German Cystic Fibrosis Registry

Annual Data Report | 2019

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Foreword

PD Dr. med.
Lutz Nährlich

Medical Director
German Cystic Fibrosis Registry

The German Cystic Fibrosis Registry is a key source of information for assessing the health status of people with Cystic Fibrosis in Germany. The 2019 report presents the data of 6463 people with Cystic Fibrosis from 87 outpatient clinics. The proportion of adults is 58.3% and the median age is 21 years. A CFTR genotyping, which is important in the age of mutation-specific therapies, shows an F508del mutation on at least one allele in 85% of all people with Cystic Fibrosis. Of the people diagnosed with Cystic Fibrosis in 2019, 61% were diagnosed via newborn screening. For the first time, we also report on the nutritional status of children under 2 years of age based on the length-to-weight ratio. 83% of the children (from 2 years of age) and adolescents and 86% of the adults have a normal nutritional status. 61% of the adolescents have an age-appropriate FEV1%pred of more than 80% at the age of 16 – 17 years. A chronic Pseudomonas aeruginosa infection can be found in 9.8% of the children and adolescents and 53% of the adults. At least one mucolytic therapy is used by 98% of the children and adolescents and 92% of the adults. An increase in CFTR modulator therapies was recorded in all age groups – 21% of all children and adolescents and 36% of all adults were treated with CFTR modulators in 2019. The frequency of oGT screening tests in patients without diabetes mellitus is reported for the first time and is 24% (from the age of 6 years). The median survival age for the period 2014 – 2018 is 50.7 years and therefore above 50 years for the first time.

The 2019 report describes the position before the year 2020, which presents particular challenges for us all as a result of the dramatic corona pandemic but also brings hope to people with Cystic Fibrosis with the approval of new CFTR modulators for different age groups. With your support, we have compiled a list of COVID-19 positive patients in the Registry, details of which are made available to the outpatient clinics on a daily basis in Muko.web and to interested parties on the home page of Mukoviszidose e.V.

This detailed overview of the health status of people with Cystic Fibrosis would not have been possible without the trust you have placed in us. I would like to express my thanks to all the outpatient clinic teams and the people with Cystic Fibrosis who allow us to document and evaluate their data. Many thanks to all those who input and evaluate the data under the difficult conditions caused by the corona pandemic. My thanks also go to the Registry Work Group, the Axaris company (Ms Jaumann, Mr Müller, Mr Volk) and the data management team of the Interdisciplinary Center for Clinical Studies (IZKS) of the University of Mainz (Ms Wosniok, Ms Wollscheid, Mr Kronfeld, Mr Ruckes, Mr Engelmann). My special thanks go to Mr Burkhart of the Mukoviszidose Institut for his tireless efforts in project management and to Ms Iris Bergmann, who is ending her many years of work in the Registry Work Group.

Please keep supporting the Registry.

PD Dr. med. Lutz Nährlich

Collective description

The history data records of 6463 patients are included in the analyses of the demography, Cystic Fibrosis diagnosis, mortality and structure of care for the reporting year 2019. In addition, patients without history data were also included in the evaluations of new CF diagnoses and mortality (17 newly diagnosed patients and 18 deceased patients without history data in 2019).

All 357 transplant patients were excluded from the evaluations of nutritional status, pulmonary function, lung infections, complications and therapies, regardless of the type of transplant. This results in a number of 6106 patients for the analysis of the history data.

Further definitions apply to the various evaluation groups in some cases. These are described in more detail in the respective chapters.

A current declaration of consent is available for all evaluated patients, or they died before consent could be renewed. Patients who withdrew their consent before death were excluded from the mortality analyses.

The age of the patients was calculated in completed years at the end of the respective reporting year for patients not documented as deceased. The age at the time of death was calculated in completed years for patients who died during the reporting year. The age was calculated in completed years at the end of the reporting year for deceased patients for whom no date of death was documented. The age of newly diagnosed patients was calculated at the time of diagnosis.

The pulmonary function was calculated and reported using the reference values of the Global Lung Function Initiative (Quanjer et al; Eur Respir J 2012; 40: 1324).

The reference values according to the KiGGS study were used for calculation of the BMI percentiles for 2 – 18-year-old patients (Robert Koch Institute: Reference percentiles for anthropometric measures and blood pressure based on the German Health Interview and Examination Survey for Children and Adolescents (KiGGS); Berlin: RKI-Hausdruckerei; 2013).

Missing values were not taken into account for the calculation of the percentages.

The history data records are documented once a year in the so-called Level 1 documentation as the status for the entire calendar year or are aggregated from the visit-related data records of the so-called Level 2 documentation. The examination date with the best FEV1%pred and the relevant body measurements are selected as the examination time point in the reporting year for patients older than 6 years with a pulmonary function measurement. The last body measurements available in the reporting year are used in the absence of an FEV1 value and for children younger than 6 years. A complication occurring at least once a year or a long-term therapy, microbiological indication or a chronic infection determine the intensity for the entire reporting year. If history data sets from several outpatient clinics are available for a patient, they are aggregated in a single data set for the annual data report in accordance with the above rules.

Contents

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Map of participating CF centers

www.muko.info/adressen

Fig. 1: Cystic Fibrosis Cystic Fibrosis centers participating in 2019

The map shows all 87 CF centers participating in the Registry in 2019. Please write to us if your facility is not represented: mburkhart@muko.info

Brief overview

	2017	2018	2019
Data status	18.09.2018	24.09.2019	10.06.2020
Participating centers	91	90	87
Participating patients with annual data	6106	6340	6463
of these, transplant patients	321	348	357
Age in years; median	20	21	21
Proportion of adults (≥ 18 years) in %	58,1	58,3	58,3
Male patients in %	52,0	51,7	51,9
New diagnoses in the reporting year[1]	206	196	194
Age for new diagnoses in years; Median[1]	0,17	0,17	0,16
of these, diagnosis via newborn screening	51,9	57,1	60,8
Deaths in the reporting year[1]	48	67	47
Deaths: % of all patients[1]	0,8	1,1	0,7
Age at death in years; median	32	33	34
(25^{th} – 75^{th} pctl)	(23 – 39)	(25 – 42)	(27 – 49)
Transplant patients in the reporting year[1]	37	48	40
of these, lung transplants[2]	32	45	35
of these, liver transplants[2]	5	4	6

Table 1: Brief overview of Cystic Fibrosis patients with annual data, valid declaration of consent and Cystic Fibrosis diagnosis in Germany in the reporting year 2019

[1] The values for new diagnoses, deaths and transplant patients also include patients without history data

[2] Multiple responses allowed

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Age structure

The age structure calculations include all 6463 patients with annual data for 2019. The age of the patients was calculated in completed years at the end of the respective reporting year for patients not documented as deceased as well as for those without a date of death. The age at the time of death was calculated in completed years if the date of death was available.

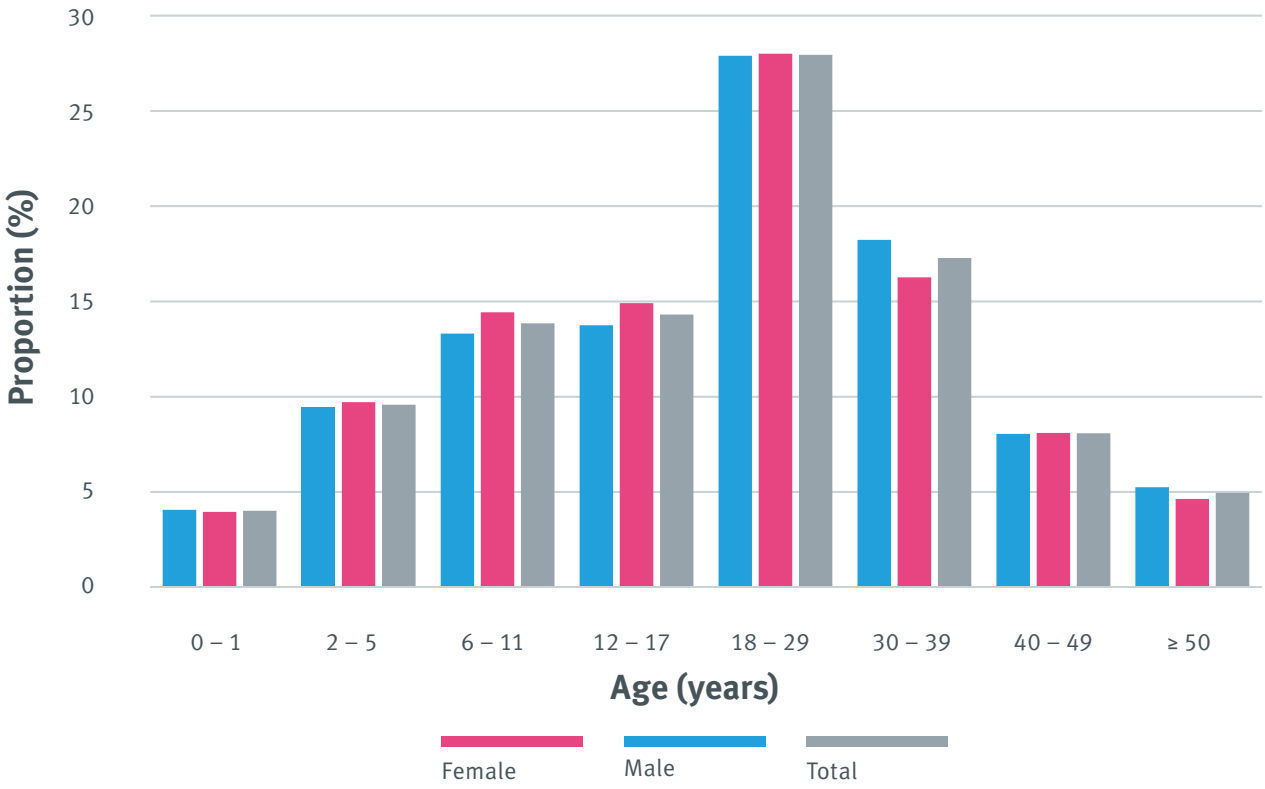

Fig. 2: Age distribution of Cystic Fibrosis patients in 2019

	Male	Female	Total
Number	3352	3111	6463
Mean value (years)	22,7	21,9	22,3
Median (years)	22	20	21
Minimum (years)	0	0	0
Maximum (years)	81	77	81
25th percentile (years)	11	10	11
75th percentile (years)	32	32	32
Number < 18 years	1360	1338	2698
Number ≥ 18 years	1992	1773	3765

Table 2: Age distribution of Cystic Fibrosis patients in 2019

Age structure

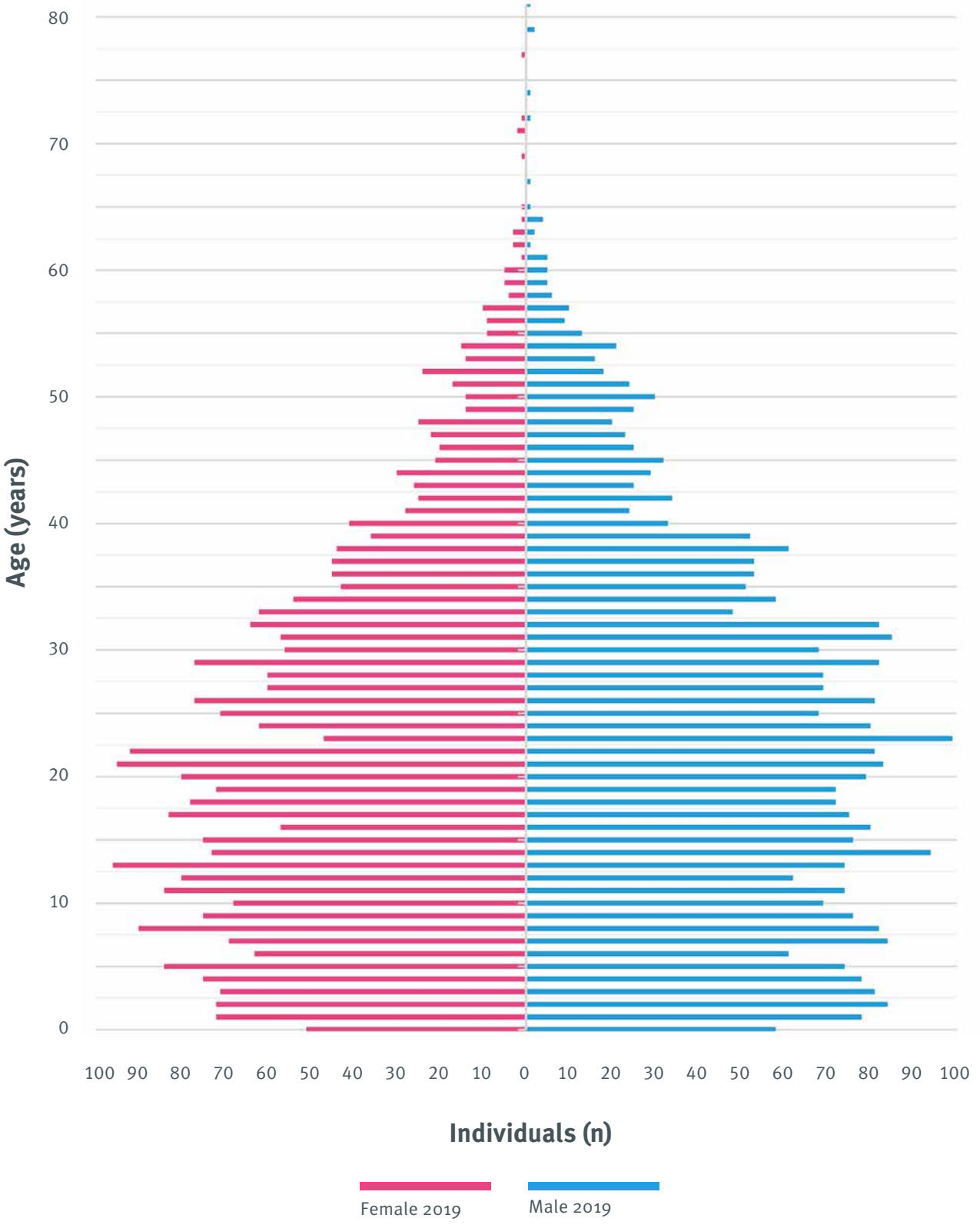

Fig. 3: Age pyramid of Cystic Fibrosis patients in 2019

04

Cystic fibrosis diagnosis

4a. Diagnoses in 2019

194 patients were diagnosed in 2019; annual data is available for 177 of these patients (91.2%). The age at diagnosis was not available for 1 patient (0.6%). The age distribution of all patients newly diagnosed in 2019 is shown in the following tables.

