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The French health care system: challenges and opportunities

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Introduction

Over the years, providing and funding high-quality healthcare has come up against a number of challenges. Complexity is by far one of these key challenges, which raises to the power the difficulties imposed by all other challenges. It is well known in the literature and among experts that health systems are paradigmatic examples of complex human organizations that blend a multitude of different professional and disciplinary characteristics within a critical environment. The failure of communication between the various actors, as well as the existence of "faulty" processes within these systems, can have a strong impact on society, in terms of economy, finance and population health. Over the years, this complexity has grown due to the continuous and constant introduction of new technologies – in terms of process, production and organization – which have increased the number of stakeholders involved, creating new relationships and new channels through which the various subjects interact.

As a consequence, modern health systems – at all levels and in all disciplines of care – are evolving towards increasingly complex structures. For example, just a decade ago, a family doctor or hospital specialist worked in settings where most of their problems could be described in biomedical terms and addressed using the knowledge and skills acquired during their academic training. Today, in most cases, this paradigm can be considered outdated and policy makers have to plan extremely complex action scenarios. What is increasingly being realized is the concept of "complexity of complexity", whereby the already complex health care system is increasingly developing (complex) relationship with other complex systems. In such environment the problems of the health care system become problems of other systems and solutions to many health care problems cannot be found without finding solutions to problems of the other complex systems.

This new "hyper-structure" leads us to think about the existence of an "ecosystem" within which different complex systems co-exist and interact through a series of "platforms" on which relationships are created between different "agents". This new way of thinking about the organization of systems makes it easier to imagine relationships and/or plans that in the past, for various reasons, were kept separate. At the same time, this vision allows us to reconsider the health care system as a structure that is no longer monolithic, nor is represented by the simple sum of the subjects. In this logic, within the ecosystem there are other complex systems such as that of communication, education, the food and tobacco industry, the fitness industry, the bio-medical industry, scientific societies, regulators, institutions (at all levels) and politics. The agents that operate in these complex systems are citizens, patients, doctors, administrators, educators, entrepreneurs, politicians. Finally, agents are put in communication with each other and between complex systems through the platforms.

Despite this new organizational structure has developed over a relatively long period of time, the health care systems have hardly adjusted to these new characteristics. There are at least three main reasons why this has occurred. The first refers to the slow pace at which the vast majority of these changes have been introduced, which has prevented the onset of structural breaks that could have let emerge the necessity to intervene according to new paradigms. The second reason deals with the monetary cost imposed by all these changes that myopic policy makers may tend to avoid. Finally, the third reason has to do with changes in position rents, which bureaucracies tend to avoid as much as possible. The direct consequences of all such changes are that health systems cannot be anymore considered as linear hierarchical structures, that could be approached with the standard intervention tools of a simple linear hierarchical system. In fact, the output of such a system can be controlled by manipulating each of its parts; unfortunately the same set of tools may become ineffective in presence of a complex system which behaves differently and strongly depends on the initial conditions and the many feedbacks that arise at different point.

It is for these reasons that organizing a health care system is one of the hottest and more difficult political issues of our time. Every country is struggling to find the right balance between social provision and market forces, to find the optimal number of payers and providers, and to figure out how all the different pieces should fit together. Populations are aging, the burden of disease is more and more bending toward long-term chronic conditions, and then there is the arrival of new technologies. These last do not refer only to the eye-catching clinical technologies but also information technology that could make health systems orders of magnitude more efficient, if only they could be deployed at scale. The upside is enormous; the degree of difficulty is very high. All this in a context in which the demand for health care goods and services and associated spending has steadily increased contributing to augmenting the stress to all modern healthcare system around the world.

Based on such setup, the aim of this paper is to explore how the French health care system is evolving in a this turbulent environment. In the next sections we will first briefly review the current organization of the French health care system to understand its current weaknesses and strengths. Further we will present some of the main common challenges that experts believe should be addressed to successfully deal with the management of a complex system and to improve population health outcome. Finally, we will explore to what extent these issues are part of the French health policy agenda "Ma soins 2030".

The current French health care system: an overview

In France the healthcare system is composed of two different pillars. The first is composed by the Statutory Health Insurance (SHI), which guarantees universal coverage and is compulsory and it is organized around a single-payer. The SHI is provided to all citizens and is a publicly sponsored health insurance, financed by employer and employee payroll taxes (50%) and by a national earmarked income tax (35%). The remaining 15% is subsidized by taxes on tobacco and alcohol, the pharmaceutical industry and voluntary health insurance companies (13%); and state subsidies (2%). The French Federal Government sets the national strategy for healthcare spending. It budgets expenditures for hospitals, ambulatory care, mental health and services for residents living with disabilities.

The SHI reimburses at a rate of 70-80%, while French patients pay the remaining 20-30% out of pocket. For this reason French citizens have the option to enroll in voluntary health insurance (VHI), which is complementary to SHI and covers co-payments for usual care, balance billing, and vision and dental care that are minimally covered by SHI. This insurance is provided by not-for-profit, employment-based mutual associations or provident institutions. Ninety-five percent of citizens subscribe to VHI. The VHI represents the second pillar.

1.1 How does it work? Organization and structures¹

As in all universalistic systems, government sets the national health strategy and allocates budgeted expenditures to regional health agencies, which are responsible for planning and service delivery. The Ministry of Social Affairs, Health, and Women's Rights is responsible for defining the national health strategy and to implements government policy for public health as well as the organization and financing of the health care system. At regional level the Ministry is represented by Regional Health Agencies, which are responsible for coordinating population health and health care, including prevention and care delivery, public health, and social care (a setting that mimic the Italian system very closely).

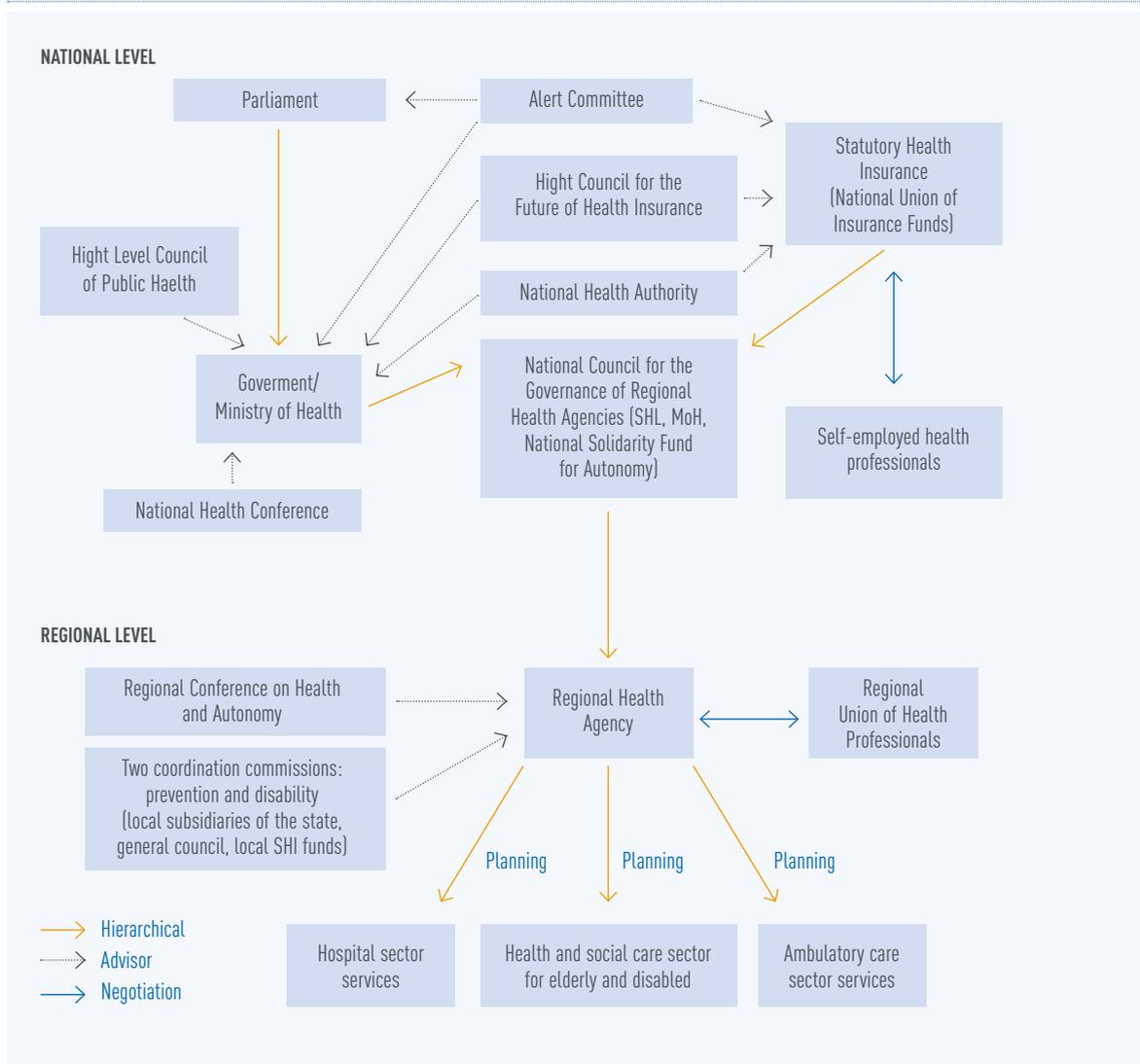
To further help the Ministry to guarantee a high quality level of health care services the French health system is supported by some specialized agencies who supervise specific aspects of the healthcare provision. Among them, the French Health Products Safety Agency, which oversees the safety of health products, from manufacturing to marketing, the Agency for Information on Hospital Care, which manages the information systematically collected from all hospital admissions and used for hospital planning and financing and the

The French health care system is based on two pillars

[1] A detailed and updated description of the French health care system is available in Durand-Zalesky (2020). Here below I provide a synthesis of that material.

National Agency for the Quality Assessment of Health and Social Care Organizations, which promotes patient rights and develops preventive measures to avoid mistreatment, particularly in vulnerable populations such as the elderly and the disabled, children, adolescents, and socially marginalized people. An overall picture of the French health care organizational structure is represented in *Figure 1*.

Figure 1. Organization of the health care system in France



Source: Durand Zaleski (2020).

Health care services are supplied by several providers which are contracted by the French national health care system. Providers are organized according to “out-patient” and “in-patient” type of service offered. Primary care and specialist services belong to the first category, while hospitals and institutionalized long term care to the second. Overall the rules governing these providers are similar to those existing in many other EU countries, especially those with universalistic schemes.

According to Durand Zaleski (2020), primary care services are guaranteed by roughly 102,299 general practitioners (GPs) and 121,272 specialists (a ratio of 3.4 per 1,000 population). About 59 percent of physicians are self-employed on a full-time or part-time basis (67% of GPs, 51% of specialists). On average GPs manage a pool of about 900 patients each. There is a voluntary gatekeeping system for people aged 16 and older, with financial incentives offered to those who opt to register with a GP or specialist. About 95 percent of the population have chosen a GP as their gatekeeper, but specialists can also serve as gatekeepers. More recently France has started piloting the so called “Experimental GP networks” that provide chronic-care coordination, psychological services, dietician services, and other care not covered by SHI. These networks are financed by earmarked funds from the Regional Health Agencies. In addition, more than 1,000 medical homes provide multi-professional services (usually with three-to-five physicians and roughly a dozen other health professionals) and after-hours care. Primary care act as gate keeper: if a patient decides to consult a specialist without a GP referral, then the SHI coverage is reduced.

While for GPs it is clear that their activity is unambiguously performed in an out-patient setting, the arrangement for specialists is a little bit more complex as they can work either in out-patient or in in-patient settings (either in offices or private clinics). Irrespective of their working place, specialists are paid on a fee-for-service basis. About 36% of them are self-employed, while the rest either are fully salaried hospital employees (inpatient setting) or have a mix of income sources. Further, specialists working in public hospitals may see private-pay patients on either an outpatient or an inpatient basis, but they must pay a percentage of their earned fees to the hospital.

For both GPs and specialists patients have to pay the full fee the end of a visit. They get reimbursed later once the claim is filed with the insurance. The reimbursement can be full or less depending on their coverage, minus the copayment. This reimbursement scheme is different from Italy, Spain or UK for whom health care services are free at the point of service. This peculiarity stems from the existence of the double pillar based on both public compulsory health insurance and VHI.

Several providers supply services and goods to the French health care system

In-patient care is primarily offered by hospitals who are composed by a network of public and private institutions. Public hospitals account for about 65 percent of hospital capacity and activity. Private for-profit facilities account for another 25 percent, and private nonprofit facilities make up the remainder. As common to the vast majority of European countries, all hospitals in France “are reimbursed under SHI via the diagnosis-related group (DRG) system set by the Ministry of Social Affairs, Health, and Women’s Rights, which applies to all inpatient and outpatient admissions and covers all medical services and physicians’ salaries in public and not-for-profit hospitals. Neither bundled payment nor performance incentives exist” (Durand-Zaleski, 2020).

Hospital revenues are mostly made by funds coming from the SHI (80%), with VHI and direct patient payments accounting for their remaining income. Another source of income is represented by research and teaching grants (up to 13% of hospital budgets) and provisions for providing emergency services, organ harvesting, and organ transplantation (on average, 10%–11% of budget). Finally, to avoid phenomena of supply induced demand, private, for-profit clinics have the same funding mechanism as public hospitals, but the DRG payment rates are lower there than those applied to public or nonprofit hospitals.

Another important form of service provided is the long-term care (LTC). LTC is organized in both out-patient and in-patient settings. The out-patient setting is managed and supervised under the jurisdiction of the General Councils, which are the governing bodies at the local (departmental) level. About 2 percent of the French population (about 1,25 million of patients) receive such type of services. On the contrary, the institutional long-term care is provided in retirement homes and long-term care units, totaling roughly 10,000 institutions with a total of 728,000 beds. Of these institutions, currently 54 percent are public, 28 percent private nonprofit, and 18 percent for-profit, although the percentage of for-profit institutions is increasing.

As common across Western countries, LTC is one of the most critical form of care to be organized and funded. In France LTC is covered by the SHI only for the medical costs of long-term care in facilities. Families are responsible for paying the housing costs. These costs can be reimbursed by the VHI. However, for the frail elderly a means-tested cash allowance is provided in terms of in-kind nonmedical services. About 1.1 percent of the total population is estimated to be eligible.

In-patient care absorbs most of the resources

LTC is another important sector which is critical

1.2 Who pays for the health care services in France?

France has an universalistic health care system based on two pillars. The universalistic feature of the system implies that France's statutory health insurance system is mandatory and in return it covers most of health care costs (hospitals, physicians, and long-term care, as well as prescription drugs). Patients are responsible for coinsurance, copayments, and balance bills for physician charges that exceed covered fees.

