



# FRENCH CYSTIC FIBROSIS REGISTRY ANNUAL DATA REPORT



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# Editorial

## Fully perceptible beneficial effects of triple therapy

***Market authorization for triple therapy in 2021 allowed beneficial effects for many patients, as evidenced by the improvement in the main indicators of the French cystic fibrosis registry: increase in the number of patients and mean age, drastic reduction in transplant referrals, less treatment, better fertility. But this major development in cystic fibrosis should not hide a painful reality of different situations. There are those who can access triple therapy and others... Overcoming Cystic Fibrosis, alongside researchers and caregivers, is multiplying initiatives so that all patients can benefit from effective treatments.***

In 2021, the overall population continues to grow (+1.8%) to reach 7,513 patients. The transplanted population remains stable (955). The average age of patients continues to increase to reach 25 years, and the proportion of adults continues to grow (61.7%), confirming that patients are living longer, as evidenced by the increase in the median age at death, which is now 37.8 years. Once again this year, the centers were fully invested to offer patients the possibility of benefiting from Kaftrio® as soon as authorization was obtained in July 2021.

The beneficial effects of Kaftrio® are fully perceptible, this time on a greater number of indicators as it is prescribed in 2,200 people, i.e. 30% of people with cystic fibrosis. We note more generally that the use of modulators is changing rapidly, 3,277 French patients take one of the four available modulators (including Kaftrio®), i.e. 44% of patients. It is interesting to note that the number of patients remaining on Orkambi®, which had increased by 30% in 2020 thanks to the extension obtained at the end of 2019, drastically decreased in 2021 (-59%) with a large number of patients having switched for Kaftrio®. The most striking effect of Kaftrio® is the fantastic reduction in the number of lung transplanted patients: 17 in 2021 (compared to 86 in 2019!). But also the prescription of intravenous antibiotic courses: 19% of patients in 2021 (26% in 2020 and 29% in 2019).

## Back to normal in the frequency of hospital follow-up and a reduction in treatment prescriptions

Impact of the public health crisis on hospital activity was less than in 2020, as evidenced by the return to 2019 values for patient follow-up, in compliance with the French Care guidelines (4 times a year). Conversely, the number of full hospitalizations continues to decline. There is also a drop in the prescription of respiratory treatments such as oxygen therapy, nasal ventilation, and respiratory rehabilitation. Ditto for digestive therapies.

## More and more pregnancies

Like other countries, the number of early pregnancies (80), which had stagnated for ten years, has increased significantly (+29%), probably due to Kaftrio®. Likely consequence of knowledge of better fertility, more patients take contraception in order to avoid unwanted pregnancies.

**A large majority of patients remain without highly effective modulator therapies**

In 2021, too many patients cannot benefit from highly effective modulator therapies due to pending marketing authorization extensions, non eligible genetic profiles or lung transplantation. Vaincre la Mucoviscidose is therefore deploying an ambitious program so that everyone can have the most effective therapeutic solution as quickly as possible:

- Obtaining compassionate prescription for off-label patients with a severe condition and likely to be a responder to triple therapy, even beyond the 177 mutations that have had marketing authorization in the United States
- Funding for a research project led by Prof. Sermet (Necker) on cell line studies to identify the mutations likely to respond to modulators beyond the current MAs.
- Launch of an innovative research support mechanism with a multi-year budget of 1 million euros, in addition to the call for projects. This exceptional support is related to research for patients not eligible for modulators or transplant recipients.
- Assistance in financing medical devices to help with bronchial drainage for patients with breathing difficulties who are not eligible for triple therapy.

Once again, the entire CF community is working to meet the expectations of patients and their families. Thanks to the rapidly evolving French Cystic Fibrosis Registry, research can progress, we can witness the evolution of the pathology and find avenues for improving patients care.

Many thanks to those who help make the Registry a success, people with cystic fibrosis and their families who agree to have their data shared, and caregivers who collect it. This would not be possible without their contribution.

Thierry Nouvel  
Chief Executive Officer

Lydie Lemonnier  
Registry Lead



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## Information

Percentages may not add up exactly to 100 due to rounding

Children are patients under 18 years of age, adults are patients aged 18 or more.



# Cystic Fibrosis

Cystic fibrosis is a hereditary disease with autosomal recessive transmission: only subjects who have inherited two mutations – one from the father, the other from the mother – are affected.

The gene responsible for the disease, called *CFTR* (Cystic Fibrosis Transmembrane Conductance Regulator) was identified in 1989. It is located on the long arm of chromosome 7 (7q31) and codes for the CFTR protein, a protein involved in the regulation of chloride ion transport across the cell membrane. To date, more than 2,000 mutations have been identified, the most common (about 80% of patients) being F508del.

Before implementation of the systematic newborn screening program, the most common context for diagnosis was as follows: clinical symptoms (meconium ileus, steatorrhea, bronchial obstruction, recurrent respiratory infections), confirmed by an elevated sweat chloride ions concentration. This would be followed by molecular analysis of the *CFTR* gene and identification of the disease causing mutations.

Newborn screening has been systematic in France and the French overseas territories since 2002. The screening technique uses measurement of immunoreactive trypsin (IRT) in the blood at age 3 days and detection of the most frequent *CFTR* mutations (30 then 29 up to 01/01/2015). The IRT protein is more abundant when there is pancreatic abnormality during foetal life and in the first few months of life. Measuring IRT concentrations enables 95% of newborn children with cystic fibrosis to be detected, though the test is not specific enough (it picks out some children who do not have cystic fibrosis) and is therefore linked with a molecular analysis.

After looking for the main *CFTR* mutations (F508del and about thirty others), three situations can arise:

- two mutations are identified. The newborn baby and its parents are asked to visit a cystic fibrosis care centre (*CRCM - Centre de Ressources et de Compétences de la Mucoviscidose*) to confirm the diagnosis based on a clinical assessment and a positive sweat test, and to initiate the necessary treatment and monitoring ;
- a single mutation is identified (the probability of not identifying a second mutation is around 10%). A sweat test must be carried out in a specialised centre. If the test is positive, the child is treated in the same way as the previous group. If negative, information concerning the heterozygous nature of the newborn will be given to the parents during genetic counselling ;
- the D3 IRT level is high and no mutation is found (or parents refused genotyping testing). A second blotting paper sample test is carried out at age 21 days. If a raised IRT level persists at D21, the child is referred to a specialised centre for an additional assessment (sweat test).

A sweat test giving an intermediate value has to be repeated.

In case of IRT above the threshold and if the genetic study is not carried out due to the absence of parental consent, a control by blood sample on blotter around 21 days of life is carried out. Persistence of an elevated IRT will lead to a consultation in a CF center for further evaluation (sweat test).

In CF, functional abnormalities occur in the digestive tract, respiratory tract, sweat glands and genital tract. This wide range of abnormalities is associated with a broad spectrum of clinical expression, both regarding the age when the first symptoms appear and their subsequent evolution. The severity of respiratory symptoms affects life expectancy in the majority of cases.

Lifelong treatment is time consuming, demanding and aimed at symptomatic relief. It is essentially based on respiratory (physiotherapy, inhaled, antibiotic treatment, oxygen therapy), digestive and nutritional management (pancreatic enzyme supplements and a hypercaloric diet). During the last few years, new therapies targeting some *CFTR* mutations (*CFTR* modulators or correctors) impact the causative mechanism of the disease. Patient education is an integral part of care.



# The French Cystic Fibrosis Registry

## Objectives

In 1992, the medical Council of the association *Vaincre la Mucoviscidose*, set up a national cystic fibrosis observatory, the *Observatoire national de la mucoviscidose* (ONM), with the following objectives:

- improving knowledge on medical and social characteristics
- gaining a better understanding of the socioeconomic cost of this disease with a view to obtaining sufficient resources to cover constantly growing needs
- improving information available to help both parents and patients in their personal choices, and institutional partners in strategic decisions
- helping research by facilitating pre-selection of patients eligible for clinical trials
- evaluating the impact of therapeutics and facilitate access to new treatments

Covering the entire population of patients in France, has since been added to the initial objectives. The patient organization has therefore transformed the ONM into a national cystic fibrosis registry. This initiative was approved in July 2006 by the Committee for Protection of Personal Data in Medical Research and in March 2007 by the Data Protection Agency. At the end of 2008 and then in 2011, 2015 and 2021, the registry was certified by the National Committee of Rare Disease Registries.

## Population and data

The population is composed of people with cystic fibrosis followed in the French CF care centres (metropolitan France and Reunion Island). Data are collected once a year by means of an e-CRF or export from electronic medical records. They refer to the previous year and include semi-anonymous patient identification, diagnosis, medical follow-up, treatments, anthropometry, respiratory function, microbiology, evolution of the condition and social and family situation. Thematic questionnaires collect data on pregnancies, *Burkholderia Cepacia* complex and related, and inclusion in clinical trials, but also on CFTR modulators and atypical mycobacteria.

## Data use

Statistical analysis is performed on anonymized data. Unless otherwise indicated, the results presented hereafter relate to the population seen during the year 2021.

Missing data were considered an absence of event, some percentages can therefore be underestimated.

## Data analysis

*Ad hoc* studies on various themes are conducted on the Registry data. Some are the subject of publications and communications at international congresses.

The French Registry sends anonymised data to the European Cystic Fibrosis Patient Registry in order to allow a wider use of the data along with other countries. Comparisons between indicators from national registries must be made with caution due to numerous biases linked in particular to the impact of neonatal screening, transplantation, socio-economic status but also to compliance with the measurement guidelines, population references and statistical limits, in particular in the event of an insufficient number of patients in an age group.

As part of a partnership with the Lyon Hospital and with the objective to carry out more in-depth analyzes, the Registry has been linked with the National Health Data System.

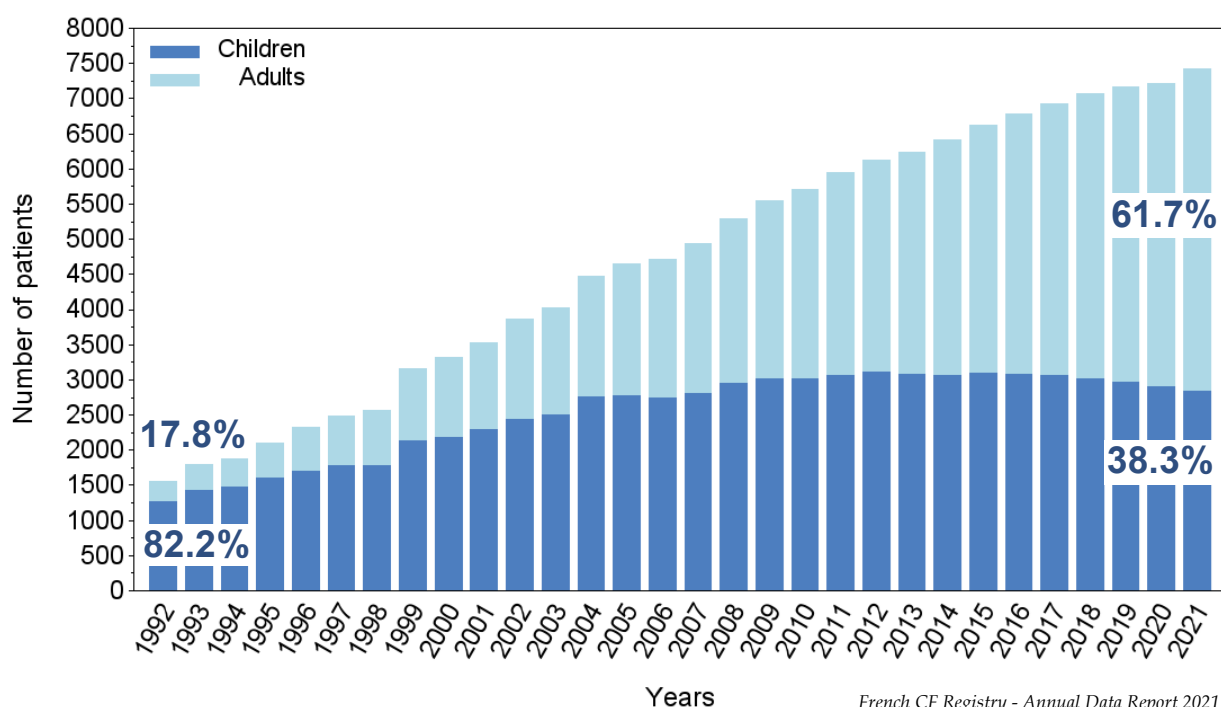




# 1. Demographics

## ■ Characteristics of the population

**Figure 1.1. Evolution of the number of patients since 1992**



*French CF Registry - Annual Data Report 2021*

**Table 1.1. Annual evolution of the main indicators**

Indicators	Years of follow-up										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
All patients*	5966	6133	6250	6429	6629	6783	7075	7179	7286	7379	7513
Patients seen during the year**	5954	6121	6239	6415	6619	6776	6932	7070	7160	7216	7418
Children	3066	3105	3084	3068	3093	3078	3060	3012	2968	2907	2842 (38.3%)
Adults	2888	3016	3155	3347	3526	3698	3872	4058	4192	4309	4576 (61.7%)
Over 40 years	399	452	510	588	670	759	826	911	986	1055	1218 (16.4%)
Men	3084	3165	3223	3315	3441	3546	3616	3683	3739	3750	3851 (51.9%)
Women	2870	2956	3016	3100	3178	3230	3316	3387	3421	3466	3567 (48.1%)
Mean age (years)	19.1	19.5	20.1	20.7	21.2	21.8	22.3	22.9	23.4	23.9	24.8
Median age (years)	17.4	17.8	18.2	18.9	19.3	19.9	20.3	20.9	21.3	21.9	22.8
Minimum age (years)	0	0.1	0.1	0	0	0.1	0.1	0.1	0.1	0.1	0
Maximum age (years)	88	86.8	82.5	82.8	83.2	84.1	85.1	86.1	84.6	85.6	86.6

*French CF Registry - Annual Data Report 2021*

\*Patients whose vital status is known, whether they visited or not a CF care centre.

\*\*Reference patients for this report, excepted for survival.

This table is updated each year with the corrections made to previous year's data. Patients with unconfirmed or withdrawn diagnosis (N=22) were excluded from the analysis.





# 1. Demographics

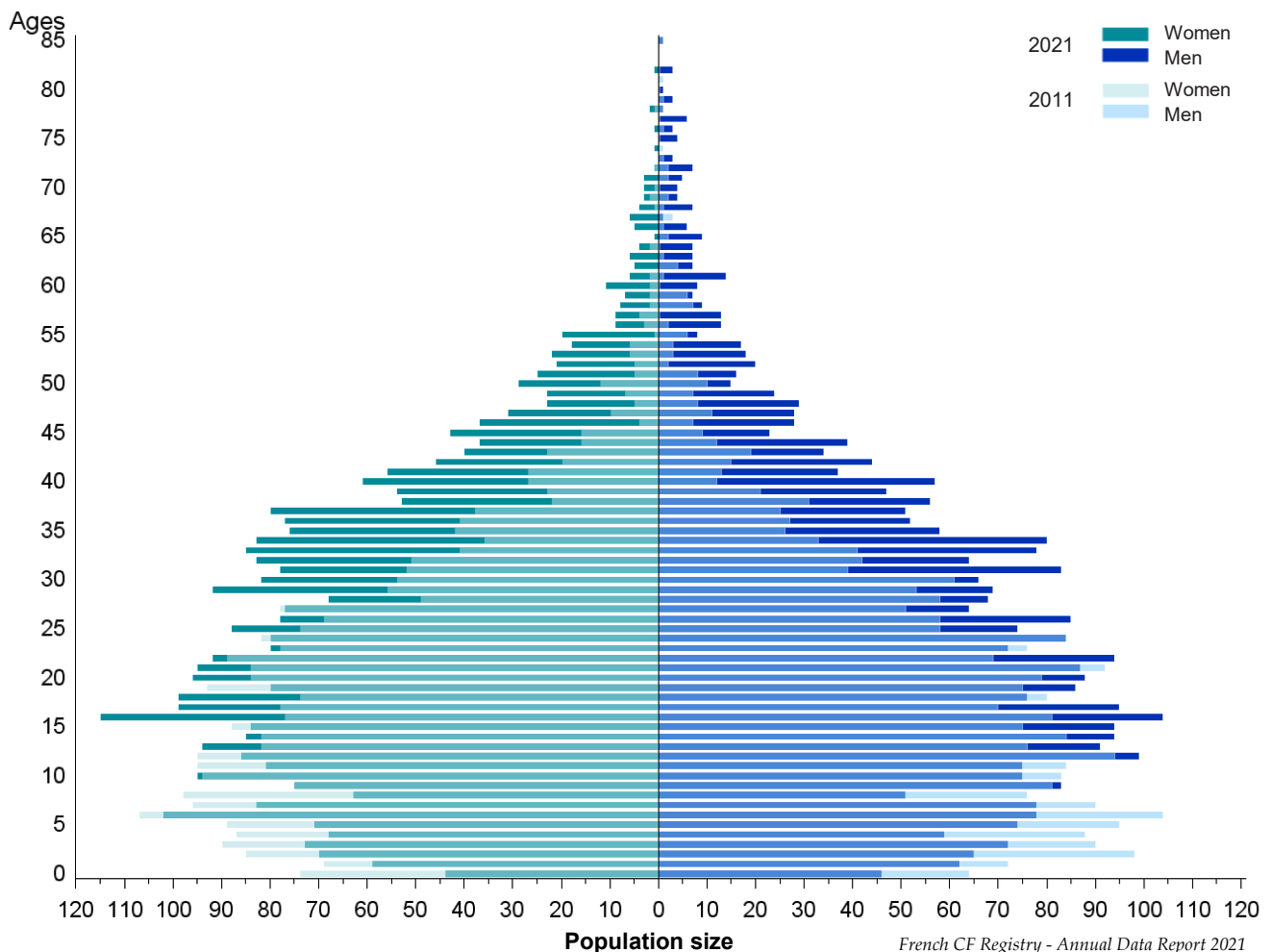
## ■ Characteristics of the population

**Table 1.2. Characteristics of the population, by sex and age**

Characteristics	2019		2020		2021	
	Men	Women	Men	Women	Men	Women
Patients seen during the year	3739	3421	3750	3466	3851	3567
Children	1522	1446	1493	1414	1447	1395
Adults	2217	1975	2257	2052	2404	2172
Mean age (years)	23.4	23.4	23.9	24	24.8	24.8
Median age (years)	21.6	21	22.2	21.6	23.2	22.5

*French CF Registry - Annual Data Report 2021*

**Figure 1.2. Population pyramid**



The number of babies born in 2021 (patients less than 1 year old) is slightly underestimated as it does not include those seen for the first time in a CF center in 2022.



# 1. Demographics

## ■ Location by type of centre

**Table 1.3. Patients' characteristics by type of centre**

Types of centres	Nb	Patients' characteristics			Age of patients (years)				
		Nb (a)	%	Mean nb by centre	Min*	Max*	Mean	Median	Inter-quartile
CRCMs									
Paediatric	17	2079	28.0	122.3	0	40.4	10.8	11.1	9.5
Adult	14	3206	43.2	229.0	17.4	86.6	35.4	33.5	15.1
Paediatric/Adult	16	2100	28.3	131.3	0.1	82.2	22.7	19.9	20.6
Subtotal	47	7385	99.6	157.1	0	86.6	24.8	22.9	21.9
Other centres									
Paediatric	2	12 (b)	0.2	6.0	5.6	16.2	10.3	9.7	4.9
Paediatric/Adult	1	21	0.3	21.0	2.9	17.3	11.4	11.2	3.6
Subtotal	3	33	0.4	11	2.9	17.3	11.0	10.8	4.4
Total	50	7418	100	148.4	0	86.6	24.8	22.8	21.9

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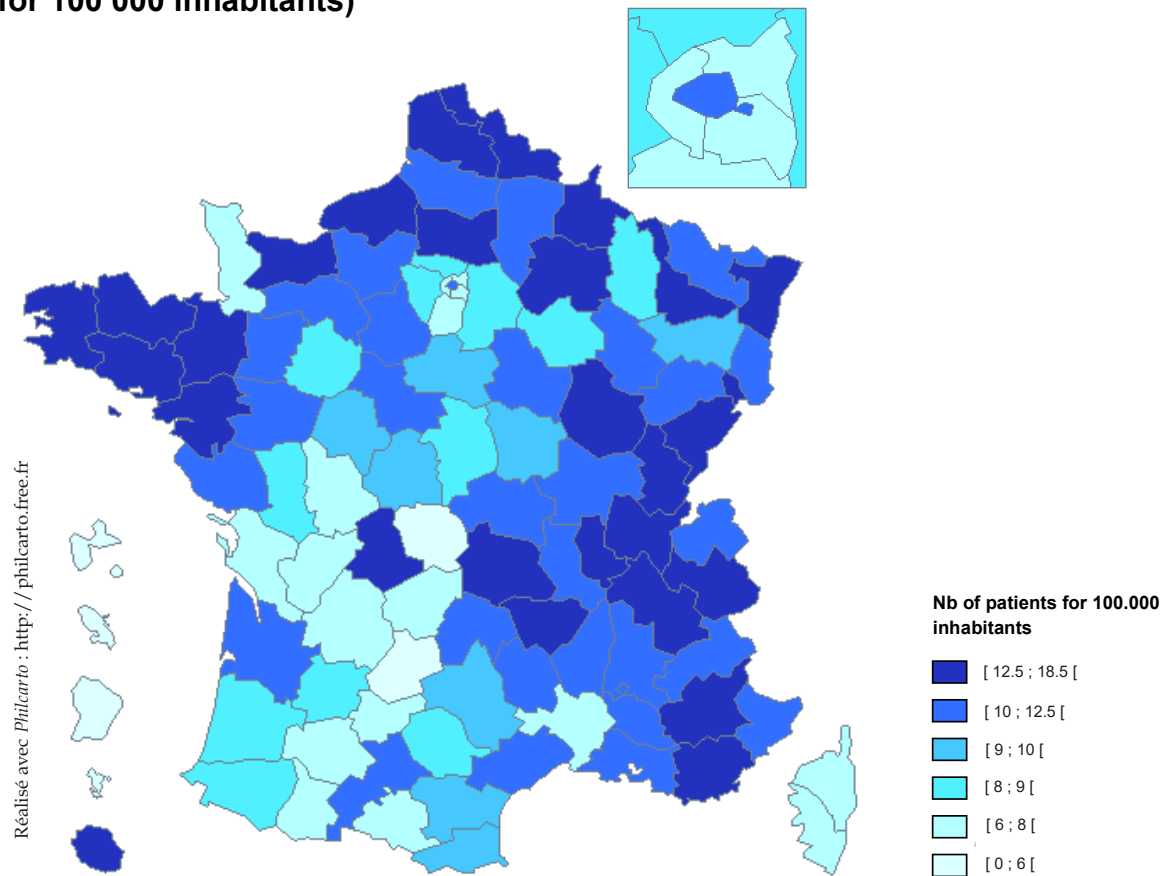
Notes : (a) Patients visiting at least 2 CF centres during the year were only counted in the one with the highest number of visits.  
(b) Including 2 patients also seen by a CF centre.