	Mean value	Median	Minimum	Maximum	25th percentile	75th percentile
Age in years	4,7	0,2	0,0	60,3	0,1	2,8

Table 3: Age at diagnosis of all Cystic Fibrosis patients diagnosed in 2019

Newborn screening was performed in 118 (60.8%) of the Cystic Fibrosis patients diagnosed in 2019. 22 patients (11.7%) had a meconium ileus. The age at diagnosis of the patients newly diagnosed via newborn screening in 2019 is as follows:

	Mean value	Median	Minimum	Maximum	25th percentile	75th percentile
Age in days	44,7	24,5	0,0	1156,0	18,0	37,0

Table 4: Alter bei Diagnose aller im Jahr 2019 über das Neugeborenenscreening diagnostizierten Mukoviszidose-Patienten

Mucoviscidosis diagnosis

4a. Diagnoses in 2019

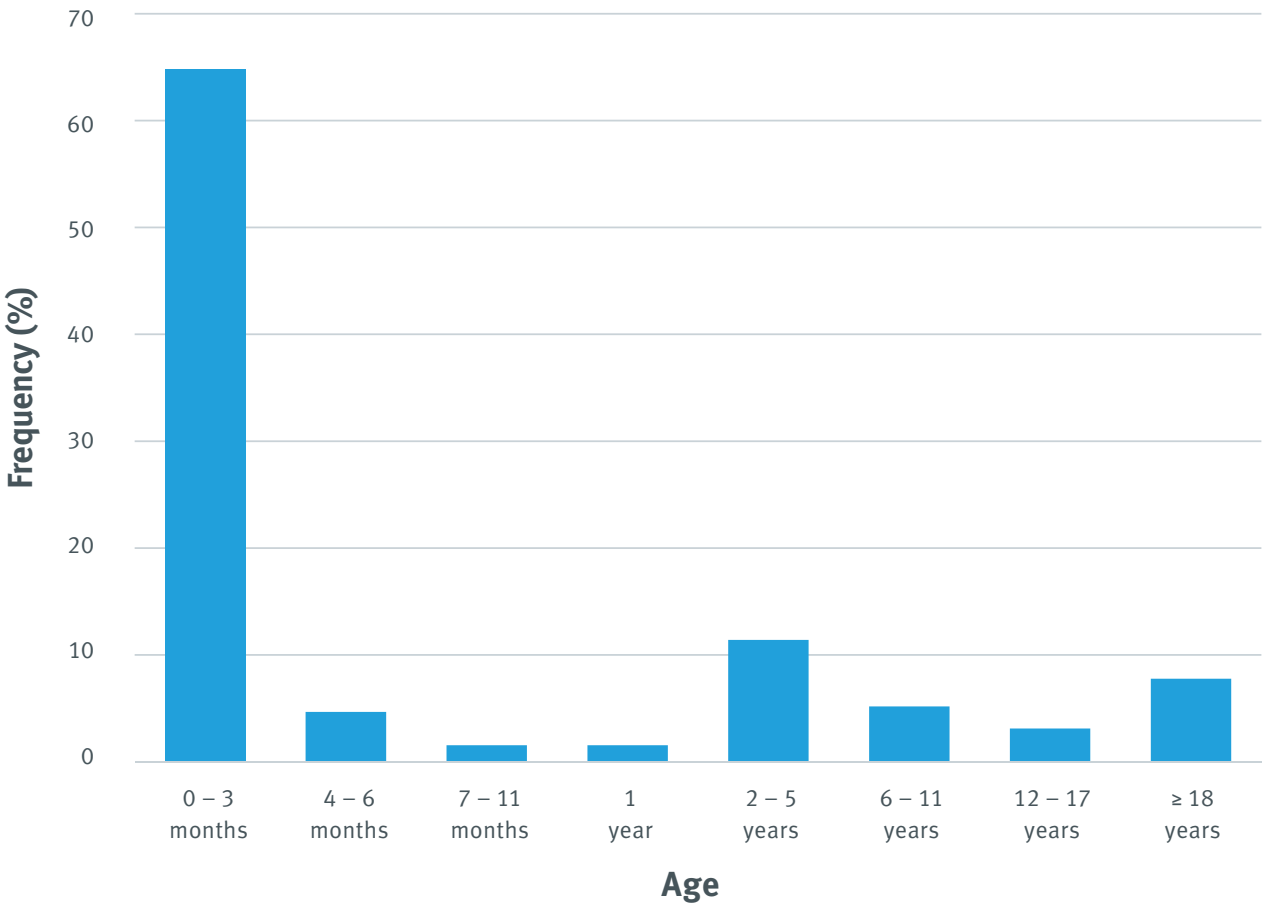

Fig. 4: Age at diagnosis of Cystic Fibrosis patients diagnosed in 2019

Age at diagnosis	Frequency	Percent	Accumulated percentages
0 – 3 months	125	64,8	64,8
4 – 6 months	9	4,7	69,4
7 – 11 months	3	1,6	71,0
1 year	3	1,6	72,5
2 – 5 years	22	11,4	83,9
6 – 11 years	10	5,2	89,1
12 – 17 years	6	3,1	92,2
≥ 18 years	15	7,8	100,0
unknown	1		

Table 5: Age at diagnosis of Cystic Fibrosis patients diagnosed in 2019

04

Mucoviscidosis diagnosis

4b. Age at diagnosis

The age distribution at diagnosis of the 6463 patients with annual data in 2019 is shown in the following tables and figures. No information on the date of diagnosis was available for 241 patients (3.8%).

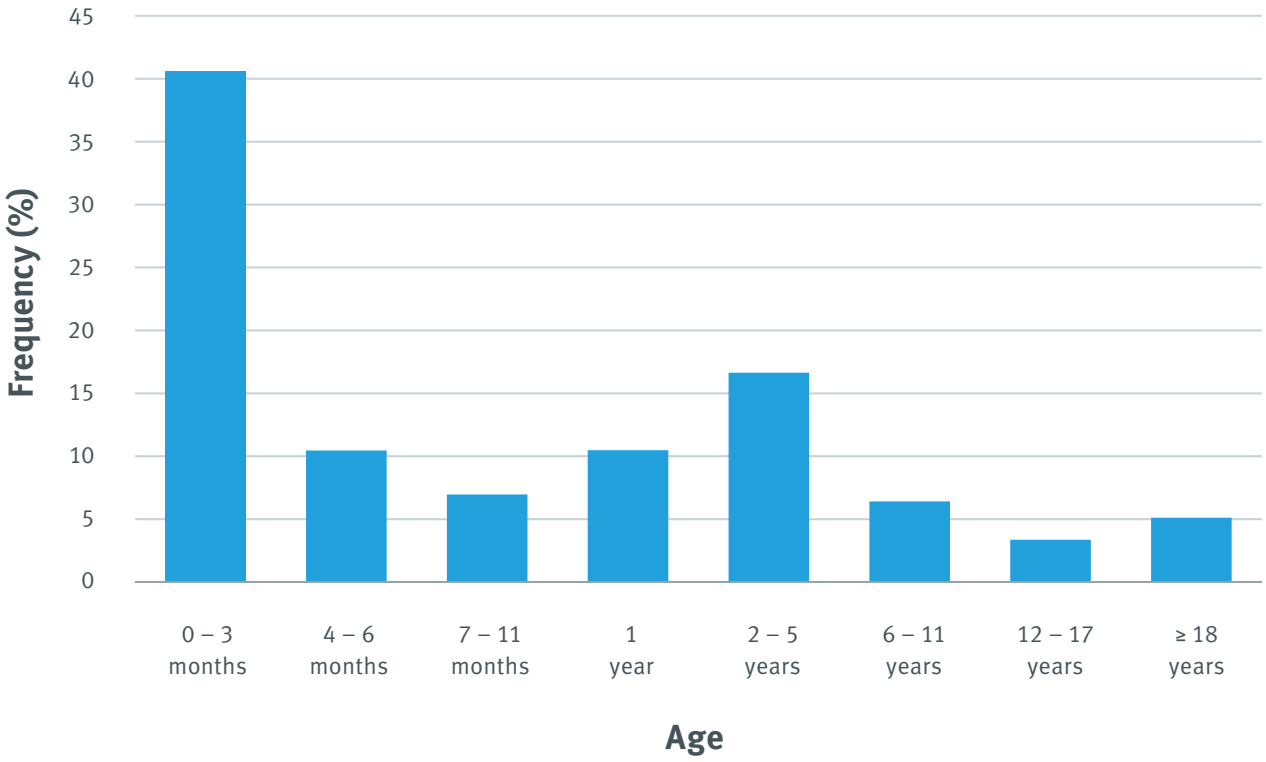

Fig. 5: Age at diagnosis – all Cystic Fibrosis patients Status 2019

Age at diagnosis	Frequency	Percent	Accumulated percentages
0 – 3 months	2526	40,6	40,6
4 – 6 months	650	10,5	51,1
7 – 11 months	433	7,0	58,0
1 year	652	10,5	68,5
2 – 5 years	1035	16,6	85,1
6 – 11 years	399	6,4	91,5
12 – 17 years	209	3,4	94,9
≥ 18 years	318	5,1	100,0
unknown	241		

Table 6: Age at diagnosis – all Cystic Fibrosis patients Status 2019

Mucoviscidosis diagnosis

4c. Genotyping

Genotyping was available for 6394 patients (99.3%). Unavailable information was treated as “No mutations identified”in the following presentation.

Mutation combinations	Frequency	Percent
F508del homozygot	2929	45,3
F508del heterozygous: Second mutation identified	2362	36,6
F508del heterozygous: Second mutation not identified	224	3,5
No verification of F508del: Both mutations identified	752	11,6
No verification of F508del: Only one mutation identified	66	1,0
No verification of F508del: No mutations identified	130	2,0
Total	6463	100,0

Table 7: Mutation combinations of Cystic Fibrosis patients in 2019

The frequencies for the individual alleles are shown below, whereby only those with an absolute frequency of at least 50 are shown individually:

First and second mutation	Frequency	Percent
F508del (p.Phe508del / c.1521_1523delCTT)	8444	66,2
N1303K (p.Asn1303Lys / c.3909C>G)	257	2,0
G542X (p.Gly542X / c.1624G>T)	256	2,0
R553X (p.Arg553X / c.1657C>T)	243	1,9
G551D (p.Gly551Asp / c.1652G>A)	222	1,7
CFTRdele2,3 (p.Ser18ArgfsX16 / c.54-5940_27310250del21kb)	176	1,4
R347P (p.Arg347Pro / c.1040G>C)	167	1,3
3849+10kbC->T (c.371712191C>T)	135	1,1
1717-1G->A (c.1585-1G>A)	107	0,8
2789+5G->A (c.26575G>A)	92	0,7
2183AA->G (p.Lys684SerfsX38 / c.2051_2052delAAinsG)	91	0,7
W1282X (p.Trp1282X / c.3846G>A)	89	0,7
M1101K (p.Met1101Lys / c.3302T>A)	58	0,5
3272-26A->G (c.3140-26A>G)	56	0,4
R117H (p.Arg117His / c.350G>A)	54	0,4
Other mutation	1929	15,1
Unknown / Mutation not identified	384	3,0
Total	12760	100,0

Table 8: CFTR genotyping of Cystic Fibrosis patients in 2019

05

Nutritional status

5a. Children and adolescents under 18 years

All patients from 2 – 17 years without a transplant with annual data in 2019 (n=2468) were included. No information on the nutritional status was available for 7 patients (0.3%). The BMI percentiles according to KiGGS were used to assess the nutritional status of children and adolescents. The age was calculated at the time of the physical examination.