Universalism is new in France. There has been a long journey to accomplish such goal, from a first extension of the statutory health insurance (SHI) to all employees and retirees (in 1945), to the self-employed (in 1966), and the unemployed (in 2000). It is only in 2016 that SHI eligibility was universally granted under the *Protection universelle maladie* (Universal Health Protection law), or PUMa, to fill in the few remaining coverage gaps. The law also replaced and simplified the existing system (there were 42 funds!) by providing systematic coverage to all French residents. It merged coverage for persons previously covered by the Universal Health Coverage and immigrants covered by the state-sponsored health insurance. Coverage is compulsory, and it is provided to all residents by noncompetitive statutory health insurance funds. As standard in universalistic systems, insurance is compulsory and citizens cannot opt out of SHI, with few exceptions represented by individuals employed by foreign companies.

The role of private health insurance in France is to complement the SHI. VHI covers mainly copayments and balance billing, as well as vision and dental care, which are minimally covered by SHI. It also partially covers long-term hospice and mental health care. Furthermore, the VHI provide full reimbursement for priority services — immunizations, mammograms, and colorectal cancer screenings, for example — as well as for preventive care for children and low-income populations. However, preventative care for adult is only partially covered.

VHI covers 95% of the French population, either through employers or via means-tested vouchers. As of 2016, all employees benefit from employer-sponsored VHI, for which employees pay at least 50 percent of the cost. Being an insurance provided mainly by not-for-profit, employment-based associations or institutes, the extent of coverage varies widely. To reduce such variability in coverage rates, in 2013 the French government passed a law to implement some standards for employer-sponsored VHI, thus reducing inequities caused by variations in access and quality. In general, all VHI contracts cover the difference between the SHI reimbursement rate and the official fee on the national fee schedule. Overall, VHI finances 13.5% of total health expenditures².

The system is based on a mandatory social health insurance (SHI) system

Private health insurance complement SHI

[2] Individuals with low incomes are entitled to free or discounted health insurance, free vision care, and free dental care. The total number of low-income beneficiaries is estimated at around 9% of the population.

1.3 How much does it cost?

According to the latest report by the DREES on the Health spending in France in 2019 (Marc et al., 2020) total spending has reached 208,0 billion euros³. After two years of moderate growth (+ 1.7% then + 1.6%), the consumption of medical care and goods (CSBM) accelerated slightly in 2019 (+ 2.1%), with the hospital care sector being the main responsible of this renewed dynamism, ahead of primary care (see Table 1). The participation of households in the financing of the CSBM continues to decline to reach 6.9% in 2019, after 7.1% in 2018. This decrease is explained by a net increase in the proportion of reimbursable drugs and by the slowdown in overruns fees, which are combined with the trend increase in 100% of social security support systems.

In terms of financing, the public sector, which accounts for 77% of hospital care, or 74.9 billion euros, the acceleration in healthcare consumption is based on prices. They accelerated sharply in 2019 (to + 1.9% after + 0.7% in 2018), in connection with the increase in the tariffs for hospital stays. At the same time, volumes continued to slow down in 2019: they barely rose, by + 0.2% after + 0.5% in 2018. This sluggishness is led by a slowdown in volumes in medicine, surgery and obstetrics, while volumes in psychiatry and in follow-up and rehabilitation care continue to contract. In the private sector, which represents 22.2 billion euros, the acceleration is driven by volumes: + 3.7% in 2019 after + 1.9% in 2018. The dynamism of volumes is driven both by that of the fees paid to the practitioners and by that of the expenses of stay. The prices of hospital care in the private sector have decreased in 2019 (as in the previous eight years), due to the regular contraction in tariffs for stays.

Health care spending as % of GDP is among the highest in OECD

[3] It is important to notice that this definition of health expenditure is different from the "Current health expenditure in the international sense (DCSI)", which corresponds to the actual final consumption (i.e. directly or via an intermediary) of health services and medical goods, whether individual (such as a medical consultation) or collective (such as a prevention campaign). It is qualified as "current" because it excludes everything that is not consumption, in particular investment expenses or replacement income (such as daily allowances). In 2018 the DCSI, which is the only aggregate harmonized at the international level, was equal to 265.8 billion euros (11.3 % of GDP), much larger than the CSBM, which accounted only for 76.7% of it.

Table 1. Consumption of healthcare and medical goods (CSBM) - Amounts in millions of euros, changes in %, contribution to the change in CSBM in % points

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Evolution 2018/2019	Contribution 2019
Hospital care	80.316,0	82.461,0	84.567,0	86.688,0	89.060,0	90.430,0	92.320,0	93.848,0	94.887,0	97.127,0	2,4	1,1
Public sector	61.701,0	63.294,0	64.952,0	66.779,0	68.603,0	69.781,0	71.182,0	72.451,0	73.349,0	74.892,0	2,1	0,8
Private sector	18.615,0	19.166,0	19.615,0	19.909,0	20.457,0	20.649,0	21.138,0	21.397,0	21.539,0	22.234,0	3,2	0,3
Outpatient care	93.168,0	95.606,0	97.229,0	98.552,0	101.154,0	102.532,0	104.827,0	106.688,0	108.861,0	110.908,0	1,9	1,0
- Outpatient medical services, diagnostic and other	44.170,0	45.749,0	47.081,0	48.314,0	49.412,0	50.553,0	52.132,0	53.464,0	54.992,0	56.467,0	2,7	0,7
Primary care and specialistic visits (including obstetrics)	18.450,0	19.160,0	19.517,0	19.827,0	20.268,0	20.638,0	21.152,0	21.668,0	22.531,0	22.965,0	1,9	0,2
Auxiliary medicine treatments	11.041,0	11.527,0	12.329,0	13.113,0	13.779,0	14.363,0	14.993,0	15.525,0	16.066,0	16.715,0	4,0	0,3
Dental care	9.999,0	10.289,0	10.490,0	10.606,0	10.600,0	10.774,0	11.108,0	11.325,0	11.498,0	11.786,0	2,5	0,1
Lab test and diagnostic	4.284,0	4.396,0	4.338,0	4.342,0	4.316,0	4.314,0	4.413,0	4.466,0	4.406,0	4.525,0	2,7	0,1
Terminal care	328,0	332,0	353,0	364,0	387,0	392,0	408,0	416,0	413,0	398,0	-3,8	-
Other	68,0	44,0	53,0	60,0	62,0	73,0	58,0	65,0	78,0	78,0	0,4	-
- Drugs	33.395,0	33.517,0	33.028,0	32.392,0	33.207,0	32.745,0	32.731,0	32.761,0	32.649,0	32.592,0	-0,2	-
- Other medical goods	11.853,0	12.488,0	13.047,0	13.559,0	14.122,0	14.630,0	15.158,0	15.476,0	16.122,0	16.798,0	4,2	0,3
- Health care transport	3.749,0	3.852,0	4.074,0	4.288,0	4.413,0	4.604,0	4.806,0	4.987,0	5.099,0	5.051,0	-0,9	-
CSBM	173.484,0	178.066,0	181.796,0	185.241,0	190.214,0	192.214,0	197.148,0	200.535,0	203.748,0	208.035,0	2,1	2,1
	8,7	8,7	8,7	8,7	8,8	8,8	8,8	8,7	8,6	8,6		
Change in CSBM (%)	Value	2,1	2,6	2,1	1,9	2,7	1,4	2,2	1,7	1,6	2,1	
	Price	- 0,5	-0,2	-0,5	-0,3	-0,4	-0,9	-0,7	0,1	-0,2	-	
	Volume	2,6	2,8	2,6	2,2	3,1	2,3	2,9	1,6	1,8	2,1	

Source: DREES, health accounts.

The French Social Security financed 162.7 billion euros of the consumption of healthcare and medical goods (CSBM) in 2019, which represents an increase of 2.3% in one year, in line with the average trend observed since 2010, but slightly higher than that of the CSBM in 2019 (Table 2). Since 2012, the French Social Security has continuously increased the financing toward health care up to 78.2% in 2019. This increase is explained in particular by the sharp increase in the number of people exempt from user fees for long-term illnesses (+ 2.6% per year on average between 2012 and 2018) due to aging population and higher prevalence of long term conditions (affections de longue durée - ALD) at a given age.

In 2019, the rate of coverage by Social Security remains highly variable depending on the type of care (Table 3). Hospital care is characterized by a particularly high share of Social Security in its funding (91.6% in 2019). This rate is higher in the public sector (92.6%, against 88.4% in

the private sector) where fee overruns are more frequent. These high rates can be explained in part by the fact that people insured under ALD consume proportionally more hospital care than other policy holders. In terms of primary care, 66.0% of the expenses were covered by Social Security in 2019. This share has increased since 2011, due to the expansion of the ALD system. The gradual increase in the various lump-sum payments paid to doctors (remuneration based on public health objectives, patient lump sum, treating physician, etc.), fully funded by Social Security, is also stimulating this increase.

Table 2. Financing of the consumption of healthcare and medical goods by Social Security (in millions of euros)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Hospital care	73.469,0	75.185,0	77.073,0	78.950,0	81.159,0	82.442,0	84.431,0	86.017,0	86.892,0	89.010,0
Public Hospitals	56.911,0	58.165,0	59.667,0	61.307,0	63.046,0	64.159,0	65.687,0	67.041,0	67.788,0	69.360,0
Private Hospitals	16.558,0	17.019,0	17.406,0	17.644,0	18.113,0	18.283,0	18.744,0	18.976,0	19.104,0	19.650,0
Outpatient care	27.843,0	28.844,0	29.818,0	30.771,0	31.753,0	32.748,0	33.840,0	34.843,0	36.180,0	37.285,0
Primary care and specialistic visits (including obstetrics)	12.519,0	13.016,0	13.358,0	13.636,0	14.051,0	14.429,0	14.842,0	15.268,0	16.099,0	16.473,0
Auxiliary medicine treatments	8.937,0	9.333,0	9.972,0	10.620,0	11.151,0	11.632,0	12.145,0	12.578,0	13.018,0	13.510,0
Dental care	3.325,0	3.381,0	3.407,0	3.425,0	3.478,0	3.597,0	3.700,0	3.791,0	3.858,0	3.759,0
Lab test and diagnostic	3.003,0	3.075,0	3.034,0	3.036,0	3.017,0	3.024,0	3.096,0	3.142,0	3.129,0	22.598,0
Other medical goods	59,0	39,0	47,0	54,0	56,0	66,0	57,0	64,0	77,0	6.075,0
Health care transport	3.485,0	3.578,0	3.783,0	3.976,0	4.095,0	4.278,0	4.468,0	4.637,0	4.743,0	4.695,0
Drugs and outpatient treatments	22.709,0	22.923,0	22.755,0	22.514,0	23.561,0	23.341,0	23.525,0	23.865,0	23.967,0	24.220,0
Other medical goods	4.878,0	5.079,0	5.317,0	5.652,0	6.295,0	6.295,0	6.655,0	6.907,0	7.199,0	7.498,0
optical	223,0	224,0	227,0	232,0	239,0	253,0	253,0	252,0	260,0	266,0
non-optical	4.655,0	4.855,0	5.090,0	5.420,0	5.756,0	6.042,0	6.402,0	6.655,0	6.939,0	7.232,0
Aggregate	132.384,0	135.609,0	138.746,0	141.863,0	146.564,0	149.105,0	152.919,0	156.269,0	158.981,0	162.708,0
percentage change	2,1	2,3	2,3	2,2	3,3	1,7	2,6	2,2	1,7	2,3
CSBN	173.484,0	178.066,0	181.796,0	185.241,0	190.214,0	192.962,0	197.148,0	200.535,0	203.748,0	208.035,0
percentage change	2,1	2,1	2,1	1,9	2,7	1,4	2,2	1,7	1,6	2,1

Source: DREES, health accounts.

Table 3. Financing of the consumption of healthcare and medical goods by Social Security (in %)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Aggregate	76,3	76,2	76,3	76,6	77,1	77,3	77,6	77,9	78,0	78,2
Hospital care	91,5	91,2	91,1	91,1	91,1	91,2	91,5	91,7	91,6	91,6
Public sector	92,2	91,9	91,9	91,8	91,9	91,9	92,3	92,5	92,4	92,6
Private sector	89,0	88,8	88,7	88,6	88,5	88,5	88,7	88,7	88,7	88,4
Primary care and specialistic visits	63,0	63,0	63,3	63,7	64,3	64,8	64,9	65,2	65,8	66,0
Health care transport	93,0	92,9	92,9	92,7	92,8	92,9	93,0	93,0	93,0	93,0
Drugs	68,0	68,4	68,9	69,5	71,0	71,3	71,9	72,8	73,4	74,3
Other medical goods (including optical)	41,2	70,7	40,8	41,7	42,5	43,0	43,9	44,6	44,7	44,6
Optical	4,1	3,9	3,8	3,9	3,9	4,1	4,1	4,1	4,1	3,9
non-optical	73,0	71,8	71,7	71,8	71,5	71,2	71,1	71,1	71,3	72,0

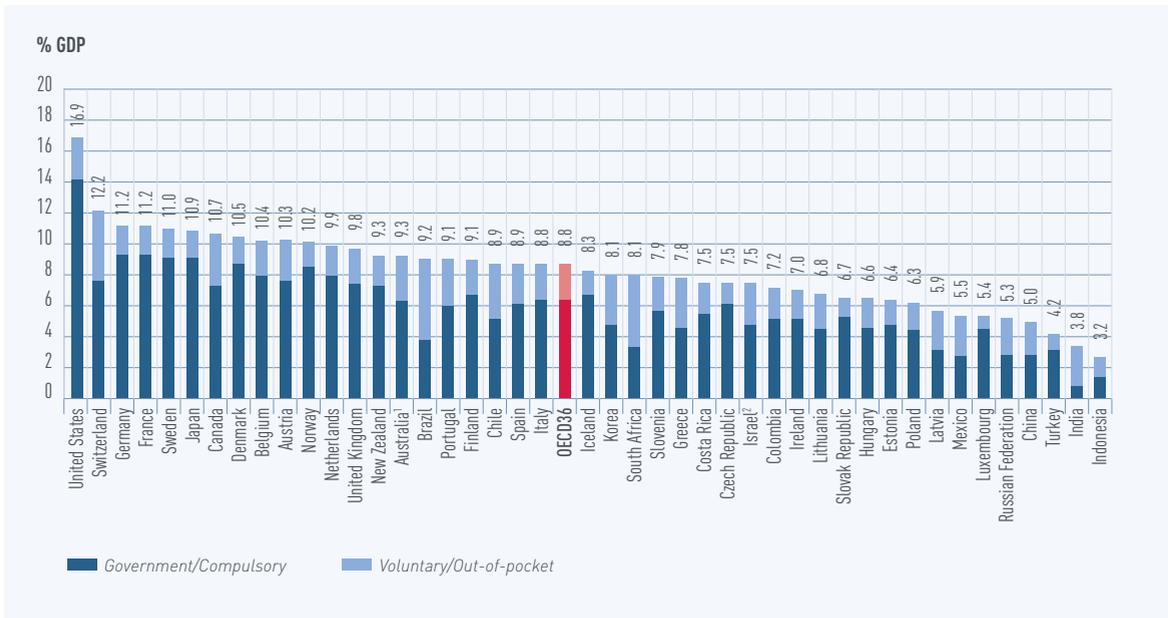
Source: DREES, health accounts.