\* Cases when a child's follow up is made by an adult centre or vice versa are very rare.

# 1. Demographics

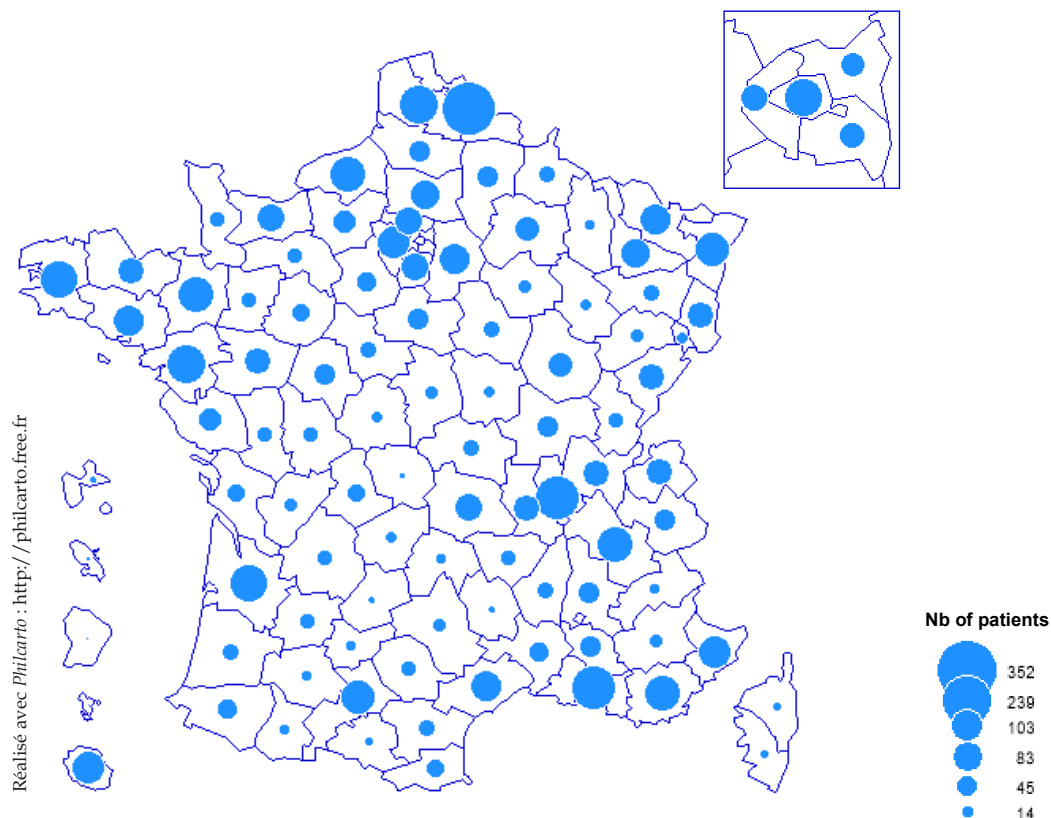
■ Geographical location

**Map 1.1. Prevalence of cystic fibrosis by « département » of residence (number of patients for 100 000 inhabitants)**



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**Map 1.2. Localisation of the patients by « département » of residence (absolute numbers)**

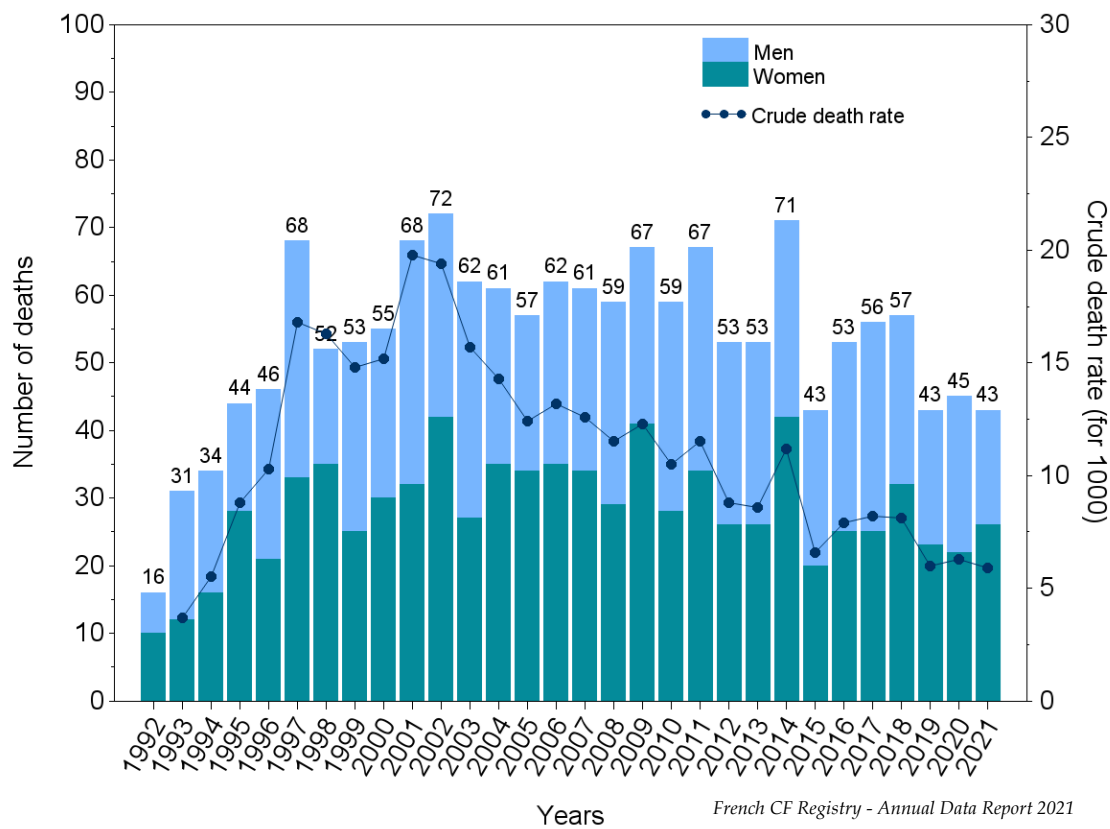


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## 2. Mortality

■ Characteristics

**Figure 2.1. Annual number of deaths since 1992**



**Table 2.1. Mortality characteristics**

Indicators	Years of follow-up										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Number of deaths	67	53	53	71	43	53	56	57	43	45	43*
- including transplanted patients	33	27	29	41	22	37	33	36	22	25	30
Crude death rate (per 1000)	11.5	8.8	8.6	11.2	6.6	7.9	8.2	8.1	6.0	6.3	5.9
Mean age (years)	26.4	32.3	34.4	29.0	34.1	31.9	35.0	33.6	35.6	36.5	42.9
Median age (years)	24.9	27.8	30.7	27.1	31.8	28.0	33.8	31.0	35.9	32.8	37.8
Minimum age (years)	1.9	2.2	1.1	0.1	9.0	1.6	5.9	7.3	0.4	0.3	12.8
Maximum age (years)	55.5	88.4	82.5	71.2	83.2	76.0	74.3	80.9	65.9	85.8	82.2

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\* 4 out of the 43 were not seen by a CF center in 2021.

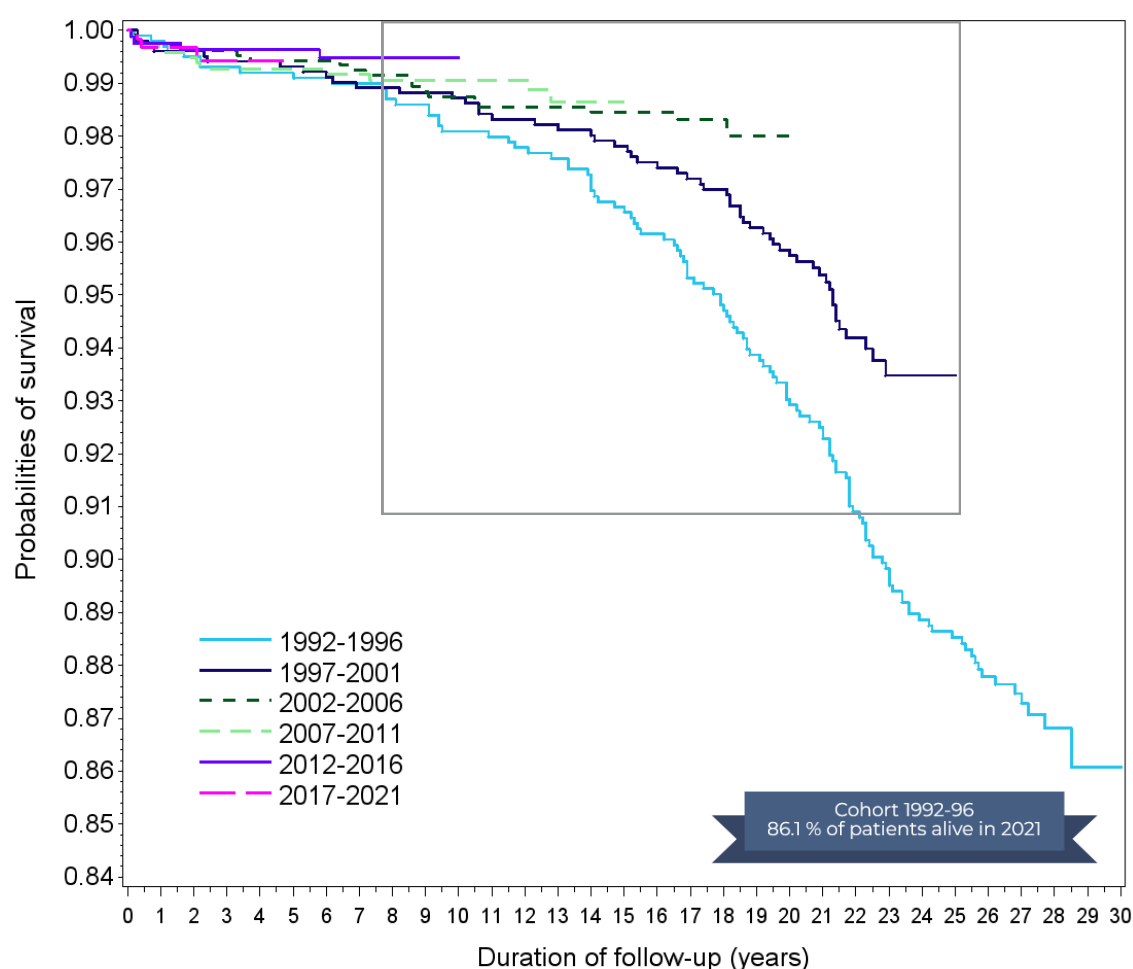
## 2. Mortality

### ■ Survival analysis

**Figure 2.2. Survival curves by birth cohort (Kaplan-Meier method)**

In order to show the evolution of health status of the patients, a survival analysis was performed on 6 birth cohorts; the numbers of patients and of deaths are:

- Births from 1992 to 1996 (in 2021 this cohort was followed during 30 years maximum): 1003 patients, 123 deaths
- Births from 1997 to 2001 (maximum 25 years of follow up): 1023 patients, 56 deaths
- Births from 2002 to 2006 (maximum 20 years of follow up): 1073 patients, 18 deaths
- Births from 2007 to 2011 (maximum 15 years of follow up): 970 patients, 11 deaths
- Births from 2012 to 2016 (maximum 10 years of follow up): 818 patients, 4 deaths
- Births from 2017 to 2021 (maximum 5 years of follow up): 635 patients, 3 deaths



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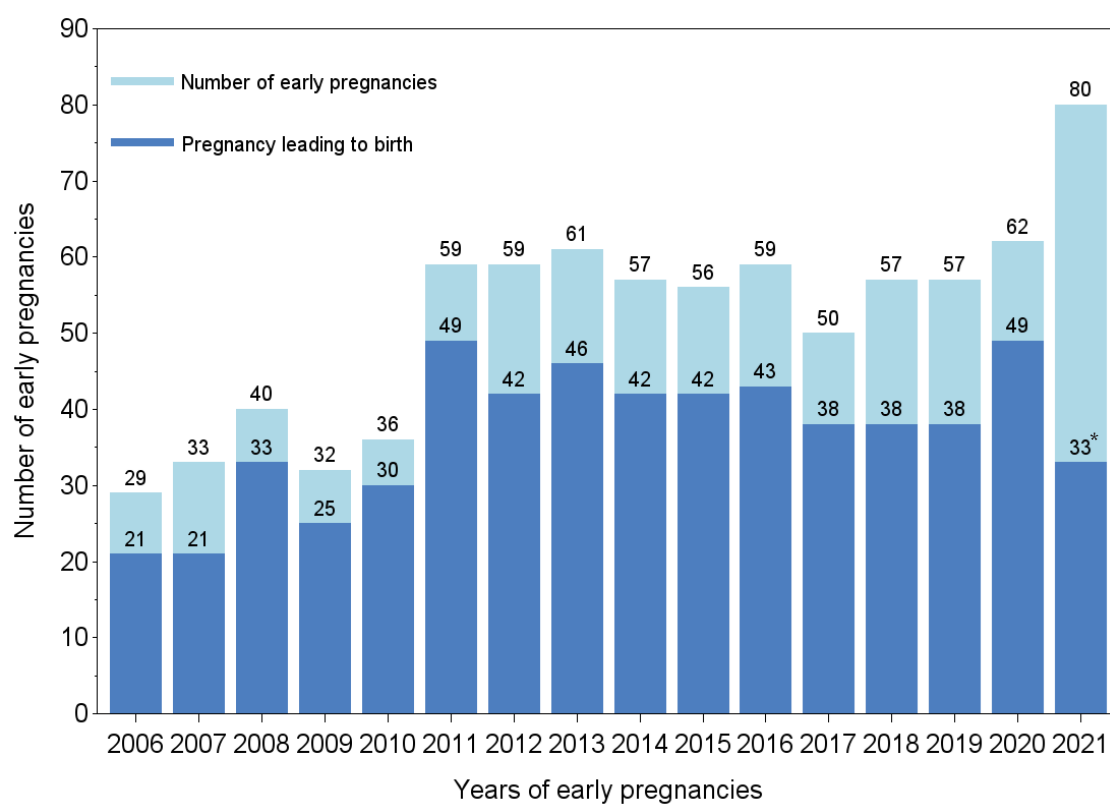
Until the age of 8, there is no difference in survival between the different birth cohorts.

After this age, a difference in survival between the two oldest cohorts (1992-1996 and 1997-2001) appears, and this difference is statistically significant (Log-Rank test = 10.5,  $p = 0.0012$ ).

Survival analysis by sex is available on annex 1.

### 3. Pregnancy – Paternity

**Figure 3.1. Annual number of early pregnancies, evolution since 2006**



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\* Some pregnancy outcomes were not known at the time of data collection. Figures given for 2021 are therefore presented for information purposes and should not be considered as definitive.

**Table 3.1. Early pregnancy characteristics**

Characteristics	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Number of early pregnancies	29	33	40	32	36	59	59	61	57	56	59	50	57	57	62	80
Pregnancy rates in women aged 15 to 49 years (for 1000)	26	29	32	24	26	40	38	38	34	32	32	27	29	29	30	37
Mean age at 31 <sup>st</sup> December of the year of early pre-	27	27	27	28	29	28	28	29	29	31	28	30	30	30	30	31
Number of lung transplanted women starting a pregnancy	1	2	1	3	3	3	7	4	1	3	4	4	10	11	4	6

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### 3. Pregnancy – Paternity

**Table 3.2. Paternities**

Characteristics	N	Proportion (%)
Number of paternities, including:	25	
- Natural father	3	12.0
- Medically assisted reproduction, including:	21	84.0
+ Intracytoplasmic Sperm Injection / in vitro fertilization	19	90.5

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Note: precision on medically assisted reproduction was missing for 1 patient.



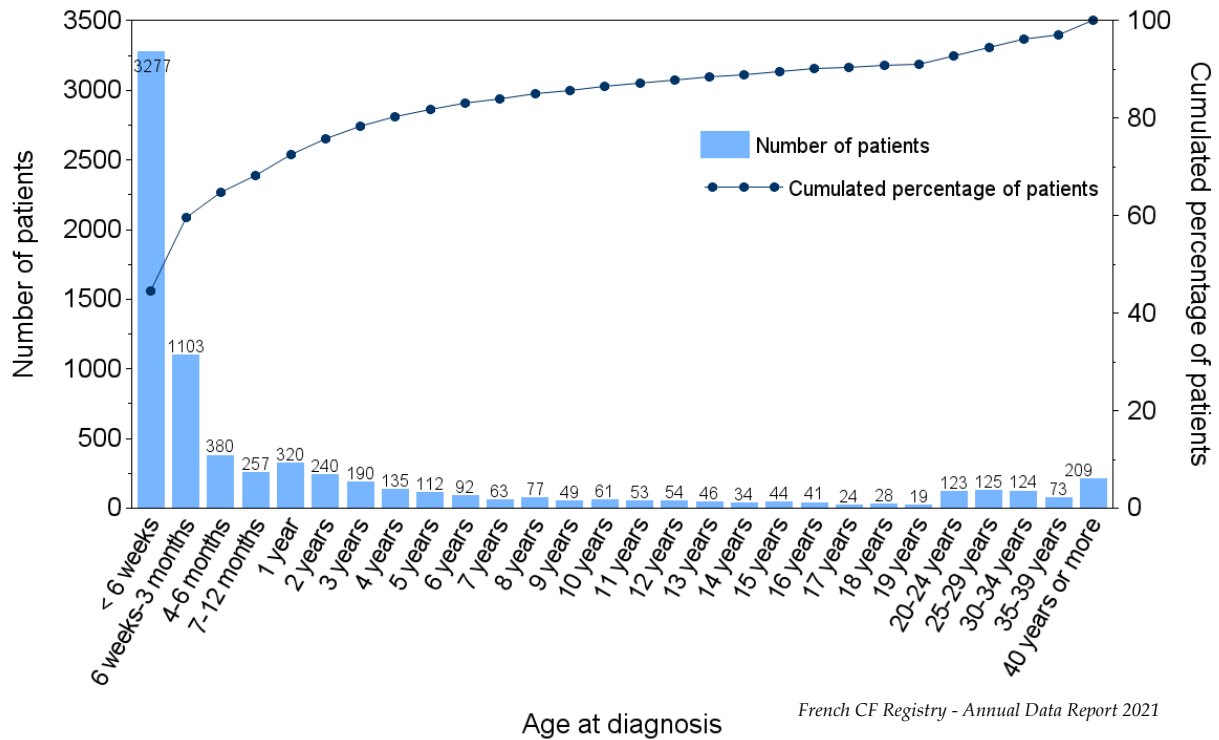


## 4. Diagnosis

### ■ Main characteristics

**Figure 4.1. Number of patients and cumulative percentage of patients by age at diagnosis**

N = 7353 (number of patients whose age at diagnosis is known).



