality at 30 days	113	2.56	0.722	68	1.16	0.343
Valvuloplasty or heart valve replacement performed with open technique: mortality at 30 days (analysis with clinical variables)	258	0.95	0.387	73	1.14	0.602
Ischemic stroke: mortality at 30 days	81	2.30	0.025	309	11.50	0.951
Ischemic stroke: readmissions after 30 days	201	4.94	0.122	271	6.29	0.312
Ischemic stroke: Proportion of hospitalizations followed within 30 days of a hospitalization in rehabilitation	200	36.90	0.195	269	37.43	0.090
Laparoscopic cholecystectomy: post-operative hospital stay < 3 days	348	90.71	0.000	199	58.54	0.000
Laparoscopic cholecystectomy: post-operative hospital stay < 1 day	349	2.15	0.000	199	3.42	0.000
Laparoscopic cholecystectomy: complications after 30 days	695	1.50	0.578	352	2.51	0.311

⁴³ Data extrapolated from the 2022 P.Re.Val.E

Laparoscopic cholecystectomy: another intervention at 30 days	695	4.66	0.000	351	3.47	0.129
Fracture of the femoral neck: mortality at 30 days	62	4.20	0.468	194	3.21	0.037
Fracture of the femoral neck: mortality at 30 days – Analysis with clinical variables	62	4.01	0.430	194	3.30	0.044
Fracture of the femoral neck: surgery within 48 hours - Analysis with clinical variables (hospitalization facility)	141	95.71	0.000	196	49.18	0.422
Fracture of the femoral neck: surgery within 48 hours - Analysis with clinical variables (access structure)	62	96.85	0.000	194	50.46	0.742
Hip replacement surgery: readmissions after 30 days	566	4.41	0.907	73	8.66	0.070
Hip replacement surgery: revision within 2 years of surgery	445	2.33	0.595	178	0.56	0.210
Lung cancer surgery: mortality at 30 days	351	2.49	0.144	368	2.27	0.240
Stomach cancer surgery: mortality at 30 days	75	5.91	0.999	85	4.31	0.553
Colon cancer surgery: mortality at 30 days	175	6.93	0.427	161	3.56	0.407
Kidney cancer surgery: mortality at 30 days	149	1.22	0.877	319	1.81	0.323
Prostate cancer surgery: mortality at 30 days	117	2.31	0.836	67	1.49	0.574
Proportion of new resection procedures within 120 days of conservative surgery for breast cancer	205	2.26	0.068	110	8.12	0.164
Proportion of reconstruction surgery or insertion of expander in index hospitalization for demolition surgery for invasive breast cancer	47	72.35	0.127	54	77.53	0.000
Proportion of new resection procedures within 90 days of conservative surgery for breast cancer	213	2.20	0.091	110	7.05	0.253
Prostate cancer surgery: readmissions at 30 days (with condensed staging)	117	2.05	0.693	67	1.54	0.598
Colon cancer surgery: mortality at 30 days (with condensed staging)	175	7.18	0.406	161	3.63	0.456
Proportion of new resection within 120 days of conservative breast cancer surgery (with condensed staging)	205	2.49	0.107	110	7.90	0.206
Proportion of reconstruction surgery, expander insertion or prosthesis implantation in index hospitalization for demolition surgery for invasive breast cancer	47	70.94	0.204	54	77.84	0.000

Proportion of new resection within 90 days of conservative breast cancer surgery (with condensed staging)	213	2.48	0.152	110	7.01	0.271
Mortality 30 days after first hospitalization for community pneumonia	391	25.21	0.913	1114	26.88	0.172

The comparison between the two hospitals demonstrates that the Umberto I Hospital in the cardiovascular clinical area achieves significantly better results in almost all indicators, with the exception of Valvuloplasty or heart valve replacement performed via open technique: mortality at 30 days (clinical variable analysis). In the cerebrovascular area, on the other hand, the situation is reversed in favour of the University Hospital Campus Bio-Medico; in fact, the three indicators considered are better at the private institution, culminating in "Ischemic stroke: 30-day mortality," where the University Hospital Campus Bio-Medico has an adj% of 2.30 compared to 11.50 at the Umberto I University Hospital. In the digestive clinical area, the two hospitals divide the four indicators into two equal groups, indeed as shown in the indicators "Laparoscopic cholecystectomy: post-operative hospital stay 3 days "and" Laparoscopic cholecystectomy: complications after 30 days "the Campus Bio-Medico has a higher efficiency, whereas for "Laparoscopic cholecystectomy: post-operative hospital stay 1 day "and Laparoscopic cholecystectomy: another intervention at 30 days" the Umberto I Hospital outperforms the Campus Bio-Medico. Also in terms of the musculoskeletal clinical area, the two hospitals divide the six indicators evenly, with Umberto I performing best in "Fracture of the femoral neck: mortality at 30 days," "Fracture of the femoral neck: mortality at 30 days - Analysis with clinical variables," and "Hip replacement surgery: revision within 2 years of surgery," while Campus Bio-Medico achieves better results in "Fracture of the femoral neck: mortality at 30 days - "Fracture of the femoral neck: surgery within 48 hours - Analysis with clinical variables (hospitalisation facility) ", " Hip replacement surgery: readmissions after 30 days ", and " Fracture of the femoral neck: surgery within 48 hours - Analysis with clinical variables (access structure) ". In the clinical area of Surgical Procedures - Malignant Tumour Interventions, the results of the two hospitals are comparable, as seven indicators favour Campus Bio-Medico and six favour Umberto I.