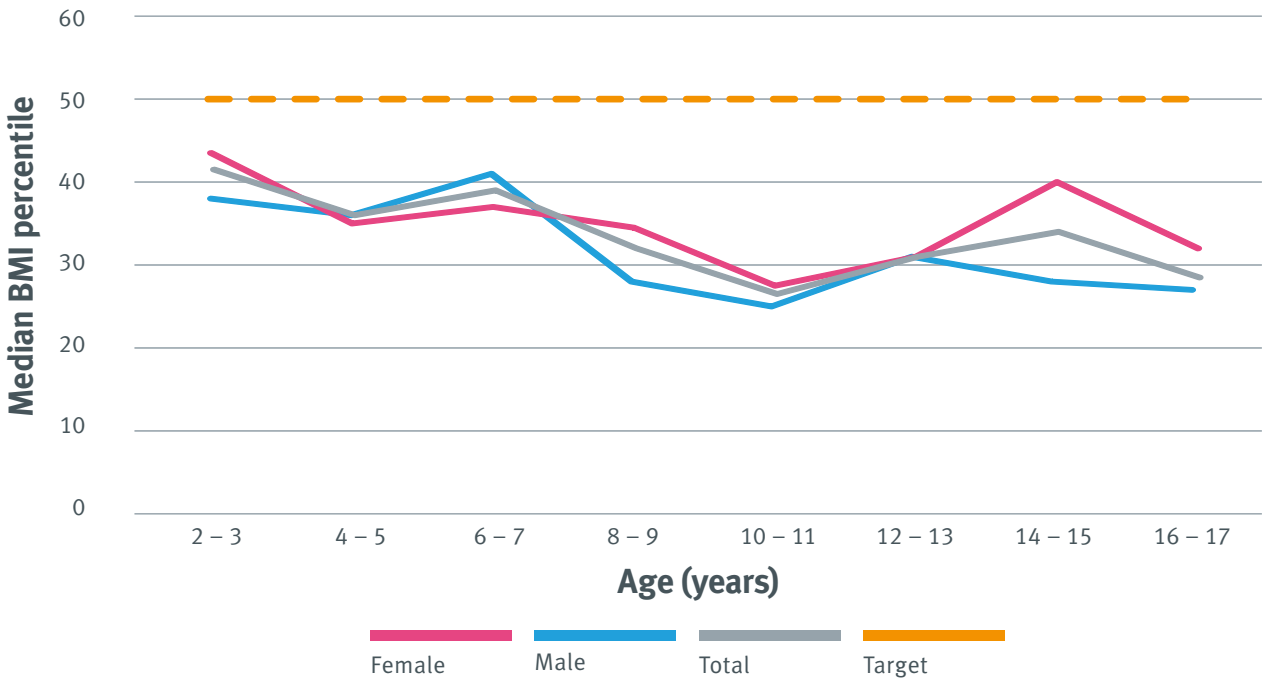

Fig. 6: BMI percentiles of children and adolescents between 2 – 17 years in 2019

Age (years)	Male			Female			Total		
	N	Median	25th – 75th pctl.	N	Median	25th – 75th pctl.	N	Median	25th – 75th pctl.
2 –3	170	38	18 – 69	150	44	20 – 74	320	42	18 – 72
4 –5	156	36	16 – 62	166	35	16 – 65	322	36	16 – 63
6 – 7	163	41	24 – 60	151	37	20 – 57	314	39	22 – 58
8 – 9	145	28	16 – 50	154	35	17 – 54	299	32	16 – 53
10 – 11	142	25	11 – 47	152	28	13 – 46	294	27	12 – 47
12 – 13	153	31	13 – 52	166	31	14 – 52	319	31	13 – 52
14 – 15	164	28	11 – 50	133	40	21 – 60	297	34	13 – 57
16 – 17	143	27	11 – 46	153	32	11 – 57	296	29	11 – 53
Total	1236	32	14 – 57	1225	34	16 – 58	2461	33	15 – 58

Table 9: BMI percentiles of children and adolescents from 2 – 17 years in 2019

Nutritional status

5a. Children and adolescents under 18 years

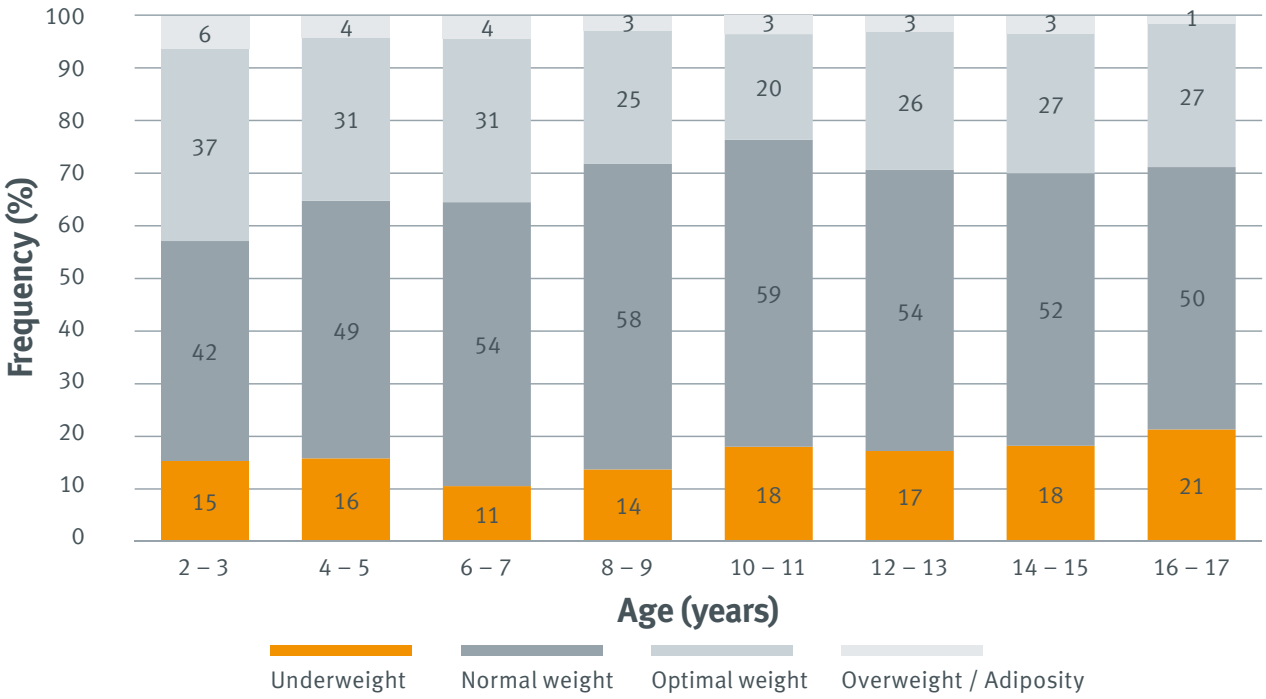

Fig. 7: Weight categories of children and adolescents from 2 – 17 in 2019 // Underweight BMI percentiles ‹ 10; Normal weight: BMI percentiles 10 – 49; Optimal weight: BMI percentiles 50 – 89; Overweight / Adiposity: BMI percentiles ‹ 90

	Male	Female	Total
Underweight	17,6	14,9	16,2
Normal weight	52,2	51,9	52,1
Optimal weight	26,6	29,8	28,2
Overweight / Adiposity	3,6	3,4	3,5

Table 10a: Weight categories of children and adolescents from 2 - 17 years in 2019 // Underweight BMI percentiles ‹ 10; Normal weight: BMI percentiles 10 – 49; Optimal weight: BMI percentiles 50 – 89; Overweight / Adiposity: BMI percentiles ‹ 90

	Male		Female		Total	
	0 – 12 months	13 – 24 months	0 – 12 months	13 – 24 months	0 – 12 months	13 – 24 months
Underweight	23,2	22,0	47,4	17,1	34,1	19,6
Normal weight	71,0	63,4	45,6	68,4	59,5	65,8
Overweight / Adiposity	5,8	14,6	7,0	14,5	6,4	14,6

Table 10b: Weight categories in % of children under 2 years by weight-for-length (WFL) in 2019 // Underweight: WFL ‹90%; Normal weight: WFL 90 – 110; Overweight / Adiposity: WFL ›110%

05

Nutritional status

5b. Adults 18 years and older

Adult patients without a transplant with annual data for 2019 (n=3348) were included. No information on the nutritional status was available for 17 patients (0.5 %). The age was calculated at the time of the physical examination.

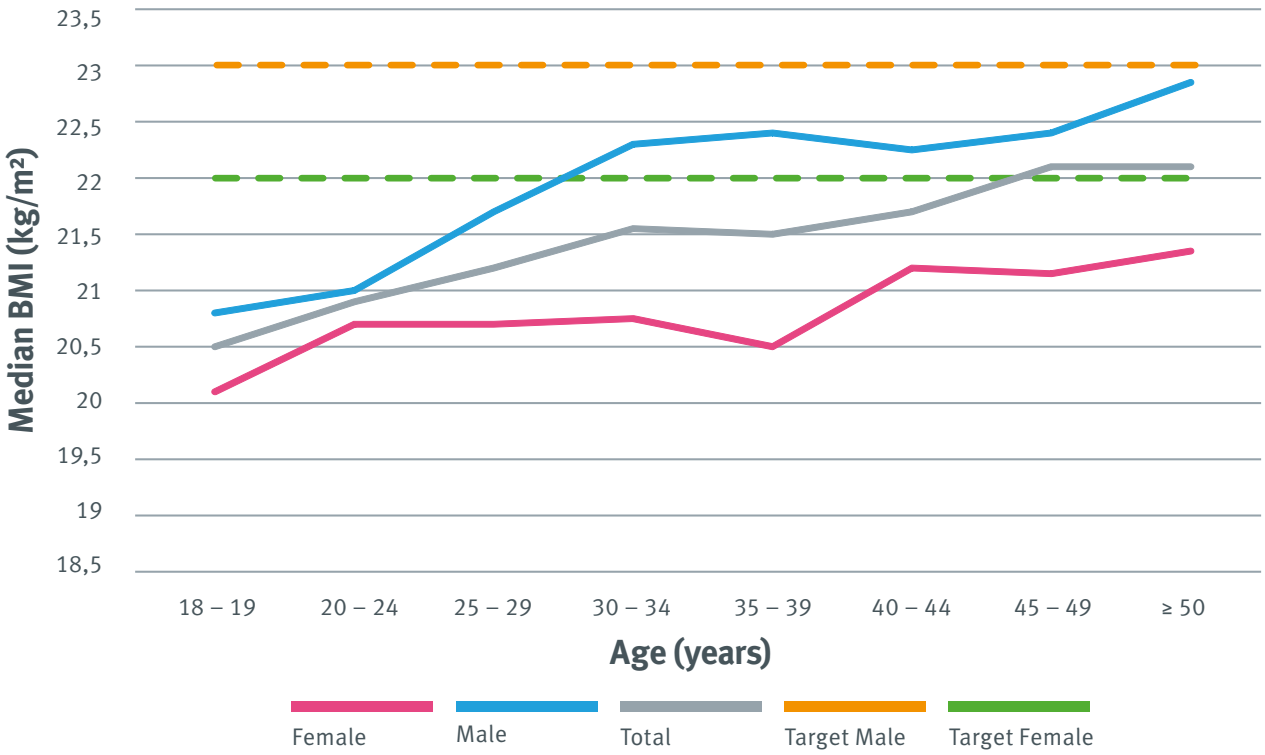

Fig. 8: BMI of adults 18 years and older in 2019

Age (years)	Male			Female			Total		
	N	Median	25th – 75th pctl.	N	Median	25th – 75th pctl.	N	Median	25th – 75th pctl.
18 – 19	143	20,8	19 – 24	131	20,1	19 – 21	274	20,5	19 – 23
20 – 24	384	21,0	19 – 23	357	20,7	19 – 23	741	20,9	19 – 23
25 – 29	349	21,7	20 – 24	311	20,7	19 – 23	660	21,2	20 – 23
30 – 34	304	22,3	20 – 25	242	20,8	19 – 23	546	21,6	20 – 24
35 – 39	224	22,4	20 – 25	183	20,5	19 – 23	407	21,5	20 – 24
40 – 44	134	22,2	21 – 24	119	21,2	20 – 23	253	21,7	20 – 24
45 – 49	116	22,4	21 – 25	78	21,2	20 – 23	194	22,1	20 – 25
≥ 50	130	22,9	21 – 25	126	21,4	20 – 24	256	22,1	20 – 25
Total	1784	21,9	20 – 24	1547	20,7	19 – 23	3331	21,3	19 – 24

