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COVID-19: third leading cause of death in France in 2020, while other major causes of death decline

In 2020, the COVID-19 outbreak resulted in 69,000 deaths in France (10.4% of deaths), making it the third leading cause of death for that year. Just over half of the COVID-19 victims were 85 years old or above, with men who died of COVID-19 being younger, on average, than women. The most common causes of death in 2020 were still tumours (25.6%) and cardiovascular diseases (20.2%). However, the number of deaths from these two disease groups is lower than in previous years, which could be explained, in part, by the fact that some vulnerable people with chronic conditions who would have died due to these illnesses during the year ultimately died from COVID-19 (competitive effect).

Furthermore, the measures taken to limit the impact of the pandemic (lockdown, wearing of masks, social distancing) were undoubtedly responsible for the decline in mortality found for respiratory diseases, infectious diseases and road accidents.

In 2020, no cause of death increased as a direct or indirect result of COVID-19, so the overall excess mortality observed in 2020 (47,000 more deaths than expected) was lower than the number of deaths that were a direct result of COVID-19.

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2020 was marked by the COVID-19 pandemic, which was an unprecedented time, in terms of both its health and societal impact and the special measures that were implemented to stop the virus from spreading. France experienced two major epidemic surges that year (between March and mid-May, then again in October) linked to the widespread circulation of the virus within the population. Among the management and prevention measures taken to limit transmission, two nationwide lockdowns were declared (from 17 March to 11 May and

from 29 October to 15 December), in addition to social distancing measures and the requirement to wear a mask in public places. However, the COVID-19 vaccination campaign had no impact on this year as it did not begin until 27 December, 2020.

The national statistics on causes of death, which are based on the comprehensive collection and analysis of medical sections of death certificates, provide information for the first time on the direct and indirect effects of the pandemic on mortality, while providing a full overview of all causes of death in 2020 [Box 1].



Find all of our data at [data.drees](https://data.drees.fr)

Box 1 Sources and method

Data sources

The national statistics on causes of death are produced by the French epidemiological centre for the medical causes of death (CépiDc) for the French National Institute of Health and Medical Research (INSERM) using the medical sections of death certificates that are completed by the doctors recording the death, and in collaboration with the French National Institute of Statistics and Economic Studies (INSEE).

Scope

All death certificates of persons who lived and died in France in 2020 were considered in this study.

Method

Medical causes of death were coded by CépiDc-Inserm according to the International Classification of Diseases (ICD-10 version 19) of the World Health Organization (WHO). Each nosological entity (disease, trauma, etc.) mentioned on the death certificate was assigned an ICD-10 code. The **underlying cause** of death was then determined and defined as the disease (or circumstances in the case of violent death) that caused the disease progression leading to death (Rey, 2016). In this study, the underlying causes of all deaths were grouped according to the European list of causes of death (Eurostat, 2012). In light of the emergence of COVID-19, as of April 2020, the WHO produced specific recommendations for coding causes of death that mentioned SARS-CoV-2 infection and rules for identifying COVID-19 as the underlying cause (World Health Organization, 2020; Amoretti and Lalumera, 2021). Two new codes have been introduced in the ICD-10 for the coding of these deaths (U07.1: COVID-19, virus identified and U07.2: COVID-19, virus not identified).

In order to describe the comorbidities and/or complications of patients who died from COVID-19, **associated medical causes** (i.e., all causes present in the certificate other than COVID-19) were used. When the same cause category appeared several times in the same certificate, it was only counted once.