The analysis of the Lazio region demonstrates that in the region, the private sector does not predominate over the public sector, as is the case nationally. In fact, at the national level, private hospitals perform better in 36 out of 42 indicators, whereas the Umberto I, a public hospital, achieves the best results in 19 of the 36 indicators considered at the regional level. However, it should be noted

that, despite the fact that the public and private sectors are generally equivalent in Lazio region, the results may vary slightly depending on the hospitals considered.

3.4 Differences in digital health between public and private hospitals in Italy

One of the most significant "side effects" of the pandemic in Italy, as in the majority of countries affected by the health emergency, is the rapid adoption of digital health care devices and procedures. In fact, the pandemic has prompted states and health institutions to move toward digital health care models, with the goal of not only limiting infections, but also ensuring - despite restrictions on freedom of movement - the maintenance of adequate standards of healthcare assistance for users.

The 2010 Digital Agenda for Europe included digital health care as one of the goals to be attained by 2020 in order to prepare Europe for the long-term challenges "that an increasingly digitalized economy and society will bring". The document "Telemedicine - National Guidelines," published in 2012 by the Italian Ministry of Health, is also inspired by this basic approach, in which it is acknowledged that technological innovation can contribute to the overall reorganisation of health care, in particular by directing the shift of the focus of health care from the hospital to the local area, ensuring "equity in access to care in remote areas, support for the management of chronic conditions, and a channel for the dissemination of best practises," among other benefits. Nonetheless, despite the programmatic indications expressed in the Guidelines, digital health care has never truly established itself in Italy, with implementations remaining scattered and sporadic. In recent months, however, this picture has changed dramatically: the pandemic has given a decisive boost to the development of digital health services in Italy, as has been noted, recording 10 years of digital health evolution in 10 days.

In both the public and private sectors, there has been a rapid proliferation of positive e-Health experiences. For instance, the startup Paginemediche has made available a chatbot capable of providing, based on the patient's symptom description, information on the patient's state of health and recommendations for behaviour in the event of an infection risk. The ParkinsonCare app, on the other hand, provides Parkinson's patients with a free remote nursing service. The app managed 908 support interventions for Parkinson's patients and their families in the first four weeks, enabling effective remote nursing management in 74% of cases. On the public front, as part of the Innova for Italy project, a fast call was issued on March 24, 2020 to find apps and technical remote assistance solutions

for domestic patients, even for diseases unrelated to Covid-19. A total of 823 projects were submitted, with 500 relating to remote healthcare.

Concurrently, numerous health facilities have already organised themselves independently to experiment with telemedicine and tele-assistance techniques. For instance, the Chieti ASL has activated a remote monitoring system for Covid-19 patients in home fiduciary isolation in order to collect and record - via daily telephone contact - the detected parameters and manage any abnormalities. The system was acquired in 2017 to enable the medical specialists of the hospitals of Chieti and Lanciano to remotely "visit" the patients hospitalised in the two peripheral units and provide a teleconsultation quickly. This drastically reduces intervention time (a crucial factor in cases of strokes, heart attacks, and major traumas), eliminates the need for ambulance transfers, and prevents emergency rooms from becoming congested with remotely manageable green code situations.

The *Centro Cardiologico Monzino*, a private hospital, has activated a home, clinical and instrumental telemonitoring service for its medical staff, which is conducted using digital technologies developed by the hospital. The *Centro Cardiologico Monzino* was one of the pioneers of this service and has implemented numerous protocols for tele cardiological assistance. At Monzino, a Telecardiology Operations Center is active, which was established in 2000 to support the implementation of the post-cardiac surgery home rehabilitation project and has over time become increasingly specialised in the management of remote clinical issues. The hospital, which is staffed by specially trained medical and nursing personnel, is operational 24 hours a day, 365 days a year, ensuring a continuous teleconsulting service. The clinical conditions of patients are monitored in order to detect changes in their state of health early and to intervene expeditiously with the requisite therapeutic modifications. This is accomplished through specialist assessments conducted at home and scheduled and repeated telephone contacts. In addition, properly trained patients can easily record and transmit their electrocardiogram via telephone using the supplied small portable device.