The share of Social Security in spending on drugs in primary care increased by 0.9 point and stood at 74.3% in 2019. This share has been increasing continuously since 2010, mainly due to the share of drugs prescribed for serious pathologies, which are the most expensive and are covered 100%, which also increased by 23.7% in 2019, after a 22.5% in 2018. Finally, the change in coverage for nicotine substitute (from an annual reimbursement package of 150 euros to 65%) has also been responsible for the increase in the share of financing for the expenditure of drugs in the primary care setting.

For other medical goods, the share of Social Security has been stable since 2017, at 44.6%. Finally, the preponderant share of Social Security in health transport expenditure (93.0% in 2019) is explained by the large proportion of the number of ALD patients using these services.

In terms of international comparison, *Figures 2-5* provide an overview of how France stands within OECD countries. In terms of overall health expenditure (extended to long-term care (LTC), governance of the healthcare system and institutional prevention), France has the highest share of expenditure to GDP (11.2% of GDP) in the European Union, together with Germany (*Figure 2*). Also, in France households are the least financially required after intervention of compulsory health insurance and complementary health.

Figure 2. Health expenditure as a share of GDP, 2018 (or nearest year)



Note: Expenditure excludes investments, unless otherwise stated.
 1. Australia expenditure estimates exclude all expenditure for residential aged care facilities in welfare (social) services.
 2. Includes investments. Source: OECD Health Statistics 2019, WHO Global Health Expenditure Database. Source: OECD Health Statistics 2019.

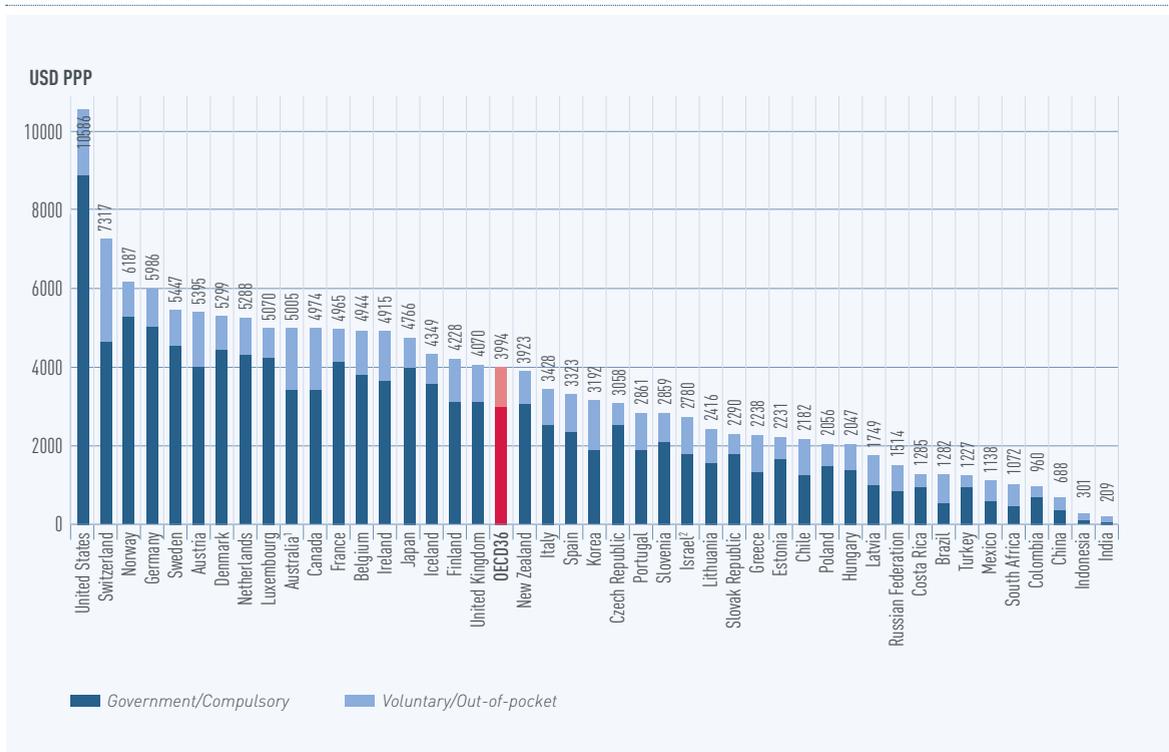
In terms of per capita health expenditure in France it increased from about 3,000 US dollars in 2003 to \$4,965 in 2018, growing at an average annual rate of 3.04% (Figure 3). This value is in between a higher value of \$5.986 in Germany and a much lower value of \$3.428 in Italy.

In 2018 the growth rate in health spending remained moderate in France and Italy. In France, in 2018, healthcare expenditure in current euros slowed slightly: + 1.6% after + 1.8% in 2017 (Figure 4). Their growth in value is lower than that of GDP. France is not an isolated case in Europe. Healthcare spending in Italy has not grown by more than 2% per year in value for the past five years (+ 1.6% in 2018). In France, this progression is largely regulated by the national target for health insurance spending. For Italy, the country's severe budgetary constraints weigh on the ability to review the minimum allocations for medical procedures performed in hospitals or in primary care financed by the Italian state (Livelli Essenziali di Assistenza- LEA). Spain, the

Per capita health expenditure is higher than average OECD

United Kingdom, the United States and Germany have more dynamic growth in their health spending (greater than or equal to 4% in value in 2018). The recent growth in Spanish spending should nevertheless be put in perspective with the sharp cuts in healthcare spending following the 2008 economic crisis: until 2013, healthcare spending fell every year in Spain.

Figure 3. Health expenditure per capita, 2018 (or nearest year)

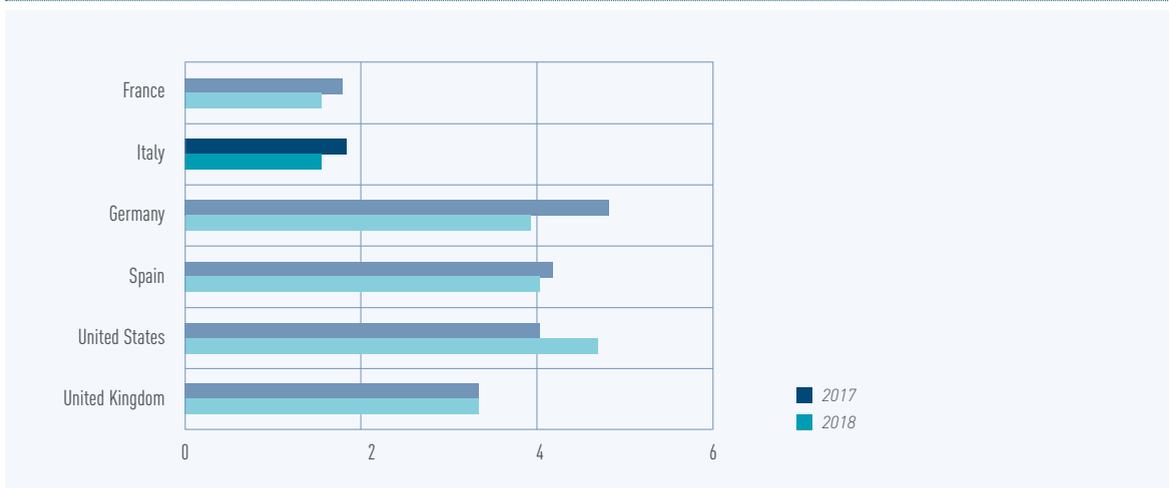


Source: OECD Health Statistics 2019.

A much better understanding of the dynamic in health care spending across OECD countries can be obtained looking at the data shown in [Figure 5](#). According to OECD (2020), “in 2017, OECD per capita spending on health care grew by an average of 2.0% - a marked slowdown from the 3.3% growth observed in 2015 and 2016, and significantly below the growth rates experienced before the onset of the global financial and economic crisis. Preliminary estimates for 2018 point to growth having strengthened in 2018. On average, since 2013, annual per capita health spending growth across the OECD has been 2.4% compared with 1.0% in the five years up to 2013, in the period following the crisis. In a number of European countries, there have been significant turnarounds in health spending. In Greece, the strong annual decreases in growth halted after 2013, even if growth in health spending has been close to zero overall since 2013 [-9.4% in the time period 2008-13 vs. 0.2% in the time period 2013-18], and real per capita spending in 2018 remained almost a third below the 2009 level. A similar if less dramatic picture can also be seen in Iceland [-3.0% vs. 4.0%]. In other European countries, such as Germany and Norway, health spending remained relatively stable over the ten-year period, with annual growth of between 2.0-2.5%. Overall, health spending growth has picked up in the majority of European countries in most recent years.”

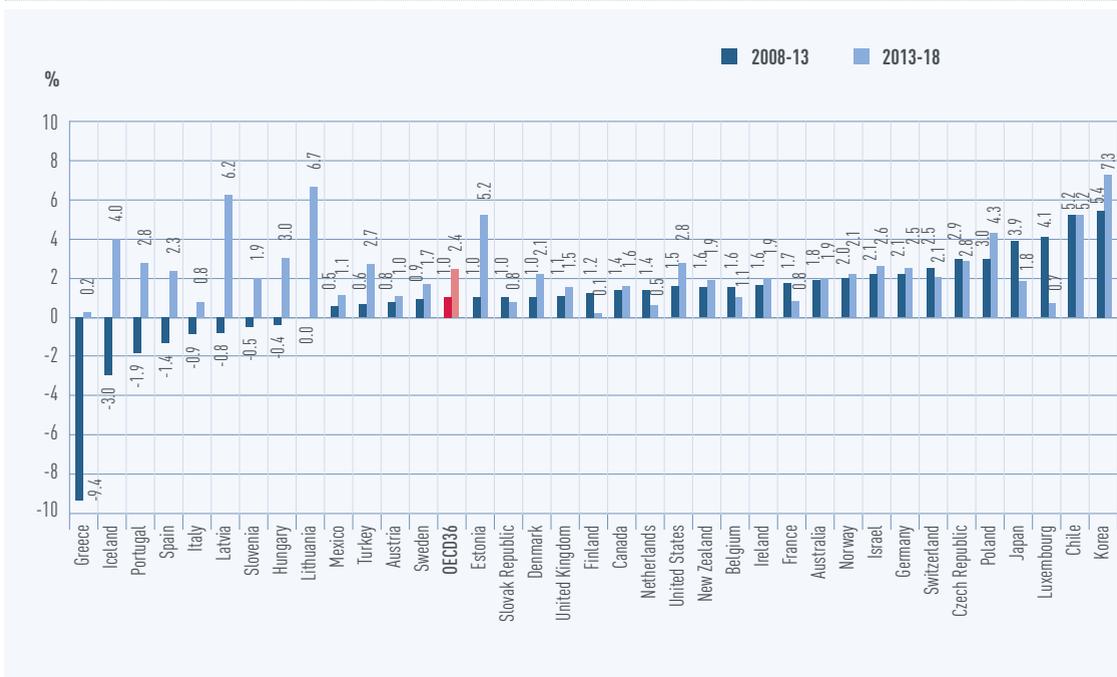
Since 2000 health care expenditure growth has always been positive

Figure 4. Growth rate of international health spending in 2017 and 2018 - Growth rate in %



Note: in constant national currency 2015 for UK and US - in current euros for other countries.
Source: DREES, health accounts.

Figure 5. Annual growth in health expenditure per capita (real terms), 2008 to 2018 (or nearest year)



Source: OECD Health Statistics 2019.

The drop in the consumption of non-reimbursable drugs (7.5% of the item) was clearly amplified in 2019: the item was reduced by 8.4% after a decline of 3.2%. This fall is due as much to prices, which contracted by 4.7% (after -0.6%) and volumes, which fell by 3.9% (after -2.6%). The contraction in volumes is mainly explained by a regulatory measure: in 2019, smoking cessation treatments, which had previously been non-reimbursable, became reimbursable. This shift also contributed to the dynamism of the volume of reimbursable drugs.

In 2019 the household out-of-pocket (OUP) participation amounts to approximately 14.3 billion euros, or 213 euros per capita per year. OUP has decreased again in 2019 to reach 6.9% of the CSBM, after 7.1% in 2018. This downward trend in the OUP as a proportion of the CSBM since 2009, can be explained by structural factors which imply an increasing participation of Social Security. With the aging of the French population, the number of people exempt from user fees for long-term illnesses (ALD) - cancer, diabetes, etc. - has increased. At the same

time, out-of-pocket expenditures on drugs have been steadily growing because more prescription drugs are being taken off the national formulary. The number of over-the-counter drugs has also risen. In addition, several regulatory decisions, in particular the payment by Social Security of innovative and expensive drug treatments, increased the funding provided by Social Security. As a result, the share of the CSBM covered by Social Security has increased almost continuously since 2010 to reach 78.2% in 2019, which contributes to reducing the share of OUP of households.

1.4 How are costs contained?

Over the past two decades, the state has been increasingly involved in controlling health expenditures funded by SHI. It regulates roughly 75 percent of health care expenditures on the basis of the overall framework established by Parliament. The central government allocates budgeted expenditures among different sectors (hospitals, ambulatory care, mental health, and services for disabled residents) and regions.

According to Durand-Zalenski (2020), the SHI has faced large deficits over the past 20 years, but they have fallen from EUR 10–12 billion (USD 12.6 –15.2 billion) in 2003 to EUR 4.1 billion (USD 5.2 billion) in 2016. This trend is the result of a range of initiatives, including:

- a reduction in the number of acute-care hospital beds
- the removal of 600 drugs from public reimbursement
- an increase in generic prescribing
- a reduction in the price of generic drugs
- the use of over-the-counter drugs
- a reduction of official fees for self-employed radiologists and biology labs
- the inclusion of central purchasing to better negotiate costs
- an increase in the proportion of outpatient surgery
- the institution of earlier post-surgery and post-delivery discharge
- a reduction in duplicate testing.