The indicators presented in this study are the **number** of deaths and the **age-standardised death rate**, which is the hypothetical proportion of people who died in the year, if the population were the same age as a given reference population. This standardisation makes it possible to compare death rates between populations who are different ages, particularly for temporal comparisons, and thus excludes the effect of age on rate variation. Population estimates as of 1 January 2020 and 2021, by sex and age, produced by INSEE, were used to calculate the average populations used in the rates. The reference population is the European Standard Population (Eurostat, 2013), which is regularly used in international comparisons and corresponds to the population by age (without distinction by sex) of the 27 EU Member States and EFTA members (Switzerland, Iceland, Norway and Lichtenstein) derived from the average of the population projections of these countries for the period 2011-2030. Analyses were broken down for three age groups (0-64 years, 65-84 years, and 85 years or older) and by sex. Standardised mortality rates were calculated for the entire year of 2020, as well as sub-annually for the following periods: January-February (pre-COVID-19), March-May (first surge of COVID-19), June-September (between surges), October-December (second surge). The populations studied to calculate these rates by period were related to the period's mortality rate in the year, in order to compare rates between periods.

- In 2020, 667,496¹ deaths of individuals residing in France were recorded (*Table 1 and Supplementary table A*), with the same proportion of men (50.0%, or 334,034 deaths) and women (50.0%, or 333,462 deaths). Less than one sixth of these individuals (99,506, 14.9%) died before the age of 65 years, with a significant contrast between sexes: 19.6% of deceased men (65,317) versus 10.3% of deceased women (34,189).

The age-standardised mortality rate for the 27 EU Member States² was 898.9 per 100,000 people in France for both sexes. When comparing age, men had a mortality rate that was 1.7 times higher than women (1,130.9 versus 666.8 per 100,000 people), which thus reflects the fact that men die younger than women. Male excess mortality was higher for those under 65 years of age than for those older than 65.

2020: a year marked by deaths from COVID-19

With 69,238 deaths (10.4% of all deaths), COVID-19 was the third leading cause of death in France in 2020, after tumours and cardiovascular diseases. The infection to SARS-CoV-2 was responsible for almost as many deaths in women (34,161) than men (35,077). However, given that the risk of dying from COVID-19 increases with age and that the elderly population is predominantly female (with men dying, on average, at a younger age), it is expected to see more women dying than men if each sex were subject to the same risk of death from COVID-19. Yet this is not the case; men are at a higher risk of death at a given age: when comparing age, men have almost twice the mortality rate of women

(121.6 versus 64.1 per 100,000 people). This excess mortality of men over women is not specific to COVID-19 but concerns most causes of death, and it is somewhat higher for COVID-19. The elderly and the very old are the most affected by deaths caused by this disease: more than half of the deaths (39,354, or 56.8%) are among those aged 85 years or older, while those under the age of 65 years account for only 4,301 deaths (or 6.2% of deaths from COVID-19). The median age of those who died from COVID-19 was therefore 86 years (88 years old for women and 83 years old for men). The standardised mortality rate from COVID-19 was 92.9 per 100,000 people for all of 2020, which is higher than the rates for all respiratory diseases in previous years (between 61.2 and 65.4 during 2015-2017). It peaked at 187.5 during the second surge (October to December), after having reached 165.5 during the first (March to May) [*Figure 1*]. COVID-19 mortality is higher in Île-de-France, Grand Est and Auvergne-Rhône-Alpes; these regions were particularly affected by the outbreak in 2020 (Warszawski, *et al.*, 2020), especially during the first surge for the Grand Est and Île-de-France (*Map 1*).

For almost 86.5% of COVID-19-related deaths, at least one comorbidity or complication was mentioned on the death certificate, and this proportion rose to 93.4% in those under 65 years of age (*Table 2 and Supplementary table B*), whereas associated causes were present in only 78% of certificates for all deaths (excluding external causes). The most common COVID-19-related comorbidities or complications were diseases of the respiratory system (50.5% of COVID-19 death certificates have at least one mention of a respiratory

1. The figure of 667,496 is different from the figure of 669,195 provided by INSEE for the year 2020, because the scope was not the same: here, only the deaths of persons who lived and died in France were considered. The results of this study therefore do not take into account the deaths of French residents that occurred abroad or deaths of foreign residents that occurred in France.