The *IFO* in Rome has made available a teleconsultation service for oncological and dermatological examinations, follow-ups, and consultations. The path for the cancer patient is *OncOnline Regina Elena*, while the path for the dermatology patient is *DermOnline San Gallicano*⁴⁴. Private Outpatient Clinic is a service provided by San Raffaele Hospital. Telemedicine enables to request initial medical opinions and consultations from the surgical and medical teams, which are split up by clinical

⁴⁴ The Hospitaller Physiotherapeutic Institutes (IFO) are the public legal entity that since 1939 manages the Regina Elena National Cancer Institute (IRE) and the San Gallicano Dermatological Institute (ISG), Scientific * Hospitalization Institutes (IRCCS) mono-specialist, oncology and dermatology.

specialties, pathologies, body region/area of interest. Team visits in Telemedicine provide the following services:

- initial consultation, which consists of a written request with the option to include clinical documentation and a case description;
- video visit, in which the patient selects the date/time in the agenda by scheduling a video call, attaching clinical documentation and a request description, in order to discuss the clinical case.

Telemedicine enables the Campus Bio-Medico University Hospital to extend its services directly to the patient's home via the My Hospital Program. In fact, the telemedicine service has been operational since October 1, 2021, allowing patients to contact University Hospital specialists via computer or smartphone in a simple and secure manner.

Despite the fact that telemedicine is becoming increasingly widespread, it is often not widely adopted or uniformly used across the Italian territory or is used only for certain aspects. As an illustration, the Dono Svizzero Hospital in Formia (Latina) utilises telemedicine to treat patients on the Pontine islands and to transmit the results of examinations and analyses. However, this adoption of telemedicine is limited to the islands and has not been adopted for other purposes. Once the current state of emergency has passed, however, the development of digital health care cannot be left to the decentralised initiatives of individual health facilities and private organisations alone. As evidenced by the case of the Dono Svizzero Hospital, telemedicine is currently utilised in only a few instances. Private hospitals are able to provide more digital services than public hospitals, but they cannot provide a capillary service.

This chapter clarified the distinctions between public and private hospitals in two important areas: quality of care and digital health. Through a comprehensive analysis of the data provided by Agenas and P.Re.Val.E, a clear picture of the state of care quality has been obtained. In terms of quality of care, the private sector clearly dominates at the national level, whereas in the Lazio region, public and private hospitals are nearly on par, based on the sampled hospitals. There is not a widespread adoption of digital health by hospitals, as there are more isolated initiatives. In general, however, it appears that private hospitals are able to provide superior digital services, unrelated to the pandemic.

Conclusions

The purpose of this thesis was to analyse the role of private hospitals in various health systems in order to determine whether the private sector may perform better than the public sector, taking into account two factors, namely quality of care and digital health.

The paper began with an analysis of the three most prominent health care systems in the world: the American, German, and Italian systems. By analysing the type of insurance and hospitals present in the three countries, it was possible to comprehend the context in which public and private hospitals operate, allowing for a better understanding of why one type of hospital is more successful in one country than another.

The second chapter elaborated on the purpose of the thesis, which is to comprehend the differences between public and private hospitals. In fact, the second chapter was devoted to an analysis of the existing literature, particularly in terms of quality of care. Through this analysis of the relevant literature, it was determined that the results are inconsistent, as they are highly dependent on the indicators and countries in question. In Germany and Italy, private hospitals perform better than public hospitals in terms of readmission and mortality rates, whereas in France, public hospitals perform better than private hospitals. In contrast, the results for Digital Health are more uniform, as private hospitals have a distinct advantage over those in the public sector. The reason for this is that public hospitals do not have adequate budgets for the development of digital health tools. Consequently, the digital divide between the public and private sectors continues to widen.

The third chapter examined the distinctions between public and private hospitals in Italy. The analysis of the data revealed the private sector to be clearly superior to the public sector, with the private sector outperforming the public sector in nearly all of the indicators considered. The analysis conducted in the Lazio Region, on the other hand, yielded a different result. In fact, a comparison of the Umberto I Hospital and the Campus Bio-Medico University Hospital revealed that the Umberto I Hospital achieves marginally superior outcomes (19 indicators out of 36 are in favour of Umberto I Hospital). The comparison described is based on these two hospitals, but it cannot be ruled out that other hospitals may yield different results. Concerning digital health, it is noted that a digital health culture has not yet been fully developed in Italy, pending the completion of the PNRR mission, which specifically provides for the digitization of our society's most vital sectors, including healthcare. Individual initiatives continue to be heavily relied upon. Private hospitals often appear to be able to provide superior digital services than public hospitals, as evidenced by the prevalence of these

individual initiatives. We cannot rely solely on the private sector for digital health, so it is crucial that the public sector also makes significant strides in this regard for the good of the nation.