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## 4. Diagnosis

### ■ Main characteristics

**Table 4.1. Diagnosis characteristics**

Characteristics	2021
<b>ALL PATIENTS</b>	
Patients whose age at diagnosis is known - N (%) *	7353 (99.1%)
<b>Age at diagnosis</b>	
- Median age (months)	1.9
- Mean age (years)	4.8
- Minimum age (years)	0
- Maximum age (years)	81
<b>NEW PATIENTS DIAGNOSED DURING THE YEAR</b>	
<b>Number of patients</b>	
New patients - N (%)	144 (1.9%)
- Including 2021 newborn patients - N	90
<b>Age at diagnosis</b>	
- Median age (months)	1.1
- Mean age (years)	10.7
- Minimum age (years)	0
- Maximum age (years)	75
<b><u>Context of diagnosis</u></b>	
<b>1. Screened positive newborns (NBS)</b>	<b>91</b>
- including Prenatal diagnosis - N (%)	9 (9.9%)
- including Meconium ileus - N (%)	16 (17.6%)
<b>2. Diagnosis on symptoms (NBS excluded)</b>	<b>53</b>
- including Meconium ileus - N (%)	3 (5.7%)
- including Symptoms (other than MI):- N (%)	50 (94.3%)
- Mean age at diagnosis (years)	28.6

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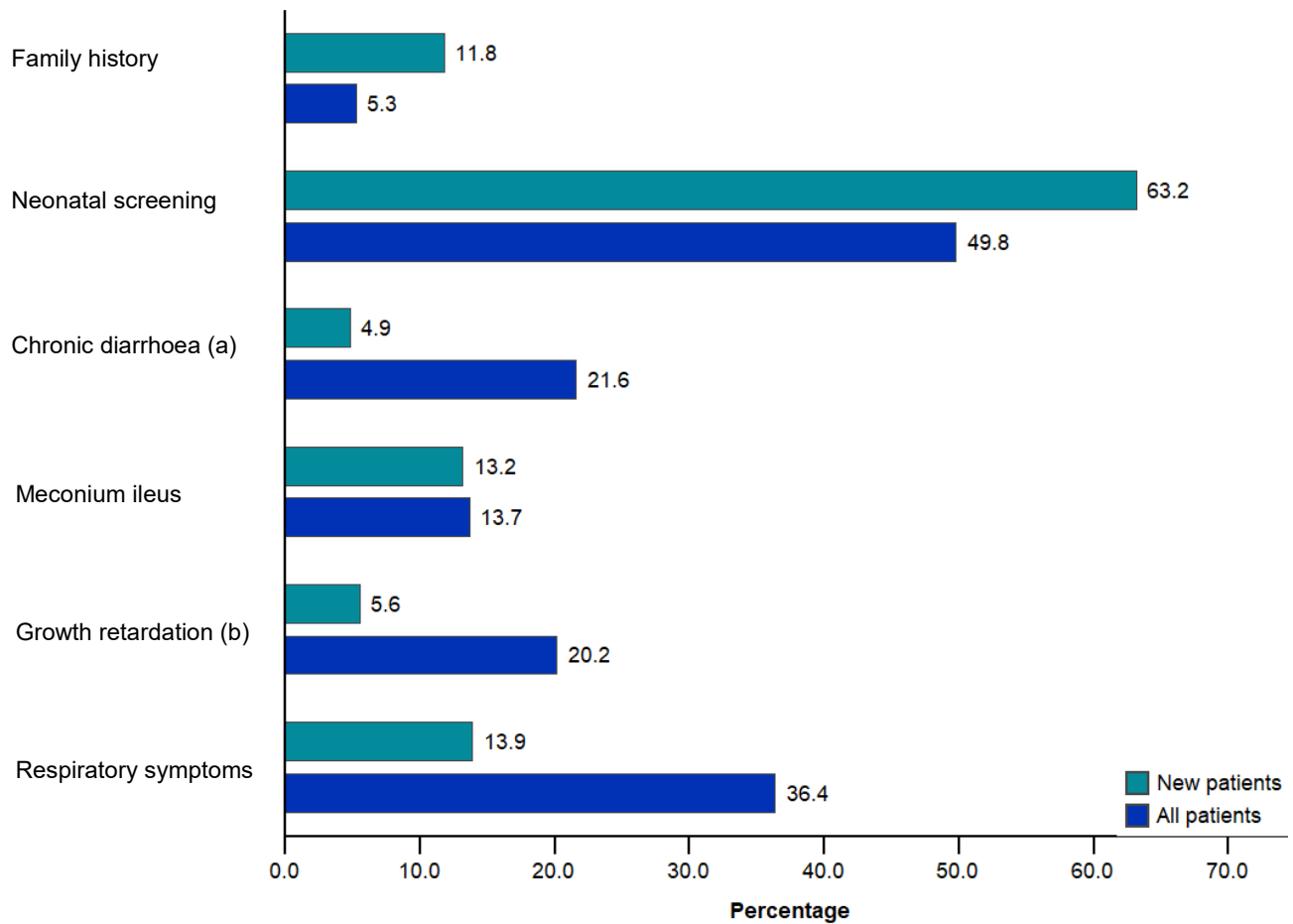
The method used to compile this report (patients seen in a care centre in 2021) means that infants born in 2021 and seen for the first time in 2022 are not included yet. For information purposes only, 9 newborns in 2020 were diagnosed in 2021 through neonatal screening. In the 2020 age pyramid, the number of patients aged 0 was 108 and should have been 108+9=117.

The number of patients diagnosed by neonatal screening (91) given in this report is not the actual number for France during the year, but represents the patients for whom screening resulted in diagnosis. It excludes patients for whom the diagnosis was made before the result of screening.

## 4. Diagnosis

■ Diagnosis signs

**Figure 4.2. Diagnosis signs (most frequent ones)**



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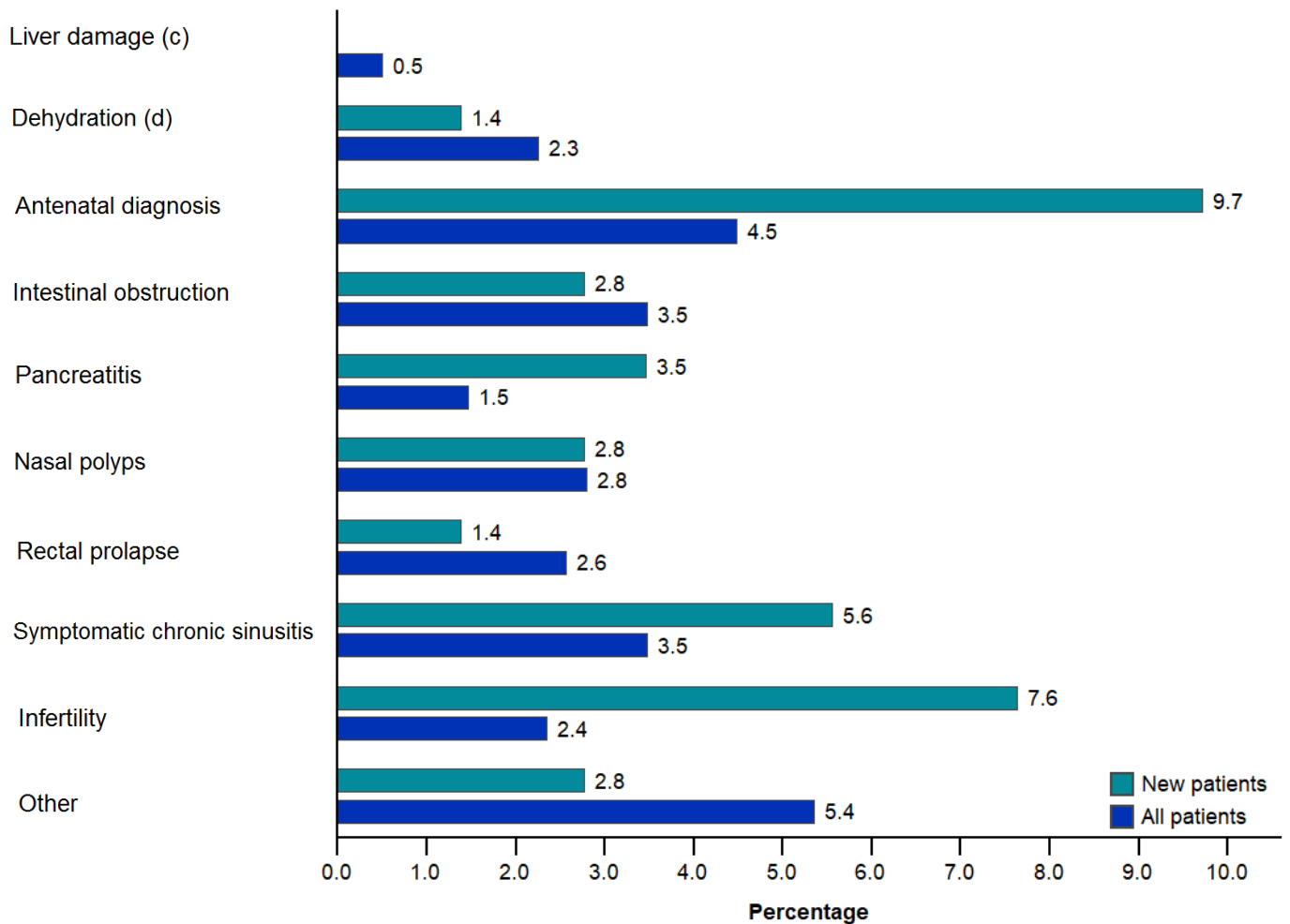
(a) Chronic diarrhoea / Steatorrhoea / Malabsorption

(b) Growth retardation / Malnutrition

## 4. Diagnosis

■ Diagnosis signs

**Figure 4.3. Diagnosis signs (less frequent ones)**



(c) Liver damage / Jaundice / Portal hypertension

(d) Dehydration / Electrolyte imbalance

## 4. Diagnosis

### ■ Genotypes

**Table 4.2. Prevalence of the 40 most common mutations**

Mutations	Number of patients *	Proportion (%)
F508del	6161	83.1
G542X	410	5.5
N1303K	313	4.2
2789+5G>A	195	2.6
1717-1G>A	163	2.2
R117H	143	1.9
G551D	131	1.8
R553X	128	1.7
W1282X	115	1.6
3849+10kbC>T	106	1.4
L206W	106	1.4
I507del	94	1.3
3272-26A>G	88	1.2
711+1G>T	86	1.2
Y122X	82	1.1
D1152H	79	1.1
2183AA>G	76	1.0
R347P	71	1.0
3120+1G>A	60	0.8
R1162X	60	0.8
Y1092X	55	0.7
R334W	54	0.7
R347H	52	0.7
G85E	51	0.7
A455E	50	0.7
3659delC	47	0.6
S945L	43	0.6
1078delT	41	0.6
394delTT	37	0.5
1811+1.6kbA>G	35	0.5
621+1G>T	33	0.4
R1066C	33	0.4
W846X	33	0.4
E60X	31	0.4
S1251N	26	0.4
E585X	23	0.3
G576A	23	0.3
L997F	23	0.3
1677delTA	22	0.3
Q220X	21	0.3

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\* With at least one copy of the considered mutation.

## 4. Diagnosis

### ■ Genotypes

**Table 4.3. Age of patients by genotype**

Genotypes	Patients		Age (years)		
	Number	%	Mean	Median	Max
F508del / F508del	3025	40.8	23.3	22.4	67.1
F508del / Other	3099	41.8	25.4	22.9	82.2
Other/ Other	1154	15.6	25.1	22.0	82.9
Subtotal (non missing genotypes)	7278	98.1	24.5	22.6	82.9
F508del / Missing	37	0.5	39.8	38.1	86.6
Other/ Missing	48	0.6	40.2	38.9	80.5
Missing/ Missing	55	0.7	40.2	37.7	77.7
Subtotal (partial genotypes / missing)	140	1.9	40.1	38.0	86.6
Total	7418	100			

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**Table 4.4. Frequency and age of patients with a gating or nonsense mutation**

	Patients		Age (years)		
	Number	%	Mean	Median	Max
At least one gating mutation	208	2.8	26.7	23.6	71.0
At least one nonsense mutation	1164	15.7	23.2	21.4	79.8

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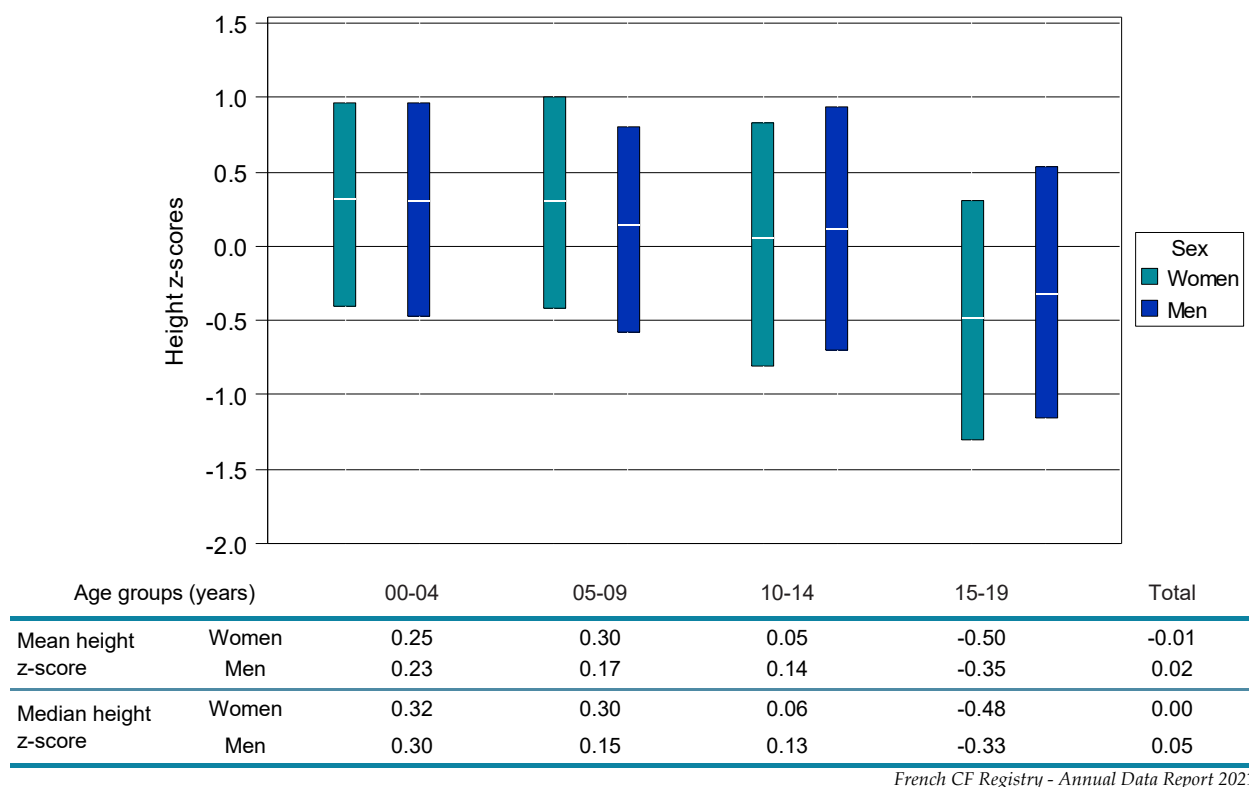
Gating mutations doesn't prevent the CFTR protein from reaching the cell membrane but alter chloride transport.

Nonsense mutations cause a premature stop codon thus an absence of CFTR protein production.

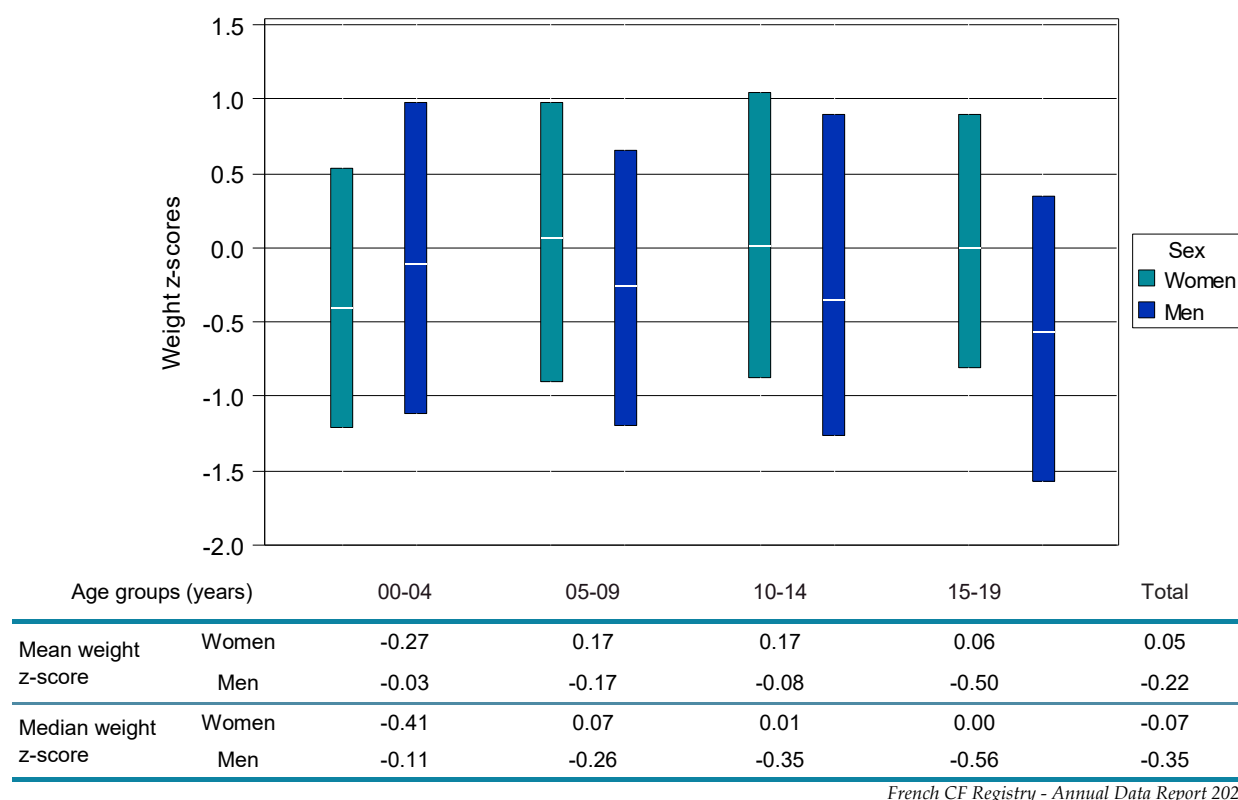
## 5. Anthropometry

### ■ Height and weight

**Figure 5.1. Height z-scores\* in children, by age group and sex**



**Figure 5.2. Weight z-scores\* in children, by age group and sex**



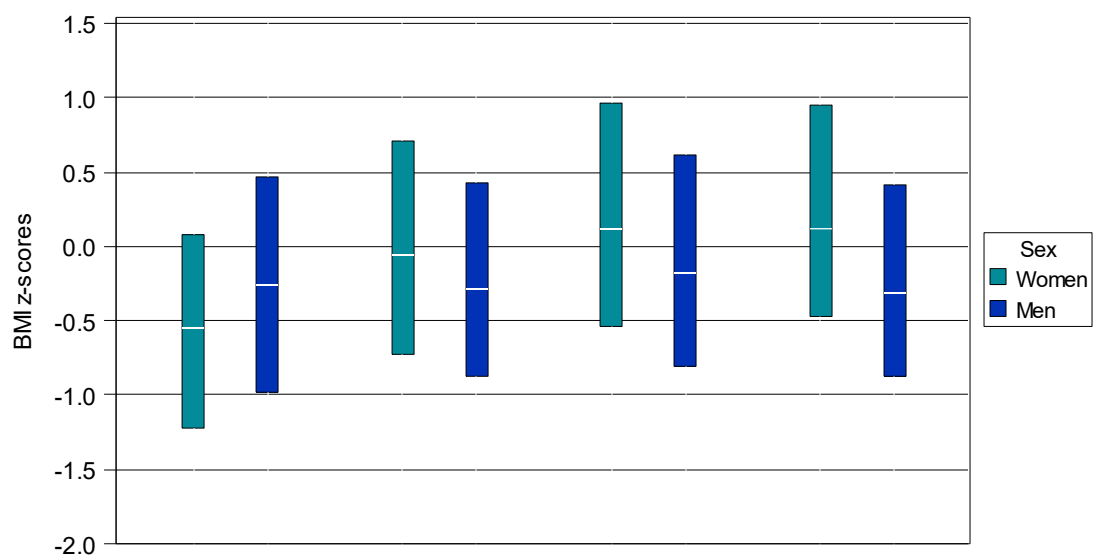
\*See explicative note p 23.



## 5. Anthropometry

### ■ Body Mass Index (BMI)

**Figure 5.3. BMI z-scores in children, by age group and sex**



Age groups (years)		00-04	05-09	10-14	15-19	Total
Mean BMI z-score	Women	-0.53	0.09	0.29	0.30	0.09
	Men	-0.20	-0.16	0.04	-0.18	-0.12
Median BMI z-score	Women	-0.55	-0.06	0.12	0.12	-0.03
	Men	-0.25	-0.29	-0.17	-0.31	-0.26
BMI z-score $\geq 0$ (% of patients)	Women	28.3	48.5	56.5	57.1	49.3
	Men	42.0	40.7	45.3	38.2	41.5

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The z-score is an anthropometric reduced centered variable ( $Z = [\text{measure} - \text{mean}] / \text{standard deviation}$ ), adjusted for gender and age; the mean and standard deviation are taken from the French reference population with the same gender and age as the patient. This index measures the difference with population norms and a negative score means growth retardation.

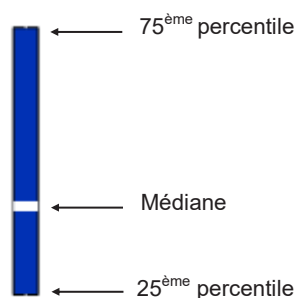
- Height and weight z-scores have been calculated with respect to the French reference population (Sempé M., 1997, Auxologie – Méthode et séquences, Méditions, Lyon, 205 p.).

- BMI z-score was calculated with respect to the French reference population (Rolland-Cachera MF et al. A. Body Mass Index variations: centiles from birth to 87 years. Eur J Clin Nutr 1991;45:13-21).

### Explanation for figures pages 22 to 25

Those figures represent z-scores of anthropométrie and spirometry values.