2. The standardised mortality rate is the rate that would be observed if the study population had the same sex and age distribution as a reference population, which allows for comparison of mortality rates irrespective of the sex and age distribution of each population. The European reference population enables comparisons between both countries and temporal comparisons.

Table 1 Number of deaths by cause in 2020, by age group and sex

Cause of death	Men	Women	Under 65 years old	65-84 years old	85 years old and above	Total
All causes	334,034	333,462	99,506	253,579	314,411	667,496
COVID-19	35,077	34,161	4,301	25,583	39,354	69,238
Infectious and parasitic diseases	5,346	5,709	1,266	3,945	5,844	11,055
Tumours	95,562	75,244	37,397	88,628	44,781	170,806
Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	1,251	1,550	297	884	1,620	2,801
Endocrine, nutritional and metabolic diseases	10,643	12,955	2,335	8,628	12,635	23,598
Mental and behavioural disorders	9,937	15,451	2,853	6,210	16,325	25,388
Diseases of the nervous system and sensory organs	15,315	22,301	3,065	14,078	20,473	37,616
Cardiovascular diseases	63,630	71,133	11,801	44,392	78,570	134,763
Diseases of the respiratory system	20,285	18,426	2,848	14,147	21,716	38,711
Diseases of the digestive system	13,394	11,581	5,299	10,084	9,592	24,975
Diseases of the skin and subcutaneous tissue	621	1,018	98	448	1,093	1,639
Diseases of the musculoskeletal system and connective tissue	1,643	2,380	379	1,468	2,176	4,023
Diseases of the genitourinary system	5,832	6,260	497	3,898	7,697	12,092
Complications of pregnancy, childbirth and puerperium	0	41	41	0	0	41
Certain conditions originating in the perinatal period	826	617	1,443	0	0	1,443
Congenital malformations, deformations and chromosomal abnormalities	770	732	1,139	270	93	1,502
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	30,600	37,172	10,851	19,684	37,237	67,772
External causes of morbidity and mortality	23,302	16,731	13,596	11,232	15,205	40,033

Notes > Causes of death are listed in the main sections and categories of the ICD-10.

Interpretation > 334,034 men died in 2020.

Scope > Deaths of individuals who lived and died in France.

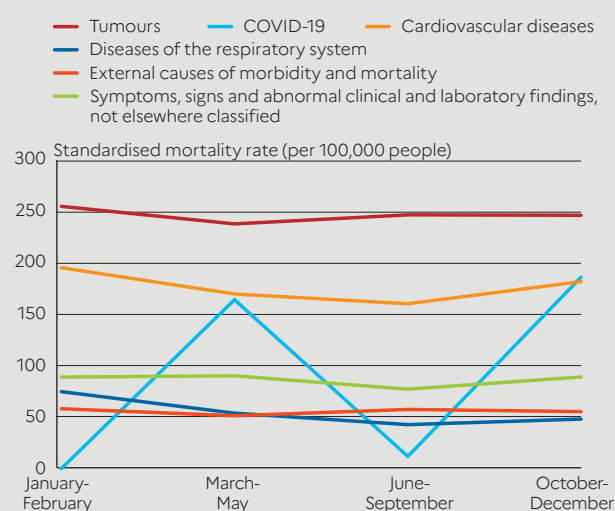
Source > CépiDc, 2020.

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disease as an associated cause). This was followed by symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified³ (38.2%) and cardiovascular diseases (36.5%). Notably, among respiratory diseases, pneumonia, which is an acute complication of the SARS-CoV-2 infection, was cited on 21.3% of certificates, whereas chronic lower respiratory diseases (such as asthma and chronic obstructive pulmonary disease [COPD]), which are comorbidities, appeared on 4.8% of certificates. In people under the age of 65 years, endocrine diseases (20.0%, including 10.9% for obesity) and tumours (19.2% versus 10.5% for all ages combined) were the most frequent comorbidities, especially in women. Among those aged 85 years or older, dementia and Alzheimer's disease were found on 10.4% and 6.5% of certificates, respectively. The hierarchy of medical causes associated with COVID-19-related deaths in France is consistent with that observed during the first epidemic surge of 2020 in Italy (Grippe *et al.*, 2020).