Competition is not used as a cost-control mechanism in SHI. Global budgets are used only in price-volume agreements for drugs or devices. Patient cost-sharing mechanisms include increased copayments for patients who refuse generics or do not use the voluntary gatekeeping system. The increasing price of drugs is being addressed through an increased use of generic and biosimilars incentivized by the pay-for-performance scheme, price-volume agreements, and undisclosed rebates with manufacturers. There are also a number of initiatives to reduce low-value care, launched by SHI and the National Health Authority, including:

Cost control strategies have been introduced over the years

- reductions in avoidable hospital admissions for patients with heart failure
- early discharge after orthopedic surgery and normal childbirth
- the use of DRG payments to incentivize shifts to outpatient surgery
- the establishment of guidelines for the number of allowable off-work days according to disease or procedure
- strengthened controls over the prescription of expensive statins and new anticoagulants
- incentives for the use of less-costly biosimilar drugs.

1.5 How does it perform?⁴

In order to evaluate the performance of a health system it is useful to analyze a set of indicators that allow to understand how the system compares along the following three dimensions: equity, static efficiency and dynamic efficiency. These are also the metrics used by international organization (i.e., WHO) and private institutions (Bloomberg) to compare and rank the quality of health care systems and organizations across the world.

The World Health Organization defines “Health equity” as a condition for which individuals have equal opportunity to reach their full health potential, including access to health-promoting services and care (WHO, 2019). “Static efficiency” is the judicious use of available resources, including the reduction of unnecessary expenditures. A health system with high static efficiency would reduce inappropriate services, eliminate excess administration and streamline processes. Finally, “dynamic efficiency” is the degree to which a health system encourages today innovation and support for new technologies in order to future opportunities for a better health. In what follows we present evidence that will allow to understand how the French system perform.

It is well known that an equitable healthcare system allows to reduce disparities among citizens, which in general tend to improve statistical indicator of population health like life expectancy (LE) and disease free life expectancy (DFLE). With respect to LE, France has historically been among the highest in Europe (82,7 years), but progress has slowed during the last decade, mainly because gains in longevity among older people have stalled. More important, large gaps in life expectancy persist by socioeconomic status, mostly linked to social, environmental and individual risk factors. The French health system generally provides good access to high-quality care, but the main challenges are strengthening prevention to improve health and reduce health inequalities and pursuing the transformation of the health system to better meet the needs of the growing number of people living with chronic conditions.

The French health care system performs quite well compared to the other OECD countries, but important inequalities persist

(4) Most of the evidence and results reported in this Section are taken from OECD/European Observatory on Health Systems and Policies (2019).

Although life expectancy of French women is high, it is worth highlighting that it increased by less than one year between 2010 and 2018, compared with about two years in the previous decade. The same pattern has been recorded for men, who slowed to 1.5 years between 2010 and 2018, down from about three years in 2000-10. France does not represent an exception among EU countries, given that the same patterns have been recorded almost everywhere in Western countries, mainly cause by the slowing of mortality rate reductions at older ages. This trend has been partly caused by the events occurred between 2011 and 2015 (potentially the side effects of the austerity plans launched after the Great Recession) when mortality rates among the population aged 85 and over have increased, resulting in a reduction in life expectancy.

Women life expectancy is 6 years higher than men

Figure 6. Life expectancy in France and other OECD countries

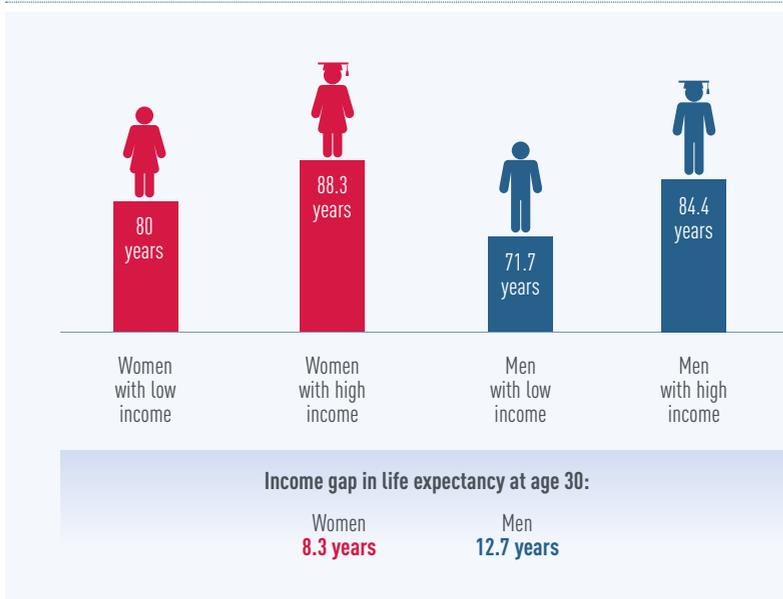


Source: OECD/European Observatory on Health Systems and Policies (2019). Most recent data refers to 2017.

Most important, during over the last decade social inequalities in life expectancy have increased. They are large not only by gender, but also by socioeconomic status. Life expectancy for men with the lowest incomes is 13 years lower than for those with the highest incomes (Figure 7). The gap was 8 years among women (INSEE, 2018). This income gap in longevity can be explained at least partly by differences in education level and living standards, in exposure to risk factors and in access to health care.

In terms of overall health status, in 2017 about two-thirds of the population reported being in good health, a proportion close to the EU average, with people on higher incomes who were more likely to report being in good health than those on lower incomes. In 2017, 73% of the French population in the highest income quintile reported being in good health, compared with 63% for those in the lowest. In comparison, the EU averages are 80% and 61%, respectively. A similar gradient is observed by education level.

Figure 7. The income gap in life expectancy is about 13 years for men and 8 years for women



Source: OECD/European Observatory on Health Systems and Policies (2019). Most recent data refers to 2017.

Furthermore, while many people remain in good health as they get older, others have health conditions that may limit their activities. The longer the LE, the higher is the number of years spent with conditions and disabilities which put pressure on the sustainability of the health care system. For example, in 2017 the LE of French people at age 65 is expected to be 22 years. At the same time, in 2017 the DFLE at age 65 was 10 ten years, which implies that French citizens spend 12 years of their life dealing with chronic conditions and disabilities. In fact, more than three in five people aged 65 and over reported having at least one chronic condition in 2017, although this does not necessarily impede them from leading a normal life. Most people are able to continue to live independently in old age, but one in six people reported some limitations in basic activities of daily living such as dressing and eating that may require long-term care assistance. One in three people aged over 65 have some depression symptoms, a slightly higher percentage than the EU average. Again, these numbers varies by socio-economic status.

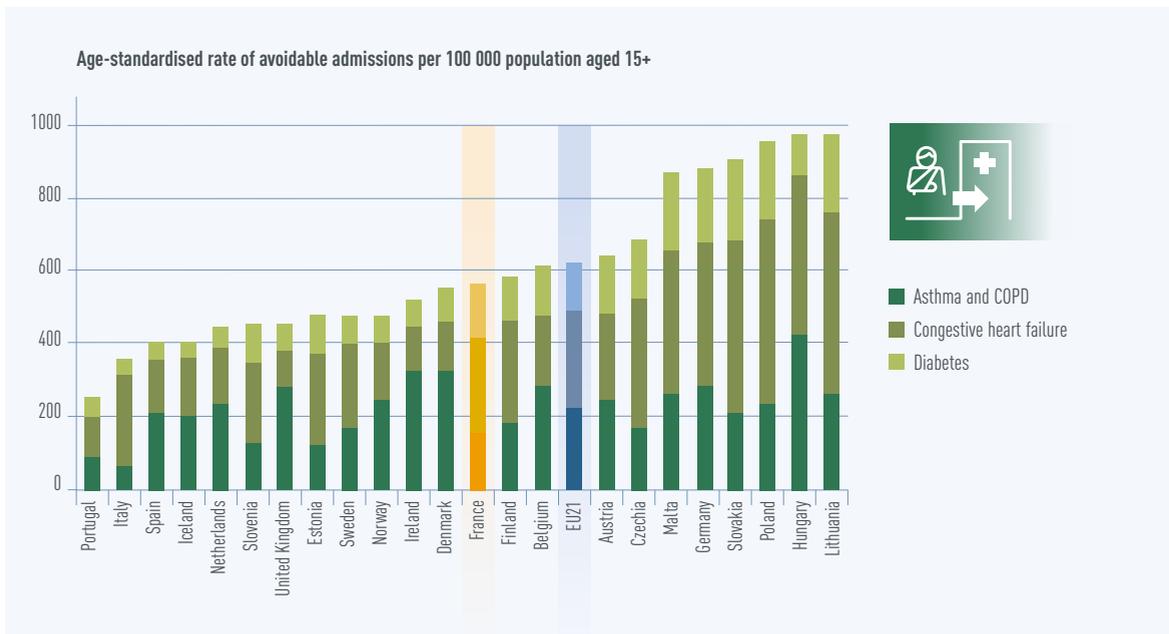
Finally, it is worth mentioning that the level of unmet needs for medical care is generally low but this may not be true when dealing with low-income groups. In general, unmet needs for medical care due to cost, distance or waiting times are very low, with only 1 % of the population reporting such unmet needs in 2017, based on the EU-SILC survey. There is some variation across income groups: about 2% of people in the lowest income quintile reported going without medical care for financial, distance or waiting time reasons, compared to only 0.3% of people in the highest quintile.

In terms of static efficiency the French health care system ranks about in the middle across EU countries. For example, in terms of avoidable hospital admissions for chronic conditions France ranks in a higher position (higher number of avoidable admissions) than many EU countries. *Figure 8* show that the France position is behind that of many other universalistic systems such as Italy, Spain and UK. Apart from Germany all other countries doing worse than France are mostly countries from Eastern Europe. Several communicable or chronic diseases admissions to hospital can be avoided through well-organised prevention and primary care interventions. While avoidable hospital admissions for some chronic diseases such as asthma and chronic obstructive pulmonary disease (COPD) are lower in France than the EU average, admission rates for diabetes are almost 20 % higher. In terms of Cancer care France has improved since the early 2000s through the introduction of multidisciplinary teams and cancer networks, greater use of clinical guidelines and more rapid access to innovative drugs.

**DFLE is only 12 years,
but could be improved**

Based on patient data diagnosed between 2010 and 2014 obtained from the CONCORD program of the London School of Hygiene and Tropical Medicine, France compares well with other EU countries for five-year survival rates following diagnosis of breast, colon, prostate and lung cancer.

Figure 8. Hospital admissions that could be avoided are higher than in many EU countries.

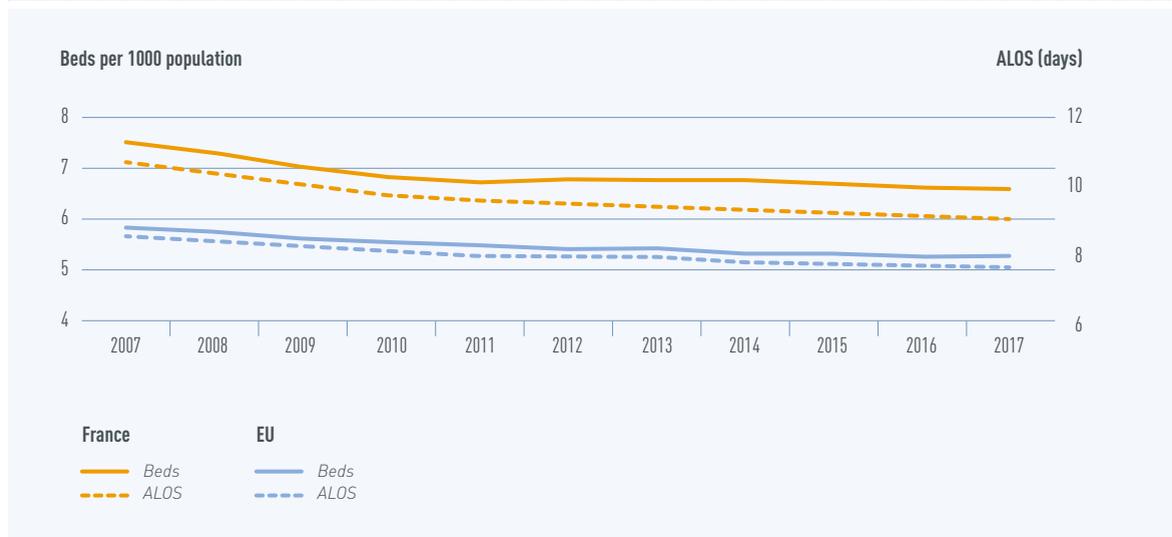


Source: OECD Health Statistics 2019 (data refer to 2017 or the nearest year, except for France 2015).

Another indicator of static efficiency is represented by number of hospital beds and average length of stay. According to [Figure 9](#), France still remain higher than EU average, despite over the last 10 the trend has been declining but not enough to reach that of the average EU. "The National Health Strategy 2018-22 proposes further restructuring of the hospital sector that would include a new category of "proximity" hospitals. These would focus on providing low-technical level care, such as general medicine, geriatrics, rehabilitation, chronic disease management, technical support (medical imaging, biology), mobile

care and eHealth, including telemedicine. It is expected that about 500 to 600 public hospitals (i.e. 35-45 %) will become proximity hospitals.” (OECD/European Observatory on Health Systems and Policies, 2019).