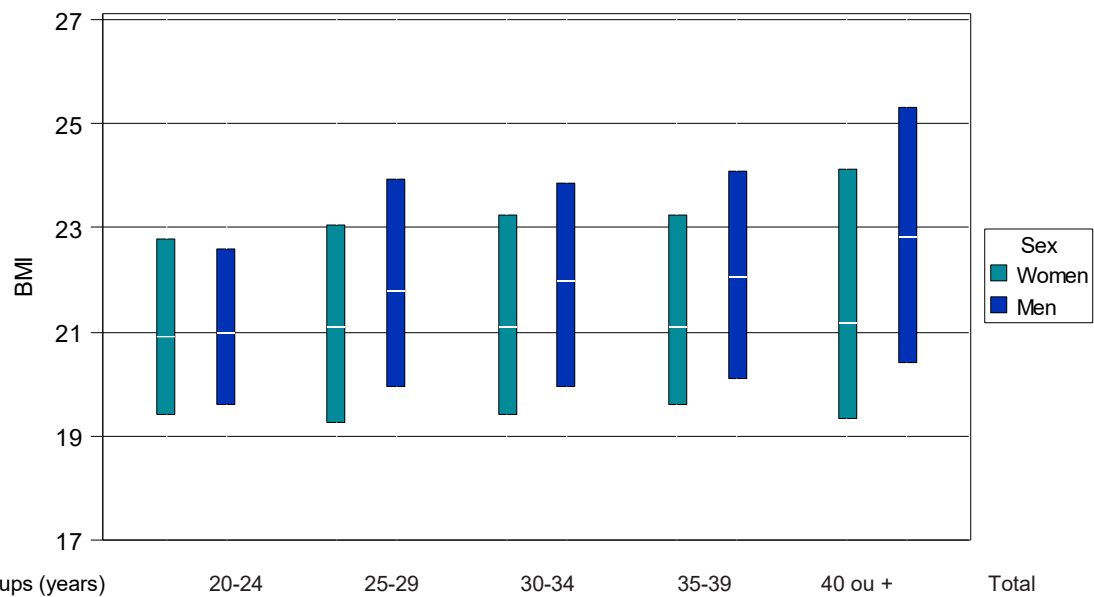
For each age and sex group, median values are the white lines, extremes are the 25<sup>th</sup> and 75<sup>th</sup> percentiles.



## 5. Anthropometry

### ■ Body Mass Index (BMI)

**Figure 5.4. BMI in adults, by age group and sex**



Age groups (years)		20-24	25-29	30-34	35-39	40 ou +	Total
Mean BMI	Women	21.4	21.6	21.6	21.9	22.3	21.8
	Men	21.3	22.2	22.2	22.3	23.2	22.3
Median BMI	Women	20.9	21.1	21.1	21.1	21.2	21.1
	Men	21.0	21.8	22.0	22.0	22.8	21.9
BMI ≥ 22 (%)	Women	32.8	35.5	36.9	39.0	40.2	37.0
BMI ≥ 23 (%)	Men	21.3	35.6	37.0	38.9	47.5	36.8
BMI < 18.5 (%)	Women	12.7	13.8	14.3	11.6	15.4	13.8
	Men	12.5	10.7	12.2	9.9	8.6	10.6

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In adults, mean height was 173 cm for men and 161 cm for women.

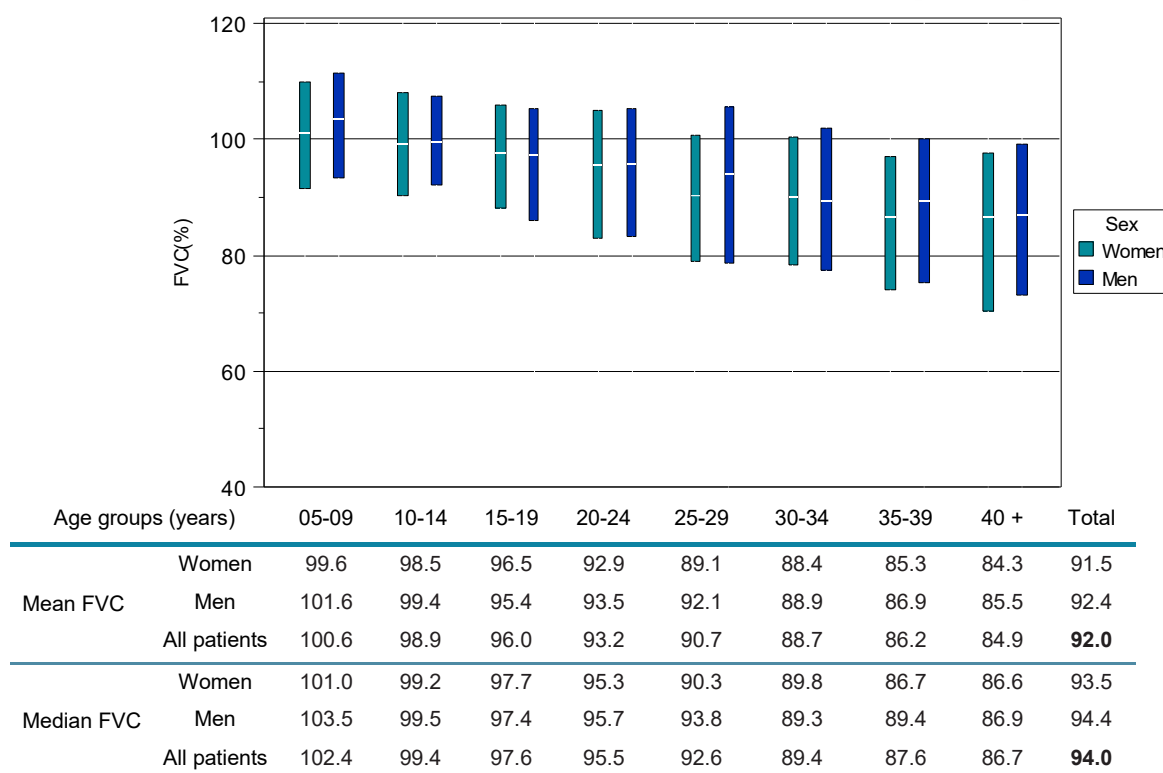
In adults, mean weight was 67 kg for men and 56 kg for women.

## 6. Spirometry

97.1%

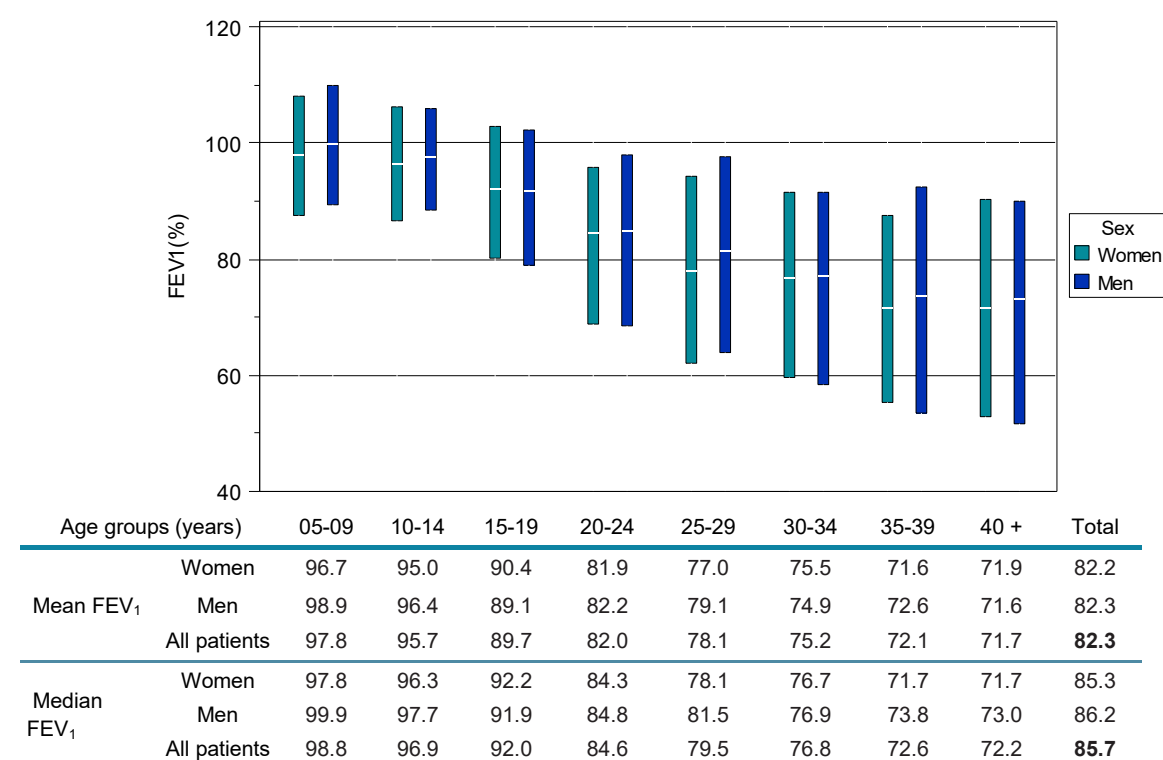
Patients aged 6 and over  
carried out spirometry

**Figure 6.1. FVC (% predicted)\*, by age group and sex**



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**Figure 6.2. FEV<sub>1</sub> (% predicted)\*, by age group and sex**



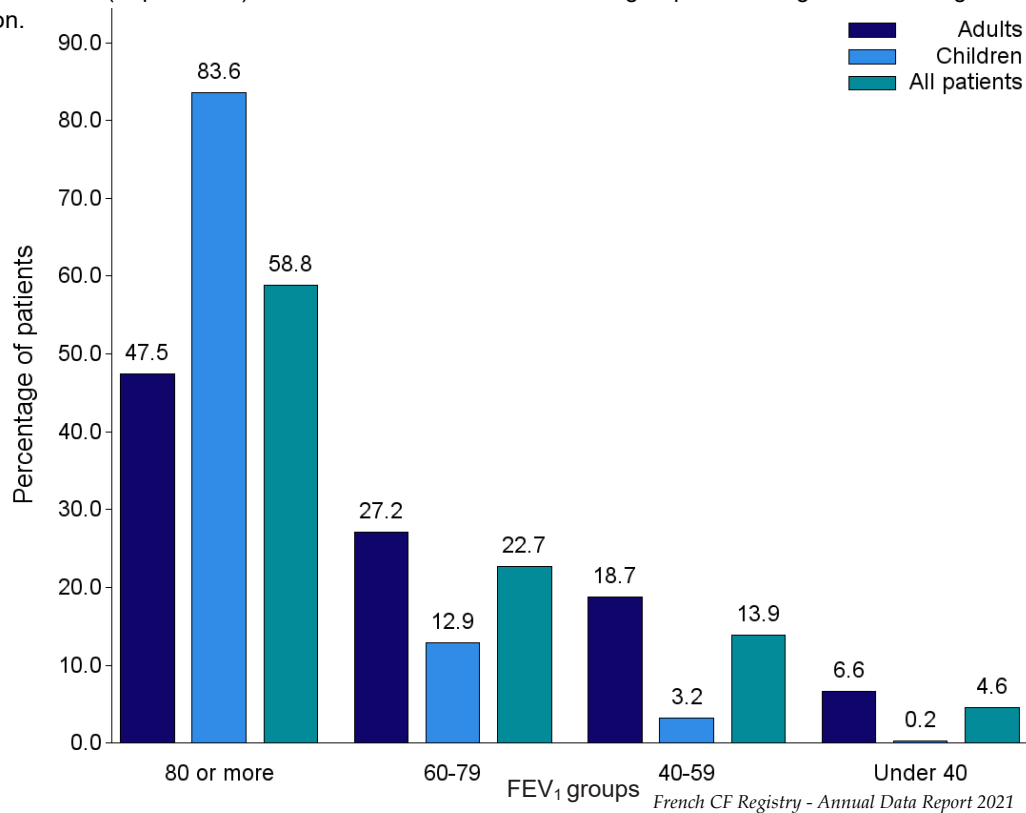
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The pulmonary function tests need an active participation of the patient, difficult to obtain before 6 years of age. The forced vital capacity (FCV) and the forced expiratory volume in the first second (FEV<sub>1</sub>) are given in% predicted (Quanjer PH *et al.* Multi-ethnic reference values for spirometry for the 3-95-yr age range: the global lung function 2012 equations. *Eur Respir J.* 2012;40(6):1324–1343).

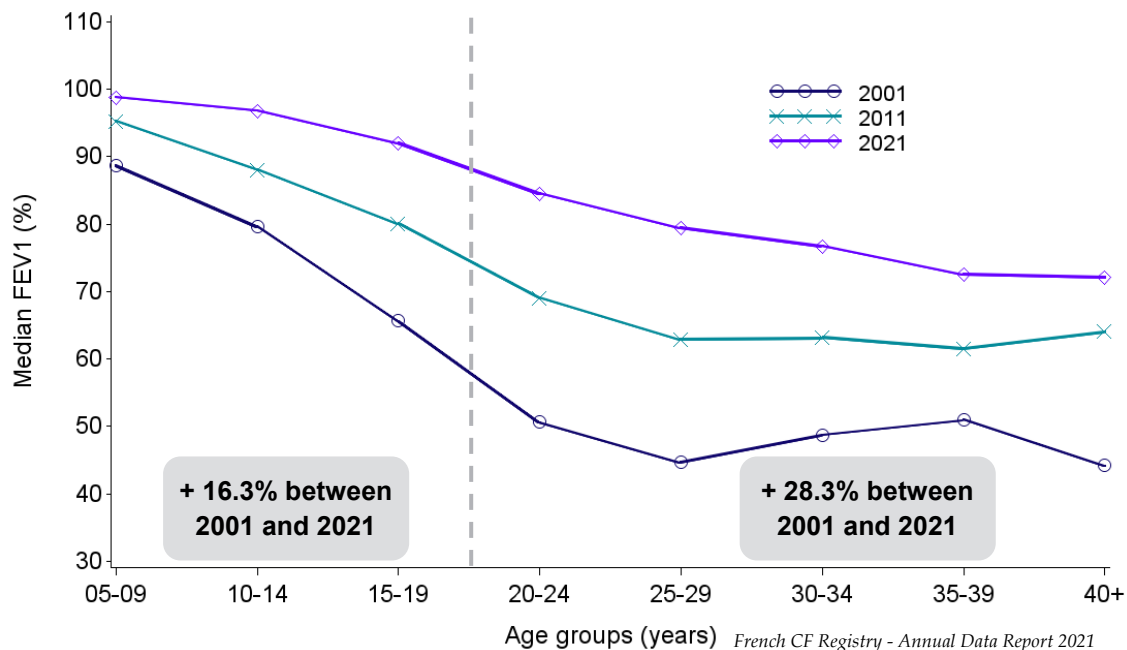
## 6. Spirometry

**Figure 6.3. FEV<sub>1</sub> (% predicted) classes**

Values of FEV<sub>1</sub>(% predicted) are classified in four « functional » groups according to various degrees of bronchial obstruction.



**Figure 6.4. Median FEV<sub>1</sub> (% predicted) in 2021 compared with 2001 and 2011**



Last FEV<sub>1</sub> (%) value of the year was collected from 1992 to 2010, and best value since 2011.

The median FEV<sub>1</sub> was 79.4% for patients aged 6 to 19 years in 2001, and 95.6% in 2021. It was 49.0% in 2001 and 77.3% in 2021 for patients aged 20 years or more.

See appendix 2 for additional information on spirometry and transplantation

## 7. Microbiology

**Table 7.1. Sputum cultures**

Patients with at least one sputum	N	Proportion (%)
All patients	6199	83.6%
Children	2758	97.0%
Adults	3441	75.2%

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In 2021, 83.6% of the patients had at least one sputum culture. Among the patients without sputum culture (N=1219), 57.9% of them were transplanted.

**Table 7.2. Distribution of the respiratory germs**

	Age groups (years)									Total	%*
	00-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40+		
<i>All patients</i>	618	758	875	932	868	763	782	604	1218	7418	
<b>Patients with at least one sputum</b>	<b>598</b>	<b>735</b>	<b>855</b>	<b>888</b>	<b>755</b>	<b>598</b>	<b>573</b>	<b>408</b>	<b>789</b>	<b>6199</b>	<b>83.6%</b>
Normal flora	212	226	228	208	67	52	48	42	98	1181	15.9%
<i>Pseudomonas aeruginosa</i> , including:	106	130	204	310	379	333	356	246	455	2519	34.0%
- Chronic <i>P. aeruginosa</i>	6	29	70	155	236	213	261	186	333	1489	20.1%
Staphylococcus, including:	411	570	696	728	610	445	381	250	406	4497	60.6%
- MSSA	404	558	686	703	572	417	342	223	363	4268	57.5%
- Chronic MSSA	190	328	461	468	406	271	225	144	223	2716	36.6%
- MRSA	10	24	21	55	57	40	54	34	51	346	4.7%
- Chronic MRSA	4	8	10	27	38	20	34	24	32	197	2.7%
<i>Achromobacter spp.</i>	12	31	46	80	87	69	66	33	49	473	6.4%
<i>Burkholderia cepacia</i>	3	7	21	14	25	29	20	10	22	151	2.0%
- Chronic <i>B. cepacia</i>	.	4	10	10	17	22	13	6	14	96	1.3%
<i>Stenotrophomonas maltophilia</i>	50	62	104	114	111	77	62	45	66	691	9.3%
<i>Haemophilus influenzae</i>	110	130	88	92	103	63	58	46	57	747	10.1%
Pneumococcus	39	29	20	6	5	3	6	8	12	128	1.7%
Enterobacteria	84	21	36	48	65	47	34	24	79	438	5.9%

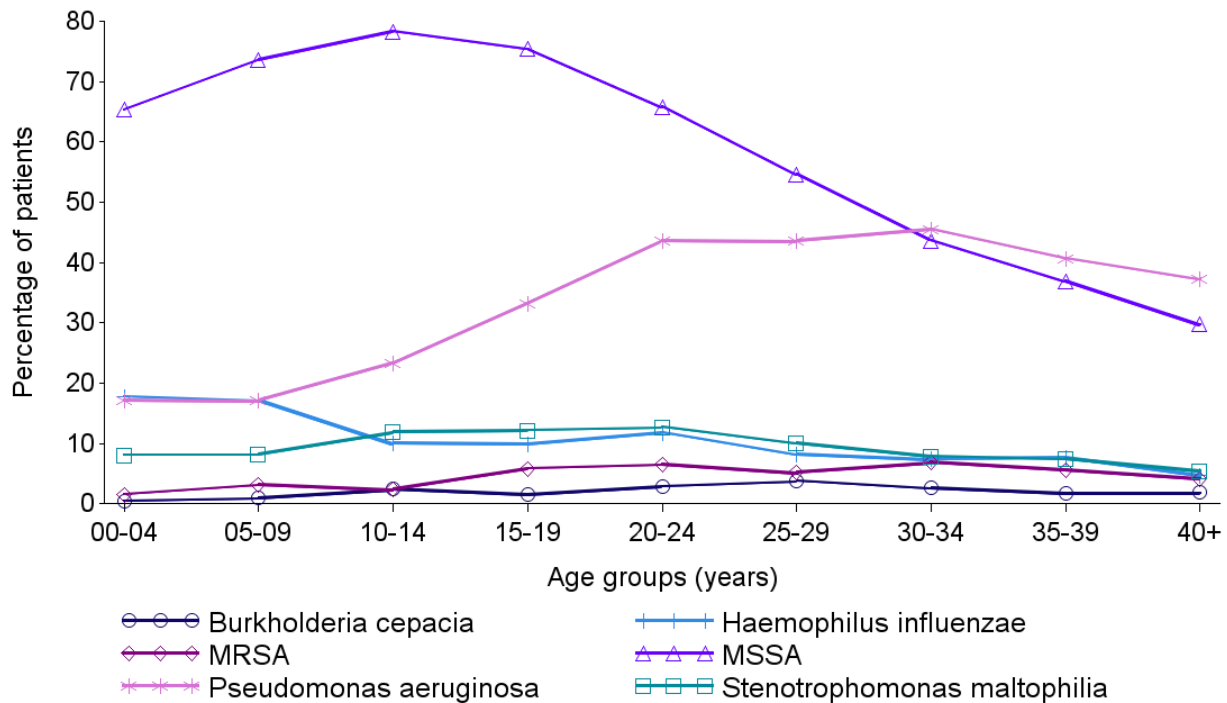
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\* Percentage with respect to the entire population.

Chronic colonization: more than 50% of positive test results in the last 12 months (with at least 4 tests during this period) and/or significant increase in anti-PA antibodies (according to the laboratory).

## 7. Microbiology

**Figure 7.1. Clinically important bacteria**



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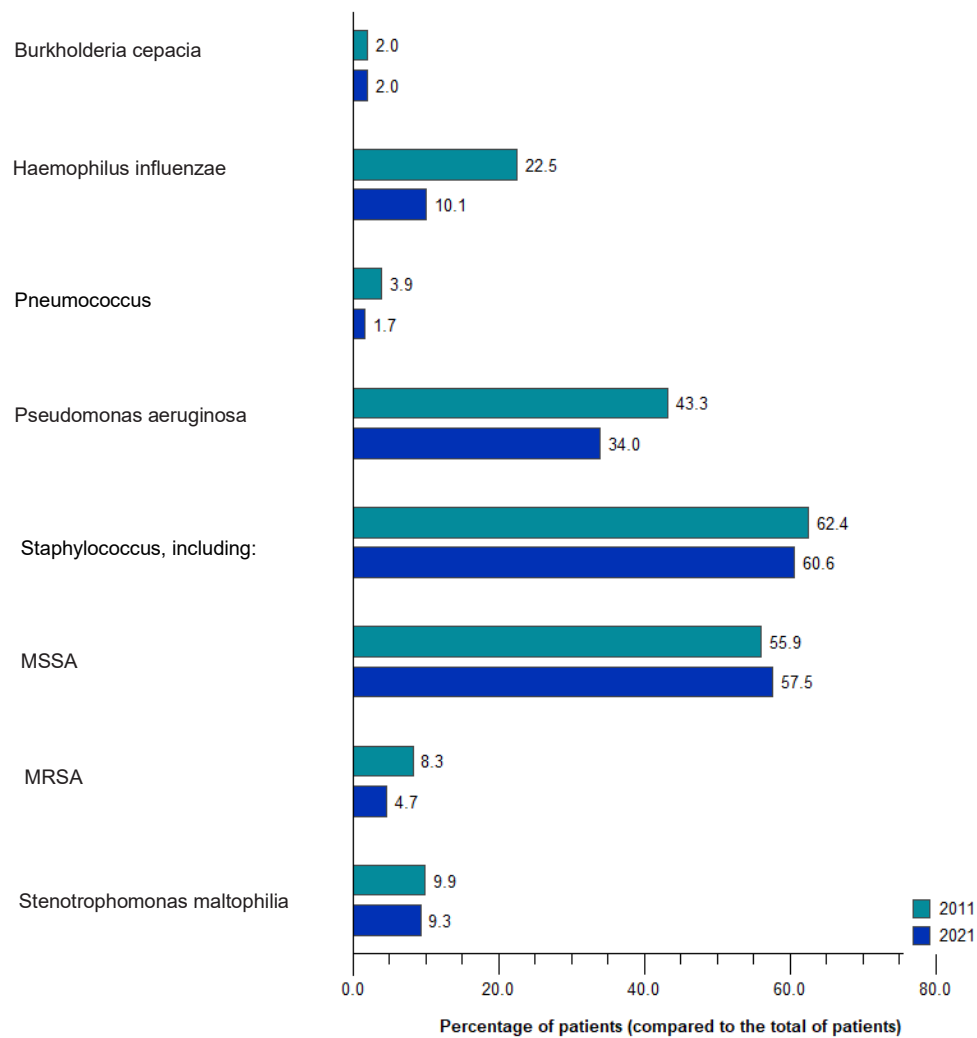
**Table 7.3. Bcc species**

	Age groups (years)									Total	%*
	00-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40+		
<i>All patients</i>	618	758	875	932	868	763	782	604	1218	7418	
<b>Patients with Bcc</b>	3	7	21	14	25	29	20	10	22	151	
<i>B. multivorans</i>	.	3	7	3	9	10	5	5	6	48	31.8%
<i>B. cenocepacia</i>	.	1	2	.	1	3	4	2	4	17	11.3%
<i>B. cepacia</i>	2	.	4	4	10	8	4	1	5	38	25.2%
<i>B. stabilis</i>	.	.	.	.	.	2	.	.	.	2	1.3%
<i>B. vietnamiensis</i>	.	.	.	.	.	.	1	.	.	1	0.7%
<i>B. gladioli</i>	.	2	6	7	2	1	3	2	3	26	17.2%
Any other Burkholderia	1	.	1	.	2	.	1	.	2	7	4.6%

\* Percentage of the number of patients colonized by Bcc.