Tumours remains the leading cause of death, with cardiovascular diseases in second place

In 2020, tumours, which have been the leading cause of death since 2004, accounted for 25.6% of deaths (170,806 deaths, standardised rate of 247.5 per 100,000 people), including 95,562 male deaths (standardised rate of 315.8) and 75,244 female deaths (standardised rate of 179.3), which represents a risk

Figure 1 Sub-annual change in mortality by major causes in 2020

Note > Rates are age- and sex-standardised.

Interpretation > Between March and May 2020, the standardised rate of deaths from COVID-19 was 165.5 per 100,000 people.

Scope > Deaths of individuals who lived and died in France.

Source > CépiDc, 2020.

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3. This ICD-10 category corresponds to ill-defined symptoms or circumstances not classified elsewhere. Generally, this category includes acute symptoms and circumstances not related to a specific diagnosis.

of tumour-related death that is 1.8 times higher for men than for women of a comparable age. More than half of the people who died of tumours were between 65 and 84 years old. Tumours of the lung, bronchus, and trachea accounted for 18.1% of tumour-related deaths in 2020 and resulted in 30,935 deaths (standardised rate of 46.9 per 100,000 people), of which 68.0%

(21,021) were men. They accounted for nearly one quarter of all tumour-related deaths in people under the age of 65 years (9,288 deaths). The second most common tumour group is colorectal tumour (10.1%), which is responsible for 17,197 deaths (rate of 30.4 per 100,000 men and 18.3 for women of a comparable age). Breast tumours were responsible for 13,008 deaths, almost all of them in women (17.0% of female tumour-related deaths).

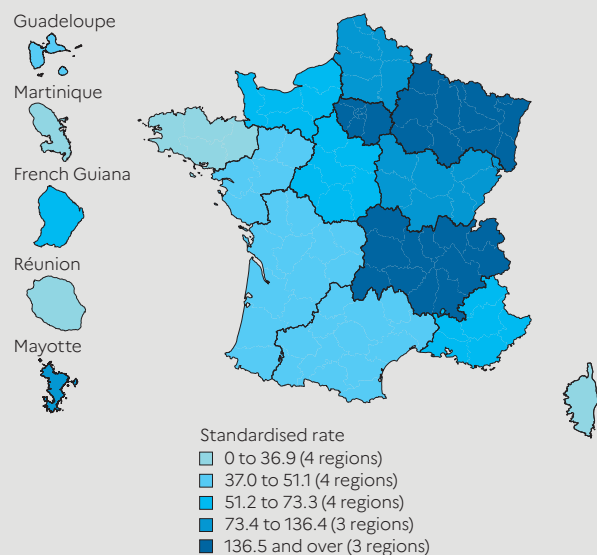
In 2020, cardiovascular diseases were the second leading cause of death, with 134,763 deaths (standardised rate of 175.2 per 100,000 people) or 20.2% of all deaths, including 63,630 for men and 71,133 for women. These diseases were responsible for 25.0% of deaths among those aged 85 years or older, compared with 11.9% among those under the age of 65 years. Ischaemic heart disease⁴ and stroke each accounted for 23.1% of deaths from cardiovascular disease. There was little difference in standardised rates between men and women for cerebrovascular disease (ratio of 1:3), in contrast to ischaemic heart disease (rate of 64.2 for men and 22.9 for women, a ratio of 2:8).

6% of deaths due to external causes

In 2020, there were 40,033 deaths due to external causes, which accounted for 6.0% of deaths, including 23,302 men (standardised rate of 77.6 per 100,000 people) and 16,731 women (standardised rate of 34.8). Accidents accounted for 69.1% of deaths from external causes, including accidental falls (22.7%) and transport-related accidents (5.4%). Deaths by accidental falls were higher for women than for men (4,836 versus 4,237) due to the fact that they occurred predominantly at older ages (62.8% are 85 years or older), but the standardised rate remained higher for men.