Figure 9. The number of hospital beds and average length of stay



Source: Eurostat Database

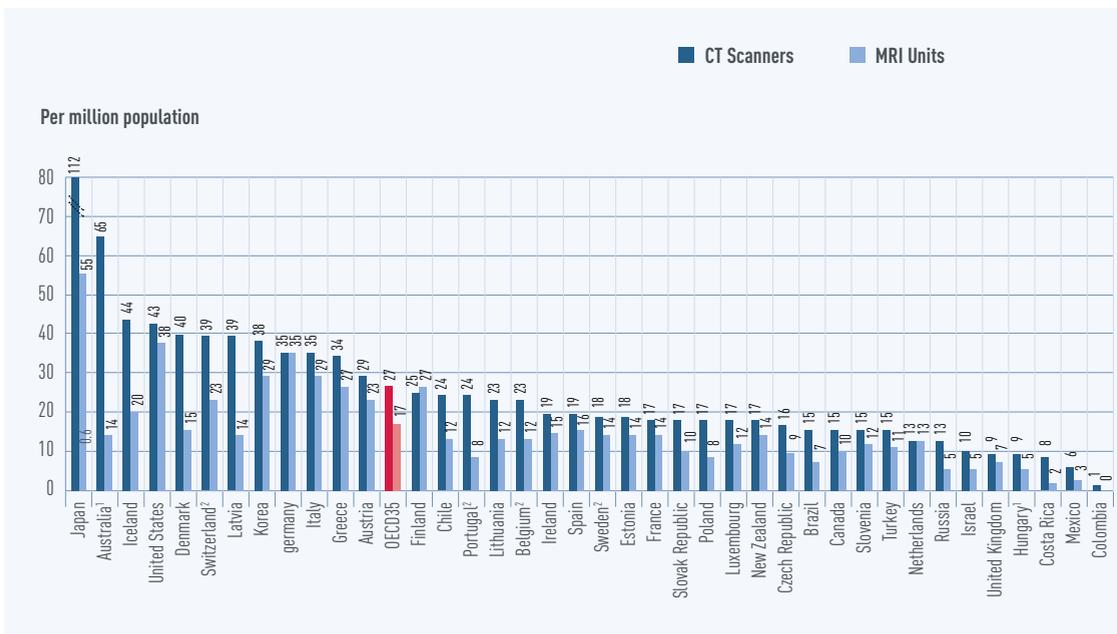
According to the OECD/European Observatory on Health Systems and Policies (2019) “there is widespread recognition that many activities and procedures in the French health system are not useful and bring little benefit to patients. The overuse of some of these procedures were illustrated in the 2016 atlas of medical practice variations, which reviewed the often large and unexplained variations in the use of ten frequently used surgical procedures (Le Bail & Or, 2016). Since 2016, each regional health agency has to provide a four-year action plan describing planned improvements in appropriateness of care, targeting the medical practice variations identified in the 2016 atlas. In addition, since 2015, a range of measures have been taken to identify extreme unjustified medical practice variations in hospitals, based mainly on the hospital IT system. Hospitals identified as atypical have to sign a contract with their regional health agency and the SHI that guides the implementation of measures to improve appropriateness of care.

The SHI also encourages more appropriate care in primary care, especially since the introduction of payments based on public health objectives and control measures if the volumes of prescribed pharmaceuticals are well above the local area average in 2012.”

At the same time, public health and prevention policies have traditionally been neglected in France. The new National Health Strategy 2018-22 has put more emphasis and resources (EUR 400 million over five years) to support prevention programs across all ages. Furthermore, in response to a recent fall in vaccination rates among children, in 2018 the government made a further eight vaccinations mandatory (for a total of 11 mandatory vaccinations) and a public awareness campaigns were also launched to restore public trust in the benefits of vaccination. Preliminary evidence suggests that these measures have successfully led to an increase in childhood vaccination rates.

Historically
preventative care
has been neglected

Figure 10. CT scanners and MRI units, 2017 (or nearest year)



Source: OECD Health Statistics 2019.

In terms of dynamic efficiency, France does not seem to perform well based on standard indicators produced by the OECD who relies on two diagnostic imaging technologies: computed tomography (CT) scanners and magnetic resonance imaging (MRI) units, which help physicians to diagnose a range of conditions. The availability of CT scanners and MRI units has increased rapidly in most OECD countries over the past two decades. Japan has by far the highest number of MRI units and CT scanners per capita, followed by the United States for MRI units and by Australia for CT scanners (*Figure 10*). France ranks below countries like Austria, Germany, Greece, Iceland, Italy, Korea and Switzerland but well above UK who lags behind. However, in terms of MRI and TC utilization France ranks second and eight, respectively. However, today these represent very poor indicators, given the fast pace at which medical technology is entering the health care sector.

The threats to financial sustainability: is France immune to this?

The magnitude of the economic crisis in 2008-2009 has sharpened the debate on the sustainability of the national health system. The collapse of the economies with the long phase of economic crisis has raised, among others, the problem of inability to maintain public services that are pillars of the welfare state: education, pensions and healthcare. The sharp fall in public revenue, which is a direct result of decreased business activity, accompanied by a dramatic increase in unemployment and the marked decline in the number of employees paying social contributions have dramatically worsened the situation. As a result, all EU countries have started discussing important reforms to guarantee financial sustainability of these important public services.

However, we should not forget that, especially in the health care systems, serious financial difficulties had been experienced long before the crisis. Over the last 50 years, universalistic coverage in most advanced European countries has contributed to a permanent improvement in health indicators, but also to a continued increase in health spending, which in many cases the countries could not afford. The same is happening in all member countries of the Organization for Economic Cooperation and Development (OECD), where health spending has increased more than the gross domestic product (GDP), becoming economically unsustainable, most of which were created and developed in times of greater prosperity (Ivanková et al., 2019; OECD, 2019a).

According to projections made by OECD in 2010, if health spending in European countries continued to grow at the prevailing rates of the first decade of the XXI century it could increase from 8% of the average GDP in 2000 to over 14% in 2030. More recent OECD estimates by Lorenzoni et al. (2019), show that growth in health spending per capita is expected to be slower than historical growth, but still above the growth rates recorded in the economy over the next fifteen years. "On average across the OECD, base estimates project health spending to reach 10.2% of Gross Domestic Product (GDP) by 2030, up from 8.8% in 2015. The lower and upper bound of plausible estimates are for health spending to reach between 9.6% and 10.8% of GDP, depending on how successful or otherwise policies are in reining in health spending. Spending by government schemes and compulsory insurance is projected to grow faster than total health spending, with its share of total health spending rising from 74.2% to 77.4% by 2030" (Lorenzoni et al., 2019). The main drivers of these projections are represented by changes in income, demography, low relative productivity in the health sector and a that other unexplained factors, including technological change. Income

Macroeconomic conditions will affect the financial sustainability of the health care system

Recent forecasts predict that health care spending will grow more than GDP

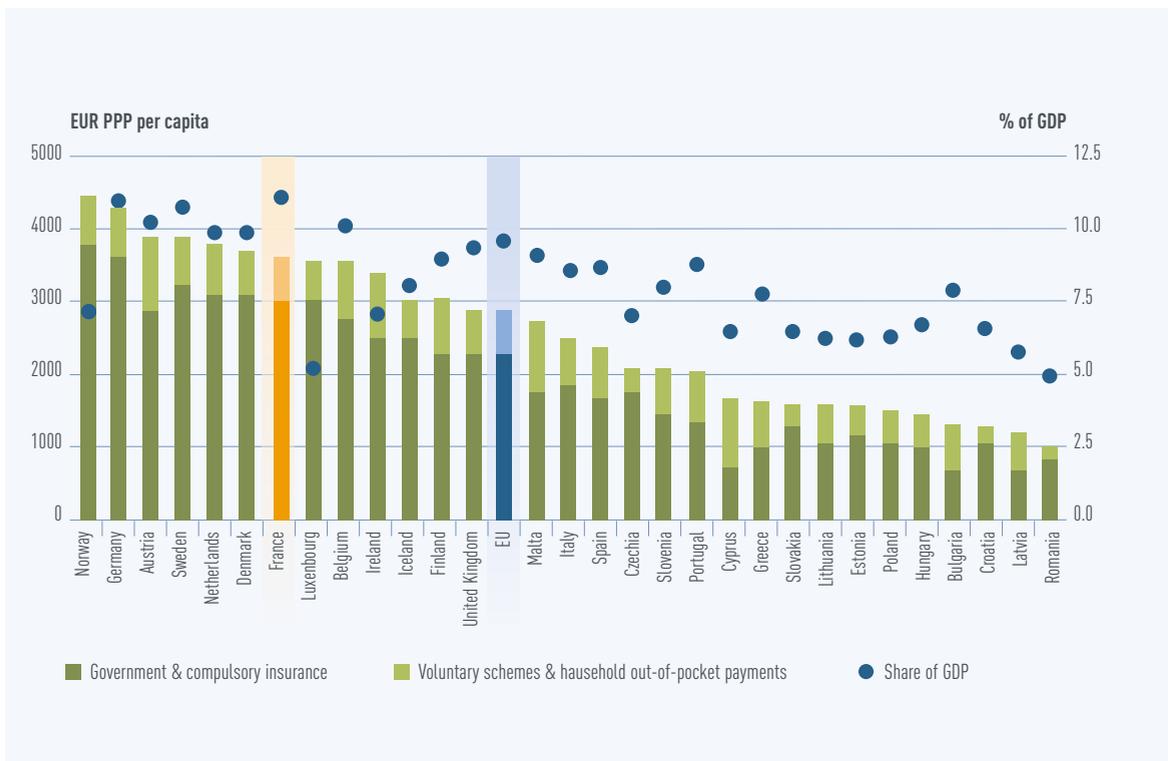
by far is the most important variable explaining half of the forecasted growth. From a policy perspective these forecasts are important as they show two major things. First, health expenditure will not cease to grow, which implies that policymakers need to plan to secure some money to finance it over time. Second, “even if health spending is likely to increase, governments can still have a substantive impact on managing the growth. Proven policy examples include improved laws and regulations on health workforce, pharmaceuticals and new technologies, and effective health promotion and disease prevention strategies” (Lorenzoni et al., 2019).

Thus, given that the sustainability of a health system mainly depends on economic growth, the economic crisis, slower growth, and the consequent deterioration of public finances are seriously endangering the sustainability of the health systems that were already experiencing structural problems. At the same time, governments are under pressure to continue pursuing their long-term goals of having more equitable, responsive and efficient health systems.

From this perspective the French health care spending is substantially higher than the EU average. Health spending as a share of GDP increased over the last decade from 10.3 % in 2007 to 11.3 % in 2017, the highest share in the EU along with Germany and well above the EU average of 9.8 % (see Figure 11). However, France only comes in sixth place in terms of health spending per capita, at EUR 3.626 per capita in 2017 (adjusted for differences in purchasing power). While this is 25% above the EU average (EUR 2.884), several countries such as Germany, Austria, Sweden, the Netherlands and Denmark spend more. The presence of a single-payer system increasingly relying on tax-based revenues to ensure the financial sustainability of health insurance funds raises the concern toward the sustainability. In the past two decades, the state has become more involved in controlling health expenditure funded by the SHI system. Since 2009, the regional health agencies have played an expanding role in managing health care provision at the local level.

The deterioration of public finances will be reflected in the financing of health care spending

Figure 11. Health spending in France is higher than in most EU countries



Source: OECD/European Observatory on Health Systems and Policies (2019). Data refers to 2017.

However, the National Health Strategy 2018-22, adopted in 2017, sets ambitious goals to improve the whole health system and to reduce health inequalities. (Ministère des solidarités et de la santé, 2017). The plan is structured around the following four main priorities: 1) health promotion and prevention policies throughout life and across all socioeconomic groups; 2) reducing social and geographical inequalities in access to health care; 3) ensuring quality, safety and appropriateness of health care; 4) transforming the system in a more patient-centric system. All these goals cannot be achieved at zero costs: in absence of a relevant change in the economy growth rates and/or of a significant reallocation of the public expenditure toward the health care sector, in the short and medium term this plan will certainly add stress to the capability of the system to remain sustainable.

Reforming the system: a long list of reforms over the last 20 years.⁵

In 2000, the WHO ranked the French healthcare system as the “best in the world.” This result came in spite of the fact that France lagged behind Europe in terms of standard benchmarks for high-tech healthcare (such as MRI or CT scanners per capita), and other major structural challenges⁶. It took less than four years, for a new evaluation to come out from French official body (the High Council for the Future of Health Insurance). According to that assessment the country’s health system was in a state of “general confusion” and faced a severe crisis - including a six-fold rise in its public budget deficit by 2020.

What came after these assessments resembled more a roller coaster tour rather than a smooth path toward improvement and the Great Recession did not help the process. Overall the French system is quite good on average in producing good levels of population health compared to the rest of the world. Life expectancy levels, as well as mortality rates, are there to remember to all of us of the good health care quality we receive in EU. However, they all face similar structural problems, which grow over time due to increasing demands of an aging population and rising costs - especially for new therapies and technologies.

It is for this reason that several reforms have been designed and then implemented to try increase efficiency. This has been particularly true for France, which introduced the first important reform in 1996 (Achievements Limited), to strengthen quality and efficiency. Some of the measures included founding of a healthcare accreditation body, new regional hospital agencies (RHAs), establishment of cash-limited budgets at both national and regional levels and a contracting procedure between health authorities and hospitals. These moves, however, did little to ensure long-term control of escalating costs, and led the way for far more drastic moves proposed in 2004 by the High Council for the Future of Health Insurance.

A reform plan, known as “Hôpital 2007”, was launched on November 2002. It was an ambitious 5-year reform program, implemented for the period 2003-2007 (which was then followed by the “Hôpital 2012”, for the years 2008-2012). The main goal of the reform was the modernization of healthcare facilities by boosting investment in buildings and equipment. As a result, total investment in hospitals doubled between 2003 and 2006. It also introduced an activity-based payment system both for public and private hospitals. Previously, resources were allocated to public and private hospitals by two different methods. Public and most private non-profit hospitals had budgets allocated by the regional hospital agencies based on

Too many reforms are not a good sign for the wellness of the French health care system

[5] A detailed description of all health care reforms implemented in France is available in Safon (2019).

[6] That exercise has never been repeated in the following years, mostly because of the opposition of the USA who were ranked 37th!

historical costs. Private for-profit hospitals had a billing system with different components: daily tariffs and a separate payment based on diagnostic and treatment procedures. In addition, doctors working in for-profit private hospitals were paid on a fee for service basis unlike those working in public and non-profit hospitals, who are salaried. Now, with the exception of long-term care and psychiatry, all hospitals are funded on the basis of "rates per activity", or homogeneous hospital stay groups. Currently, funding models and tariffs calculation for public and private hospitals remain different. However, from 2018, the aim is to harmonize payment methods and tariffs of both sectors. Another important element of this reform has been to give public hospitals flexibility to deal with this new financial environment. The goal was to simplify management of public hospitals and to integrate medical staff in managerial decisions. Hospitals now have the opportunity to create large clinical departments in order to organize their medical activities in a more efficient way. Resource allocation and most of the management rules concerning recruitment, investment strategy and the use of new interventions are still constrained.

The "Hôpital 2012" plan was announced in February 2007. With this second reform the targets were on security, working conditions, information system and mergers. Moreover, this new investment plan was supposed to guarantee the continuation with the previous plan without ruptures.

In 2009, a new law "Hôpital, Patient, Santé et Territoire" was adopted. The aim of the law is to reorganize and modernize the entire health system. It includes four titles devoted respectively to the Hospital, the distribution of doctors and access to city care, public health measures and prevention, and finally to the creation of regional health agencies (ARS) responsible for coordinate all health policies within a territorial framework (hospital, town medicine, public health and prevention). The reform introduced also a new mechanisms of cooperation between providers and changed the internal governance of public hospitals giving more power to the Chief Executive. At the same time it enlarged the capacity of the private for profit sector to deliver public service missions.