Table 11: BMI of adults 18 years and older in 2019

Nutritional status

5b. Adults 18 years and older

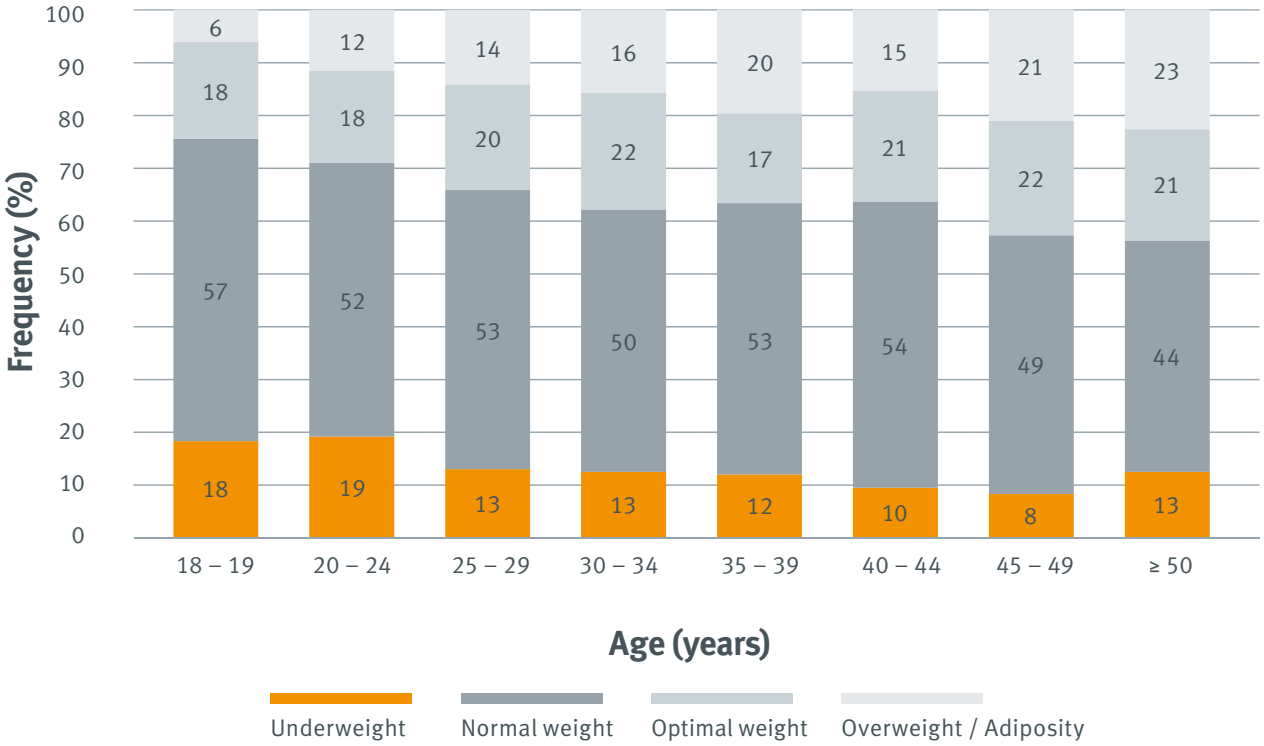

Fig. 9: Weight categories of adults 18 years and older in 2019
Underweight: BMI < 18.5 kg/m²; Normal weight: BMI Men 18.5 – 22.9 kg/m²; BMI Women 18.5 – 21.9 kg/m²; Optimal weight: BMI Men 23.0 - 24.9 kg/m², BMI Women 22.0 - 24.9 kg/m²; Overweight/Adiposity: BMI < 25 kg/m²

	Male	Female	Total
Underweight	11,6	16,9	14,0
Normal weight	51,4	51,6	51,5
Optimal weight	18,2	21,1	19,5
Overweight / Adiposity	19,0	10,4	15,0

Table 12: Weight categories of adults 18 years and older (frequencies in %) in 2019
Underweight: BMI < 18.5 kg/m²; Normal weight: BMI Men 18.5 – 22.9 kg/m²; BMI Women 18.5 – 21.9 kg/m²; Optimal weight: BMI Men 23.0 - 24.9 kgm², BMI Women 22.0 – 24.9 kg/m²; Overweight/Adiposity: BMI < 25 kg/m²

06

Pulmonary function

All patients of 6 years and older without a transplant with a pulmonary function measurement in 2019 were included in the evaluations of the pulmonary function. A total of 5074 data sets were available.

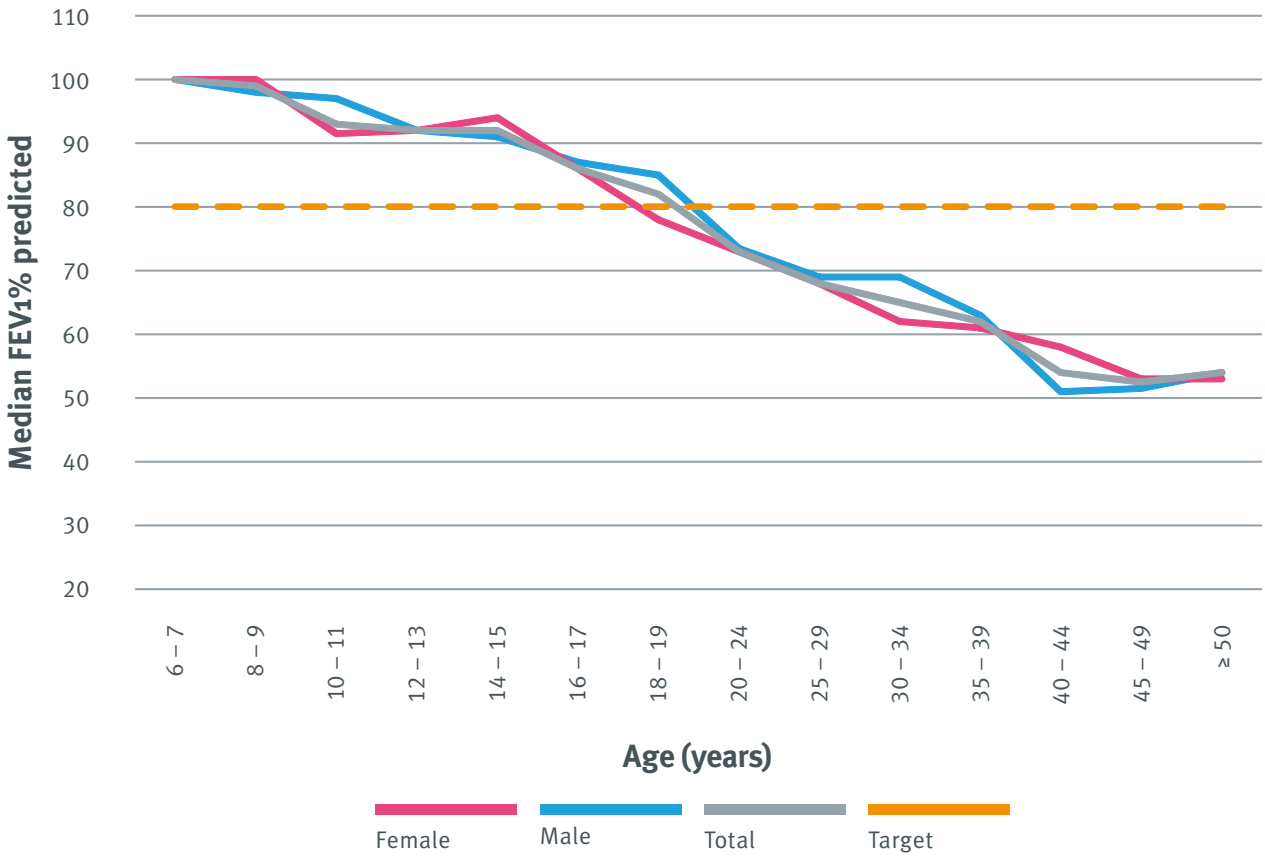

Fig. 10: FEV1% value in 2019 acc. to Global Lung Initiative

Pulmonary function

Age (years)	Male			Female			Total		
	N	Median	25th – 75th pctl.	N	Median	25th – 75th pctl.	N	Median	25th – 75th pctl.
6 – 7	159	100	91 – 110	148	100	90 – 110	307	100	90 – 110
8 – 9	142	98	87 – 105	151	100	87 – 108	293	99	87 – 107
10 – 11	140	97	87 – 104	150	92	83 – 101	290	93	85 – 103
12 – 13	151	92	82 – 104	166	92	78 – 102	317	92	80 – 102
14 – 15	161	91	79 – 101	132	94	81 – 102	293	92	80 – 101
16 – 17	143	87	73 – 99	151	86	69 – 96	294	86	72 – 97
18 – 19	142	85	66 – 99	131	78	51 – 97	273	82	58 – 97
20 – 24	380	74	53 – 90	350	73	54 – 91	730	73	54 – 90
25 – 29	346	69	50 – 87	304	68	48 – 91	650	68	49 – 87
30 – 34	301	69	48 – 85	238	62	46 – 80	539	65	46 – 83
35 – 39	221	63	40 – 82	179	61	46 – 80	400	62	42 – 81
40 – 44	133	51	34 – 73	114	58	43 – 72	247	54	37 – 73
45 – 49	112	52	37 – 76	78	53	40 – 65	190	53	39 – 70
≥ 50	128	54	36 – 79	123	53	42 – 73	251	54	39 – 76
Total	2659	80	55 – 96	2415	78	56 – 96	5074	79	56 – 96

Table 13: FEV1% value in 2019 acc. to Global Lung Initiative

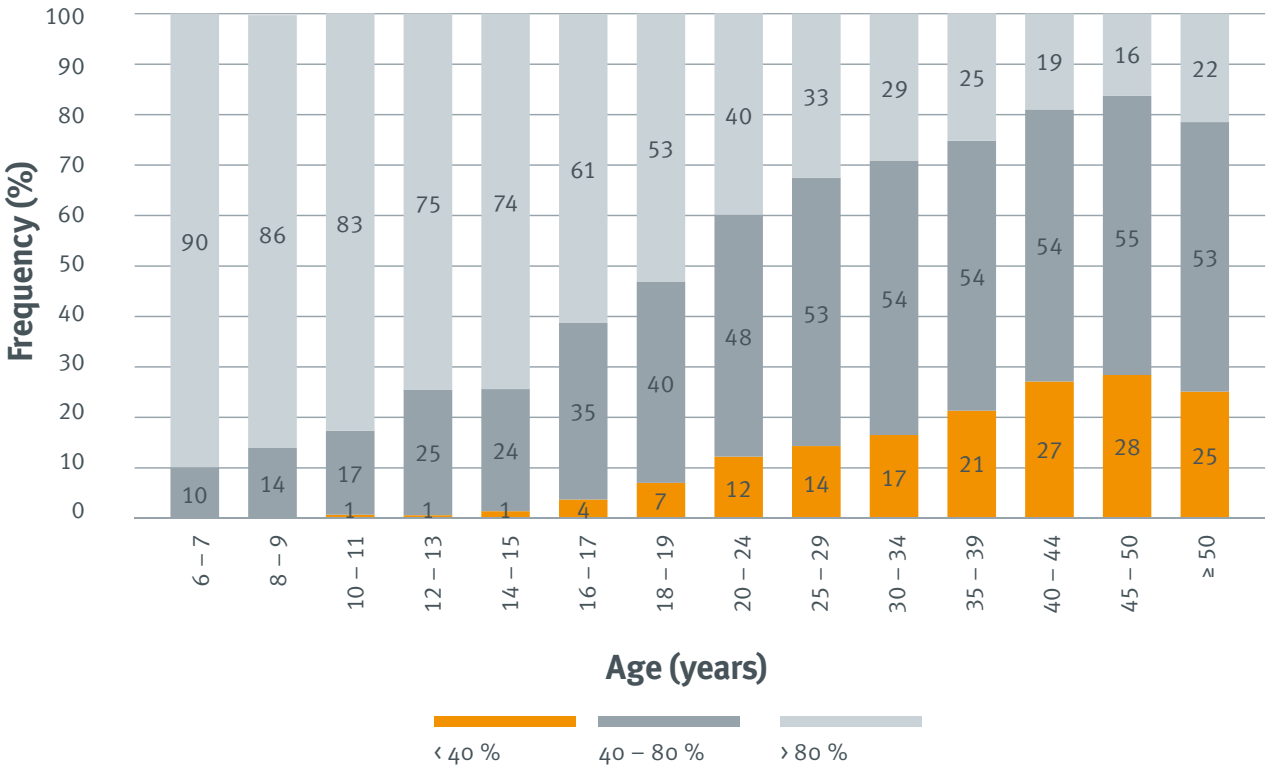

Fig. 11: Severities of the FEV1% (categories ‹ 40 %, 40 – 80 %, › 80 %) in 2019 acc. to Global Lung Function Initiative

07

Lung infections

7a. Annual verification at least once

All patients without a transplant who had at least one microbiological test in the calendar year were included in the evaluations of lung infections (n=6008). No information on a microbiological test in the calendar year was available for 98 patients (1.6%).