Suicides reported in death certificates represented 22.4% of deaths from external causes with 8,986 deaths in 2020 (standardised rate of 14.1 per 100,000 people) [Box 3]. Three quarters of deaths by

Map 1 Regional distribution of deaths due to COVID-19 in France in 2020



Interpretation > In Île-de-France, the number of deaths from COVID-19 was 162,000 in 2020, which corresponds to a standardised rate of 163.2.
Scope > COVID-19-related deaths of individuals who lived and died in France.
Source > CépiDc, 2020.

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Table 2 Comorbidities or complications associated with COVID-19-related deaths in 2020, by cause of death and by age group

Associated causes	Under 65 years old		65-84 years old		85 years old and above		All ages	
	Number	Percentage of certificates	Number	Percentage of certificates	Number	Percentage of certificates	Number	Percentage of certificates
No associated comorbidity	284	6.6%	2,812	11.0%	6,268	15.9%	9,364	13.5%
At least one associated cause	4,017	93.4%	22,771	89.0%	33,086	84.1%	59,874	86.5%
Infectious and parasitic diseases	325	7.6%	1,304	5.1%	1,464	3.7%	3,093	4.5%
Tumours	824	19.2%	3,672	14.4%	2,779	7.1%	7,275	10.5%
Endocrine, nutritional and metabolic diseases	862	20.0%	4,871	19.0%	5,696	14.5%	11,429	16.5%
Mental and behavioural disorders	344	8.0%	2,637	10.3%	4,928	12.5%	7,909	11.4%
Diseases of the nervous system and sensory organs	457	10.6%	3,270	12.8%	4,598	11.7%	8,325	12.0%
Cardiovascular diseases	1,286	29.9%	8,937	34.9%	15,029	38.2%	25,252	36.5%
Diseases of the respiratory system	2,650	61.6%	14,780	57.8%	17,540	44.6%	34,970	50.5%
Diseases of the digestive system	238	5.5%	886	3.5%	898	2.3%	2,022	2.9%
Diseases of the genitourinary system	304	7.1%	2,252	8.8%	3,111	7.9%	5,667	8.2%
Diseases of the kidney and ureter	169	3.9%	1,101	4.3%	1,606	4.1%	2,876	4.2%
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	1,949	45.3%	9,470	37.0%	15,020	38.2%	26,439	38.2%

Notes > A single category of causes corresponds to the presence of at least one diagnosis code belonging to the relevant ICD-10 category. Only the most frequent causes (more than 2,000 occurrences) are presented here.

Interpretation > Among all COVID-19-related deaths in those under 65 years old, 6.6% of certificates had no associated cause.

Scope > COVID-19-related deaths of individuals who lived and died in France.

Source > CépiDc, 2020.

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4. Ischaemic heart disease corresponds to vascular-related heart conditions, including myocardial infarction.

suicide (6,737) were among men (standardised rate of 21.8 per 100,000 people, compared with 6.4 for women) and 66.2% were among people under the age of 65. Suicides were slightly less frequent during the two epidemic surges (Berthou *et al.*, 2022).

Nearly 5% of deaths were due to dementia and Alzheimer's disease, respectively, among those aged 85 years or older

Among people aged 85 or older, cardiovascular diseases were the leading cause of death (25.0%), followed by tumours (14.2%) and COVID-19 (12.5%). Dementia, Alzheimer's and Parkinson's diseases, which are partly age-related, accounted for 4.6%, 4.2% and 1.1% of deaths in this age group, respectively. Falls accounted for 1.8% of deaths in this age group.

Non-COVID-19 mortality declined in 2020 compared to 2015-2017

Since the end of the Second World War, mortality has followed a general downward trend. In particular, evolution between 2000 and 2016 showed a decrease in mortality for AIDS, transport accidents, and cardiovascular diseases for both sexes (Boulat, 2019). In contrast, mortality increased significantly for lung cancer in women, and more moderately for pancreatic cancer and brain cancer for both sexes.