In June 2014 another reform was presented by the Minister of Social Affairs and Health, Marisol Touraine, and then adopted by the Council of Ministers on October 15, 2014. This new reform was in line with the Hospital, Patients, Health and Territories (HPST) law of July 21, 2009. It stems from several preparatory works: the 19 recommendations of the Comité des Sages chaired by Alain Cordier, the proposals for

official reports such as the one chaired by Claire Compagnon on health democracy, by Bernadette Devictor on the territorial public health service (SPTS) and the Public Hospital Service (SPH), and that chaired by Edouard Coutu on the hospital trust pact. The law is structured around three axes: prevention, access to care, and patient rights and safety. Its title was also changed to a bill "to modernize our health system".

However, in 2016 a new reform called "the 2016 act to modernize healthcare system" was approved. The law intended to overhaul the public hospital service. This begins with a reaffirmation of the public hospital service, which was considered deeply disorganized following the law of July 21, 2009, known as the "HPST", which divided the public service into fourteen public service missions (including emergencies).

Finally, in September 2018 the President announced the "Ma santé 2022" strategy which is supposed to offer an overview and global responses to the challenges of the French health system. First of all, it should address inequalities in access to care which cause an increasing number patients with difficulty accessing a doctor, to go to the emergency room as first choice. Then, it should help professionals to cooperate better with each other, to have more time to care for their patients and to be trained differently. In particular, it should bring together caregivers in the primary care and caregivers in hospitals around health projects adapted to the needs of French people in the territories. It is supposed to give each French person the opportunity to be treated every day of the week until the evening and on Saturday morning without having to go through the hospital, to strengthen preventive actions, to keep at home as much as possible fragile people with several pathologies. Proximity care must be organized within structures of coordinated exercise such as homes or health centers, within the framework of territorial professional health communities (CPTS). Along these lines, the reform will introduce new medical assistant functions who will be able to take on administrative and nursing tasks to allow physicians to spend more time with their patients, especially the most fragile or those suffering from chronic diseases. The hospital offer will be redesigned around hospitals and local hospital services for day-to-day care (medicine, geriatrics, rehabilitation), more necessary than ever in a context of aging population and increase in chronic diseases.

In order to support these developments and support hospital professionals in carrying out their missions, "Ma santé 2022" will strengthen training activities at all levels. A new vision and a new organization of the French health care system cannot be possible without rethinking the way caregivers and managers are trained. Overall, "Ma santé 2022" will be tailored around the common thread

**The last plan
"Ma Santé 2022"**

of quality and relevance of care. With the establishment of real care pathways, patients will not have to assume alone the coordination of the various health professionals. This process should be facilitated thanks to the adoption of digital technology.

In conclusion, in a time span of 20 years the French health care system went through 5 important structural reforms (not considering a couple of other minor changes implemented during these years), whose aims and objectives sometimes have been contradicting. On average, each reform did not have more than 5 years to be implemented and produce the expected results (considering that "Ma santé 2022" is still a work in progress). This represents a very inefficient process, resembling more a "roller coaster tour" rather than a clear smooth transition toward improvement, and could partly explain some of the existing structural problems in the French health care system. Hopefully, if correctly implemented and not "hijacked" during its implementation period, "Ma santé 2022" could help solve many of them.

Future health care challenges: is France ready to tackle them?

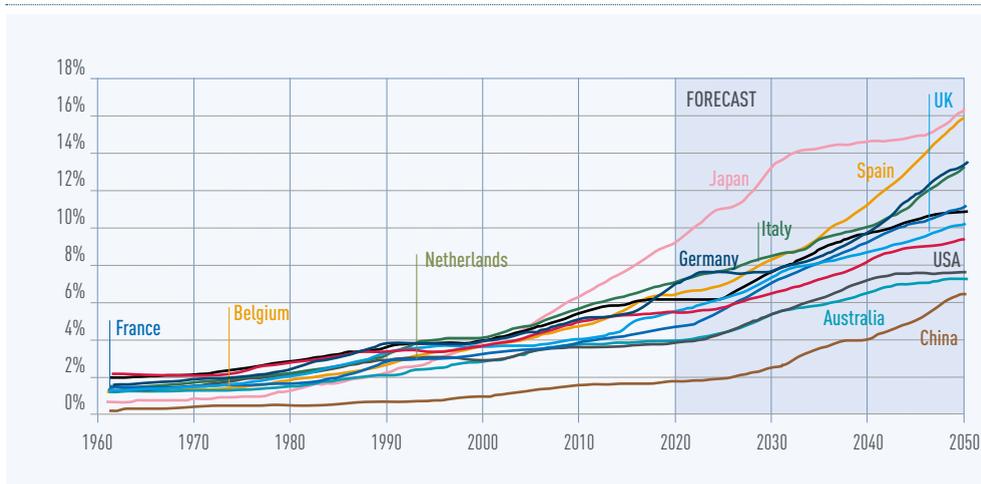
Healthcare is facing rapid changes, now more than ever in past. These changes pose new challenges to healthcare organizations. In particular, within the context of complexity discussed in the introduction, the fast-evolving government regulations, technological innovations, and patient expectations create a new environment in which, for example, running a medical practice isn't just about treating patients anymore. In what follow we provide a description of the main challenges and if and how the French health care system is ready to approach them.

4.1 Epidemiological challenges: the surge of chronic diseases

The first challenge is represented by the aging population. We are already seeing an impact in many European countries, but forecasts suggest the potential strain on healthcare systems could be monumental. In the UK, there is already a discussion about the potential impact of an ageing "time bomb", but this demographic shift is not unique to the UK. As *Figure 12* shows, the share of people over the age of 80 is expected to surge across Europe and especially so in France, Germany, Italy and Spain. This demographic shift is mainly driven by increasing life expectancy – a product of developments in medicine and medical procedures. As *Figure 13* illustrates, both men and women across Europe are now expected to survive 18-24 years beyond the age of 65.

France is one of
the oldest countries
in the world

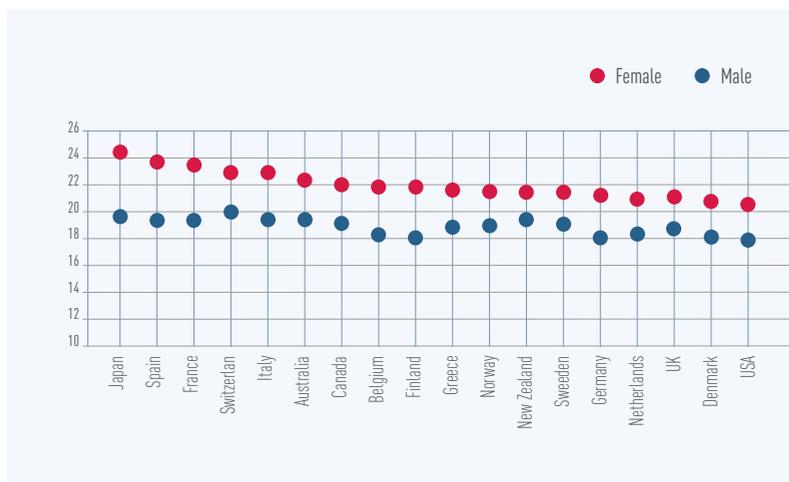
Figure 12. Share of population aged 80 and over (%)



Source: OECD.

Ageing is a great thing and is certainly a mark of an advancing society as it means that we are living longer. However, this phenomenon carries side effects caused by the insurgence of one or more chronic conditions. As such, the future world will present a different structure of burden of disease than what we have seen 20 years ago and certainly 50. Compared to 50 years ago, people are less likely to die of infectious diseases during their childhood or adulthood. They do not even die because of accidents as before. Furthermore, if they have a heart attack they can be treated and, usually, survive.

Figure 13. Life expectancy at 65 by gender



Source: OECD.

As a result, we see more chronic diseases associated with aging, but also with poor lifestyle. Among these chronic diseases an important role is that of neuro-degenerative diseases, with dementia becoming an increasing challenge. Finally, also mental health is becoming one of the big challenges, affecting not only the elderly but also adult population.

This epidemiological trend will require a very different type of healthcare than 20 years ago, when the interventions and the care provided were more focused around "acute illness". Having an accident, having a major infection, or having a heart attack are all things that can be dealt with in a hospital setting. On the contrary,

the new diseases require a continuum of care, organized around the patient and his/her life, lifestyle, health behaviors and well-being, but also, crucially, healthcare that is proactive rather than reactive. That is a completely different mind-set both for caregivers as well as for the different infrastructures and the systems and the mechanisms that deliver healthcare. That is a major challenge for all developed countries: to shift our organizations to think that we do not simply need to provide “more care”, but also “different care”: this requires a sort of structural adjustment.

Another challenge posed by aging is that it will create strong synergies with the escalating trend of new technologies: together they will be responsible for the increase in healthcare costs. Clearly, having more performing and effective technologies is a good news as is aging. However, this combination is something that requires a lot of attention by policy makers.

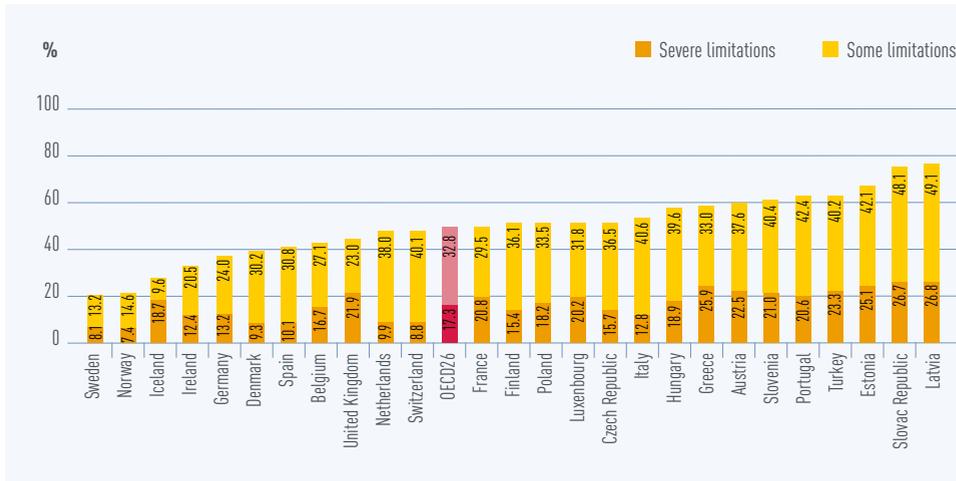
This is why one of the main challenges is to provide more healthcare, better healthcare, different types of healthcare, but also more healthcare for less, because that ultimately is going to be the only way to find a solution to the financial sustainability problem. This is not an easy task. It has to do with increasing productivity in the sector as well as to re-engineering several processes. For example, if we need a continuum of care, what's the role of the several high fixed-cost infrastructures that have been built so far? They may be useful in parts, but our future will be less and less dominated by situations in which patients require acute treatment with short stay in a hospital.

4.2 Trends in disabilities (or what can be wrong with chronic diseases)

As the EU population is getting older, the number of Europeans with disabilities is rising significantly. It is estimated that at the end of 2020 approximately 120 million Europeans will have a disability (EU-SILC 2014). The share of women with disabilities in the overall population is higher than the share of men (29.5% vs 24.5%). According to the OECD (2019), 26 European OECD countries, 50% of people aged 65 and over reported having at least some limitations in their daily activities: 33% reported some limitations and a further 17% reported severe limitations (Figure 14). Many of the countries reporting the highest rates of self-rated poor health also reported high rates of limitations in daily activities in adults aged 65 and over.

Ageing and new technologies will stress the health care system

Figure 14. Limitations in daily activities in adults aged 65 and over, European countries, 2017 (or nearest year)



Source: Eurostat Database in OECD (2019).

These evidence suggest that in the next years an increasing number of people will require support from long-term care (LTC) services, including nursing homes and LTC living facilities. Providing safe care for these patients is a key challenge for OECD health systems, as residents of LTC facilities are more frail and sicker, and present a number of other risk factors for the development of patient safety events, including healthcare-associated infections (HAIs) and pressure ulcers (OECD/European Commission, 2013). Across OECD countries, an average of 10.8% of people aged 65 and over received LTC in 2017. This represents a 5% increase compared with 2007. Slightly more than 10% of individuals aged 65 and over received LTC services in France compared to about 22% in Switzerland. According to OECD (2019), the majority of LTC recipients are older adults. Although LTC services are also delivered to younger disabled groups, people are more likely to develop disabilities and need support from LTC services as they age. In 2017, just 21% of LTC recipients on average across OECD countries were younger than 65, while a further 27% were between 65 and 79. Adults aged 80 and over represent the majority of LTC recipients in OECD countries. On average in OECD countries, 51% of LTC recipients were aged 80 and above in 2017.

Dementia represents one of the greatest challenges associated with ageing. Dementia describes a variety of brain disorders, including

Disabilities are increasing over time

Alzheimer's disease, which progressively lead to brain damage and cause a gradual deterioration of a person's functional capacity and social relations. Despite billions of dollars spent on research into dementia-related disorders, there is still no cure or even substantially disease-modifying treatment for dementia. Nearly 20 million people in OECD countries are estimated to have dementia in 2019. If current trends continue, this number will more than double by 2050, reaching nearly 41 million people across OECD countries. Age remains the greatest risk factor for dementia: across the 36 OECD countries, average dementia prevalence rises from 2.3% among people aged 65-69 to nearly 42% among people aged 90 or older. This means that as countries age, the number of people living with dementia will also increase – particularly as the proportion of the population over 80 rises. Already, countries with some of the oldest populations in the OECD – including France, Germany and Italy also have the highest prevalence of dementia. Across OECD countries on average, 15 people per 1,000 population are estimated to have dementia, with France scoring 20 per 1,000 thousand habitants, one of the highest within OECD. This number is further projected to reach 33.5 per 1,000 thousand habitants in 2050.