At the conclusion of the writing of this thesis, it is possible to answer the question posed at the outset, namely whether private hospitals can perform better than public hospitals in terms of the quality of care and digital health. In Italy, private hospitals achieve better results than public hospitals, both in terms of health indicators and the adoption of digital health tools, whereas in other countries, the results are more uncertain, particularly in terms of quality of care. In fact, results for digital health indicate that private hospitals perform significantly better than public hospitals or on par with them in almost all countries.

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Executive summary

1.THE ROLE OF PUBLIC AND PRIVATE HOSPITALS IN THE MAIN HEALTHCARE SYSTEMS

Health care services are offered by a variety of institutions, although hospitals are the primary providers. In accordance with their ownership, hospitals can be either private or public. They seek the same objective, which is the provision of health care services, but their characteristics are vastly distinct. Private hospitals are administered and financed by an individual or group. The owners are responsible for the day-to-day operations of the hospital, including compliance, management of funds, human resources, and equipment. Private hospitals can be classified as either for-profit or non-profit. Investors own profit-making hospitals. In contrast to hospitals that are not-for-profit, these facilities seek profits for their shareholders. These for-profit facilities are typically among the nation's highest-charging hospitals. Non-profit hospitals qualify as charities and are therefore exempt from paying property tax, state and federal income tax, and sales tax. In exchange for their tax-exempt status, non-profit hospitals are required to reinvest any surplus funds into their surrounding communities. The state entirely manages and finances public hospitals. Due to the low doctor-to-patient ratio, customised care may not be as efficient in public hospitals as it is in private hospitals. Due to the low cost of treatments, public hospitals attract a high number of patients, resulting in lengthy wait times. In each country, each of these two types of hospitals plays a different role and is of varying importance. Moreover, each country's healthcare system has a distinct structure that emphasises the private or public sector. In industrialised nations, primarily three healthcare systems were developed in the 20th century. In the United States, the system was founded on a combination of private insurance and public financing through Medicare and Medicaid, with no formal controls on the delivery of care. In Germany, social security plans dominated through a network of sickness funds providing insurance and largely governing delivery of care independently of the government. In Italy, healthcare is primarily administered and funded by the government and the market forces are reduced. The U.S. healthcare system is a combination of public and private, for-profit and non-profit insurers and health care providers. The federal government provides funding for public insurance programmes such as Medicare, Medicaid, the Children's Health Insurance Program and the Veterans Health

Administration. The federal government has only a negligible role in directly owning and supplying providers and it is not involved in healthcare planning. The U.S. Department of Health and Human Services is the primary federal agency responsible for health care services. In the United States, there is no universal health insurance coverage. It was estimated that in 2020, 91.4% of the population would be covered, leaving 28 million uninsured. Principal among the public insurance programmes are Medicare, Medicaid, the Children's Health Insurance Program and the Veterans Health Administration. Medicare guarantees the right to health care for all individuals aged 65 and older. Medicaid provides health coverage for low-income adults, children, pregnant women, the elderly, and individuals with disabilities. The Children's Health Insurance Program is a health insurance programme for low-income children whose families earn too much to qualify for Medicaid but cannot afford private insurance. Veterans Health Administration is the component of the United States Department of Veterans Affairs responsible for implementing the VA health programme through a nationalised health service in the United States, providing veterans with health care and ancillary health services. The Affordable Care Act, also known as Obamacare, represents the greatest expansion of the federal government's role in financing health care. The Affordable Care Act (ACA) established "shared responsibility" among government, employers, and individuals to guarantee that every American has access to affordable, high-quality health insurance. In 2022, there are 5,139 community hospitals in the United States, of which 19 % are government-owned, 24 % are for-profit, and 57 % are non-profit. In addition, there are 207 federal hospitals, 635 non-federal psychiatric hospitals, and 112 hospitals of other categories. Therefore, there are 6,093 hospitals in all. Private equity is a phenomenon that affects American hospitals. Private equity firms are corporations that invest in privately held companies. While many organisations engage in startups and small enterprises, an increasing number are supporting the healthcare sector. Private equity firms frequently acquire faltering healthcare systems or hospitals. Typically, they intervene when a hospital is failing to make a profit, when complying with rules is challenging, when a practise owner is retiring, or when a hospital offers an innovative service or product but requires financial assistance. Since 2015, investments in healthcare have more than tripled.

The German healthcare system, which dates to the 1880s and is the oldest in Europe, is a dual public-private system. This dual system is funded by both statutory health insurance and private health insurance. The German federal government has broad regulatory authority over health care but is not directly involved in care delivery. Universal health coverage occurred in 2007, when all citizens and permanent residents were required to carry either statutory or private health insurance. The current system provides comprehensive coverage for the entire population, as well as generous benefits.

Health insurance is provided by two subsystems: statutory health insurance (SHI), which consists of competing, non-profit, non-governmental health insurance plans known as sickness funds, and private health insurance. In Germany there are 1.914 hospitals. Hospitals are mainly private but are highly regulated. Public hospitals are 545 which represent just the 28% of the total. The remaining 72% of hospitals are private which are divided in 724 (38%) for-profit hospitals and 645 (34%) non-profit hospitals. In recent years, the number of private for-profit hospitals has increased. Since the early 1990s, the number of private for-profit hospitals has steadily increased, resulting in the emergence of a handful of major private hospital corporations. However, the lack of investment by the Federal States provides the greatest impetus to privatisation.