Compared to 2015-2017, which are the latest years of available data before the COVID-19 outbreak, 2020 differs in two ways. Firstly, the level of mortality broke the downward trend: the standardised mortality rate was 37 points higher than in 2017 (861.4) (Table 3 and Supplementary table C), because of COVID-19-related mortality (Box 2). Despite this, mortality was lower in 2020 than in 2017 for every major cause category except COVID-19.

Is the decrease due to "competition" with COVID-19?

With the exception of pancreatic tumours, which is on the rise, the downward trend in tumour-related deaths seen in men between 2015 and 2017 continued in 2020. While tumour-related deaths remained almost stable among women between 2015 and 2017, they declined in 2020, particularly for oesophageal tumours and breast tumours. When considered sub-annually, the decline in the death rate for tumours in 2020, compared to 2015-2017, was greater from March to May (first surge) and October to December (second surge), than during the rest of the year (Supplementary table B). Some of the biggest declines were observed in the Île-de-France and Grand Est regions (Supplementary table E). Moreover, since tumours are a chronic illness, the pandemic and its context (delay in diagnosis or treatment by the healthcare system in 2020) could have a delayed impact that should be evaluated when data from 2021 and 2022 will be available.

Deaths from cardiovascular diseases in 2020 were on a downward trend for both men and women. An even greater decrease is noted for other heart diseases, which include heart failure and cardiac arrest. The decline in deaths from cardiovascular causes was greatest among those aged 85 years or above and during the first surge (Supplementary table F). Some of the biggest declines were observed in the Grand Est region and in Brittany.

The standardised rates of death from diseases of the nervous system declined in 2020 for both men and women, after relative stability during 2015-2017, particularly for deaths from Alzheimer's disease. Similarly, standardised rates of death from mental and behavioural disorders (which include addictions), particularly

dementia, continued their downward trend observed over the 2015-2017 period. The decrease was more significant among those aged 85 years or older.

For these four major disease groups (tumours, cardiovascular diseases, nervous system diseases, and mental and behavioural disorders), it can be assumed that some people who would have died within a year from these diseases may have died from a SARS-CoV-2 infection instead. This possible "competitive" effect with COVID-19 could thus have contributed to the decrease observed in these four groups. The analysis of the causes of death associated with COVID-19-related deaths supports this hypothesis (see above). Furthermore, a history of tumours, dementia, and cardiovascular disease are known to be risk factors for death caused by COVID-19 infection (Semenzato, *et al.*, 2021; Muller, *et al.*, 2021). At the same time, the number of hospital stays for these diseases decreased in 2020 (Naouri, 2021).

International data, on the other hand, shows contrasting developments. Whereas the United Kingdom reported an increase

Box 2 How to read the monitoring components for COVID-19-related deaths in 2020?

The national statistics on causes of death currently count 69,238 deaths as being directly caused by COVID-19 in 2020. During the COVID-19 epidemic, several data sources were used to approximate this number of deaths more responsively for management purposes.

- Therefore, according to an algorithm applied to free texts of the medical sections of death certificates, 77,535 deaths that mentioned COVID-19 were identified in 2020. Once the ICD-10 cause coding step was completed and the underlying cause of all deaths was identified, 89% of deaths that mentioned COVID-19 in the certificate were considered COVID-19-related deaths as the underlying cause. A "COVID-19-related death" is defined for surveillance purposes as a death resulting from a clinically compatible illness in a probable or confirmed COVID-19 case, unless there is a clear alternative cause of death that cannot be related to COVID-19 disease (e.g. trauma).

- From surveillance systems based on death reports by hospital departments (SI-VIC systems) and by medico-social facilities (SurvESMS), 64,632 deaths due to or involving COVID-19 were recorded in hospital and medico-social facilities in 2020. The numbers of deaths collected by these two systems are consistent with the number of deaths mentioning COVID-19 in the medical causes of death (Clanché, 2022).