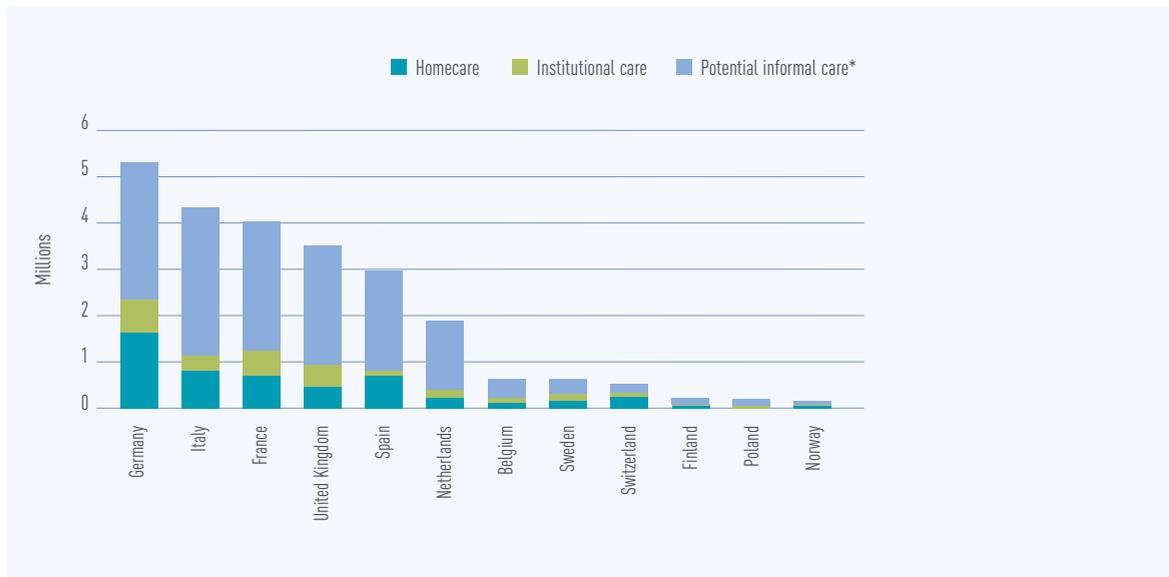
The OECD estimates that the cost of long-term care across Europe will rise from 1.8% of GDP at present, to between 3% and 5% in 2060. This jump will strain public funds at a time when government budgets are already squeezed. The Netherlands and Scandinavian countries are already allocating between 3-4% of GDP to long-term care provision. The share for France is 1.9%, which is above the OECD17 average (1.7%) and higher than countries like Italy and Spain, where cultural norms have limited the need for long-term care, may need to adjust their healthcare budgets as their societies evolve. Compared to other areas of health care, spending on LTC has seen the highest growth in recent years. Generally, the health component of LTC represents the vast majority of all LTC expenditure, but some issues remain around properly distinguishing between health and social LTC in some countries.

According to Brame (2020), many western European countries rely heavily on homecare or informal methods to care for the elderly. Informal care is typically delivered within families and households and while difficult to quantify is very common in Italy, Spain and France [see Figure 15]. Some governments encourage and incentivize informal care to minimize healthcare expenditure by the state. For example, in Italy workers are granted up to 35 days paid leave per year to provide short-term care to dependent relatives, while in France employees are entitled to 20 days paid leave. Incentivizing informal care is not a comprehensive solution to population ageing – a view echoed by the European Commission. Firstly, the number of multi-generational households is declining across Europe, limiting the ability of many

Affording LTC costs is becoming a huge problem

families to assist elderly relatives. Secondly, the scale of population ageing in many countries is such that by 2050, 1 in 6 adults will be over the age 80. This compares to around 1 in 15 at present levels. Over 80's are more likely to suffer from chronic and degenerative health conditions, such as dementia, that require specialist nursing care and propel the need for full-time residential care.

Figure 15. Elderly recipients of formal care and potential recipients of informal care



Source: OECD, Eurofound,

* Calculated as total over 80 population, less recipients of homecare and institutional care

These figures implies a change in the strategy followed so far with more investments and interventions in this segment of the health care market. "France has a care home market totalling 750,000 beds and 11,000 care home facilities, commonly known as Établissement d'hébergement pour personnes âgées dépendants (EHPADs). The market is mature, but informal care is common to rural areas, supported by generous worker rights to paid leave. Although France spends 11.5% of GDP on healthcare, roughly 2% is allocated to long-term care and the government has sought tighter control of the commissioning of services across geographies. With occupancy

New strategies are required to manage the demand of LTC

rates now reaching capacity [95%], local and central government are beginning to relax restrictions on the private sector with new supply greatly needed.” (Brame, 2020). However, a largely fragmented and state-controlled care sector has historically limited the investment opportunity, but this is now beginning to change with major private sector operators increasing their market share and expanding their operations home and abroad. Continued market consolidation is expected to create more real estate opportunities going forward at a time when investors are turning to alternative sectors. While the broad story is similar across Europe, markets are maturing at different rates, have different models of care, and present different investment opportunities. Building a knowledge of the care sector in France will be essential for any prospective investor.

4.3 The new technologies: how will they shape the future of health systems?

In order to understand the variety of technologies available in the healthcare sector, how they are evolving, and how they can affect costs and outcomes, in this section we provide an overview of the main domains in which technological progress leverages the healthcare sector. For convenience of exposition, they have been broadly categorized into digital technologies (which includes among others support systems, cybersecurity, big data and e-health), drug treatments, medical and surgical procedures, medical devices, and precision medicine.

4.3.1 Digital technologies⁷

According to the OECD report on Health in the 21st Century: Putting data to work for stronger health systems, digital technology plays a fundamental part in just about every facet of human activity (OECD [2019c]). Its scale, reach and expansion is certainly colossal. For example, OECD countries currently have about one mobile internet subscription per inhabitant. Mobile data usage more than doubled in most OECD countries between 2015 and 2017. By 2021, three connected devices will exist per person around the globe (OECD, 2019b). Digital technologies - and especially electronic data - can be put to work with the goal of generating positive health system transformation through different channels: improving health service delivery models, empowering patients and health system users, readying the health workforce to make the most of digital technologies such as artificial intelligence (AI), using big data in public health policy, the importance of cross-border collaboration, using routine and real-world data to generate evidence on treatments and therapies, and improving overall health system governance and stewardship. Needless to say, investing in a digital transformation of the health sector can generate potential health and economic returns.

New technologies represent the “good” and the “bad” news in a health care system

(7) Part of the text of this section comes from material reported in the “Introduction” of OECD [2019c], to which the interested reader could refer for more information and details.

Unfortunately, the health sector is slow to embrace a digital transformation and this is a matter that requires urgent attention. Evidence from other sectors should drive this attention as this has led to continual improvement of services and products, and the creation of considerable value on the supply and demand side of the global economy (OECD, 2019b). “The health sector provides a stark contrast. Take for instance, the fact that health systems generate mountains of data, but do not routinely re-purpose these for assessing the performance and value of treatments. In some places, it is not possible to detect when patients are re-admitted to hospital if this occurs a different location. More fundamentally, health is one of the few sectors where technological advances result in higher costs and expenditure (OECD, 2017; Marino and Lorenzoni, 2019). To put it plainly, the sector is a decade or so behind. This represents a considerable amount of foregone health and economic benefits. Despite some signs of progress [...] the consensus is that health systems could and should be doing much more to put data and digital technologies to work.” (OECD, 2019b)

Support systems - According to Kvedar, Coye, and Everett (2014), new care models that employ connected care have the potential to revolutionize healthcare delivery by widening access to high-quality and cost-efficient health services. As an alternative to face-to-face care, hospital professionals and physicians have employed remote healthcare. Such extending of healthcare provision under the constraints of value-based services is found to improve health outcomes (Antonicelli et al., 2008; Bartolini & McNeill, 2012; Fifer, Everett, Mitchell, & Vincequere, 2010; Kvedar et al., 2014).

Provision of connected healthcare requires substantial organizational changes, but the potential medical and financial benefits are extensive; however, because this type of technology development is frequently applicable to prevention and diagnosis, the benefits tend to materialize only in the long run. The developments of information technology (IT) in the health sector are strictly related to the evolution of informatics technology, wireless broadband connectivity, and data storage solutions. This technological domain is also challenged by concerns related to data privacy and security. The application of information technology underlines the role of electronic health records, which in the presence of increasingly cheaper computer power and sophisticated analytics may constitute the interconnection between face-to-face visits and telehealth, coordinating various workforce models in healthcare provision. In fact, according to the meta-analysis of Buntin, Haviland, McDevitt, and Sood (2011), a large majority of recent studies highlight the importance and positive effects of the IT introduction in the healthcare provision system. According to the same review, studies that do not find health IT beneficial often show that the

French health care digitalization is slow

negative evaluation stems from the lack of satisfaction of healthcare professionals, who are not appropriately introduced to the new functioning and management of care. As a result, authors conclude that while telehealth and related health information technologies are developed to render healthcare provision more efficient, cutting down on face-to-face visits and physical contact, they still require the "human element" in provision aspects. Electronic health records and other information technology aspects that physicians find difficult to use shed light on the need to implement adequate training and support among providing professionals in order to maximize the potential of the technologies introduced.

Another important aspect to tackle is the capacity to use digital technology, manage data and extract knowledge from them. All this must exist and requires investment in not just hardware but the expertise to make the most from it. It must target the supply side and the demand side. Providers and patients need to be engaged. Surprisingly, OECD countries typically invest only under 5% of health budgets on managing information. In other sectors investment in this technologies is four times higher. Closer inspection reveals that the health sector spends similar amounts to comparable sectors on tangible products such as ICT hardware, computers and network infrastructure. However, spending on intangible products such as software and databases, and the purchases of ICT services is comparatively modest.

These evidence show that the potential economic benefits of data- and digitally-driven process innovation are abundantly clear. This is a sector that consumes a tenth of national incomes (a figure that is also rising), where approximately 20% of expenditure does not generate health benefit, and where technological progress tends to increase prices and spending. Investing in a digital transformation is therefore a very attractive proposition. Rather than creating new things to do, data and digital technology can make existing health system processes and activities more productive and efficient. However, a digital transformation must begin with an explicit recognition that data are a valuable resource, but have no intrinsic value unless put to work within an enabling institutional environment. This recognition must be pan-sectoral in order to begin bridging the silos that impede digital transformation. Digital strategies abound in health, but approaches that are shared across all sectors and on which enabling policy frameworks can be built are rare. This represent the real challenge to face to reinvent the French health care sector and to make it financially sustainable and of high quality.

Cybersecurity - The health sector has unique characteristics. For example, some health data are very privacy-sensitive and complex and

a hallmark of digital transformation is efficient data exchange. This is made possible with adoption of common standards and protocols. The global internet protocol (IP), which enables the seamless exchange of data across the internet, is perhaps the pre-eminent example of this. Collection, storage, treatment and exchange of highly sensitive patient information collected by healthcare organizations has brought the health care sector to become a prime target for cybercriminals. In 2017, the US medical and healthcare sector experienced over 350 data breaches, exposing 4.93 million patient records. Unfortunately, this trend shows no signs of slowing down. In the first half of 2019, there already were 32 million patient records breached. This trend will continue as many healthcare providers are still slow in responding to threats while the decentralized systems make them more vulnerable to attacks. When a breach occurs, not only confidential patient information are compromised, but also the provider face a hefty penalty if he is found to have violated the many compliant standards regulating the industry. Besides improving cybersecurity, healthcare providers can also outsource their processes involving sensitive patient information such as invoicing and billing to a HITRUST-certified third-party provider which has dedicated resources to ensure that its system is properly protected against cybercriminal⁸. Digitalization cannot occur if cybersecurity problems are not solved.

This subject was discussed in particular in France during the General Assembly of Bioethics in 2018. Open data would go against medical confidentiality. However, in February 2018, following checks carried out on the SNIIRAM database, the National Commission for Informatics and Freedoms (CNIL) issued a formal notice to Health Insurance to strengthen its means of securing.

Finally, there is the problem of how to effectively protect data collected without the knowledge of patients during research on the Internet or by connected objects. For example, how to ensure that GAFA (Google, Apple, Facebook, Amazon) do not appropriate them? With these technologies new and formidable ethical questions emerge. These questions transcend borders and cannot be resolved only at the national level. In addition, they call into question questions as fundamental as equality in access to care and the limits of science in intervention on human beings.

Big data - Although more and more healthcare data is being generated, it's scattered across multiple parties and systems including payers, providers, and patients. There's no single "source of truth" that providers can use to optimize patient experience. For instance, when patients switch insurance plans or healthcare providers, most medical practices rely on patients' self-reporting to reconstruct their records. As a result, not all the information is transferred properly and it's

Cybersecurity is a big concern in a world of electronic clinical records

[8] The HITRUST Third Party Assurance Program enables organizations to apply the HITRUST CSF Assurance Program to streamline the third-party risk management process by using a single comprehensive framework harmonizing multiple standards and best practices to support a single assessment that may be reported out in multiple ways. Using the CSF Assurance Program for third-party risk management can result in significant reductions in the cost and level of effort. An increasing number of organizations are now requiring their business associates within their industries to obtain CSF Certification.

very challenging to harness the power of data and generate accurate insights. In addition, healthcare data comes from many sources in a variety of formats. Currently, there's no single system or technology infrastructure to retrieve, store, and analyze data from various sources at scale. For healthcare organizations to successfully harness the power of big data, leadership needs to embrace data-driven decision-making. The use of analytics should be woven into the organization culture to develop a trust in data so the insights can be used to support decision-making at the executive level. In order to fully leverage all the patient data from a variety of sources, healthcare organizations need to implement non-relational information technology so data from various sources can be utilized even if the datasets come in different formats.

E-health - Another important field is changing the relationship between patients and medical personnel is e-health, which includes the set of health-related services that use new information and communication technologies. E-health, uses the internet, applications for smartphones and/or connected objects. However, smartphones are not the only connected objects used by e-health. Connected bracelets and activity trackers are on the rise. Practical, light, they offer to monitor the daily physical activity of users and encourage them to move more to be in better health. Connected watches are also part of this dynamic (e.g., Cardiogram app for Apple's smart watch). The Apple Health application proposes to gather information on the health of holders of iPhone or Apple Watch (diet, physical activity, sleep, etc.).

In the era of *big data*, all data passing through connected objects or health systems could also help researchers and doctors in their work. The proliferation of applications such as collecting data from doctors and pharmacists has considerably increased the amount of information available in the health sector. All of this data represents a windfall for researchers. In France, health cost reimbursement data is collected by the National Health Insurance Inter-Regime Information System (SNIIRAM). Another system, the National Health Data System (SNDS), collects health data made available to researchers after having been anonymized. Such files make it possible to draw up a picture of the prevalence of a disease within the population, to identify risk factors for the disease or to verify the effectiveness of treatments. The analysis of this data could help to avoid important health problems, like that of the Mediator, by spotting unwanted effects of certain drugs. Finally, new technologies can also help in treating certain disorders, thanks to the so called "serious games". For example, in physiotherapy, virtual reality can allow a patient an autonomous rehabilitation thanks to a helmet which takes him in a virtual space to help him to perform movements.

E-health is also useful to allows for better access to care in rural areas and developing countries. In France, for example, although the number of doctors is rather high, its distribution on the territory remains

Big data remains a big bet for the improvement of care and the management of health systems

E-health will represent a paradigm shift in patient care

very unequal with some “desert” areas. Nursing homes deployed in the region can work in teleconsultation with hospitals and transmit medical data (radiology, results of analyzes, etc.) in order to avoid sometimes unnecessary transfers of patients to emergency services.