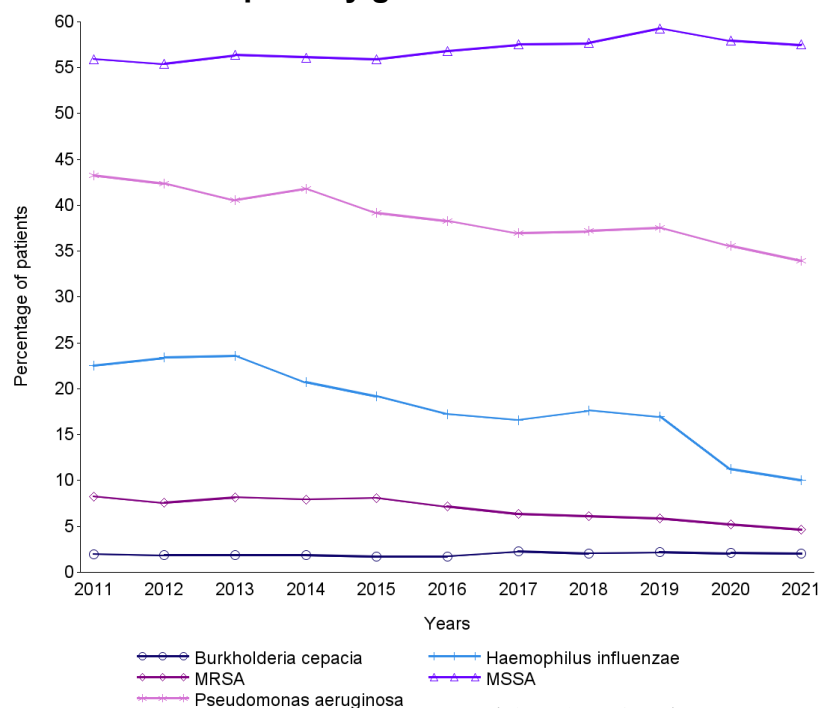
## 7. Microbiology

**Figure 7.2. Comparison of germs in 2011 and in 2021**



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**Figure 7.3. Evolution of respiratory germs since 2011**



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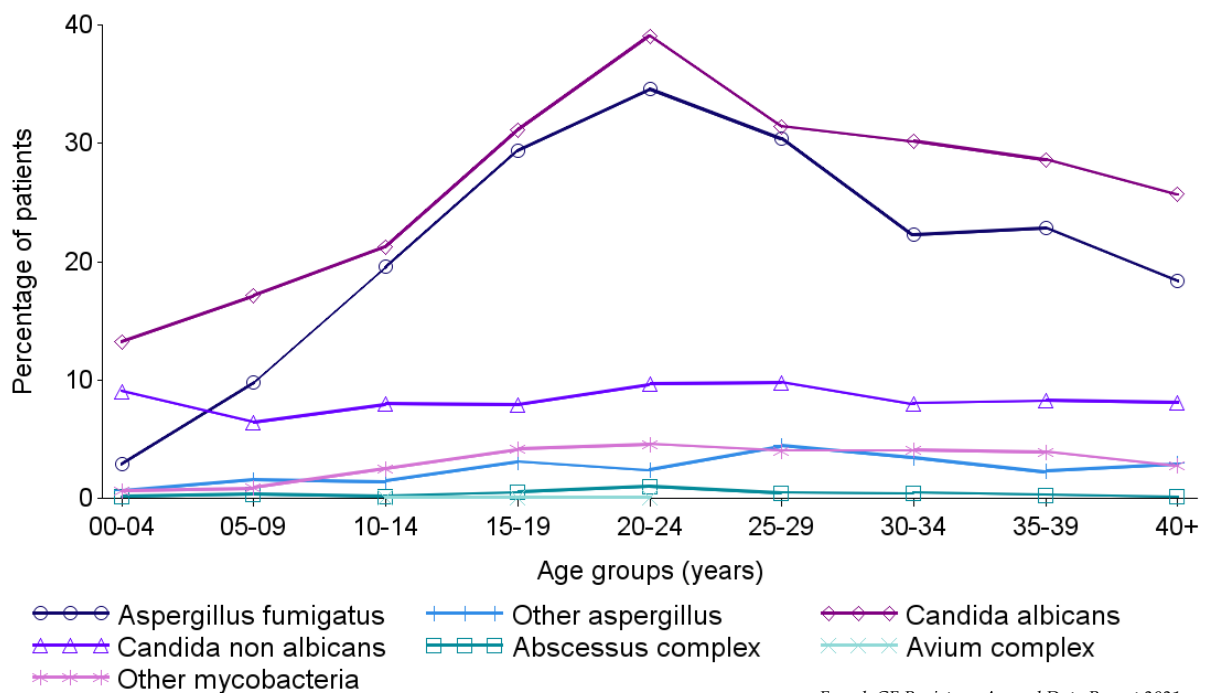
## 7. Microbiology

**Table 7.4. Fungal elements, mycobacteria and viruses**

	Age groups (years)									Total	%*
	00-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40+		
<i>All patients</i>	618	758	875	932	868	763	782	604	1218	7418	
<i>Aspergillus fumigatus</i>	18	74	171	274	300	232	174	138	224	1605	21.6
<i>Other aspergillus</i>	4	12	13	29	21	34	27	14	36	190	2.6
<i>Candida albicans</i>	82	130	186	290	339	240	236	173	313	1989	26.8
<i>Candida non albicans</i>	56	49	70	74	84	75	63	50	99	620	8.4
<i>Search for mycobacteria</i>	265	426	586	658	555	402	388	281	528	4089	55.1
- Abscessus complex	3	9	10	23	23	19	15	10	10	122	1.6
- Avium complex	.	.	11	18	14	12	15	9	19	98	1.3
- Other mycobacteria	2	1	4	4	13	4	6	7	7	48	0.6
<i>Search for viruses</i>	145	114	116	144	63	68	68	50	92	860	11.6
- Coronavirus	15	12	33	38	11	26	17	21	29	202	2.7
- Influenza A	1	3	2	2	1	.	.	2	1	12	0.2
- Influenza B	.	.	2	1	.	.	1	.	.	4	0.1

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**Figure 7.4. Fungal elements, mycobacteria and viruses**



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## 8. Complications

### ■ Respiratory

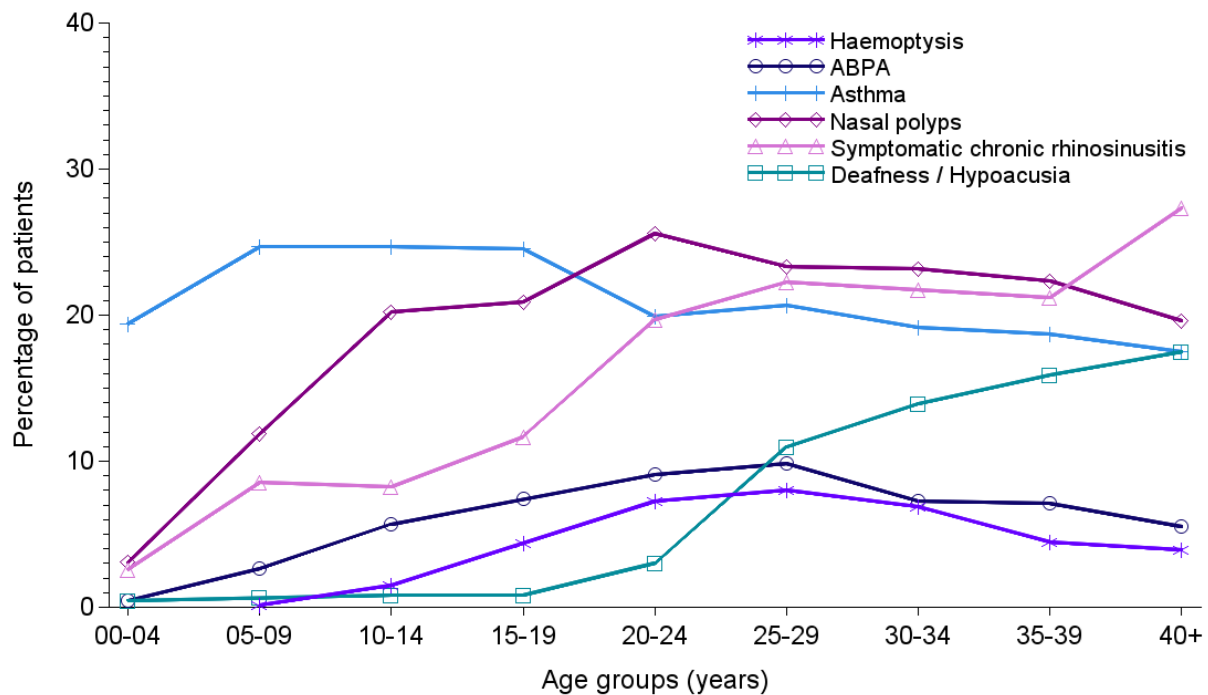
**Table 8.1. Respiratory complications and ENT**

	Age groups (years)									Total	%
	00-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40+		
<i>All patients</i>	<i>618</i>	<i>758</i>	<i>875</i>	<i>932</i>	<i>868</i>	<i>763</i>	<i>782</i>	<i>604</i>	<i>1218</i>	<i>7418</i>	
Pneumothorax	.	.	1	5	6	8	6	6	7	39	0.5
Haemoptysis	.	1	13	41	63	61	54	27	48	308	4.2
ABPA	3	20	50	69	79	75	57	43	67	463	6.2
Non APBA aspergillosis	.	6	13	22	30	23	22	16	36	168	2.3
Pulmonary arterial hypertension	.	.	.	1	5	4	9	6	22	47	0.6
Asthma	120	187	216	229	173	158	150	113	213	1559	21.0
Nasal polyps	19	90	177	195	222	178	181	135	239	1436	19.4
Symptomatic chronic rhinosinusitis	16	65	72	109	171	170	170	128	333	1234	16.6
Deafness / Hypoacusia	3	5	7	8	26	84	109	96	213	551	7.4

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**Figure 8.1. Respiratory complications and ENT**

*Percentage of age groups reporting complications.*



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## 8. Complications

### Gastro-intestinal

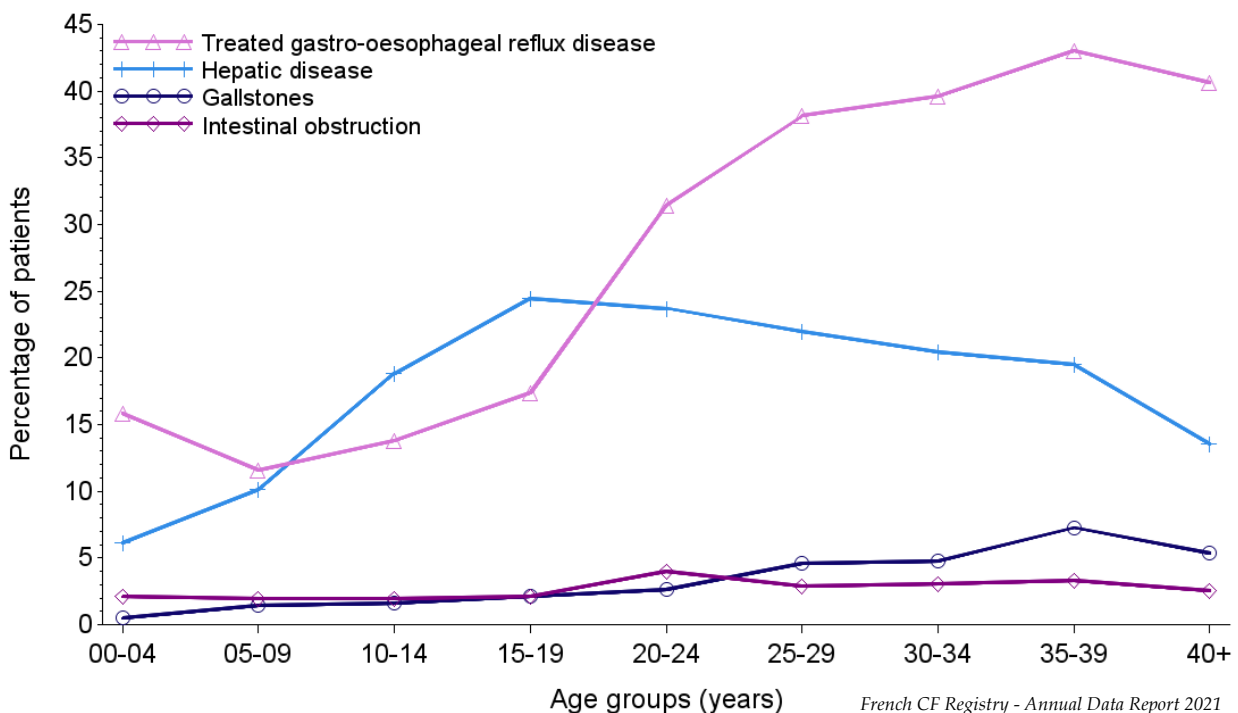
**Table 8.2. Gastro-intestinal complications**

	Age groups (years)									Total	%
	00-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40+		
<i>All patients</i>	618	758	875	932	868	763	782	604	1218	7418	
Abnormal exocrine pancreatic function	499	589	699	738	741	653	665	513	850	5947	80.2%
Treated gastro-oesophageal reflux disease	98	88	121	162	273	291	310	260	495	2098	28.3%
Hepatic disease	38	77	165	228	206	168	160	118	165	1325	17.9%
- Hepatic disease without cirrhosis	33	70	128	161	138	120	112	85	121	968	13.0%
- Cirrhosis without portal hypertension	.	3	14	33	31	22	17	9	13	142	1.9%
- Cirrhosis with portal hypertension	1	1	12	25	26	18	27	19	25	154	2.1%
Digestive Hemorrhage	1	.	2	.	.	.	1	.	2	6	0.1%
Gallstones	3	11	14	20	23	35	37	44	65	252	3.4%
Intestinal obstruction	13	15	17	20	35	22	24	20	31	197	2.7%
Acute pancreatitis	.	5	7	7	10	7	7	12	25	80	1.1%

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**Figure 8.2. Gastro-intestinal complications**

*Percentage of age groups reporting complications.*





## 8. Complications

### Metabolic complications

**32.8%**

of adult patients are with diabetes mellitus

**Table 8.3. Metabolic complications**

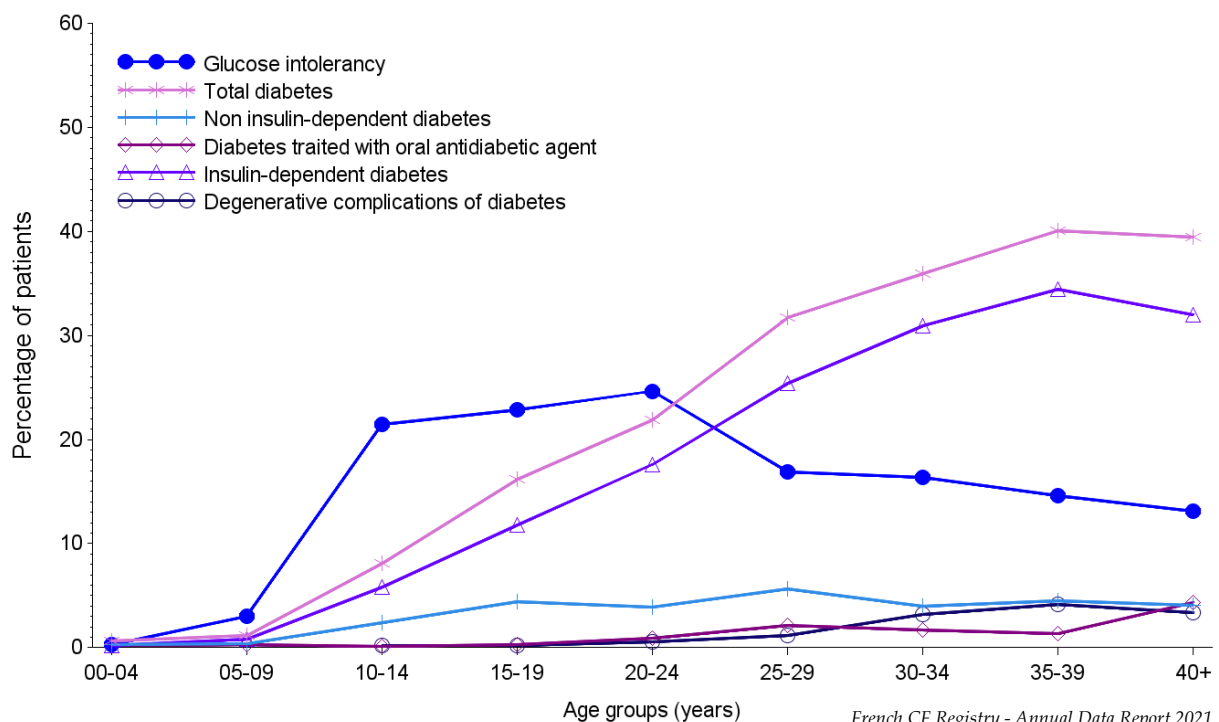
	Age groups (years)									Total	%
	00-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40+		
<i>All patients</i>	<i>618</i>	<i>758</i>	<i>875</i>	<i>932</i>	<i>868</i>	<i>763</i>	<i>782</i>	<i>604</i>	<i>1218</i>	<i>7418</i>	
OGTT done	2	37	386	383	293	203	160	108	190	1762	23.8%
Glucose intolerance	2	23	188	213	214	129	128	88	160	1145	15.4%
Total diabetes	4	9	71	151	190	242	281	242	481	1671	22.5%
Non insulin-dependent diabetes	2	3	21	41	34	43	31	27	50	252	3.4%
Diabetes treated with oral antidiabetic agent	1	2	1	3	8	16	13	8	53	105	1.4%
Insulin-dependent diabetes	1	6	51	110	153	194	242	208	390	1355	18.3%
Degenerative complications of diabetes	.	.	2	2	5	9	25	25	41	109	1.5%
- Retinopathy	.	.	.	.	2	6	11	11	18	48	0.6%
- Nephropathy	.	.	1	1	2	5	19	16	24	68	0.9%
- Neuropathy	.	.	.	1	2	1	.	1	8	13	0.2%
- Diabetic macroangiopathy	.	.	.	.	.	1	1	1	1	4	0.1%
Adrenal insufficiency	3	2	7	4	4	12	14	11	22	79	1.1%

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The line « Total diabetes » sums the number of patients having at least one type of diabetes. Among the 1671 patients, 15 patients presented with both types of diabetes during the year.

**Figure 8.3. Metabolic complications**

Percentage of age groups reporting complications.