In countries such as Italy, United Kingdom and Nordic countries healthcare is considered as a fundamental right of citizens and the government is fully responsible for healthcare planning. Italy's health care system is a regionally based national health service (Sistema Sanitario Nazionale – SSN) that provides universal coverage free of charge at the point of service. Italy's National Health Service automatically covers all citizens and legal foreign residents. Italian NHS is a universalistic system which is founded on pillars like solidarity, equal access, equal distribution on resources independently from geographical location and human dignity. Organization and delivery of health services are decentralised, and the system is structured on three tiers: national, regional and local. At the national level, the Ministry of Health, on behalf of the National Government, establishes the fundamental principles and objectives of the health system, determines the core benefit package of nationally guaranteed health services (the so-called LEAs), allocates funds to the regions, and oversees the NHS. At the regional level, regions are responsible for ensuring the general objectives and fundamental principles of the national health care system through specialised health departments. In the State-Regions Conference, 19 regions and 2 autonomous provinces share planning and financing responsibilities with the central government and are solely responsible for providing public health and health-care services. At the local level, geographically based Local Health Authorities provide public health, community health services, and primary care directly to a defined population, as well as secondary and specialised care directly or through either public hospitals or accredited private providers.

Since the SSN does not permit individuals to opt out of the system and seek only private care, there is no substitute insurance. However, complementary and additional private health insurance play a limited role in the health system.

The public system is primarily financed by two mechanisms:

- A national corporate tax that is redistributed back to the regions. Typically, corporate tax allocations are proportional to a region's contributions. There are substantial interregional differences in the corporate tax base, resulting in financing disparities.
- A fixed percentage of the national value-added tax revenue collected by the central government and redistributed to regions with insufficient resources to provide essential services.

There are two types of private health insurance:

- Corporate, where companies cover employees and sometimes their families.
- Non corporate, where individuals purchase coverage for themselves or their families. For-profit and not-for-profit organisations offer either collective or individual policies. Mutual insurance organisations, corporate and collective funds organised by employers or professional associations for their employees or members, and mutual insurance organisations make up the market. The majority of insured individuals are covered by non-profits.

There are a total of 1004 hospitals within Italy's national healthcare system. They are decreasing as there were 1049 hospitals in 2015. The number of hospitals is comprised of 516 public hospitals (51.4% of the total) and 488 accredited private hospitals (48.6 %). There are also 61 private hospitals that are not accredited. There are very old infrastructures in Italy, so the NHS is now focusing on new technologies and infrastructure renovation. The government has focused on the future of the health care system in recent months, aiming to restructure the investment plan for Next Generation EU funds, reserving a substantial portion for healthcare construction. The *Missione Salute* ("Health Mission") section of the Italian Recovery Plan (PNRR) calls for an investment of €15.63 billion in the country's national healthcare system. In addition to community health services and telemedicine, the Draghi government will allocate €7 billion for hospital development.

2. DIFFERENCES IN QUALITY OF CARE AND DIGITAL HEALTH BETWEEN PUBLIC AND PRIVATE HOSPITALS

The dual system, which includes both public and private hospitals in the delivery of health care, has always been highly controversial due to concerns that the two types of hospitals cannot provide

uniformly high-quality services to patients. Particularly debated is the role of the private sector in the health care system. Under competitive pressure and favourable conditions, private hospitals could theoretically perform better than public hospitals. This is due to the fact that private hospitals have unrestricted budgets, and as a direct result, they are known for providing quality service in which patients receive individualised care and attention, and do not have to wait long periods to be seen because the number of patients per doctor is low. In addition, the common perception in the NHS versus private healthcare debate is that if you pay for medical care, then you will have a superior treatment. Due to the unrestricted budget also the use of technology in private hospitals could be superior with obvious advantages for patients in terms of digital health. A crucial factor in determining whether policymakers should engage private providers is the extent to which their quality exceeds or falls short of that of public providers. Economic theory offers contradictory forecasts as to whether private hospitals are superior or inferior to public hospitals in terms of quality. Literature has identified various mechanisms that operate in opposite directions. Private hospitals may sacrifice quality in order to generate a greater financial surplus because they have a greater incentive to maximise profits. In addition, private providers may have a greater financial incentive to avoid treating expensive patients, which could result in skewed quality measures in favour of private providers. On the other hand, precisely because they are more profit-driven, they have a stronger incentive to compete for demand by increasing quality if demand is elastic enough. Consequently, this topic's results are contradictory, making it challenging to reach a conclusion. Clearly, the results of these studies do not point in a single direction. Indeed, countries have varying results, but even within a single nation the outcomes vary considerably. Private hospitals may perform better on observable quality outcomes, such as mortality and readmission rates in Germany and Italy. Private hospitals in France specialise in specific elective procedures. As a result of such specialisations, one might expect private hospitals to have better outcomes, but in France, the findings overwhelmingly favour public hospitals. This raises questions about the benefits of private hospital specialisation.