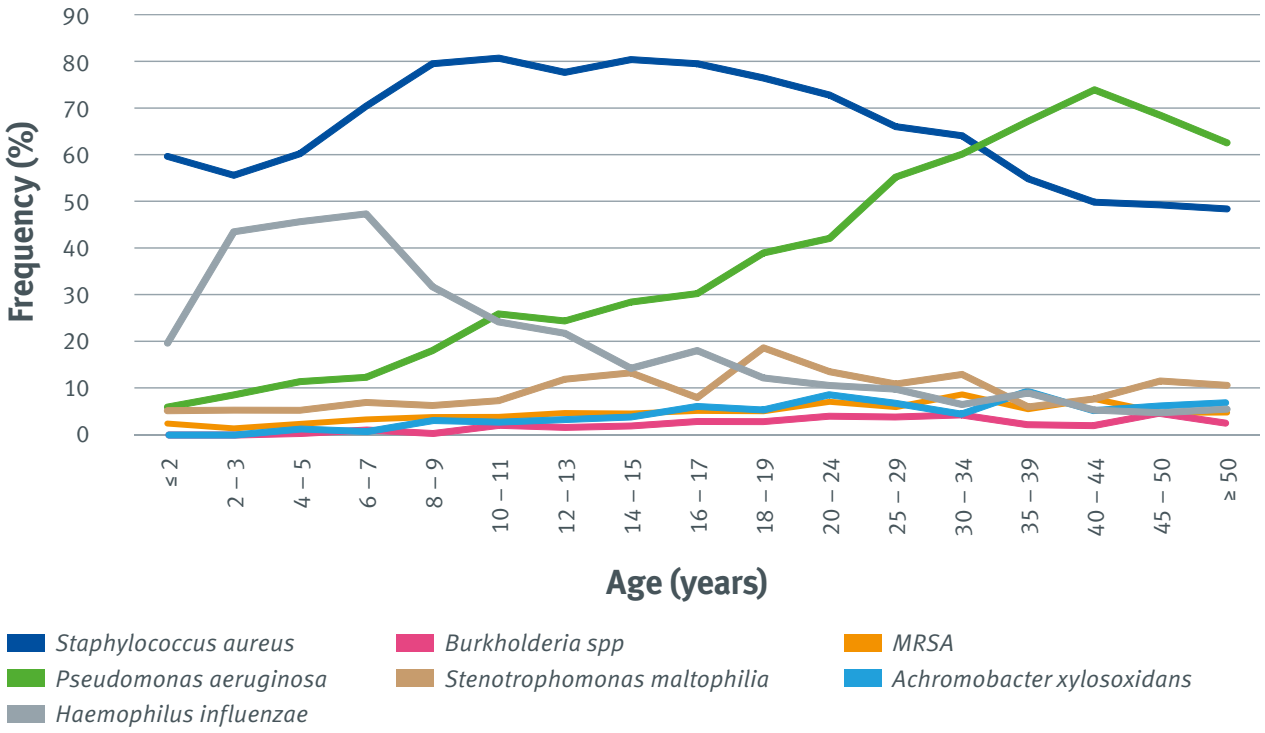

Fig. 12: Bakteriennachweise bei Mukoviszidose-Patienten mit mikrobiologischer Untersuchung 2019

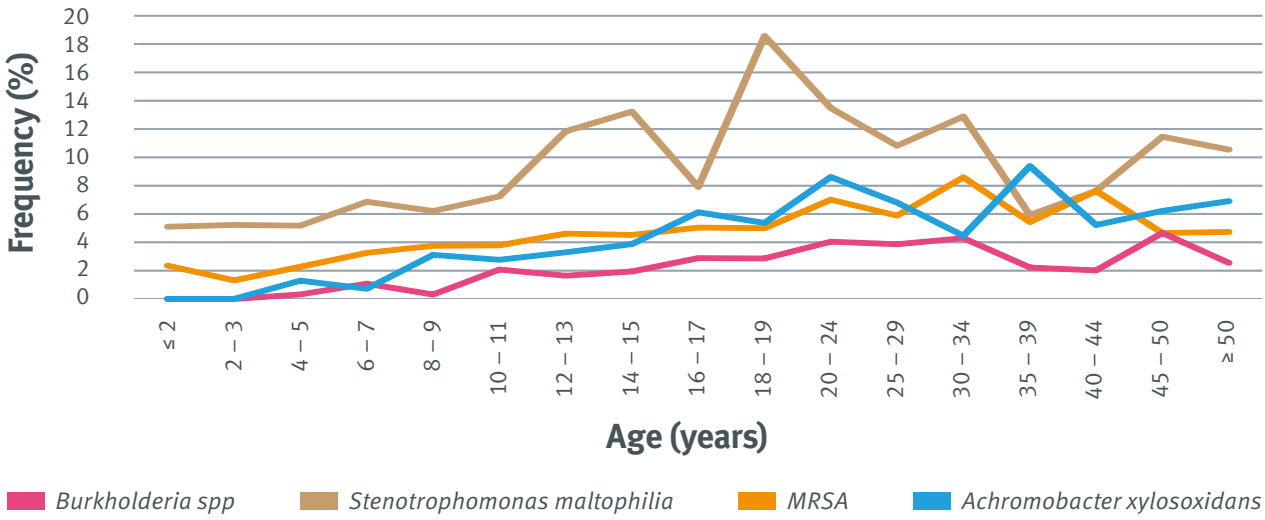

Fig. 13: Detection of bacteria in Cystic Fibrosis patients with a microbiological test (excluding Pseudomonas aeruginosa and Staphylococcus aureus) in 2019

Lung infections

7a. Annual verification at least once

Age (years)	Staph. aureus	MRSA	Pseudomonas aeruginosa (PSA)	Burkholderia spp	Stenotro-phomonas maltophilia	Achromobacter xylosoxidans	Haemophilus influenzae
< 2	59,6	2,4	5,9	0,0	5,1	0,0	19,6
2 – 3	55,6	1,3	8,5	0,0	5,2	0,0	43,5
4 – 5	60,2	2,3	11,3	0,3	5,2	1,3	45,6
6 – 7	70,4	3,3	12,3	1,1	6,9	0,7	47,3
8 – 9	79,5	3,8	18,0	0,3	6,2	3,1	31,7
10 – 11	80,7	3,8	25,9	2,1	7,2	2,8	24,1
12 – 13	77,6	4,6	24,3	1,6	11,8	3,3	21,7
14 – 15	80,4	4,5	28,4	1,9	13,2	3,9	14,2
16 – 17	79,5	5,0	30,2	2,9	7,9	6,1	18,0
18 – 19	76,4	5,0	38,9	2,9	18,6	5,4	12,1
20 – 24	72,8	7,0	42,1	4,0	13,5	8,6	10,5
25 – 29	66,0	5,9	55,2	3,9	10,8	6,8	9,7
30 – 34	64,0	8,6	60,1	4,3	12,9	4,5	6,4
35 – 39	54,8	5,4	67,2	2,2	5,9	9,4	8,9
40 – 44	49,8	7,6	73,9	2,0	7,6	5,2	5,2
45 – 49	49,2	4,7	68,4	4,7	11,5	6,2	4,7
≥ 50	48,4	4,7	62,6	2,6	10,6	6,9	5,5
Total	66,9	5,1	39,4	2,5	9,9	4,9	17,9
< 18	71,6	3,4	18,5	1,1	7,7	2,4	29,7
≥ 18	63,1	6,4	55,9	3,5	11,6	6,9	8,5

Table 14: Detection of bacteria in Cystic Fibrosis patients with a microbiological test (frequencies in %) in 2019

07

Lung infections

7b. Chronische Lungeninfektionen

All patients without a transplant who had at least one microbiological test in the calendar year were included in the evaluations of chronic lung infections (n=6008). No information on a microbiological test in the calendar year was available for 98 patients (2 %).

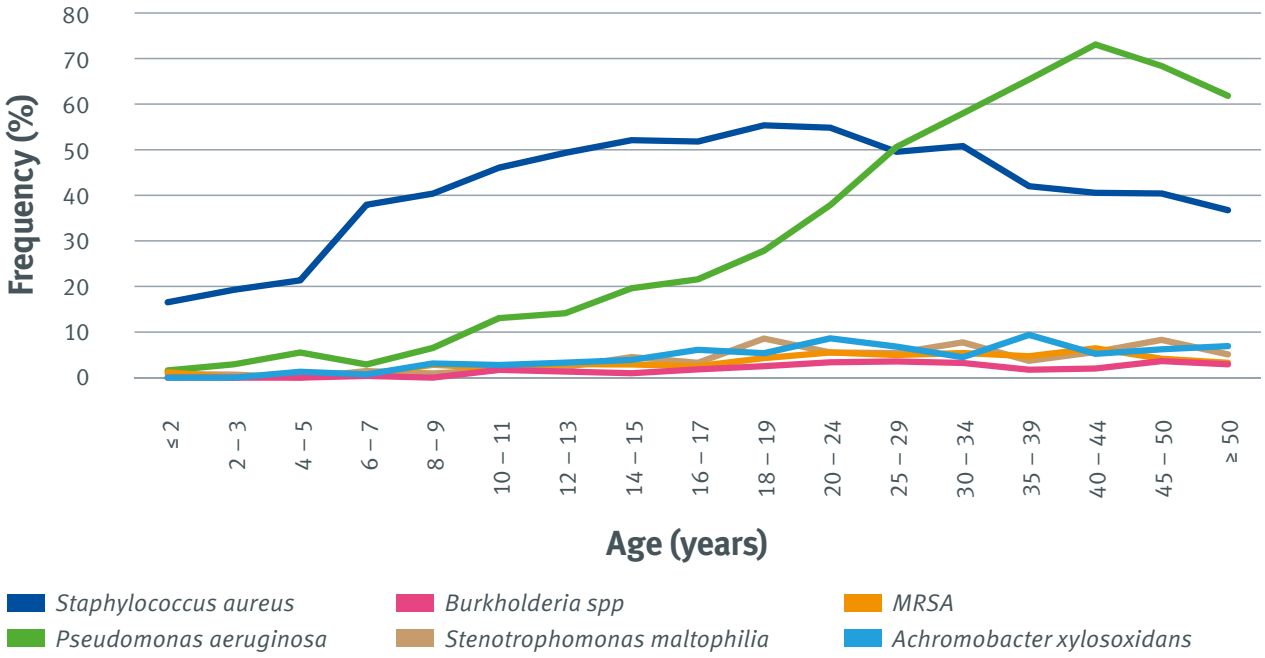

Fig. 14: Chronic lung infections in Cystic Fibrosis patients with a microbiological test in 2019

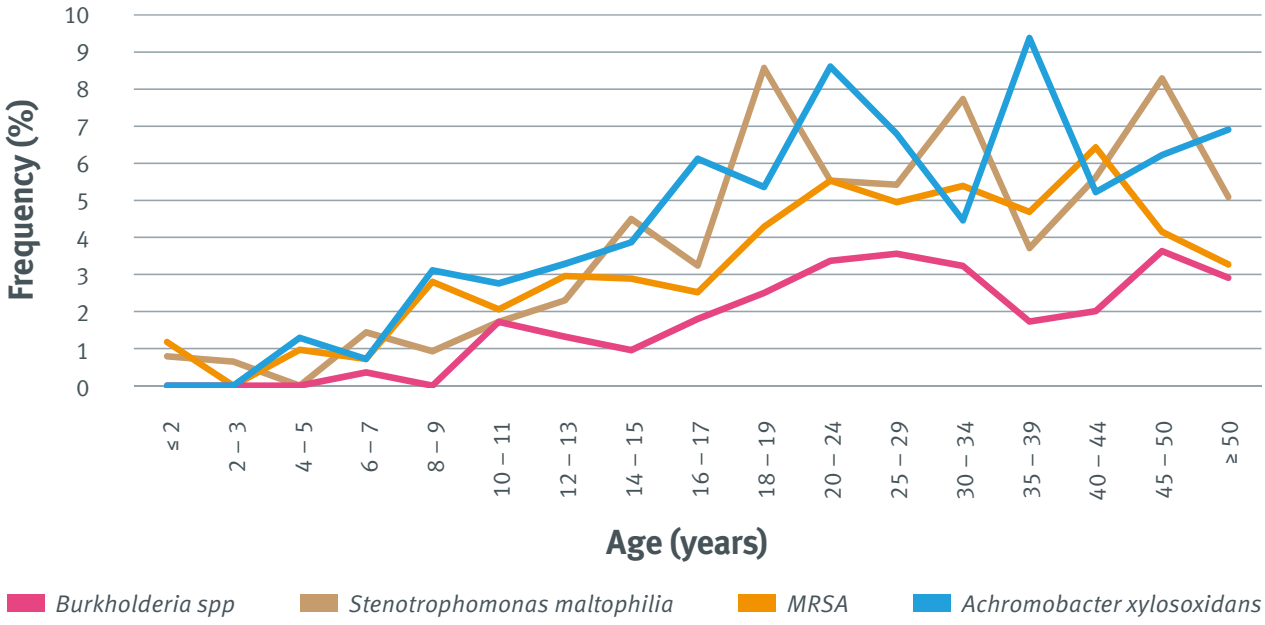

Fig. 15: Chronic lung infections in Cystic Fibrosis patients with a microbiological test (excluding Pseudomonas aeruginosa and Staphylococcus aureus) in 2019

Lung infections

7b. Chronic lung infections

Age (years)	Staph. aureus	MRSA	Pseudomonas aeruginosa	Burkholderia spp	Steno-trophomonas maltophilia	Achromobacter xylosoxidans
< 2	16,5	1,2	1,6	0,0	0,8	0,0
2 – 3	19,3	0,0	2,9	0,0	0,7	0,0
4 – 5	21,4	1,0	5,5	0,0	0,0	0,7
6 – 7	37,9	0,7	2,9	0,4	1,4	0,7
8 – 9	40,4	2,8	6,5	0,0	0,9	1,6
10 – 11	46,1	2,1	13,1	1,7	1,7	1,0
12 – 13	49,3	3,0	14,1	1,3	2,3	3,3
14 – 15	52,1	2,9	19,6	1,0	4,5	1,6
16 – 17	51,8	2,5	21,6	1,8	3,2	4,3
18 – 19	55,4	4,3	27,9	2,5	8,6	2,9
20 – 24	54,9	5,5	37,9	3,4	5,5	6,1
25 – 29	49,5	5,0	50,6	3,6	5,4	6,0
30 – 34	50,8	5,4	58,0	3,2	7,7	5,2
35 – 39	42,0	4,7	65,4	1,7	3,7	8,4
40 – 44	40,6	6,4	73,1	2,0	5,6	3,2
45 – 49	40,4	4,2	68,4	3,6	8,3	5,7
≥ 50	36,7	3,3	61,8	2,9	5,1	5,1
Total	43,5	3,6	33,7	2,0	4,1	3,8
< 18	37,4	1,8	9,8	0,7	1,7	1,5
≥ 18	48,3	5,0	52,5	3,0	6,0	5,6

Table 15: Chronic lung infections in Cystic Fibrosis patients with a microbiological test (frequencies in %) in 2019

07

Lung infections

7c. Atypical mycobacteria

All patients without a transplant who had at least one microbiological test for mycobacteria in 2019 were included in the analyses (n=2315).