Box 3 Identifying suicides

In 2018, a new death certificate format was implemented, requiring medical certifiers to fill in additional information about the circumstance of occurrence of a violent death (suicides, homicides, accidents), coded in the "external causes" chapter in the ICD-10. Furthermore, in 2020, the Paris Forensic Institute (IML) communicated the medical causes for the deaths that were the subject of a post-mortem. This feedback from the IML concerns mainly violent deaths and has allowed for a better determination of the intentionality of violent deaths and thus better accuracy for the underlying cause of death. These two developments make it necessary to interpret the change in external cause mortality in 2020 relative to the baseline period (2015-2017) more carefully: the observed increase in the 2020 statistics is likely due – at least in part – to these changes in data collection (Supplementary table C). Studies to assess the impact of these changes in mortality trends are in progress and must include data from 2018 and 2019 death certificates, which are not yet available.

Table 3 Standardised mortality rates by cause of death in 2020 and 2015-2017, by sex

For 100,000 residents

Cause of death	Men			Women			Total		
	2015	2017	2020	2015	2017	2020	2015	2017	2020
All causes	1,114.6	1,076.3	1,130.90	666.9	646.5	666.8	890.8	861.4	898.9
COVID-19	0	0	121.6	0	0	64.1	0	0	92.9
Infectious and parasitic diseases	20.5	20.0	18.3	12.9	12.6	11.1	16.7	16.3	14.7
Tumours	351.4	337.2	315.8	187.3	186.5	179.3	269.3	261.9	247.5
Endocrine, nutritional and metabolic diseases	37.1	35.5	36.5	26.5	25.4	25.0	31.8	30.5	30.7
Mental and behavioural disorders	40.5	37.9	34.3	30.8	29.6	27.3	35.7	33.8	30.8
Diseases of the nervous system and sensory organs	56.6	56.9	52.3	50.0	48.6	43.4	53.3	52.8	47.8
Cardiovascular diseases	262.6	245.9	219.5	163.3	150.9	130.8	212.9	198.4	175.2
Diseases of the respiratory system	85.4	83.7	70.5	45.3	44.3	35.0	65.4	64.0	52.7
Diseases of the digestive system	46.9	45.8	44.5	25.8	24.3	24.2	36.4	35.0	34.3
Diseases of the genitourinary system	20.1	19.9	20.5	10.9	11.1	11.6	15.5	15.5	16.1
External causes of morbidity and mortality	82.7	79.6	77.6	37.0	36.2	34.8	59.8	57.9	56.2

Note > Only the most frequent causes (more than 10,000 deaths) are listed here.

Rates are age- and sex-standardised for the "all" category.

Interpretation > The standardised tumour-related mortality rate for men in 2015 was 351.4 per 100,000 people.

Scope > Deaths of individuals who lived and died in France.

Source > CépiDc 2015, 2016, 2017 and 2020.

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in tumour-related deaths in the first 30 weeks of the COVID-19 epidemic (Kontopantelis, *et al.*, 2021), other countries, such as Italy, the United States and Mexico, reported a moderate fall in tumour-related deaths in 2020 (Grande, *et al.*, 2022; Gleit, 2022; Palacio-Mejia, *et al.*, 2022).

Health measures: do they protect against respiratory and infectious diseases?

There has been a sharp decrease in mortality from respiratory and infectious diseases. For respiratory diseases, the decrease was mainly in deaths from influenza (flu), pneumonia and lower respiratory tract diseases. For infectious diseases, this includes tuberculosis, viral hepatitis, and, to a lesser extent, AIDS⁵. Firstly, the 2019-2020 influenza outbreak was short, moderate in magnitude, and had a low impact in terms of mortality (Santé publique France, 2020). Subsequently, in addition to the competitive effect between causes of death mentioned above, the transmission of infectious agents was reduced because of social contact restrictions and social distancing measures. These results are consistent with the decline in hospital stays in 2020 for respiratory and infectious reasons (Naouri, 2021). In addition, the observed decrease in deaths from respiratory causes was greatest among those aged 65-84 years and 85 years or older, as well as during the second surge, in which deaths due to influenza had virtually disappeared; those from pneumonia and chronic respiratory diseases experienced a significant decrease.