Digital health is the use of digital innovations and technologies for health-related purposes such as wellness, assistance, care, and drug delivery. Digital health technologies have the potential to significantly enhance the efficacy of health systems, both in terms of care delivery and system administration as a whole. Digital health can increase the health system's economic viability and expand population access to care. In other instances, entire economic sectors have been transformed by information and communication technologies. For many years, health systems have made efforts to facilitate and promote their use. Realizing the potential of digital tools in health care, however, has proven to be a lengthy, arduous, and complicated endeavour with mixed results. While there are

numerous examples of digital health innovations that have improved accessibility, quality, or efficiency, their widespread adoption in practise has been persistently challenging. Many of the greatest obstacles to adoption have not been technical in nature, but rather stem from difficulties in implementing changes to larger health and care processes. Inadequate investment, absence of a supportive and clear legal framework governing their use, health professionals' concerns over their use, gaps in planning and support for implementation, and insufficient leadership have all played crucial roles in inhibiting adoption in some nations. Digital health focuses on the use of information and communication technologies to improve processes of communication, such as electronic prescriptions or the electronic sharing of lab results, and information recording, in particular the transition to electronic health records and electronic databases to support information systems such as registries.

Prior to the COVID-19 pandemic, there was a large disparity across Europe in terms of digital health area and country-specific policy and strategy development. 70% of WHO Europe reporting countries had an eHealth policy or strategy in place in 2015, but only 27% have one for telehealth. Prior to COVID-19, the degree of adoption of digital health varied by application type and country. While 83% of responding WHO Europe Member States reported using teleradiology and 81% reported using social media for health promotion campaigns, only 59% had a national electronic health record system in place. Implementation and adoption of these tools in many nations of the region have been generally sluggish, and significant untapped potential remains. Individual, organisational, and system obstacles exist in the implementation of digital health technologies; they are not primarily technical. Introducing new technologies necessitates alterations to broader health and care processes, and the costs and benefits of such alterations are not uniformly distributed. For instance, the transition to electronic record keeping necessitates additional data entry effort from clinical staff, particularly nurses, resulting in system-wide benefits primarily felt by managers, administrators, and payers. Despite the fact that the technological aspect of digital health is vital and constantly evolving, putting it into practise is a challenge that necessitates the participation and support of all relevant stakeholders, just like any other significant system change. Digital health systems have evolved dramatically in terms of their potential and usability, including as a result of substantial investment through national and international programmes, such as the European Union's eHealth programmes. The digital revolution in healthcare in the United States is advancing steadily, propelled by federal government regulations and financial incentives, technological advancements, and the imperatives of enhancing treatment efficacy and reducing cost and economic impact. Obama changed the face of healthcare with the passage of the Health Information Technology for Economic and Clinical Health (HITECH) Act in

2009. The law provided financial incentives for providers to implement health information technologies and monetary sanctions for those who did not. Additionally, the persistent lockdowns and travel bans caused by the COVID-19 pandemic contributed to the widespread adoption of telehealth services. Due to the COVID-19 pandemic, the adoption rate of telemedicine has increased from 11% in February 2020 to 28% in April 2020 to 32% and 35% in June 2020 and July 2020, respectively. Moreover, the digital technology giants present in the United States, such as Google, IBM, and Apple, are continuously focusing on the development of solutions to improve the virtual healthcare experience with enhanced data security features, which also contributes to the growth of the market.

In terms of digital health, the private sector has a general advantage over public hospitals, although in some countries the two types of providers are on par. The reason for these statistics is that public hospitals typically have limited budgets and are therefore unable to develop digital health tools effectively, resulting in a growing digital divide between public and private hospitals. In Italy, no specific national laws regulate telehealth. Telemedicine is governed by the general Italian laws and regulations pertaining to healthcare services. Due to the lack of specific national regulations, telehealth services are utilised in private practise more frequently. In Germany groups that own large private hospitals are investing in electronic health records, additional patient services, and ways to increase efficiency. This is in contrast to public hospitals, whose extremely limited IT budgets prevent them from making investments until it is demonstrated that a digital solution can save money while maintaining or improving quality. In France the French government has chosen to make digital consultations available to everyone, and this objective is achievable by ensuring that both public and private providers have the same level of digitalization. In the USA the adoption of electronic health records (EHRs) and telehealth systems reveal a significant divide between public and private hospitals; from a digital health perspective, private hospitals are significantly more advanced. In England although public and private hospitals are adopting eHealth tools in a similar manner, the diffusion of telemedicine is not uniform between public and private hospitals, indeed, the Care Quality Commission, the regulator of private healthcare providers in the United Kingdom, had particular concerns with telemedicine for a long time, including lack of access to patients' records, identification of the patient and their key characteristics (gender, sex, and weight), and healthcare not being provided in real time and via text. As a result, private hospitals have been slower to adopt digital tools than public hospitals, and it is only due to pandemic needs that they have reached parity with the public sector.