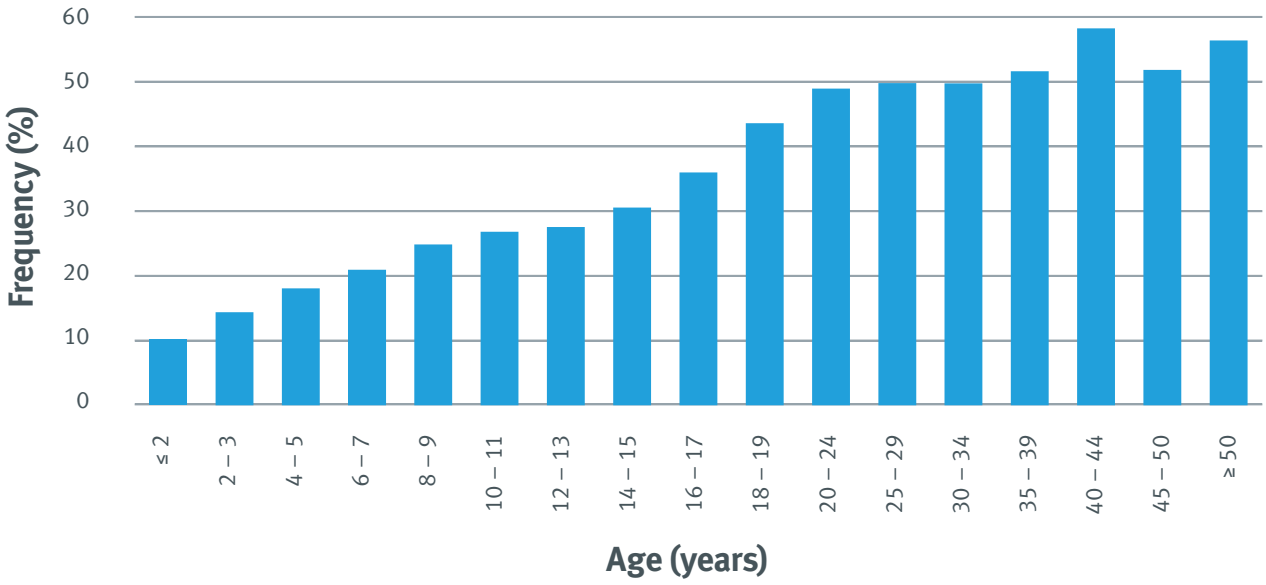

Fig. 16: Cystic Fibrosis patients with a test for atypical mycobacteria in 2019

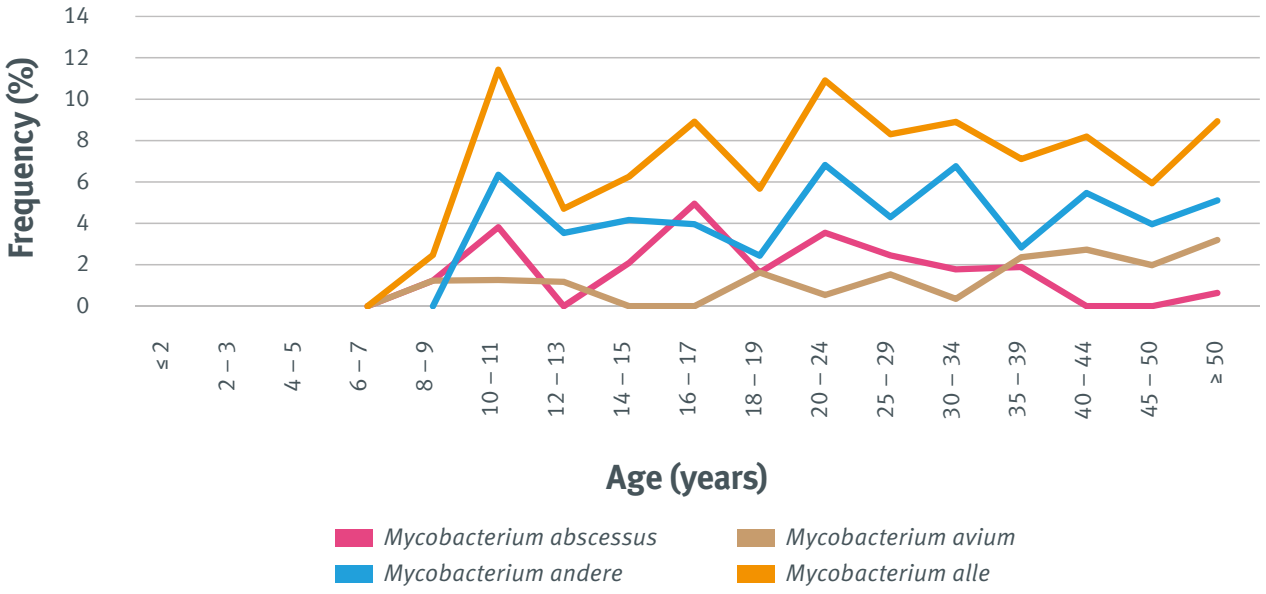

Fig. 17: Cystic Fibrosis patients in whom various atypical mycobacteria were detected in 2019

Lung infections

7c. Atypical mycobacteria

Age (years)	Test for atypical mycobacteria conducted	Mycobacterium abscessus[1]	Mycobacterium avium complex[1]	Myco-bacterium other[1]	Myco-bacterium all[1]
< 2	10,2	0,0	0,0	0,0	0,0
2 – 3	14,4	0,0	0,0	0,0	0,0
4 – 5	18,1	0,0	0,0	0,0	0,0
6 – 7	20,9	0,0	0,0	0,0	0,0
8 – 9	24,8	1,3	1,3	0,0	2,5
10 – 11	26,8	3,9	1,3	6,4	11,5
12 – 13	27,5	0,0	1,2	3,6	4,8
14 – 15	30,6	2,1	0,0	4,2	6,3
16 – 17	36,0	5,0	0,0	4,0	9,0
18 – 19	43,6	1,6	1,6	2,5	5,7
20 – 24	48,9	3,6	0,6	6,9	11,0
25 – 29	49,8	2,5	1,6	4,4	8,4
30 – 34	49,7	1,8	0,4	6,8	9,0
35 – 39	51,6	1,9	2,4	2,9	7,2
40 – 44	58,2	0,0	2,8	5,5	8,3
45 – 49	51,8	0,0	2,0	4,0	6,0
≥ 50	56,4	0,7	3,2	5,2	9,0
Total	38,6	1,9	1,3	4,5	7,6
< 18	23,4	1,8	0,5	2,6	4,8
≥ 18	50,6	2,0	1,5	5,1	8,6

Table 16: Cystic Fibrosis patients in whom various atypical mycobacteria (frequencies in %) were detected in 2019
[1] Frequency in % of patients with respect to the test for atypical mycobacteria

08

Extended complications

All patients without transplant for whom the question about complications was documented were included in the analysis of complications. A total of 6072 data sets were available. A total of 35 patients (0.6%) did not answer the question about complications.

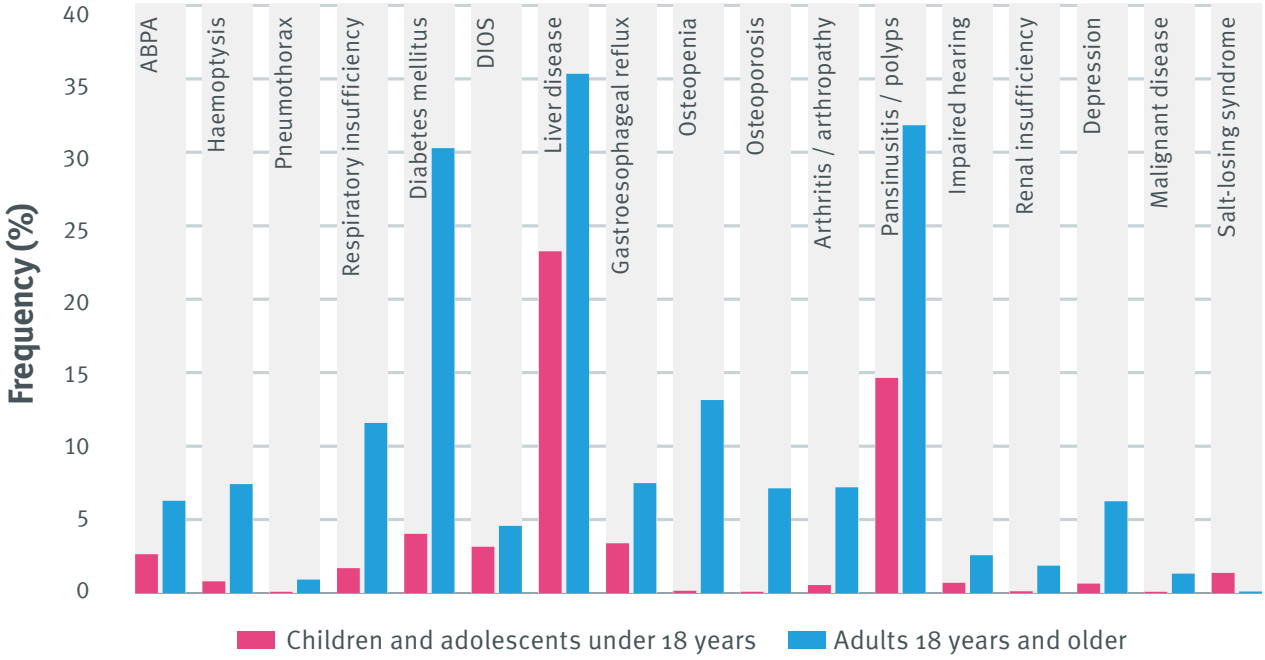

Fig. 18: Cystic Fibrosis patients with complications (without pancreatic insufficiency) in 2019

Extended complications

8a. Children and adolescents under 18 years

Complications	0 – 5 years	6 – 11 years	12 – 17 years	Total
Allergic bronchopulmonary aspergillosis (ABPA)	0,0	2,5	5,4	2,6
Haemoptysis	0,0	0,3	2,0	0,8
of these, at least one serious episode (› 240 ml in 24h)	0,0	0,0	5,6	4,8
Pneumothorax	0,0	0,0	0,2	0,1
of these, requiring drainage	0,0	0,0	0,0	0,0
Respiratory insufficiency	1,6	1,7	1,8	1,7
of these, partial insufficiency	78,6	80,0	87,5	82,2
of these, global insufficiency	0,0	13,3	6,3	6,7
Exocrine pancreatic insufficiency	88,2	86,1	86,9	87,1
Diabetes mellitus	0,1	1,2	10,6	4,0
of these, Type 3	0,0	100,0	91,6	91,6
of these, not Type 3	100,0	0,0	8,4	8,4
Distal intestinal obstruction syndrome (DIOS)	3,2	3,0	3,2	3,2
Liver disease	12,2	22,8	34,4	23,3
of these, liver cirrhosis	4,7	8,9	19,4	13,4
of these, with portal hypertension	0,9	4,4	7,4	5,3
of these, without portal hypertension	2,8	2,5	6,5	4,5
Gastroesophageal reflux	1,4	2,8	5,9	3,4
Bone disease				
Osteopenia	0,0	0,0	0,4	0,2
Osteoporosis	0,0	0,0	0,2	0,1
Arthritis / arthropathy	0,1	0,2	1,2	0,5
Pansinusitis / polyps	3,6	16,7	23,4	14,7
Impaired hearing	0,5	0,7	0,9	0,7
Renal insufficiency	0,0	0,0	0,3	0,1
Depression	0,0	0,1	1,8	0,6
Malignant disease	0,0	0,1	0,1	0,1
Salt-losing syndrome	2,6	1,0	0,5	1,4

Table 17: Cystic Fibrosis patients under 18 years with complications (frequencies in %) in 2019

08

Extended complications

8b. Adults 18 years and older

Complications	18 – 29 years	30 – 39 years	≥ 40 years	Total
Allergic bronchopulmonary aspergillosis (ABPA)	7,1	5,8	5,1	6,3
Haemoptysis	6,7	8,6	7,5	7,4
of these, at least one serious episode (› 240 ml in 24h)	1,8	1,3	1,9	1,6
Pneumothorax	1,1	0,8	0,6	0,9
of these, requiring drainage	44,4	50,0	75,0	50,0
Respiratory insufficiency	9,1	11,7	17,2	11,6
of these, partial insufficiency	66,5	69,9	67,5	67,8
of these, global insufficiency	17,4	21,2	22,0	20,0
Exocrine pancreatic insufficiency	87,6	83,5	78,0	84,4
Diabetes mellitus	22,6	32,6	45,3	30,3
of these, Type 3	96,1	96,5	96,6	96,4
of these, not Type 3	3,9	3,5	3,4	3,6
Distal intestinal obstruction syndrome (DIOS)	5,3	3,9	3,6	4,6
Liver disease	38,2	33,3	31,5	35,3
of these, liver cirrhosis	17,4	19,8	19,8	18,5
of these, with portal hypertension	8,5	9,8	7,2	8,6
of these, without portal hypertension	4,2	5,0	7,2	5,0
Gastroesophageal reflux	5,8	7,8	10,9	7,5
Bone disease				
Osteopenia	7,5	15,7	23,1	13,1
Osteoporosis	3,6	7,2	15,2	7,1
Arthritis / arthropathy	4,2	10,2	10,1	7,2
Pansinusitis / polyps	30,4	33,9	32,5	31,8
Impaired hearing	1,4	2,5	5,5	2,6
Renal insufficiency	1,2	2,3	2,9	1,9
Depression	6,0	6,4	6,6	6,2
Malignant disease	0,4	0,8	4,3	1,3
Salt-losing syndrome	0,1	0,0	0,3	0,1