4.3.2 Drug treatment

Over the years, the pharmaceutical sector has gone through important modifications. Historically, it has been based on drugs obtained from “chemical” synthesis, combining specific chemical ingredients in an ordered process. More recently, new technologies have allowed companies to produce completely different types of drugs known as “biologic.” Most modern biologics (including vaccines) are manufactured in a living system (i.e., a microorganism, a plant, or animal cells) inside bioreactors that house genetically engineered microbes or mammalian cell cultures. Many biologics are produced using recombinant DNA technology. Today they represent the forefront of the innovation in the pharmaceutical sector.

A further group of products is represented by advanced therapy medicinal products (ATMPs), which leverage cell and gene-based approaches to treat disease. ATMPs are distinct from traditional biopharmaceuticals as they contain active cells or genetic constructs that exert a metabolic, immunologic, genetic, or other non-pharmaceutical mechanism of action. ATMPs are technically demanding to design and manufacture and to date have met with very limited commercial success, but the industry is rapidly evolving.

Until the first decade of this century successful companies relied on blockbuster-type therapies, where highly effective breakthrough drugs for common conditions were introduced to target extremely wide markets with large-volume sales. Today this paradigm is disappearing, with an increasingly large role played by the development and delivery of drugs that fit the individual patient’s biology and pathophysiology. This process is changing the industry manufacturing process from “blockbuster medicine” to “personalized medicine,” thus influencing the way that drugs are going to be developed, marketed, and prescribed in the future.

Biotech products are extremely precise and tailor-made for specific characteristics of patients, hence their price is usually relatively high. Frequently they are initially manufactured by small companies, which, due to the downturn in the capital markets, are often purchased by big pharma companies. The complexity of the conditions biotech drugs address also sparks a serious ethical debate. Since they are frequently developed for lethal diseases, as in the case of cancers or hepatitis C, their complexity justifies the high cost per treatment, but the high cost also casts a shadow on the reputation of their manufacturers, who reap their benefits from dying patients. Recent hepatitis C drugs and

Drug innovation is the most important driver of innovation in the health care sector

treatments for patients with advanced melanoma (T-VEC) are among the most striking examples of drugs that show how the potential effectiveness of a drug may drive the willingness to pay for it and at the same time compromise already limited budgets.

Finally, pharmaceutical companies consider the broad concept of innovating “beyond the pill,” hence assuring the overall treatment process related to the actual pharmacological product. In the developed world, the problem of adherence to drug therapies for common chronic conditions represents an important opportunity for big pharma. Adherence is crucial in therapies for chronic conditions, which are frequently asymptomatic. Such therapies are purely preventive in nature, generating side effects but at the same time requiring very strict medical compliance (Jackevicius, Mamdani, & Tu, 2002). While disease management aimed at adherence improvement is difficult to design and provide from the manufacturers’ point of view, the potential gains from encouraging patients to comply and persist with the treatments prescribed is estimated to have the potential of generating important savings in terms of comorbidities (Sabate, 2003). A number of practical solutions, with the simplest ones such as blister packs to more advanced microchips contained within drug packages or within the pills themselves, should be the future direction of research.

4.3.3 Medical and surgical procedures

Modern medicine has come a long way in the diffusion of certain medical and surgical procedures by rendering them less risky, less invasive, less time consuming, and more accessible. Overall, the lion’s share of the technological progress in this domain is based on the development of medical equipment that enables access to bodily organs in a non-invasive mode. Laser, radiofrequency, light energy, electronic miniaturization, and ultrasonic developments have given rise to significant improvements in surgical procedures, and the 21st century is likely to benefit even more from high-tech innovations.

4.3.4 Medical devices

Medical devices are closely related to the technological progress accomplished in surgical and medical procedures. Less invasive diagnostic tools have provided access to a wide number of treatments, replacing once complex and prolonged hospital procedures with less invasive treatments. Not only has technology changed the way procedures are performed, it has also widened access to them for patients with milder conditions. An example is biopsy, which in the 1990s was still an invasive and time-consuming procedure, while with new devices (such as flexible scopes and enhanced visualizations) it is frequently preceded by a diagnostic test verifying the actual need for biopsy, and it is sometimes performed in a non-invasive environment.

**“Beyond the pill”
innovation: a new
frontier for drug
manufacturers**

**Advancement in
medical devices are
becoming as important
drug innovations**

Due to the rise in unit cost and the number of patients served, ambulatory costs are exploding and hospital stays are more costly. While the initial costs of technical devices are very high, the net present value of the investment is likely to be positive, especially in terms of health outcomes and productivity. However, for many devices this type of evaluation is not straightforward. A simple example of how medical devices evolved over the years is the x-ray developed by Roentgen, which originally introduced unquestionable benefits to the targeted population. In the 21st century, radiation imaging went several steps further with magnetic resonance imaging (MRI), computed tomography (CT) scanning, and positron emission tomography (PET) scanning. In spite of the effectiveness of these devices in the early detection of certain pathologies, in particular cancer, their application is not free of risks and inappropriateness. Radiation exposure accompanying scans points to the need for accurately selecting patients for diagnosis. Thus, the overprescribing of scans is likely to represent sources of inefficiency, which may be magnified by the negative impact of inaccurate diagnosis, false-positive diagnosis in particular, leading to further useless and costly testing (Eklund, Nichols, & Knutsson, 2016).

The evaluation of the cost-effectiveness of medical devices entails specific complications. According to Drummond, Griffin, and Tarricone (2009), the diagnostic nature of many devices introduces important difficulties in evaluating the quantitative impact of the device with respect to the subsequent treatment or patient outcome related to the diagnosis. The devices also frequently have numerous applications, rendering it difficult to assess the value of each action separately. Moreover, the evolution of devices, diagnostic instruments in particular, frequently accompanies the evolution of skills of technicians and medical personnel. As reported by Drummond et al. (2009), the so-called "learning curve" in the use of devices for laparoscopic-assisted surgeries in colorectal cancer patients described in Guillou et al. (2005) shows how the effectiveness of a new device with respect to older techniques may change during its evolution. It is also linked to the experience and skills of the operating personnel, which heavily influence devices' cost-effectiveness. Different uses of devices are also likely to determine the differences in the costs of procedures faced by patients, which vary substantially.

4.3.5 Precision medicine

When talking about new directions in health technology development, one crucial aspect is personalized care. Personalized or precision care is based on genetics and exploiting individual clinical history together with familiarities in order to improve treatment outcomes. As genetic differences determine the response to type and dosage of a treatment and the relative side effects, biomarker testing may allow targeting specific subpopulations in order to avoid trial-and-errors procedures

Precision medicine is reshaping how health care systems will work in the future

in therapy assignment. The ultimate technology, DNA sequencing, delivers the possibility to identify specific therapies that best fit the patient's genotype, increasing its effectiveness and reducing drug waste and healthcare costs in general.

The success of precision medicine will to a major extent depend not on sequencing but on the way the results of sequencing will be implemented in clinical practice. This is strictly related to interpretation of genomic sequences, which will involve important demand for highly skilled professionals who will be able to interpret and evaluate the new variants of genome discovered not present in the available databases (Beckmann, 2015). In the early 21st century, the ability to collect sequencing data far outweighs the ability of medical professionals to interpret, understand, and integrate it in clinical practice. Training programs will have to be addressed to healthcare professionals working at every step of patient pathway care (Demmer, 2014). However, training, recruitment, and maintenance of clinical and analytical staff is seen as a challenge due to shortages of professionals with a proper understanding of genetics and genetic interrelations with the diseases.

Current trends in big-data analysis techniques and the advancement of artificial intelligence algorithms may lead to the development of decision support tools to help healthcare professionals identify and manage patients with specific genetic features. In that case, IT in the medical field will transform the practice of medicine. Also, the costs of infrastructures that enable the clinicians to use sequencing will stay high. In fact, according to Christensen et al. (2015), while the literature discusses the costs of genomic sequencing, it neglects the importance of infrastructure requirements for genomic sequencing, which are very high. Interpretation of the variants requires considerable effort in terms of structures, professionals, and software to be made ad hoc for immediate analysis needs, for re-analysis, and for integrating genomic information with other types of information typically from clinical records. In addition, data storage, maintenance, transfer, and analysis are all activities requiring significant resources and are expected to represent a growing percentage of the overall future sequencing costs. If one considers that the human body consists of at least 20 trillion living cells, each containing about 20,000 to 22,000 genes that only encode proteins, the amount of data that has been and will be produced by sequencing, mapping and genomic analysis will easily push this branch of medicine into the realm of big data. It is also likely that the cost of resequencing genomes of patients will be minor with respect to storing the files containing genetic information for re-analysis (Hegde et al., 2015).

Genome-based medicine offers incredible promise and power to revolutionize clinical care and analysis of health information. Genomics is recognized to have clinical, ethical, social, and economic effects that go far beyond the healthcare sector, involving large parts of the economy in industrial and research sectors. From a clinical perspective, the genomic revolution will give rise to customized medicine where clinically relevant anomalies will be identified in the early stages of the disease, enabling operators to target a timely action. Personalized medicine is thus going to move the focus of medicine from care to prevention and allow clinicians to choose optimal therapies for each patient, avoid adverse reactions to drugs, and increase patient adherence to treatment.

This development will change not only the way in which drugs are developed but also the practice of medicine. With the spread of ultra-fast genome sequencing, an increasing number of patients could benefit from genomic routine exams, including patients with most common chronic diseases and conditions. As such, personalized care will pose important novelties for the provision of healthcare in general. On the one hand, its supporters hypothesize substantial savings for healthcare systems by cutting down on provision of costly and useless diagnostic procedures and reducing ineffective and potentially dangerous pharmacological treatments in favor of more sensitive and faster tests with greater social and economic benefits resulting from a significant improvement in healthy life expectancy. On the other hand, skeptics question the real ability to identify clinically relevant genomic variants, pointing to the existence of potential errors in both technical and computational analysis, the enormous amounts of information derived from genomics, and the subsequent availability of effective clinical interventions that can benefit from such analysis (Crawford & Aspinall, 2012). Either way, it is plausible that the reduction of errors in diagnosis and the elimination of ineffective treatments may improve the quality of life of patients with effects in terms of healthcare costs that are difficult to project. The vast array of tests and their applications will definitely call for cost-effectiveness evaluations in order to assess the clinical and economic benefits of precision medicine. However, what is likely to be universally true is that precision medicine is about to cause a cost reduction for a year of life saved and spent in good health [quality-adjusted life year (QALY)]. This conclusion is mainly supported by the history of medical discoveries and their reflection in terms of costs on health systems.

The promise of genome-based medicine

Conclusions

In the year 2000, WHO ranked the French health care system number one among the 191 member countries surveyed, stating that it provides “the best overall health care”. Judging took into consideration five criteria: overall level of health within a population; health inequalities within a population (how much economic status affects health); health system responsiveness (patient satisfaction); responsiveness within the population (how well people in various economic groups are served); and distribution of costs (who pays the bill). Since then, for long time French citizens have believed that their health care system, while perhaps costly, was among the best in the world. As we already know, it took less than four years to understand that the country’s health system was in a state of “general confusion” and faced a severe crisis - including a six-fold rise in its public budget deficit by 2020.

Since then the French system entered a 20-year-period of continuous reforms, which has not yet been completed, and yet it is still struggling to guarantee good health care quality and financial sustainability. And the future is looking glooming, given the projections in terms of population ageing and new expensive medical technologies that will appear in the market.

All this ask for a complete rethinking of the health care systems in France (as well as abroad). If excellence must be maintained, excess should be removed. But this may not be enough. We know that the provision of health care services and goods is an important determinant of good health status. However, we know also that health care is responsible for at most 30% of population health outcomes and longevity. The remaining 70% comes from other factors such as education, employment, housing, nutrition, physical exercise, not smoking, not drinking, driving safely, etc.. Attention to public health is essential to ensure the population is healthy and resilient to future threats: government programs to tackle obesity, inequalities, and cancer care need to be revived urgently. Furthermore, investments in prevention remain one of the most important elements of a sustainable health strategy, starting from interventions in early childhood, especially for children born into poverty. As Nobel prize Jim Heckman at the University of Chicago has shown, these interventions returned \$7 to \$15 per kid.

A similar concern may exists for the innovation aspects. The last part of this report has stressed the important role that innovations will have in the healthcare sector in the next years. New promising treatments are arriving on the market to improve even more the way doctors have to manage their patients. However, this is not the only form of innovation that we should care about. There is also a lot of innovation and experimentation going on not focused on medical innovation but rather on how to pay for care differently and how to deliver care differently. These innovation will important as well as and will deal with new models on chronic care coordination and mental health care.

Changes in healthcare are long overdue. There is a strong need to redesign the systems to address all type of care (primary, secondary, community and acute care). For example, the role of hospitals should be reduced in favor of outpatient care. All this will demand a more agile, inter-professional workforce that will deliver team-based care; with empowered front-line staff leveraging technology (including virtual care) to allow them to focus on higher-value work. If from one side the recent COVID-19 experience will increase the level of complexity of the needed interventions and changes, on the other side COVID-19 will provide the impetus for these long overdue changes to the way that we receive and deliver care. However, now more than ever, what is really needed to make these changes effective is a strong national leadership, a substantial plan of public investments in the health system, more community engagement, and clear a strategy of government communication.

Unfortunately, these conclusions do not seem to fully match with what has been written in the report submitted by Nicole Notat, coordinator of the “Séjour de la santé”, and presented by the Minister of Solidarity and Health, Olivier Véran, on July 21st, 2020. Despite the large financial effort (9,1 billions of extra funds per year from 2022 +19 billions for investment) the new plan seems more oriented to fix old problems rather than addressing future challenges. For example, most of the additional investment funds (13 out 19 billions of euros) will be devoted to take over 13 billions of euros in debt from institutions participating in the public service hospital to give them the financial margins necessary for the investment daily life and improve working conditions (mostly current expenditure), while only 6 billions will be devoted to investment to improve hospital infrastructure and to create continuity among in-patient and out-patient care. Despite having stressed that the transformation of the health system cannot take place without a massive and coherent development of digital health, the share of funds devoted to digital health care is limited in relative terms. Furthermore, the Pillar 3 (simplification of organizations and the daily lives of teams) will not receive extra fund. Of the 9,1 billions of extra funds, 7,6 billions will serve mostly to increase the salary of all professionals working in the hospital, with the stated objective of gaining “9 places in the OECD ranking of the remuneration of caregivers”. The same funds will serve also to hire 15,000 more professionals in the public hospitals. Overall, the new plan seems to move the French health care system more in the direction of securing now better remunerations for all health care professionals, while leaving to the future the provision of better health care for patients. It is also true that there will be a “Public Health Segur” follow up planned for the coming months, with the aim of addressing some of these concerns. However, the date is not set yet, nor the participants. So far, unions are happy about that, patients will wait and see.

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