Internationally, trends in deaths from respiratory disease in 2020 were mixed: while Italy and the United States reported an increase in deaths from respiratory diseases, particularly for influenza and pneumonia, during the first surge of COVID-19, the United Kingdom, Australia, Norway, and the United States (excluding March-April 2020) reported a decrease in deaths from respiratory diseases. The increase reported in Italy and the United States during the first surge may be attributed to poor coding of causes of death at the start of the pandemic due to similar clinical diagnoses between influenza and COVID-19 (Grande, *et al.*, 2022; Gleit, 2022).

There was also a decline in deaths from transport accidents and drowning. The decreases observed were greater during the first and second surges, which may be explained by the lockdowns, as well as travel and activity restrictions. The decrease in transport accident fatalities was widely reported at national (French Road Safety Observatory [ONISR], 2022) and international level (Sanmarchi, *et al.*, 2022).

Continued rise in deaths from falls among the older population

Deaths from falls among those aged 85 years or older increased in 2020. This upward trend in mortality may have been exacerbated by isolation linked to lockdowns and reduced social contact to limit contamination among vulnerable people.

Diseases of the genitourinary system continued their slight upward trend, particularly for "other diseases" (which include urinary tract infections and bladder and urethra diseases), especially among men. The observed increase was more significant among those aged 85 years or older, as well as during the first two surges. It should be noted that there was no increase in mortality from chronic kidney disease.

Finally, whereas all international studies (Kontopantelis, *et al.*, 2021; Grande, *et al.*, 2022; Gleit, 2022; Palacio-Mejia, *et al.*, 2022) reported an increase in diabetes-related deaths during 2020, mortality in France in 2020 showed a slight decrease compared with that observed during the 2015-2017 period.

Overall, the downward trends in cause-specific mortality in 2020 do not suggest the existence of short-term aggravating effects on mortality that could be attributed to delays in treatment, due to saturation of the healthcare system or patients being anxious to come for appointments, for example.

COVID-19-related deaths exceed excess mortality

Over the whole of 2020, the excess deaths over those expected was estimated at 47,000 (Blanpain, 2022). This excess (for all causes) cumulates different upward and downward effects on the mortality of an event that has impacts

5. AIDS-related deaths are most often linked to opportunistic infection caused by immunosuppression secondary to HIV infection.

on health. Most excess deaths are usually due to the direct impact of the event, such as a typical outbreak during winter or a heat surge. However, the COVID-19 pandemic has had a profound and unprecedented change on the way healthcare is organised, as well as on individual and collective behaviour in terms of health protection, travel and social interactions. In 2020, these changes led to a decrease in mortality from causes other than COVID-19, which quantitatively reduced the excess deaths directly and indirectly associated with the pandemic. The decline in mortality for causes other than COVID-19 can also be explained by the fact that

some vulnerable people with chronic conditions who would have died of these causes over the year instead fell victim to COVID-19 (competitive effect).

This study proposes hypotheses on the respective upward and downward effects of the pandemic and its context. However, it does not allow a quantitative estimate of the respective contribution of each cause of death to excess mortality from all causes. This will require more detailed analysis, allowing an expected number of deaths in 2020 for each cause to be estimated, taking into account its evolution over the previous years (particularly over the years 2018 and 2019, which are not yet available). ●

Key words: Cause of death COVID-19 Pandemic

Data related to the study: <https://drees.solidarites-sante.gouv.fr/publications-communique-de-presse/covid-19-troisieme-cause-de-deces-en-france-en-2020-quand-les>

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