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## 8. Complications

### Other complications

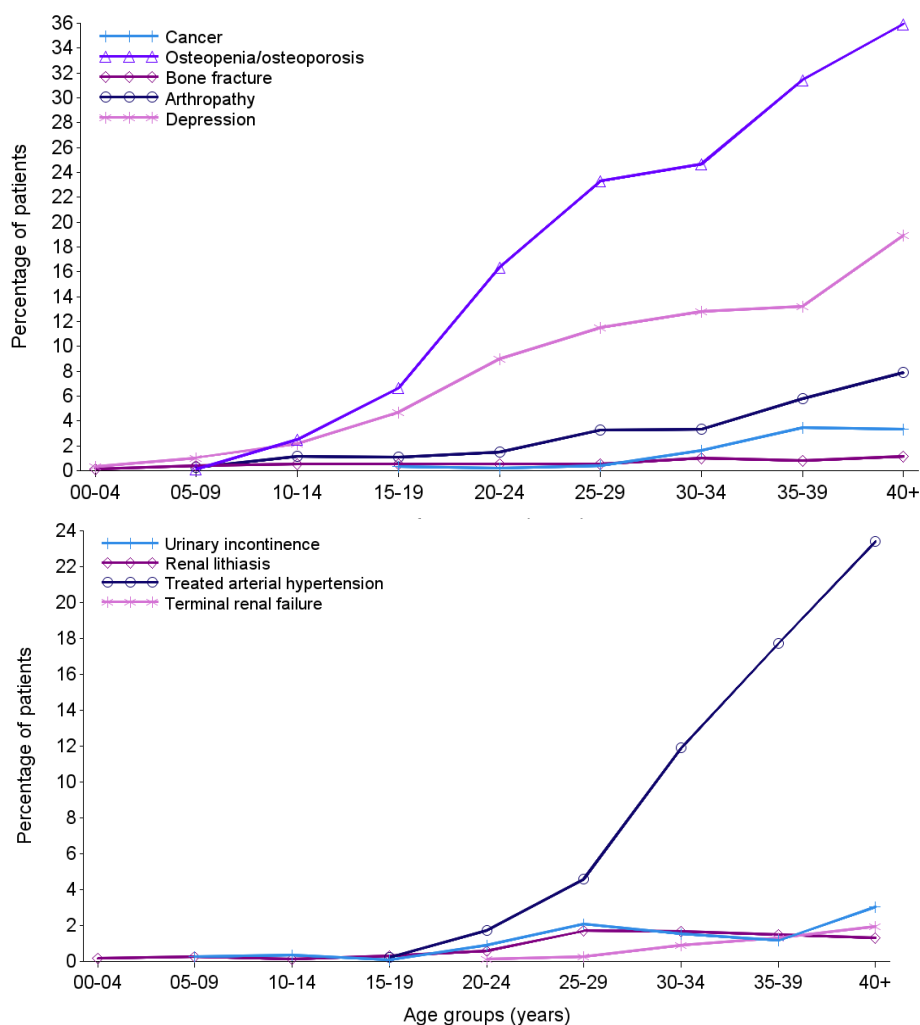
**Table 8.4. Other complications**

	Age groups (years)									Total	%
	00-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40+		
<i>All patients</i>	<i>618</i>	<i>758</i>	<i>875</i>	<i>932</i>	<i>868</i>	<i>763</i>	<i>782</i>	<i>604</i>	<i>1218</i>	<i>7418</i>	
Cancer	.	.	.	3	2	3	13	21	41	83	1.1%
Osteopenia / osteoporosis	.	1	22	62	142	178	193	190	438	1226	16.5%
Bone fracture	1	3	5	5	5	4	8	5	14	50	0.7%
Arthropathy	.	2	10	10	13	25	26	35	96	217	2.9%
Urinary incontinence	.	2	3	1	8	16	12	7	37	86	1.2%
Renal lithiasis	1	2	1	3	5	13	13	9	16	63	0.8%
Treated arterial hypertension	.	.	.	2	15	35	93	107	285	537	7.2%
Terminal renal failure	.	.	.	.	1	2	7	8	24	42	0.6%
Depression	2	8	19	44	78	88	100	80	231	650	8.8%

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**Figure 8.4. Other complications**

Percentage of age groups reporting complications.



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## 9. Transplantation

20.5%

of adult patients are living with a transplant

**Table 9.1. Characteristics of the patients on waiting list and of transplant recipients**

Were included in this table all the patients seen and/or dead in 2021.

	All years	2021
WAITING LIST	All waiting patients	Listed in 2021
<b>Nb of patients</b>	<b>65</b>	<b>27</b>
Mean age (years) and standard deviation (SD)	37.7 ± 10.0	34.0 ± 11.3
Extremes of age (years)	12.8-60.8	12.8-57.6
Deaths on waiting list	2	0
TRANSPLANTATION	All transplanted *	Transplanted in 2021
<b>Nb of patients</b>	<b>955</b>	<b>31</b>
<b><u>Single organ transplant:</u></b>		
- bilateral lung - N (%)	921 (96.4%)	16 (51.6%)
- liver - N (%)	31 ( 3.2%)	
- kidney - N (%)	84 ( 8.8%)	14 (45.2%)
- bilobar lung transplantation, N(%)	1 ( 0.1%)	
- single lung - N (%)	7 ( 0.7%)	
- pancreatic islets, N(%)	1 ( 0.1%)	
- bone marrow - N (%)	1 ( 0.1%)	
<b><u>Multiple organ transplant:</u></b>		
- heart-lung - N (%)	19 ( 2.0%)	
- heart-lung / liver - N (%)	2 ( 0.2%)	
- bilateral lung / liver - N (%)	29 ( 3.0%)	
- bilateral lung / kidney - N (%)	8 ( 0.8%)	1 ( 3.2%)
- bilateral lung / islet of Langerhans - N (%)	9 ( 0.9%)	
- liver / single lung - N (%)	1 ( 0.1%)	
- liver / pancreas - N (%)	1 ( 0.1%)	
- liver / pancreatic islets - N (%)	1 ( 0.1%)	
- kidney / pancreas - N (%)	3 ( 0.3%)	
Mean age (years)	37.9	38.9
SD	10.1	10.9
Extremes of age (years)	10.5-72.3	12.8-60.8
Post-transplantation deaths	30	2

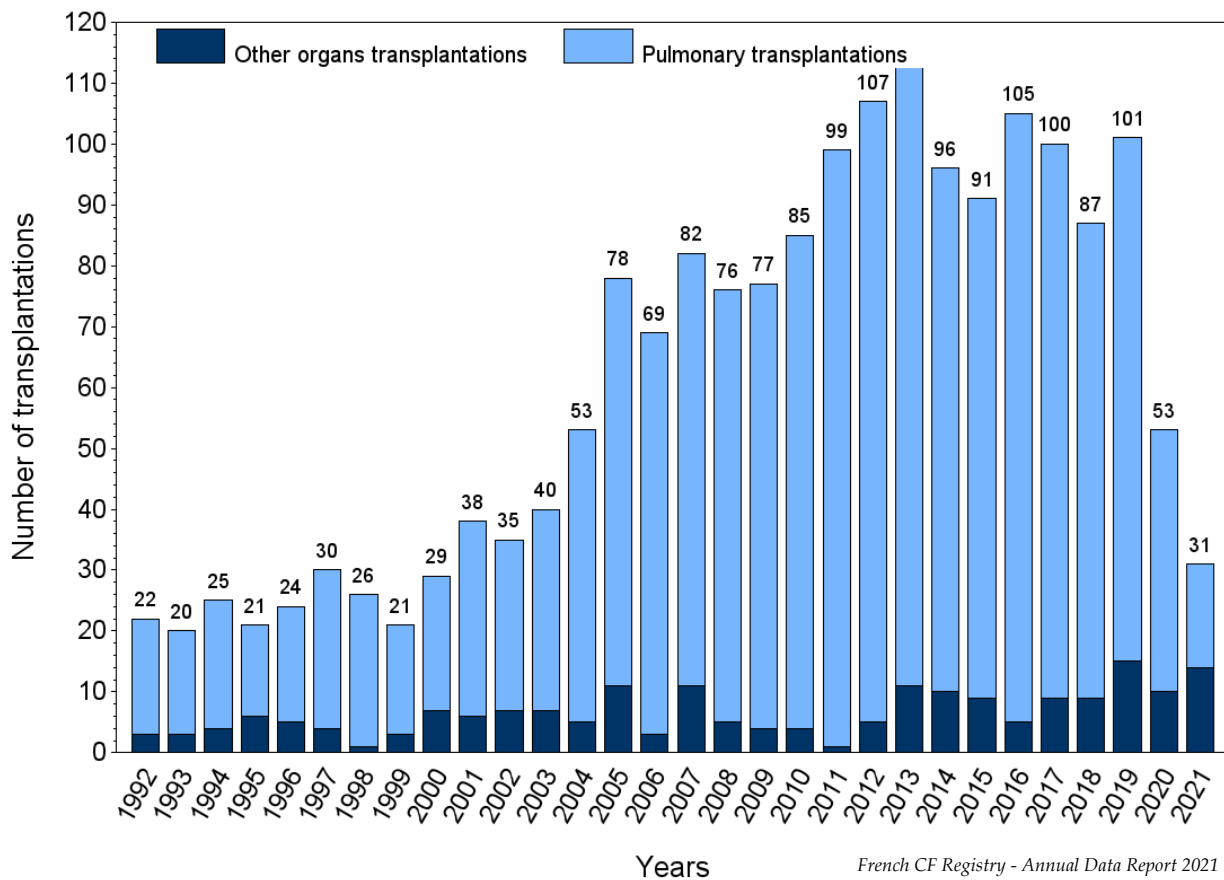
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\* 149 patients underwent two or more organ transplants.

## 9. Transplantation

**Figure 9.1. Annual number of transplanted patients, since 1992**

Since 1992, 1834 transplants have been performed.



**Table 9.2. Annual number of transplanted patients, since 2008**

Transplant type	Years													
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Pulmonary*	71	73	81	98	102	102	86	82	100	91	78	86	43	17
Other organs	5	4	4	1	5	11	10	9	5	9	9	15	10	14

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\* single lung, bilobar lung transplantation, bilateral lung or heart-lung (alone or combined with another organ).

**Table 9.3. Surgeries**

	Types of surgeries			
	Abdominal	Thoracic	ENT	Other
Number of surgeries in 2021	127	41	125	187

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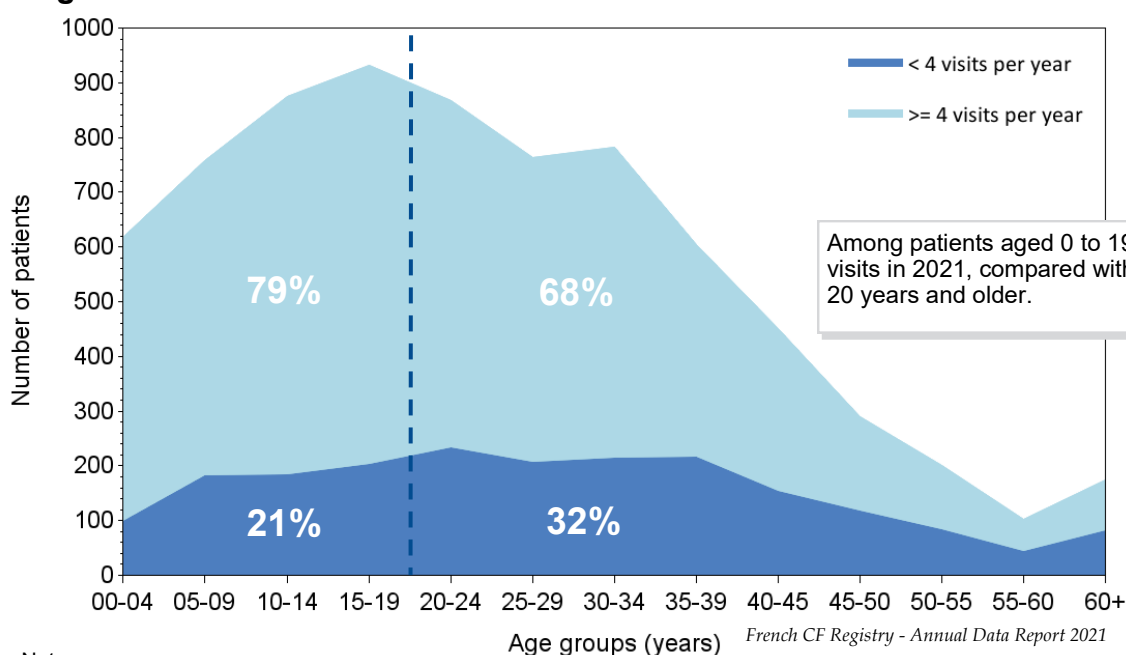
# 10. Outpatient and inpatient visits

**Table 10.1. Characteristics of the visits**

	Age groups (years)									Total
	00-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40+	
<b>All patients</b>	<b>618</b>	<b>758</b>	<b>875</b>	<b>932</b>	<b>868</b>	<b>763</b>	<b>782</b>	<b>604</b>	<b>1218</b>	<b>7418</b>
< 4 visits per year	100	184	186	204	235	208	215	218	491	2041
≥ 4 visits per years	518	574	689	728	633	555	567	386	727	5377
<b>Outpatient visits*</b>										
Number of patients with at least one outpatient visit	276	302	359	453	545	500	495	399	819	4148
Median number of visits	3.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0
Mean number of visits	3.3	2.5	2.8	2.8	3.2	3.5	3.8	3.5	3.2	3.2
<b>Telehealth <span style="border: 1px solid red; padding: 2px;">New</span></b>										
Number of patients with at least one telehealth visit	43	53	54	75	50	38	45	40	48	446
Median number of telehealth visits	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Mean number of telehealth visits	1.5	1.6	1.5	1.6	1.4	1.6	1.6	1.5	1.4	1.5
<b>One-day hospitalizations</b>										
Number of patients with at least one one-day visit	588	731	837	887	737	616	629	491	920	6436
Median number of visits	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	2.0	3.0
Mean number of visits	4.5	3.6	4.1	4.1	3.2	3.1	3.2	2.9	2.8	3.5
<b>Inpatient visits</b>										
Number of patients with at least one inpatient visit	120	79.0	137	210	199	169	188	141	300	1543
Median number of visits	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Mean number of visits	1.7	1.6	2.0	1.9	1.8	2.0	1.9	1.8	1.9	1.9
Median duration (days)	9.0	8.0	8.0	9.0	7.0	7.0	8.0	6.0	6.5	8.0
Mean duration (days)	18.5	12.3	16.0	14.2	17.8	14.7	16.5	14.4	14.5	15.5

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**Figure 10.1. Number of visits**



Notes:

- Visits include outpatient, one-day hospitalizations and inpatient visits.
- Mean and median are calculated on patients with at least one visit (any type).

# 11. Therapeutic management

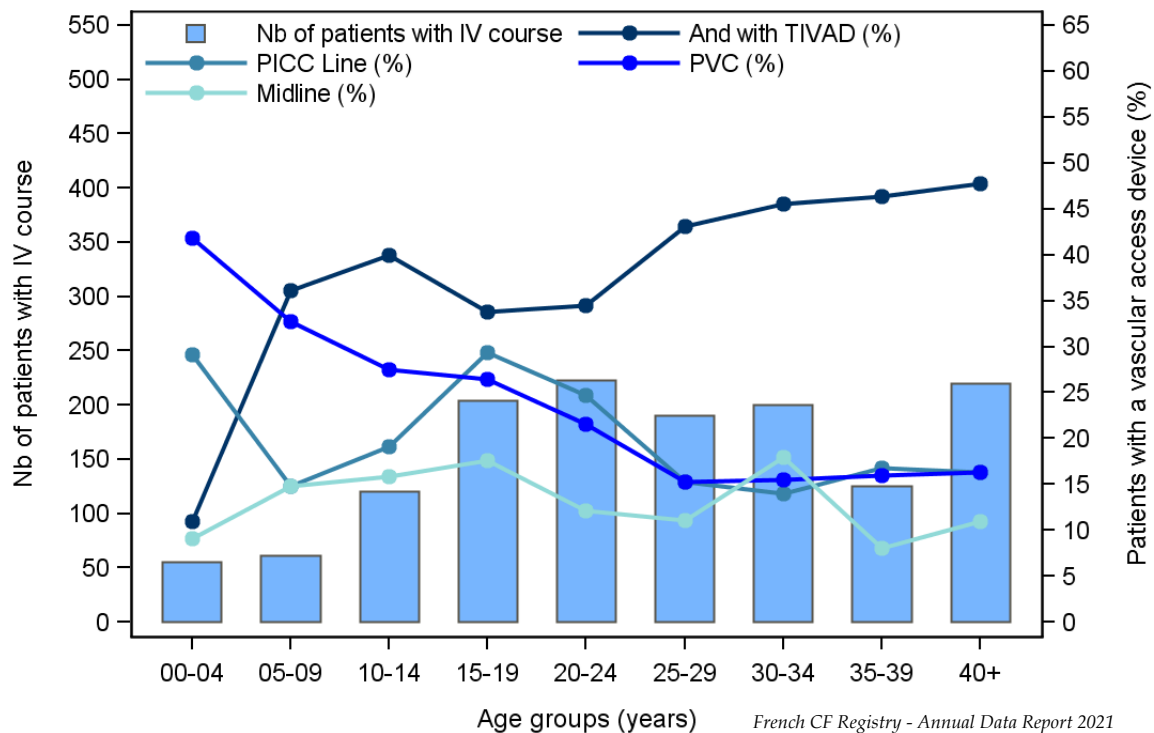
## Antibiotic courses – Vascular access devices

**Table 11.1. IV antibiotic courses**

	Age groups (years)									Total
	00-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40+	
<i>All patients</i>	618	758	875	932	868	763	782	604	1218	7418
<b>Nb of patients with at least one course</b>	55 (8.9%)	61 (8.1%)	120 (13.7%)	204 (21.9%)	223 (25.7%)	190 (24.9%)	200 (25.6%)	125 (20.7%)	220 (18.1%)	1398 (18.8%)
- and with TIVAD*	6	22	48	69	77	82	91	58	105	558
- PICC Line	16	9	23	60	55	29	28	21	36	277
- Peripheral venous catheter (PVC)	23	20	33	54	48	29	31	20	36	294
- Midline	5	9	19	36	27	21	36	10	24	187
Nb of courses	71	97	214	379	383	341	356	206	405	2452
Nb of days of courses including:	997	1415	3551	5821	5904	5401	5083	3017	5814	37003
- at hospital	713	780	1312	2180	1529	1010	1072	544	1461	10601
- at home	284	635	2239	3462	4220	4221	3763	2337	3977	25138
TIVAD* (with or without course)	7	24	53	78	88	93	109	72	122	646

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**Figure 11.1. Patients with at least one IV antibiotic course and a vascular access device\***



\* TIVAD: Totally Implantable Vascular Access Device



# 11. Therapeutic management

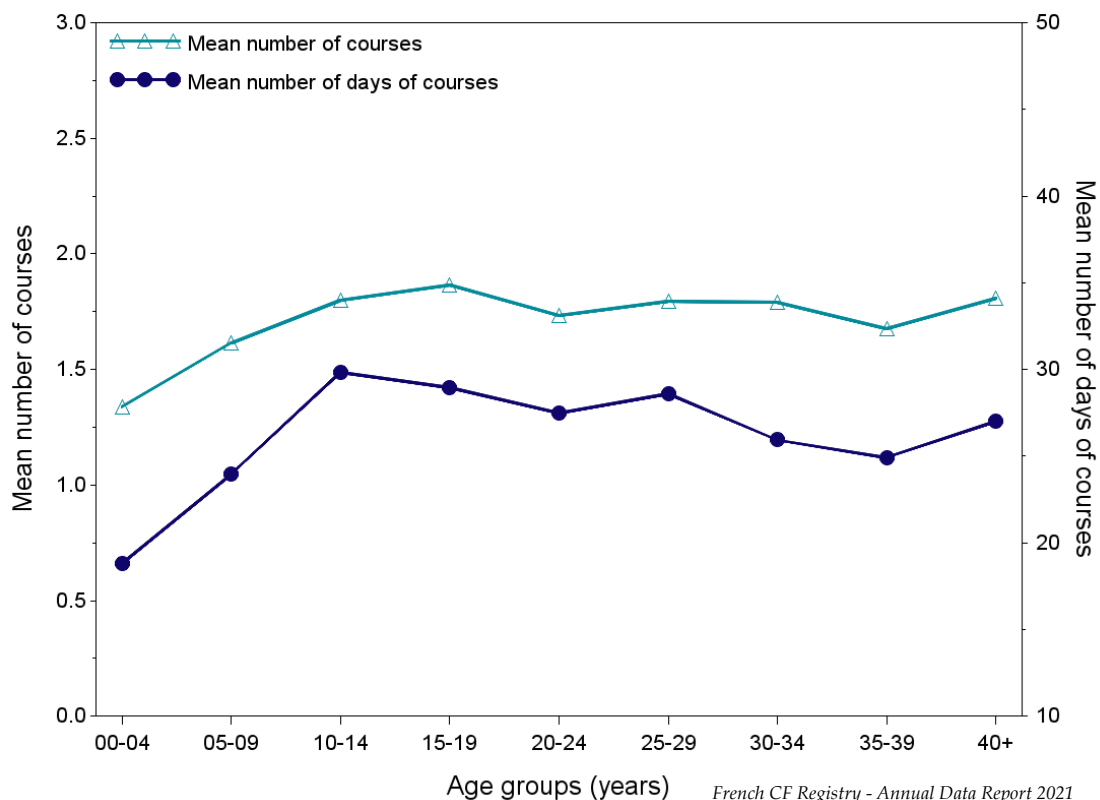
## ■ IV antibiotic courses

**Table 11.2. Mean number of IV antibiotic courses and of days of courses \***

	Age groups (years)									Total
	00-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40+	
Courses										
Mean number of courses	1.3	1.6	1.8	1.9	1.7	1.8	1.8	1.7	1.8	1.8
SD	0.8	1.0	1.5	1.4	1.2	1.2	1.5	1.1	1.3	1.3
Day of courses										
Mean duration of courses (days)	18.8	24.0	29.8	29.0	27.5	28.6	25.9	24.9	27.0	27.0
SD	13.1	16.7	22.8	25.9	23.2	30.2	21.4	17.8	21.2	23.2
Median duration of courses (days)	14.0	15.0	22.0	16.0	15.0	15.0	15.0	15.0	16.0	15.0
1 <sup>st</sup> quartile (Q1)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
3 <sup>rd</sup> quartile (Q3)	16.0	30.0	42.0	36.0	30.0	35.0	29.5	30.0	30.5	30.0

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**Figure 11.2. Mean number of IV antibiotic courses and of days of courses \***



\* Among patients having received at least one IV course.