3. THE ITALIAN SCENARIO

Italy has the second-highest life expectancy in Europe, despite significant regional, socioeconomic, and gender disparities. In general, the Italian health system is efficient and ensures good access to high-quality health services at relatively low costs, despite substantial regional disparities. Improving the coordination of health services for the growing segment of the population affected by chronic diseases and reducing inequalities in access to care are the primary challenges facing the Italian health system. In 2016, the number of deaths deemed potentially preventable through the use of health interventions was also one of the lowest in the EU, demonstrating the overall efficacy of the Italian health system in treating patients with life-threatening conditions. These positive results are attributable to relatively low mortality rates from ischemic heart disease, stroke, and colorectal cancer, which are significantly lower than the EU average, owing to the efficacy of treatments typically provided for these diseases. Later mortality rates demonstrate that the quality of acute hospital care for life-threatening conditions, such as acute myocardial infarction, has improved over the past decade and is now fully comparable to that of other EU countries. Italy's primary health care system is robust, allowing the country to meet the needs of an ageing population. Multiple regions are experimenting with new models of service delivery, with the establishment of territorial outpatient clinics and intermediate care facilities that lie between primary and hospital health care, thereby enhancing case management capacity and combining health care and social assistance services.

On July 13, 2021, the European Council approved the final version of the RRP. The RRP is part of the EU Next Generation program (NGEU), namely the €750 billion package of which €222 billion has been allocated to Italy. Through the RRP, the Italian government intends to invest €15.63 billion in the healthcare sector. Specifically, it intends to invest more than €2 billion in healthcare digitalization. In Italy the need for a more efficient National Health Service is quite imperative. Hence, it is interesting to see how digital technology fits in this framework, considering the resources allocated to foster digital healthcare and the perception of e-health among both professionals in the sector and patients. In the next few years, the expenditure on eHealth is expected to gradually increase. Most of the resources invested in this field are addressed to the digitalization of clinical departmental systems and the implementation of Electronic Health Record (Fascicolo Sanitario Elettronico). Until 2019, the diffusion of Digital Health services in Italy was quite contained. The Covid-19 pandemic gave a consistent acceleration to the digitalization of healthcare. The health emergency has in fact proved to be the engine of change, especially since Digital Health solutions have often proved to be

the only possibility of providing health services. Digital Health and Telemedicine have therefore become hot topics on the Italian political agenda. Public decision makers are understanding how crucial it is to renew the health system by ensuring continuity of care, even at home, and thus integrating the hospital and the local area. Digital Health services in Italy are experiencing a period of interesting development. New technologies have helped the health sector to adapt to the difficulties of the pandemic, reshaping its processes and methods of treatment. The present is therefore the right time to take a further leap forward. The historical, regulatory and technological context puts the health system in the ideal conditions to accelerate innovation. Not taking advantage of these great opportunities would be detrimental to health care and especially to citizens. Digital Health services must belong to the “new normal” of health, providing solutions to respond with quality, speed and personalization of care to people's health demands.

One of the most debated topics regarding public and private hospitals is whether the two sectors can provide patients with comparable quality of care or whether the private sector can outperform the public sector due to the availability of more advanced technologies. To understand this, a series of medical indicators have been examined from the data collected by AGENAS in the PNE 2020. To ensure the significance and homogeneity of the comparison, the "ADJ" results from the PNE, i.e., those resulting from the AGENAS-approved adjustment procedure for "raw" data, were utilised. The "Risk adjustment" procedure uses correction coefficients of the raw data, taking into account various confounding factors, such as gender, age, and a series of comorbidities present in the hospitalisation episode under study and in hospitalizations that occurred in the two preceding years. The data indicate that private hospitals performed better than the national average (public + private) for 36 of the 42 analysed indicators; for 5 indicators, the national averages performed better; and for 1 indicator, the means were equal. The results from this analysis tell that there is a huge predominance of the private sector over public hospitals in almost every clinical area.