Table 18: : Cystic Fibrosis patients 18 years and older with complications (frequencies in %) in 2019

Extended complications

8c. Exacerbations treated with antibiotics

Age (years)	Number of exacerbations treated with antibiotics per patient						
	0	1	2	3	4	5+	unknown
0 – 5	63,3	17,9	9,5	4,3	2,3	2,2	0,6
6 – 11	61,5	18,3	9,4	4,6	2,7	3,4	0,2
12 – 17	57,5	18,1	11,1	5,3	3,9	3,0	1,1
18 – 29	51,7	19,1	12,1	6,1	3,4	6,4	1,2
30 – 39	49,0	21,8	13,2	5,8	3,0	5,1	2,1
≥ 40	52,3	21,7	10,1	6,2	2,7	4,9	2,1
Total	55,1	19,5	11,2	5,5	3,1	4,5	1,2
< 18	60,7	18,1	10,0	4,7	3,0	2,9	0,6
≥ 18	51,0	20,5	12,0	6,1	3,1	5,7	1,7

Table 19: Number of exacerbations treated with antibiotics per Cystic Fibrosis patient (frequencies in %) in 2019

09

Therapies

9a. Basic therapy

All patients without transplant for whom the question about gastrointestinal and pulmonary long-term therapy was documented were included in the evaluation of the basic therapies. The data sets of 2671 patients under 18 years and 3406 patients 18 years and older are included in the analyses. A total of 31 patients (0.5 %) did not answer the question about gastrointestinal and pulmonary long-term therapy.

9a.i. Children and adolescents under 18 years

Basic therapy	0 – 5 years	6 – 11 years	12 – 17 years	Total
DNAse	14,2	55,4	69,4	46,6
Mannitol	0,1	0,0	1,2	0,5
Hypotonic saline solution	97,2	96,9	94,2	96,1
of these, 0.9 %	8,6	2,0	4,4	5,0
of these, 1 – 2.9 %	2,0	0,5	1,1	1,2
of these, 3 – 5.7 %	39,2	33,7	24,6	32,5
of these, ≥ 5.8 %	49,6	63,1	68,7	60,5
At least one mucolytic therapy (mannitol, DNAse, hypertonic saline solution)	97,5	98,2	96,7	97,5
ß2-sympathomimetics				
Short-acting (SABA)	65,7	73,1	72,4	70,4
Long-acting (LABA)	4,0	21,6	31,0	19,0
Anticholinergics	8,8	15,6	17,9	14,1
Antistaphylococcal therapy	7,9	9,2	10,7	9,3
Steroids				
Nasal	8,1	24,8	26,3	19,8
Inhalative	8,9	25,2	29,6	21,3
Oral	0,3	3,6	4,6	2,9
Vitamins				
Vitamin A	83,1	83,9	82,9	83,3
Vitamin D	97,0	96,8	95,7	96,5
Vitamin E	77,3	78,4	81,5	79,1
Vitamin K	73,5	70,7	71,6	71,9

Table 20: Cystic Fibrosis patients under 18 years with basic therapy (frequencies in %) in 2019

Therapies

9a. Basic therapy

9a.ii. Adults 18 years and older

Basic therapy	18 – 29 years	30 – 39 years	≥ 40 years	Total
DNAse	63,7	56,3	47,8	58,2
Mannitol	7,0	8,5	5,8	7,2
Hypotonic saline solution	86,2	83,3	79,5	83,9
of these, 0.9 %	5,3	7,6	9,7	6,8
of these, 1 – 2.9 %	1,6	1,2	2,7	1,7
of these, 3 – 5.7 %	23,6	23,1	23,7	23,5
of these, ≥ 5.8 %	68,6	67,8	63,3	67,4
At least one mucolytic therapy (mannitol, DNAse, hypertonic saline solution)	93,9	91,8	88,7	92,2
ß2-sympathomimetics				
Short-acting (SABA)	68,9	68,7	71,5	69,4
Long-acting (LABA)	55,9	69,1	76,7	64,1
Anticholinergics	41,2	54,7	67,5	50,7
Antistaphylococcal therapy	8,8	7,5	6,2	7,9
Steroids				
Nasal	23,0	22,1	21,1	22,3
Inhalative	44,4	56,5	63,7	52,0
Oral	7,6	10,2	13,5	9,6
Vitamins				
Vitamin A	78,6	70,2	62,3	72,7
Vitamin D	94,5	92,4	92,3	93,4
Vitamin E	77,8	68,9	60,8	71,6
Vitamin K	70,7	62,2	57,2	65,4

Table 21: Cystic Fibrosis patients 18 years and older with basic therapy (frequencies in %) in 2019

09

Therapies

9b. Indication therapy

9b.i. Adults 18 years and older

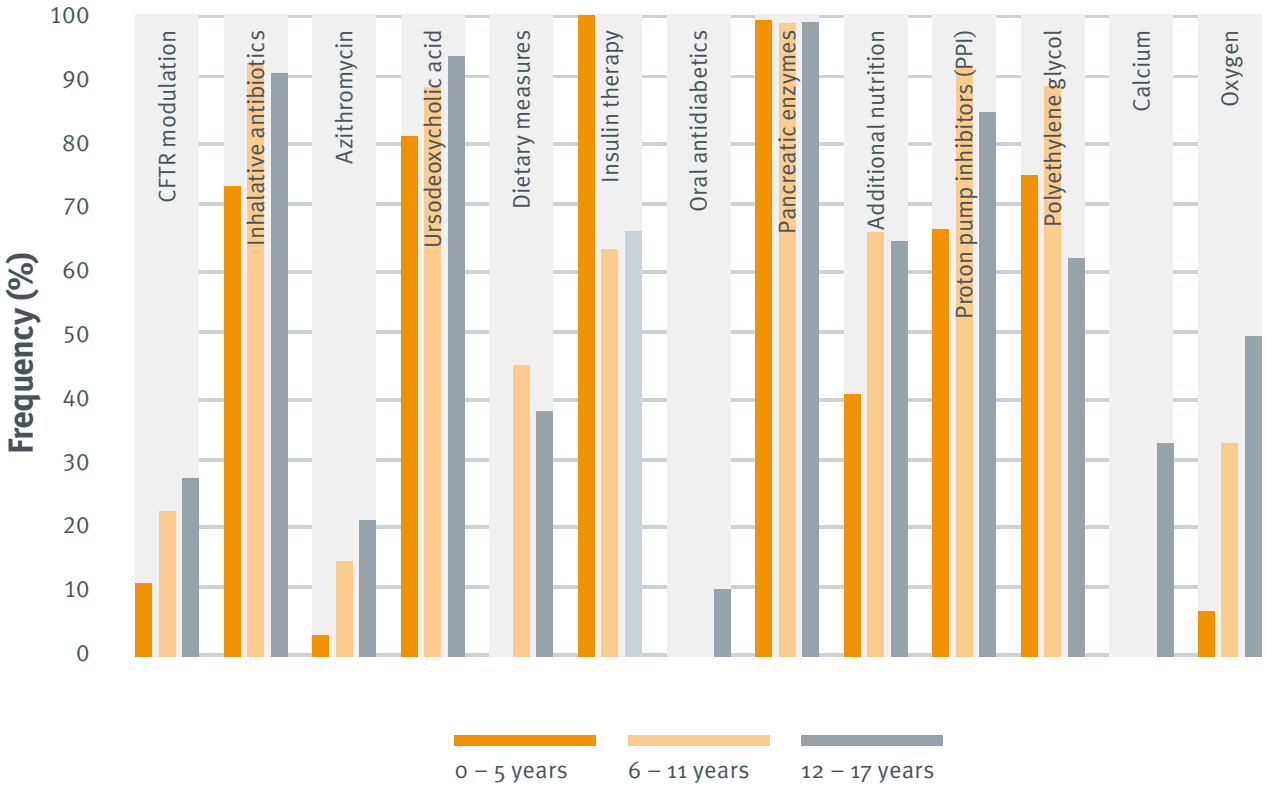

Fig. 19: Cystic Fibrosis patients under 18 years with indication therapy in 2019

Therapies

9b. Indication therapy

9b.i. Children and adolescents under 18 years

Indication therapy	0 – 5 years	6 – 11 years	12 – 17 years	Total
CFTR-Modulation	11,4	22,7	27,8	20,7
of these, Ivacaftor *with gating mutations*[1]	63,6	76,5	96,7	80,2
of these, Lumacaftor / Ivacaftor *with F508del / F508del*[2]	19,5	41,0	33,3	31,5
of these, Tezacaftor / Ivacaftor *with indicated mutation combination*[3]	0,3	0,5	21,3	7,7
Inhalative antibiotics *with chronic Pseudomonas infection*	73,3	92,5	90,9	89,3
of these, inhalative tobramycin	33,3	68,7	51,2	53,6
of these, inhalative colistin	56,7	62,7	57,9	59,0
of these, inhalative aztreonam	3,3	16,4	17,1	15,3
of these, DPI tobramycin	0,0	3,0	12,8	8,8
of these, DPI colistin	3,3	1,5	12,2	8,4
of these, levofloxacin	0,0	1,5	3,7	2,7
of these, inhalative gentamicin	0,0	0,0	0,0	0,0
of these, others	6,7	3,0	3,1	3,5
Azithromycin *with chronic Pseudomonas infection*	3,3	14,9	21,3	17,6
Ursodeoxycholic acid *with liver disease*	81,1	88,7	93,6	89,8
Dietary measures *with Diabetes mellitus*	0,0	45,5	38,3	38,7
Insulin therapy *with Diabetes mellitus*	100,0	63,6	66,3	66,4
Oral antidiabetics *with Diabetes mellitus*	0,0	0,0	10,6	9,4
Pancreatic enzymes *with exocrine pancreatic insufficiency*	99,2	98,7	98,9	98,9
Additional nutrition *with underweight*	40,9	66,1	64,7	56,4
Additional oral nutrition	39,0	63,6	55,4	51,7
PEG	1,2	4,1	12,5	6,2
Proton pump inhibitors (PPI) *with gastroesophageal reflux*	66,7	92,0	84,9	84,4
Polyethylene glycol *with DIOS*	75,0	88,9	62,1	75,0
Calcium *with osteoporosis / osteopenia*	0,0	0,0	33,3	33,3
Oxygen *with respiratory insufficiency*	7,1	33,3	50,0	31,1

Table 22: Cystic Fibrosis patients under 18 years with indication therapy (frequencies in %) in 2019
[1] Ivacaftor is approved in Germany for gating mutations from the age of 2: G551D, G1244E, G1349D, G178R, G551S, S1251N,S1255P or S549R and for R117H from the age of 18. [2] Lumacaftor / Ivacaftor is approved in Germany from the age of 2. [3] Tezacaftor / Ivacaftor is approved in Germany from the age of 12.