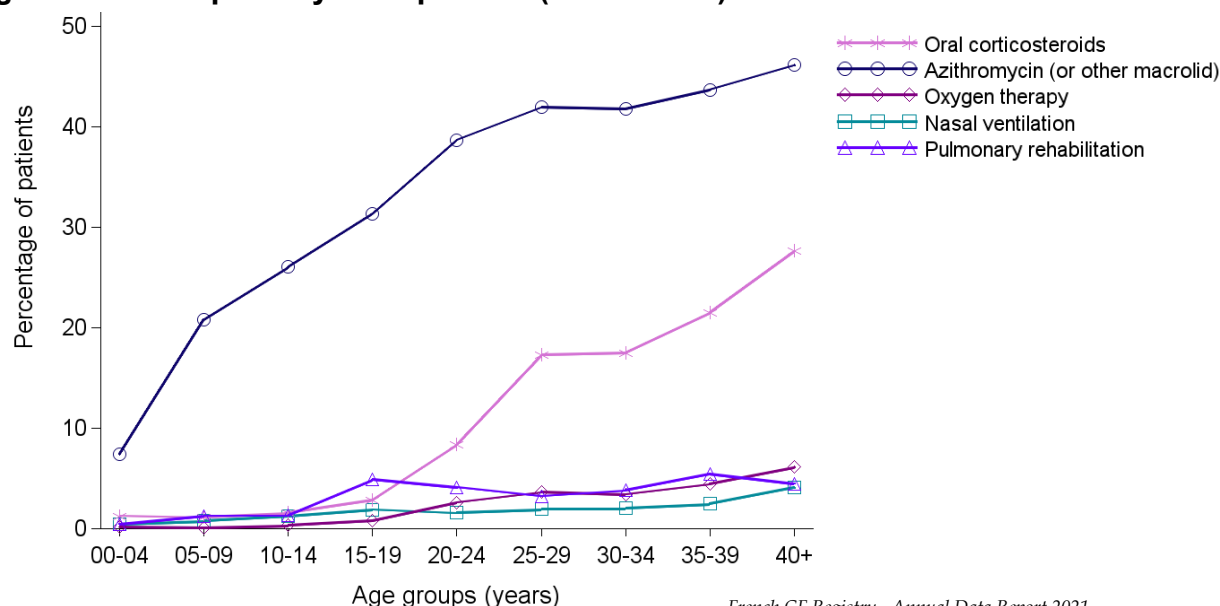
# 11. Therapeutic management

## ■ Respiratory /CFTR gene modulators

**Table 11.3. Respiratory therapeutics (≥ 3 months)**

	Age groups (years)									Total	%
	00-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40+		
<i>All patients</i>	618	758	875	932	868	763	782	604	1218	7418	
Aerosol therapy*	312	594	762	795	724	577	538	399	873	5574	75.1%
Oral corticosteroids	8	9	14	27	73	132	137	130	337	867	11.7%
Azithromycin (or other macrolid)	46	158	228	292	336	320	327	264	562	2533	34.1%
Oxygen therapy	1	1	3	8	23	28	27	27	75	193	2.6%
Nasal ventilation	3	6	11	18	14	15	16	15	50	148	2.0%
Pulmonary rehabilitation	3	10	12	46	36	25	30	33	55	250	3.4%

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**Figure 11.3. Respiratory therapeutics (≥ 3 months)**


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\* By nebulization, spray or powder

**Table 11.4. CFTR gene modulators**

	Age groups (years)									Total	%
	00-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40+		
<i>All patients</i>	618	758	875	932	868	763	782	604	1218	7418	
Ivacaftor	12	12	30	26	27	16	16	15	36	190	2.6%
Lumacaftor-ivacaftor	156	268	166	52	33	16	13	7	6	717	9.7%
Tezacaftor-ivacaftor / ivacaftor	.	.	5	19	18	13	18	16	85	174	2.3%
Tezacaftor-elexacaftor-ivacaftor / ivacaftor	.	7	294	478	436	319	275	168	219	2196	29.6%

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If two modulators were prescribed during the year, only the last one was taken into account in this table.

# 11. Therapeutic management

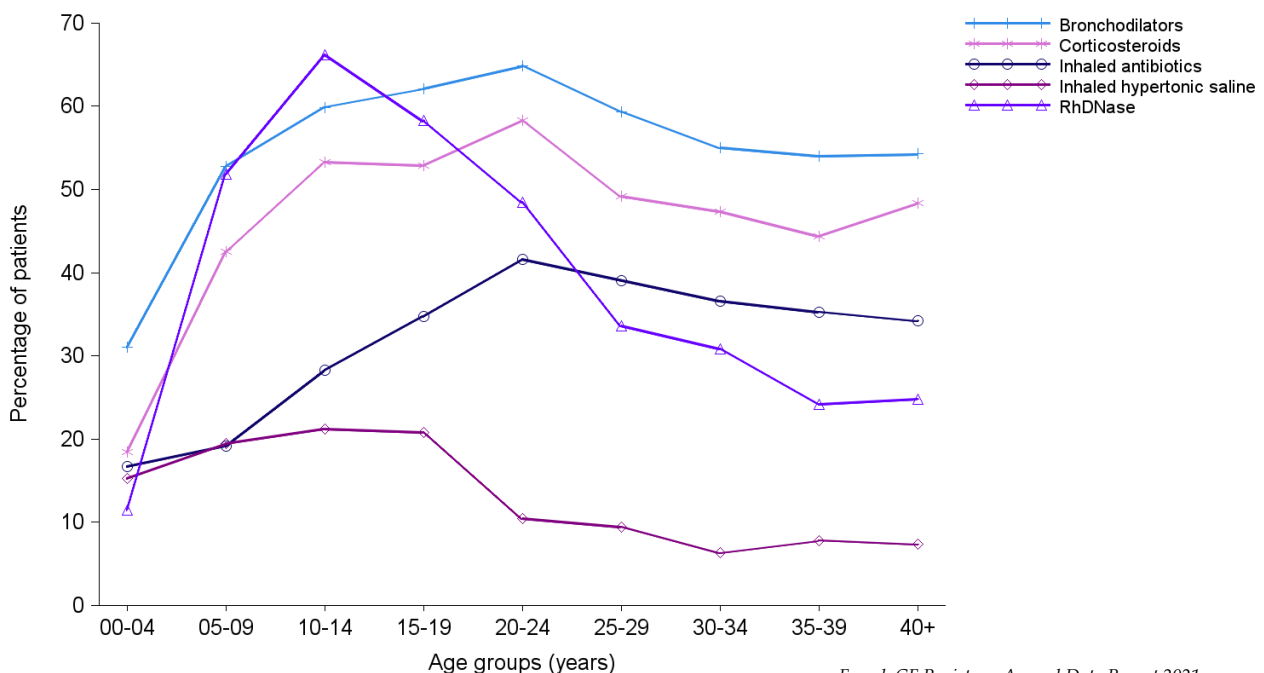
## Aerosoltherapy

**Table 11.5. Aerosoltherapy treatments (≥ 3 months)**

	Age groups (years)									Total	%
	00-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40+		
<i>All patients</i>	618	758	875	932	868	763	782	604	1218	7418	
<b>Patients under aerosol therapy*</b>	<b>312</b>	<b>594</b>	<b>762</b>	<b>795</b>	<b>724</b>	<b>577</b>	<b>538</b>	<b>399</b>	<b>873</b>	<b>5574</b>	<b>75.1%</b>
Inhaled antibiotics, including:	103	145	247	324	361	298	286	213	417	2394	32.3%
- <i>Tobramycin</i>	42	61	118	167	174	138	132	75	125	1032	13.9%
- <i>Colistin</i>	34	67	128	180	194	167	172	140	263	1345	18.1%
- <i>Aztreonam</i>	.	1	9	12	26	27	28	26	48	177	2.4%
Bronchodilators	192	400	524	579	563	453	430	326	661	4128	55.6%
- inhaled alone	162	275	353	401	398	353	345	252	486	3025	40.8%
- nebulized	25	26	13	17	19	29	37	26	54	246	3.3%
Corticosteroids	114	322	466	493	506	375	370	268	589	3503	47.2%
- inhaled alone	92	66	36	43	38	21	23	21	62	402	5.4%
- nebulized	23	22	12	8	4	3	4	4	6	86	1.2%
- association of inhaled bronchodilators and corticosteroids	69	242	355	392	391	274	274	204	433	2634	35.5%
- intranasal corticosteroids	36	152	228	216	254	191	191	134	284	1686	22.7%
Inhaled hypertonic saline	94	147	185	194	90	72	49	47	89	967	13.0%
RhDNase	71	393	579	543	421	256	241	146	302	2952	39.8%

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\* By nebulization, spray or powder

**Figure 11.4. Aerosoltherapy treatments (≥ 3 months)**


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# 11. Therapeutic management

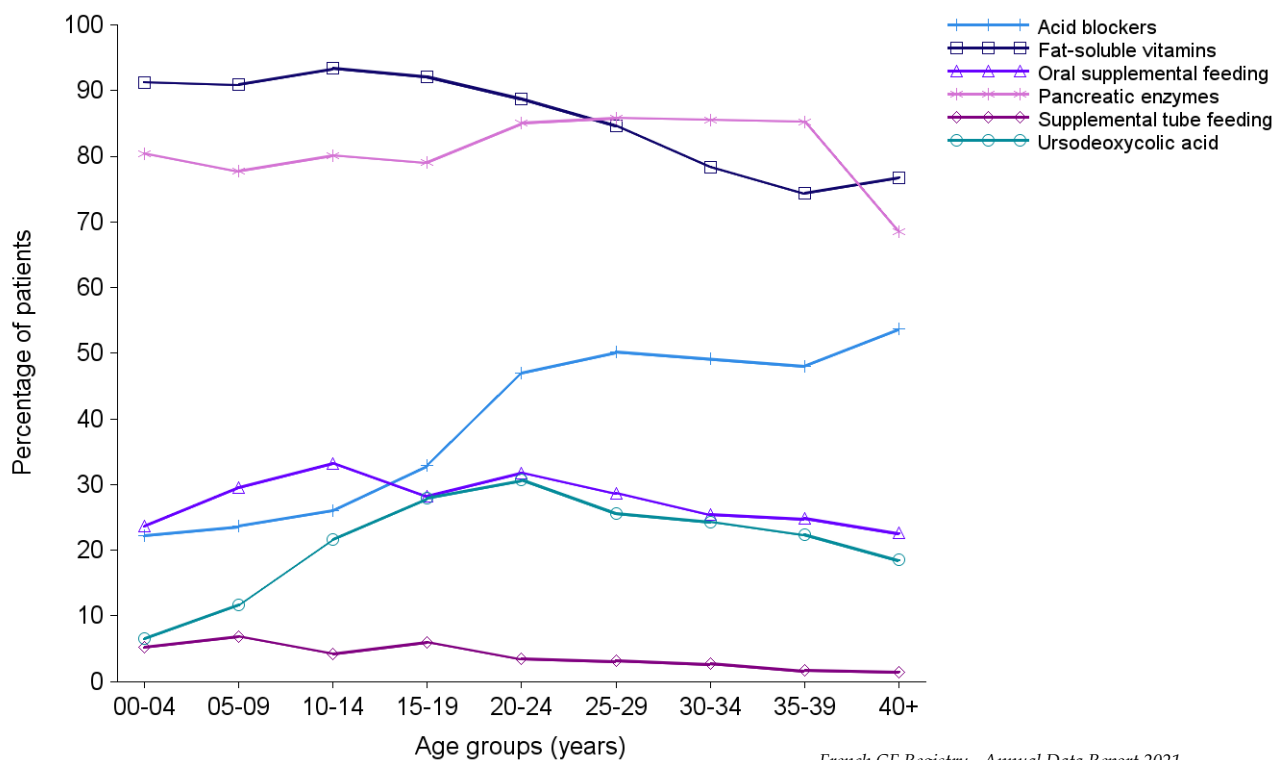
## Hepatic, digestive and nutritional

**Table 11.6. Hepatic, digestive and nutritional treatments (≥ 3 months)**

	Age groups (years)									Total	%
	00-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40+		
<i>All patients</i>	<i>618</i>	<i>758</i>	<i>875</i>	<i>932</i>	<i>868</i>	<i>763</i>	<i>782</i>	<i>604</i>	<i>1218</i>	<i>7418</i>	
Ursodeoxycholic acid	40	88	189	260	266	195	190	135	225	1588	21.4%
Acid blockers	137	179	228	307	408	383	384	290	654	2970	40.0%
Pancreatic enzymes	497	589	701	737	738	655	669	515	835	5936	80.0%
Supplemental tube feeding	32	52	37	56	30	24	21	10	18	280	3.8%
Oral supplemental feeding	146	224	291	263	276	219	199	150	275	2043	27.5%
Fat-soluble vitamins	564	689	817	858	770	646	613	449	935	6341	85.5%

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**Figure 11.5. Hepatic, digestive and nutritional treatments (≥ 3 months)**



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# 11. Therapeutic management

## Other treatments

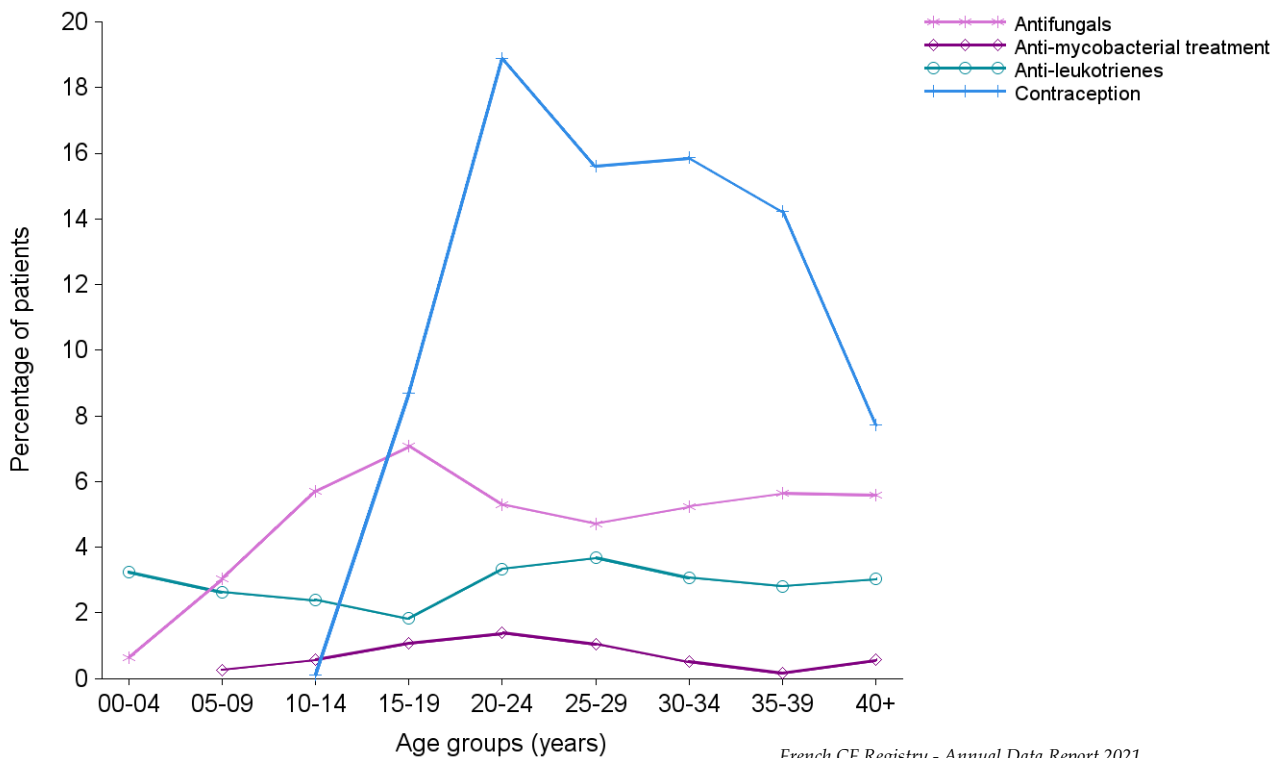
**Table 11.7. Other treatments**

	Age groups (years)									Total	%
	00-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40+		
<i>All patients</i>	<i>618</i>	<i>758</i>	<i>875</i>	<i>932</i>	<i>868</i>	<i>763</i>	<i>782</i>	<i>604</i>	<i>1218</i>	<i>7418</i>	
Antifungals	4	23	50	66	46	36	41	34	68	368	5.0%
Anti-mycobacterial treatment	.	2	5	10	12	8	4	1	7	49	0.7%
Anti-leukotrienes	20	20	21	17	29	28	24	17	37	213	2.9%
Contraception	.	.	1	81	164	119	124	86	94	669	9.0%

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\* Percent of women aged 15-49 currently using the pill is around 30%.

**Figure 11.6. Other treatments**

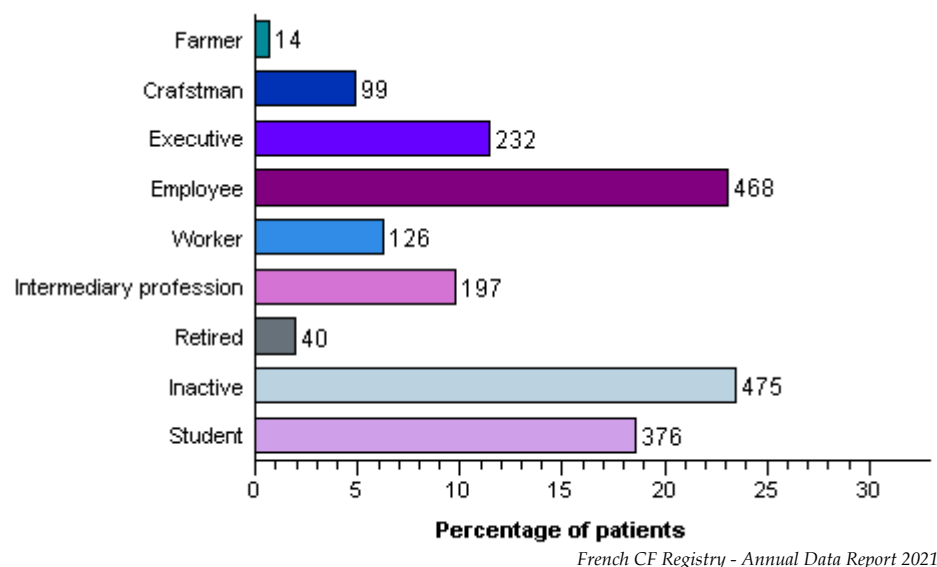


## 12. Social data

### ■ Employment

**Figure 12.1. Employment of men  $\geq 18$  years**

N = 2027 (number of men with a known employment situation, corresponding to 84.3% of adults men).

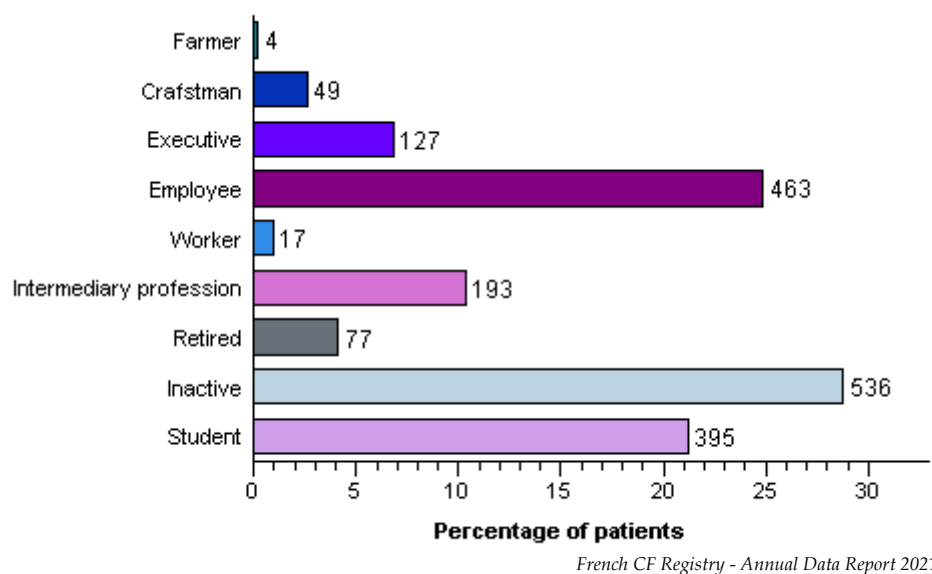


Among men aged 18 to 65, 47.7% are workers.

Among men aged 18 to 25, 51.1% are students.

**Figure 12.2. Employment of women  $\geq 18$  years**

N = 1861 (number of women with a known employment situation, corresponding to 85.7% of adults women).



Among women aged 18 to 65, 40.5% are workers.

Among women aged 18 to 25, 54.2% are students.