The Lazio Region started to conduct a Regional Outcome Evaluation Program, called P.Re.Val.E. P.Re.Val.E. is the most comprehensive comparative evaluation of regional healthcare outcomes and the only Italian study to publicly disclose performance data. P.Re.Val.E. aims to define and measure the outcomes of health interventions, measure the variability of outcome between structures and geographical areas, identify critical areas on which to implement programs to improve the quality of care, and monitor the progress of the quality of care over time. Into P.Re.Val.E all hospitals are analysed and so it is possible to make a comparison between main hospitals in the region also in order to understand quality differences between private and public hospitals in the provision of care. The

Campus Bio-Medico University Hospital and the Umberto I Hospital, two of the most important hospitals in the Lazio region, were selected from the P.Re.Val.E portal in order to collect data for this study. They are a private hospital and a public hospital, respectively. The selection of the two hospitals was based on the high number of cases treated and the fact that they share a large number of indicators for purposes of comparison. Regarding the selection of indicators, this was based on the indicators that allowed for an accurate comparison between the two hospitals. In reality, not all hospitals have the same indicators, as a certain number of cases must be treated in order to generate a statistic, or because the two hospitals do not necessarily have the same departments; for instance, the Campus Bio-Medico University Hospital lacked perinatal clinical area data. The analysis of the Lazio region demonstrates that in the region, the private sector does not predominate over the public sector, as is the case nationally. In fact, at the national level, private hospitals perform better in 36 out of 42 indicators, whereas the Umberto I, a public hospital, achieves better results in 19 of the 36 indicators considered at the regional level. However, it should be noted that, despite the fact that the public and private sectors are generally equivalent in Lazio region, the results may vary slightly depending on the hospitals considered.

Digital health care has never truly established itself in Italy, with implementations remaining scattered and sporadic. In recent months, however, this picture has changed dramatically: the pandemic has given a decisive boost to the development of digital health services in Italy, as has been noted, recording 10 years of digital health evolution in 10 days. Numerous health facilities have already organised themselves independently to experiment with telemedicine and tele-assistance techniques. For instance, the Chieti ASL has activated a remote monitoring system for Covid-19 patients in home fiduciary isolation in order to collect and record - via daily telephone contact - the detected parameters and manage any abnormalities. The *Centro Cardiologico Monzino*, a private hospital, has activated a home, clinical and instrumental telemonitoring service for its medical staff, which is conducted using digital technologies developed by the hospital. The *Centro Cardiologico Monzino* was one of the pioneers of this service and has implemented numerous protocols for tele cardiological assistance. The *IFO* in Rome has made available a teleconsultation service for oncological and dermatological examinations, follow-ups, and consultations. Private Outpatient Clinic is a service provided by San Raffaele Hospital. Telemedicine enables to request initial medical opinions and consultations from the Surgical and Medical teams, which are split up by clinical specialties, pathologies, body region/area of interest. Team visits in Telemedicine provide the following services:

- initial consultation, which consists of a written request with the option to include clinical documentation and a case description;
- video visit, in which the patient selects the date/time in the agenda by scheduling a video call, attaching clinical documentation and a request description, in order to discuss the clinical case.

Telemedicine enables the Campus Bio-Medico University Hospital to extend its services directly to the patient's home via the My Hospital Program. In fact, the telemedicine service has been operational since October 1, 2021, allowing patients to contact University Hospital specialists via computer or smartphone in a simple and secure manner.

Through a comprehensive analysis of the data provided by Agenas and P.Re.Val.E, a clear picture of the state of quality of care has been obtained. In terms of quality of care, the private sector clearly dominates at the national level, whereas in the Lazio region, public and private hospitals are nearly on par, based on the sampled hospitals. There is not a widespread adoption of digital health by hospitals, as there are more isolated initiatives. In general, however, it appears that private hospitals are able to provide superior digital services, unrelated to the pandemic.

The purpose of this thesis was to analyse the role of private hospitals in various health systems in order to determine whether the private sector may perform better than the public sector, taking into account two factors, namely quality of care and digital health. The analysis of the data revealed the private sector to be clearly superior to the public sector, with the private sector outperforming the public sector in nearly all of the indicators considered. The analysis conducted in the Lazio Region, on the other hand, yielded a different result. In fact, a comparison of the Umberto I Hospital and the Campus Bio-Medico University Hospital reveals that the Umberto I Hospital achieves marginally superior outcomes (19 indicators out of 36 are in favour of Umberto I Hospital). The comparison described is based on these two hospitals, but it cannot be ruled out that other hospitals may yield different results. Concerning digital health, it is noted that a digital health culture has not yet been fully developed in Italy, pending the completion of the PNRR mission, which specifically provides for the digitization of our society's most vital sectors, including healthcare. Individual initiatives continue to be heavily relied upon. Private hospitals often appear to be able to provide superior digital services than public hospitals, as evidenced by the prevalence of these individual initiatives. We cannot rely solely on the private sector for digital health, so it is crucial that the public sector also makes significant strides in this regard for the good of the nation.

At the conclusion of the writing of this thesis, it is possible to answer the question posed at the outset, namely whether private hospitals can perform better than public hospitals in terms of the quality of care and digital health. In Italy, private hospitals achieve better results than public hospitals, both in terms of health indicators and the adoption of digital health tools, whereas in other countries, the results are more uncertain, particularly in terms of quality of care. In fact, results for digital health indicate that private hospitals perform significantly better than public hospitals or on par with them in almost all countries.