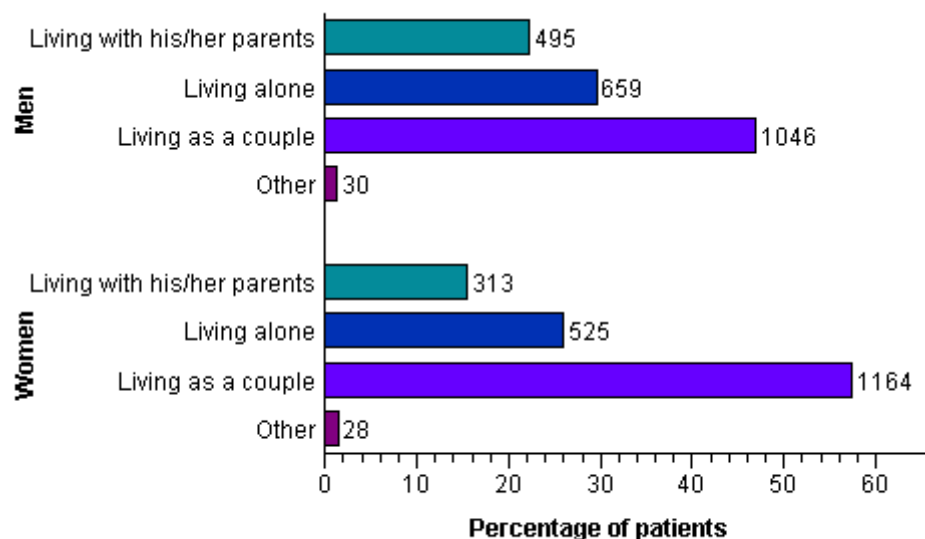
## 12. Socioeconomic characteristics of adults

15.4%

15% of patients have at least one child

**Figure 12.3. Family and marital status**

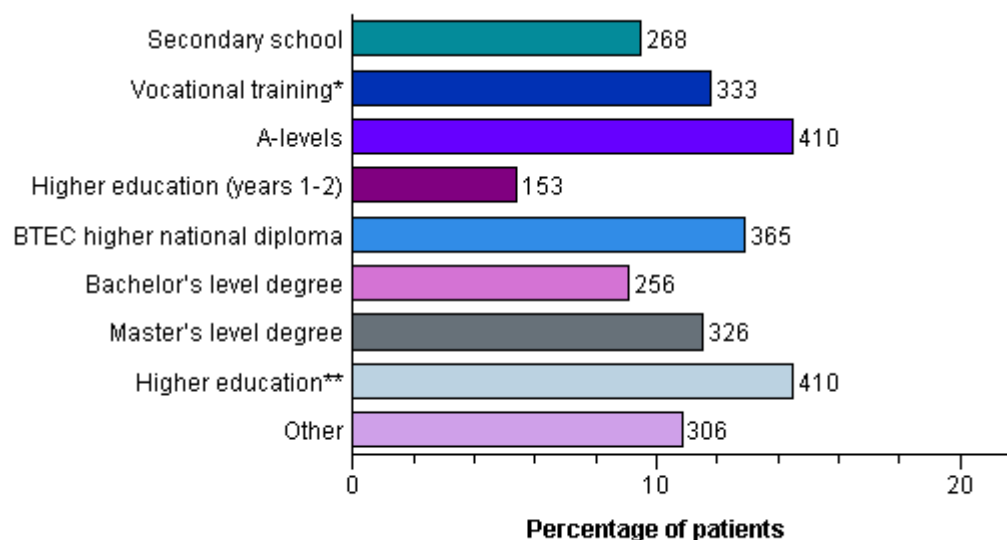
Status is known for 2230 men (92.8% of adult men), and 2030 women (93.5% of adult women).



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**Figure 12.4. Education**

Education is known for 2827 patients (61.8% of adults).



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\* and Technical school certificate

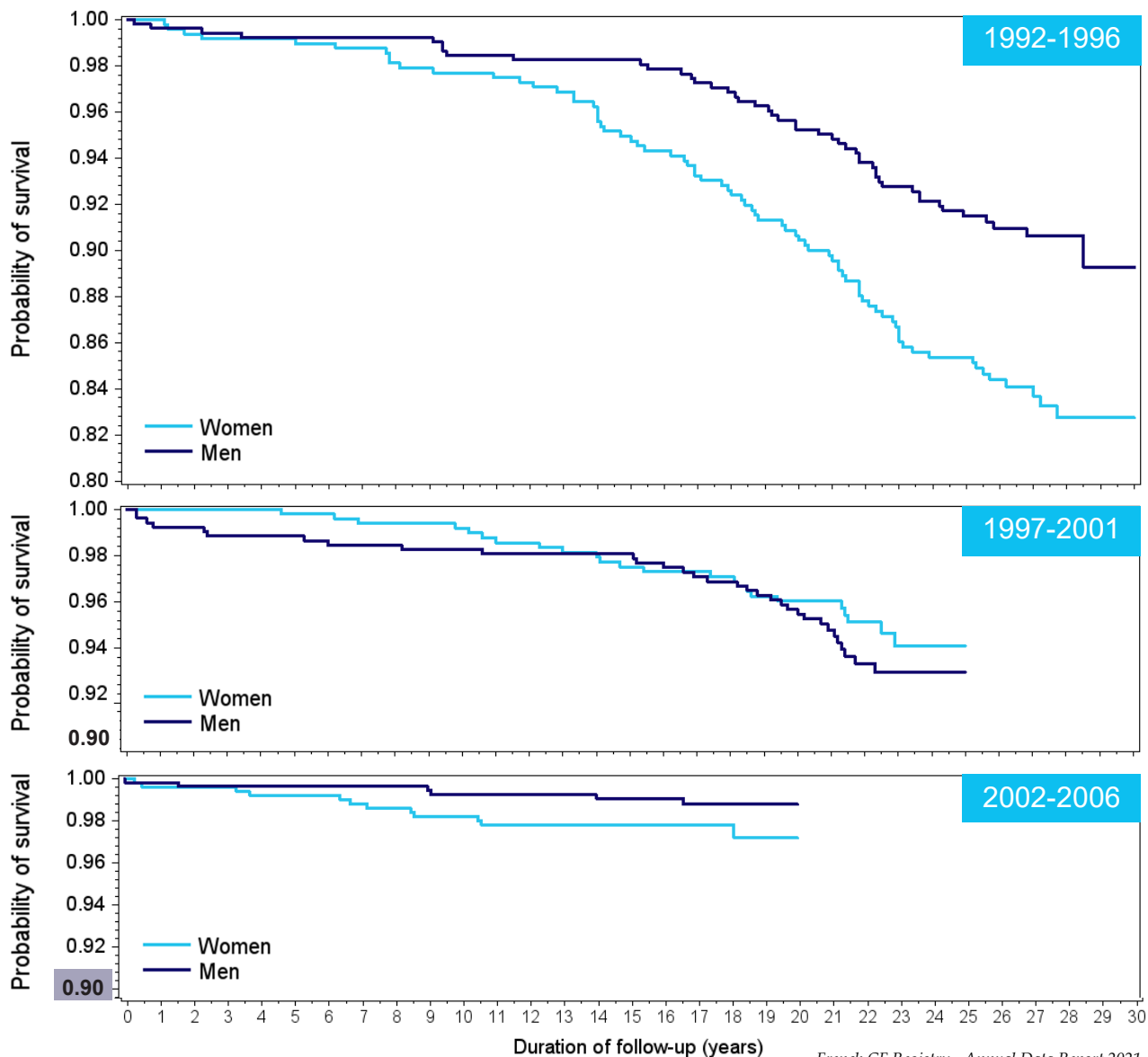
\*\* Level not specified

# Annex 1

## ■ Complement on survival analysis – stratification by sex

**Figure A1.1. Survival curves by birth cohort and sex (Kaplan-Meier method)**

Birth cohorts	Men		Women	
	Patients (N)	Deaths (N)	Patients (N)	Deaths (N)
1992-1996	521	47	482	76
1997-2001	522	32	501	24
2002-2006	558	6	515	12



In the 1992-1996 cohort, women had a lower survival, from the age of 6 years compared with men gender group. This no longer appears in the 1997-2001 birth cohort, suggesting an improvement in the health status of women over time.

In the most recent cohort (2002-2006), a slight gender gap appears.



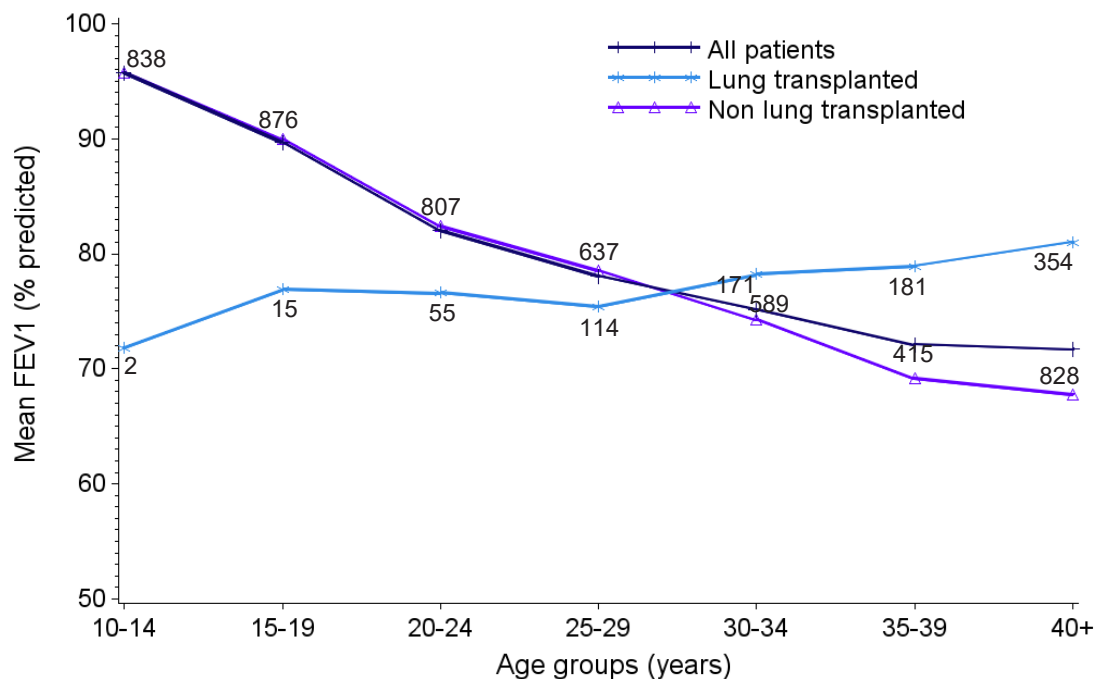
## Annex 2

### Spirometry and transplantation

In this complementary analysis, FEV<sub>1</sub>(%) values of the whole CF population are compared, by age group, to: 1) double lung or heart-lung transplant recipients and, 2) non transplanted patients.

The curves of the whole population and of non-transplanted patients are identical up to age 30-34. Above this age, FEV<sub>1</sub> (%) of non-transplanted patients drops more sharply, with a difference of almost 4% at ages 35-39.

**Figure A2.1. Mean FEV<sub>1</sub> (% predicted) and transplantation**



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Curve « Lung transplant recipients »:

- The values **below** the curve represent the number of lung transplant recipients with a FEV<sub>1</sub> value (eg: 114 patients in the 25-29 age group).
- No pulmonary transplantation has been reported in patients under 10.

Curve « Non lung transplant recipients »:

- The values **above** the curve represent the number of non lung transplant recipients with a FEV<sub>1</sub> value (eg: 637 patients in the 25-29 age group).



## Annex 3 (1/2)

### ■ Participating centres

**Table A3.1. List of the participating CF care centres**

CF care centres	Number of patients*
<b>Paediatric CF care centres</b>	
Besançon	72
Bordeaux	167
Grenoble	110
Lille	172
Lyon	262
Marseille	138
Nancy	126
Nantes	109
Paris Necker	180
Paris Robert Debré	143
Paris Trousseau	52
Rennes St Brieuc	119
Saint Denis de la Réunion	62
Strasbourg	116
Toulouse	117
Tours	117
Versailles	59
<b>Adults CF care centres</b>	
Besançon	75
Bordeaux	197
Grenoble	139
Lille	205
Lyon	423
Marseille	269
Nancy	102
Nantes	260
Paris Cochin	587
Rennes	139
Strasbourg	189
Suresnes Foch	498
Toulouse	218
Tours	99
<b>Paediatric and Adults CF care centres</b>	
Amiens	108
Angers-Le Mans	129
Caen	129
Clermont-Ferrand	158
Créteil	120
Dijon	129
Dunkerque	88
Giens	196
Limoges	76
Montpellier	241
Nice	120
Reims	140
Roscoff	181
Rouen	225
Saint Pierre de la Réunion	80
Vannes-Lorient	102

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## Annex 3 (2/2)

### ■ Participating centres

**Table A3.2. List of the non-CF specific participating centres**

Centres	Number of patients*
Paediatric local centres	
Brest	1
Le Havre	16
Paediatric and Adults local centres	
Lens	21

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\* Number of patients who visited the centre during the year. Patients followed by a centre and who did not visit it in 2021 were excluded from those statistics.

# Annex 4 (1/2)

**Table A4.1. Summary of data**

	2019	2020	2021
<b>Patients seen during the year and centres participating to the registry</b>			
- Patients registered* (N):	7286	7379	7513
- Patients seen during the year in a centre** (N):	7160	7216	7418
- Centres (N) :			
Paediatric CRCMs:	17	17	17
Adult CRCMs:	14	14	14
Paediatric and Adult CRCMs:	16	16	16
Other centres:	3	3	3
<b>Demographics</b>			
- Male patients (%):	52.2	52.0	51.9
- Age of patients, in years (mean):	23.4	23.9	24.8
- Age of patients, in years (median):	21.3	21.9	22.8
- Age of patients, in years (min-max):	0.1-84.6	0.1-85.6	0-86.6
- Patients aged 18 years and over (%):	58.5	59.7	61.7
- Early pregnancies in the year (N):	57	62	80
- Pregnancy rates in women aged 15 to 49 years (for 1000):	28.8	30.3	37.3
- Age at 31 <sup>st</sup> December of the year of early pregnancy (mean):	29.8	29.5	30.8
- Deaths (N):	43	45	43
- Crude death rate (for 1 000):	6.0	6.3	5.9
- Age at death, in years (mean):	35.6	36.5	42.9
- Age at death, in years (median):	35.9	32.8	37.8
<b>Diagnosis and genetics</b>			
- Age at diagnosis, in months (median) :	2	1.9	1.9
- New patients diagnosed during the year (N):	165	157	144
- Age at diagnosis of the new patients, in years (median):	1.1	1.1	1.1
- Age at diagnosis of the new patients, in years (min-max):	0-76	0-81	0-75
- Full genotypes identified (%):	98.2	98.2	98.1
F508del / F508del:	40.9	41.3	40.8
F508del / Other:	41.9	41.5	41.8
Other / Other:	15.4	15.4	15.6
F508del / Missing:	0.5	0.5	0.5
Other / Missing:	0.6	0.7	0.6
Missing / Missing:	0.7	0.7	0.7
<b>Anthropometry</b>			
- Patients aged 17 years and less, Height z-score (mean):	0.04	0.08	0.08
Weight z-score (mean):	-0.21	-0.06	-0.06
<b>Spirometry</b>			
- Patients aged 17 years and less, FEV <sub>1</sub> (% predicted) - GLI (mean):	91.6	92.3	95
- Patients aged 18 years and over, FEV <sub>1</sub> (% predicted) - GLI (mean):	71.4	72.2	76.6

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\* Patients whose vital status is known, whether they visited or not a centre during the year.

\*\* Reference patients for the statistics of this report, with the exclusion of survival data.

# Annex 4 (2/2)

**Table A4.1. Summary of data**

	2019	2020	2021
<b>Microbiology</b>			
- Patients with at least one sputum during the year (%):	85.9	83.4	83.6
<i>H. influenzae</i> :	17	11.2	10.1
MSSA:	5.9	5.2	4.7
MRSA:	59.3	58	57.5
<i>P. aeruginosa</i> :	37.6	35.6	34
<i>S. maltophilia</i> :	10.4	9.2	9.3
<i>B. cepacia</i> :	2.2	2.1	2
<i>Achromobacter spp.</i> :	6.9	6.4	6.4
<i>Aspergillus fumigatus</i> :	27.8	23.1	21.6
<b>Complications and transplantations</b>			
- ABPA (%) :	7.7	6.7	6.2
- Non APBA aspergillosis (%) :	1.2	1.5	2.3
- Abnormal exocrine pancreatic function (%) :	80	80.6	80.2
- Treated gastro-oesophageal reflux (%) :	26	27.1	28.3
- Osteopenia/osteoporosis (%) :	14.5	15	16.5
- Haemoptysis (%):	5.9	4.7	4.2
- Hepatic disease (%):	15.7	16.7	17.9
- Total diabetes (%):	21.4	21.9	22.5
- Transplanted patients (N):	923	958	955
Including patients transplanted during the year:	95	52	31
- Patients on waiting list (N):	155	94	65
Including patients listed during the year:	101	37	27
Deaths on waiting list:	4	0	2
<b>Therapeutic management</b>			
- IV courses (%):	27.5	24.2	18.8
- Oxygenotherapy (%):	4.4	3.8	2.6
- Nasal ventilation (%):	4.4	3.3	2
- Azithromycin (or other macrolid) (%):	34	35.9	34.1
- Inhaled antibiotics (%):	37	35.6	32.3
- Bronchodilators (%):	56.9	55.6	55.6
- RhDNase (%):	38.2	43.2	39.8
- Corticosteroids (%):	46.1	45.7	47.2
- Pancreatic enzymes (%):	80.3	80.7	80

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# Annex 5

**Table A5.1. Summary of data - Transplanted vs non transplanted patients**

	Transplanted patients	Non transplanted patients	2021 data
- Patients seen during the year in a centre* (N):	951	6467	7418
<b>Demographics</b>			
- Age of patients, in years (mean):	37.9	22.9	24.8
- Age of patients, in years (median):	37.3	20.4	22.8
- Patients aged 18 years and over (%):	98.5	56.3	61.7
- Early pregnancies during the year (N):	7	73	80
- Deaths (N):	30	13	43
<b>Diagnosis and genetics</b>			
- Age at diagnosis, in months (median) :	5.3	1.7	1.9
- Full genotypes identified (%):	97.5	98.2	98.1
F508del / F508del:	48.7	39.6	40.8
F508del / Other:	37.6	42.4	41.8
Other / Other:	11.1	16.2	15.6
F508del / Missing:	0.7	0.5	0.5
Other / Missing:	0.6	0.6	0.6
Missing / Missing:	1.2	0.7	0.7
<b>Anthropometry</b>			
- Patients aged 17 years and less, Height z-score (mean):	-1.12	0.08	0.08
Weight z-score (mean):	-1.62	-0.05	-0.06
BMI z-score (mean):	-0.87	-0.01	-0.02
- Patients aged 18 years and over, BMI (mean):	20.4	22.3	22
<b>Spirometry</b>			
- Patients aged 17 years and less, FEV <sub>1</sub> (% predicted) - GLI (mean):	78.4	95.1	95
- Patients aged 18 years and over, FEV <sub>1</sub> (% predicted) - GLI (mean):	78.5	76.1	76.6
<b>Complications</b>			
- Treated aspergillosis (%)	3.9	6.6	6.2
- Non APBA aspergillosis (%) :	3.6	2.1	2.3
- Abnormal exocrine pancreatic function (%) :	94.5	78.1	80.2
- Treated gastro-oesophageal reflux disease (%) :	59.2	23.7	28.3
- Osteopenia/osteoporosis (%) :	49.7	11.6	16.5
- Haemoptysis (%):	1.8	4.5	4.2
- Hepatic disease (%):	18.8	17.7	17.9
- Total diabetes (%):	68.3	15.8	22.5
<b>Therapeutic management</b>			
- Pancreatic enzymes (%) :	95.6	77.7	80
- Oral steroids (%) :	69.9	3.1	11.7

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\* The difference between the number of transplanted patients page 35 (955) and the number of patients shown in this table (951) are the patients who died and were not seen in 2021.





# Annex 6

**Table A6.1. Summary of data - classical vs atypical CF**

Atypical CF includes CFSPID/CRMS and mono-symptomatic CFTR-RD.

	CF	Atypical CF	2021 data
- Patients seen during the year in a centre* (N):	6820	448	7418
<b>Demographics</b>			
- Age of patients, in years (mean):	24.4	26.1	24.8
- Age of patients, in years (median):	22.6	18.5	22.8
- Patients aged 18 years and over (%):	61.6	51.8	61.7
- Early pregnancies during the year (N):	78	0	80
- Deaths (N):	40	1	42
<b>Diagnosis and genetics</b>			
- Age at diagnosis, in months (median) :	1.7	36.7	1.9
- Full genotypes identified (%):	98.9	87.7	98.1
F508del / F508del:	43.8	.	40.8
F508del / Other:	40.6	61.4	41.8
Other / Other:	14.5	26.3	15.6
F508del / Missing:	0.3	2.9	0.5
Other / Missing:	0.3	5.4	0.6
Missing / Missing:	0.5	4	0.7
<b>Anthropometry</b>			
- Patients aged 17 years and less, Height z-score (mean):	0.03	0.65	0.08
Weight z-score (mean):	-0.1	0.59	-0.06
BMI z-score (mean):	-0.04	0.3	-0.02
- Patients aged 18 years and over, BMI (mean):	21.8	24.4	22
<b>Spirometry</b>			
- Patients aged 17 years and less, FEV <sub>1</sub> (% predicted) - GLI (mean):	94.6	100.2	95
- Patients aged 18 years and over, FEV <sub>1</sub> (% predicted) - GLI (mean):	76	89	76.6
<b>Complications</b>			
- Treated aspergillosis (%)	6.6	1.8	6.2
- Non APBA aspergillosis (%) :	2.4	1.1	2.3
- Abnormal exocrine pancreatic function (%) :	85.1	13.2	80.2
- Treated gastro-oesophageal reflux disease (%) :	29.3	13.4	28.3
- Osteopenia/osteoporosis (%) :	17	5.8	16.5
- Haemoptysis (%):	4.3	1.6	4.2
- Hepatic disease (%):	19.1	3.3	17.9
- Total diabetes (%):	23.8	2.9	22.5
<b>Therapeutic management</b>			
- Pancreatic enzymes (%) :	84.9	13.4	80
- Oral steroids (%) :	12.2	1.6	11.7

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\* Diagnosis type is missing for 150 patients.

Therefore the data for these patients are not presented in the groups CF et atypical CF.

## NOTES

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## NOTES

# FRENCH CYSTIC FIBROSIS REGISTRY

Coordinated by the patient organization Vaincre la Mucoviscidose, the French Cystic Fibrosis Registry collects annual clinical data from the CF care centers. This epidemiological database allows evaluation of the CF patients' characteristics, health status and care monitoring.

It is also used for research and feasibility studies.

In partnership with the French Cystic Fibrosis-CFTR Network.



[vaincrelamuco.org](http://vaincrelamuco.org)

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