09

Therapies

9b. Indication therapy

9b.ii. Adults 18 years and older

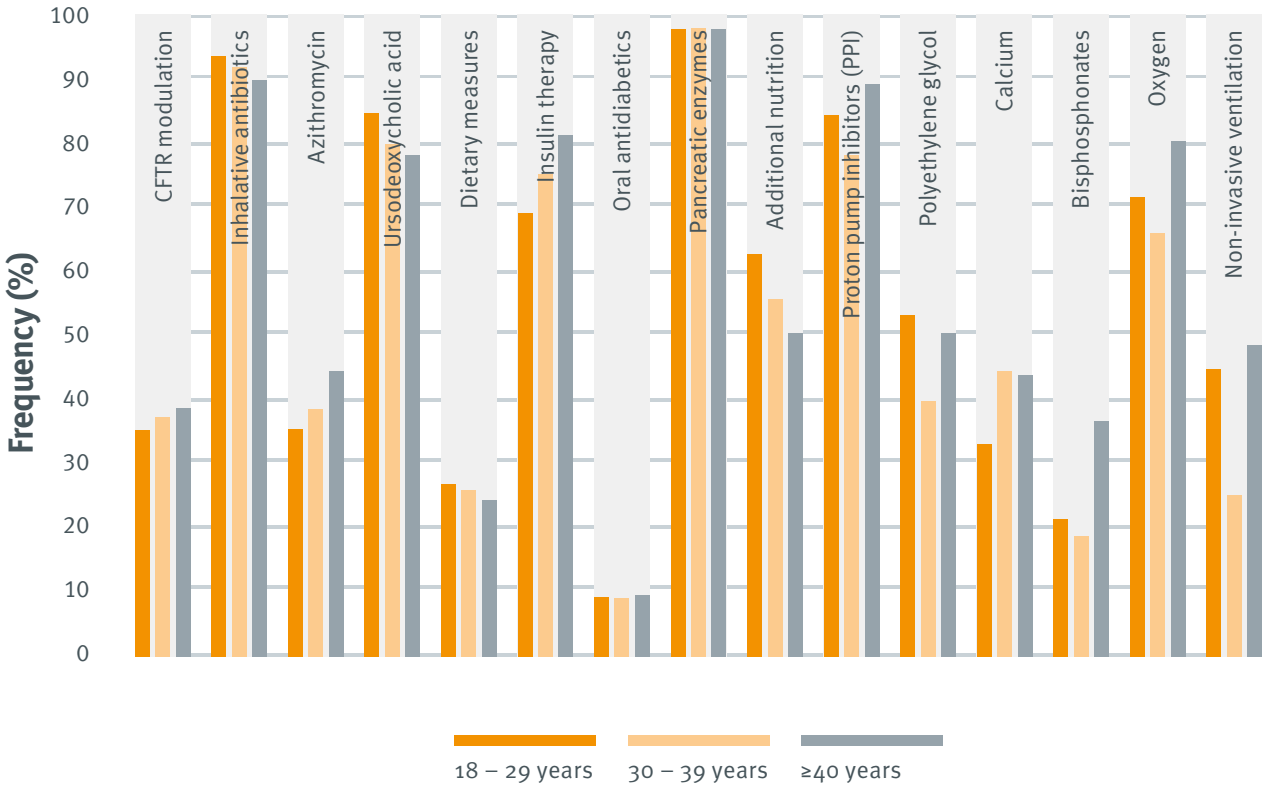

Fig. 20: Fibrosis patients 18 years and older with indication therapy in 2019

Table 23 (S. 37): Cystic Fibrosis patients 18 years and older with indication therapy (frequencies in %) in 2019
[1] Ivacaftor is approved in Germany for gating mutations from the age of 2: G551D, G1244E, G1349D, G178R, G551S, S1251N,S1255P or S549R and for R117H from the age of 18. [2] Lumacaftor / Ivacaftor is approved in Germany from the age of 2. [3] Tezacaftor / Ivacaftor is approved in Germany from the age of 12.

Therapies

9b. Indication therapy

9b.ii. Adults 18 years and older

Indication therapy	18 – 29 years	30 – 39 years	≥40 years	Total
CFTR-Modulation	35,0	37,0	38,4	36,3
of these, Ivacaftor *with gating mutations*[1]	76,5	84,0	73,1	77,6
of these, Lumacaftor / Ivacaftor *with F508del / F508del*[2]	29,9	28,1	20,1	27,5
of these, Tezacaftor / Ivacaftor *with indicated mutation combination*[3]	37,7	44,2	50,1	42,2
Inhalative antibiotics *with chronic Pseudomonas infection*	92,9	91,2	89,1	91,3
of these, inhalative tobramycin	35,0	26,9	22,5	28,9
of these, inhalative colistin	55,8	53,1	57,6	55,4
of these, inhalative aztreonam	31,3	36,5	39,5	35,3
of these, DPI tobramycin	21,1	17,7	7,6	16,3
of these, DPI colistin	18,1	18,7	15,6	17,6
of these, levofloxacin	15,0	19,1	21,2	18,1
of these, inhalative gentamicin	0,3	0,0	0,2	0,2
of these, others	4,4	4,3	5,3	4,6
Azithromycin *with chronic Pseudomonas infection*	35,2	38,3	44,2	38,7
Ursodeoxycholic acid *with liver disease*	84,0	79,2	77,5	81,5
Dietary measures *with Diabetes mellitus*	26,6	25,7	24,2	25,6
Insulin therapy *with Diabetes mellitus*	68,6	74,6	80,7	74,3
Oral antidiabetics *with Diabetes mellitus*	9,2	9,0	9,5	9,2
Pancreatic enzymes *with exocrine pancreatic insufficiency*	97,0	97,2	97,0	97,0
Additional nutrition *with underweight*	62,3	55,3	50,0	58,6
Additional oral nutrition	54,0	45,3	43,8	50,2
PEG	10,4	6,0	2,5	8,0
Proton pump inhibitors (PPI) *with gastroesophageal reflux*	83,7	77,6	88,6	83,4
Polyethylene glycol *with DIOS*	52,8	39,5	50,0	49,0
Calcium *with osteoporosis / osteopenia*	32,8	44,2	43,6	40,8
Bisphosphonates *with osteoporosis*	21,3	18,6	36,4	27,4
Oxygen *with respiratory insufficiency*	71,0	65,5	79,8	72,2
Non-invasive ventilation (NIPPV) *with respiratory global insufficiency*	44,4	25,0	48,2	39,7

Table 23: Cystic Fibrosis patients 18 years and older with indication therapy (frequencies in %) in 2019

10

Mortality

47 patients (21 girls/women and 26 boys/men) died in the reporting year 2019. The main causes of death were cardio-pulmonary diseases (63.8%), transplants (4.3%), liver diseases/failure (2.1%) and malignant diseases (2.1%). Other or unknown causes were present in 27.7% of cases. The age at death is broken down as follows:

	Mean value	Median	Minimum	Maximum	25th percentile	75th percentile
Age at death in full years	37	34	16	74	27	49

Table 24: Age at death in 2019

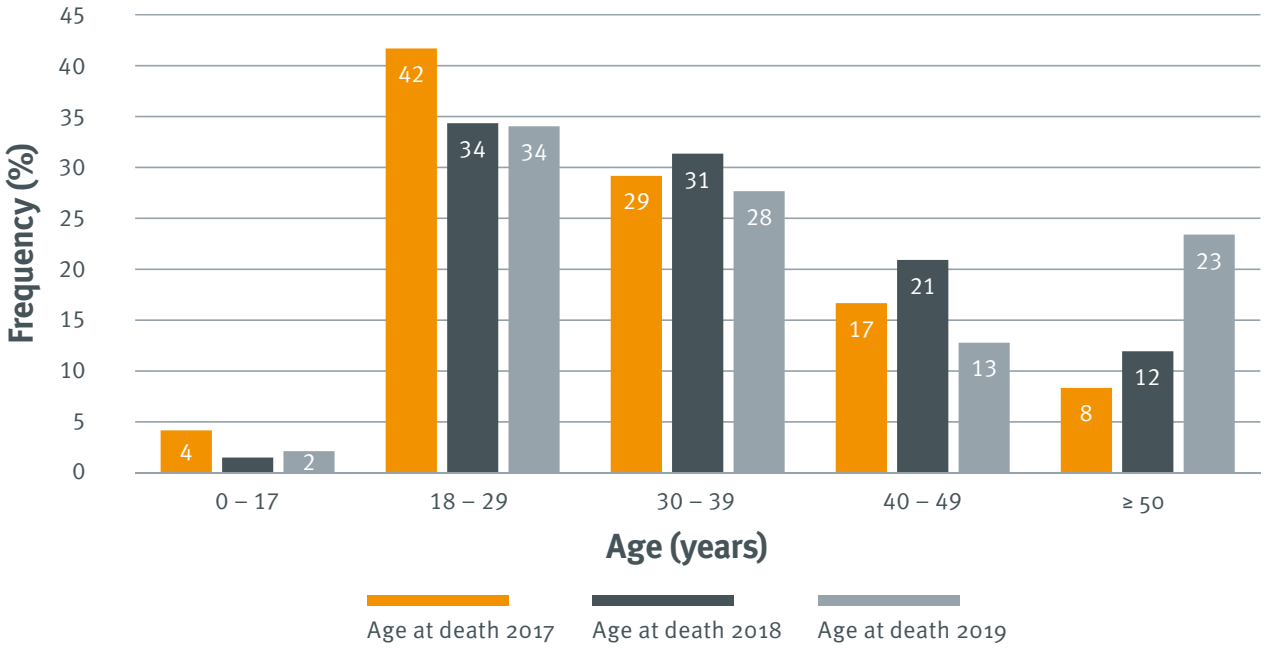

Fig. 21: Deceased Cystic Fibrosis patients in the years 2017 – 2019

Age (years)	Number	Percent
0 – 17	1	2,1
18 – 29	16	34,0
30 – 39	13	27,7
40 – 49	6	12,8
≥ 50	11	23,4
Total	47	100,0

Table 25: Deceased Cystic Fibrosis patients in 2019

Mortality

The lifespan is described by the average age at death, the median survival age and the average age-specific life expectancy. We will present these statistical values in this annual data report on the basis of internationally accepted and comparable analytical methods. Owing to the higher number of patients lost from the follow-up for the reporting year 2019, we decided to report the current median age at death for the year 2019 as well as the average survival age and the life expectancy with respect to the period 2014 – 2018.

Average age at death

The average age at death for a given year describes the age at which half of the patients died. The average age at death was 34 years in the reporting year 2019 (2018).

Median survival age 2018

The median survival age describes the expected age at which only 50% of the patients are still alive. A COX PH regression analysis according to Sykes (Journal of Clinical Epidemiology 2016; 70: is conducted over a 5-year period to compensate for variations in the annual number of deaths. 7567 people with Cystic Fibrosis (including patients with transplants) and 409 deaths were recorded In the 5-year window between 2014 and 2018. 66 patients (0.87%) were lost from the follow-up. The median survival age was 50.7 years (confidence interval: 47.9 to 53.3).

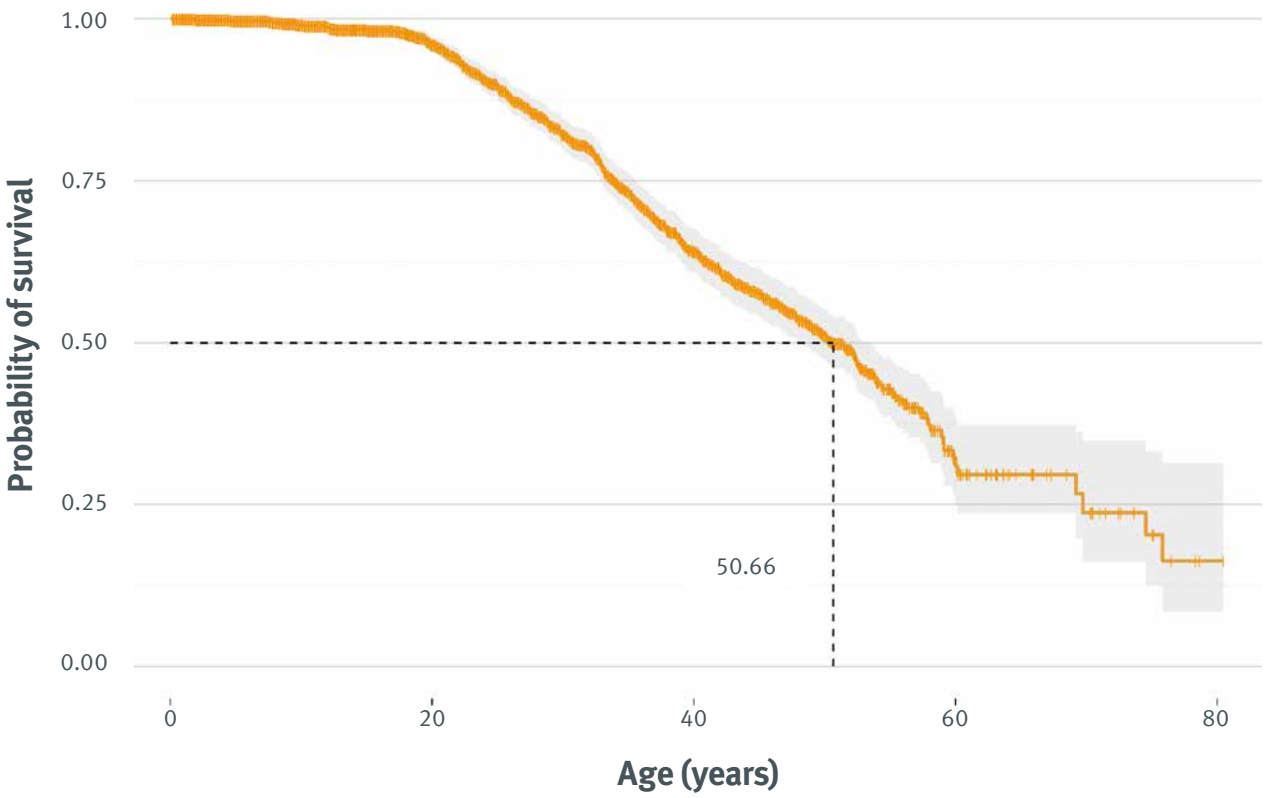

Fig. 22: Median survival age for Cystic Fibrosis patients for the period 2014 – 2018

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Mortality

Life expectancy

Life expectancy is the average time a person can be expected to live from a specified age until death. It is calculated for a fixed period of time and is based on current and age-specific death rates. Currently the life expectancy of a healthy male newborn in Germany is 78 years and that of a female newborn 83 years (www.statista.de). The life expectancy is different for each age and does not correspond to the median survival age.

All statistical values refer to the population of Cystic Fibrosis patients in Germany, who vary greatly from individual to individual. As a result, only allow limited conclusions can be drawn about the individual. According to the literature, important influencing factors include gender, the existing gene mutation and the exocrine pancreatic function. All calculations are based on the current death rate, which has fortunately been steadily decreasing over the past years.

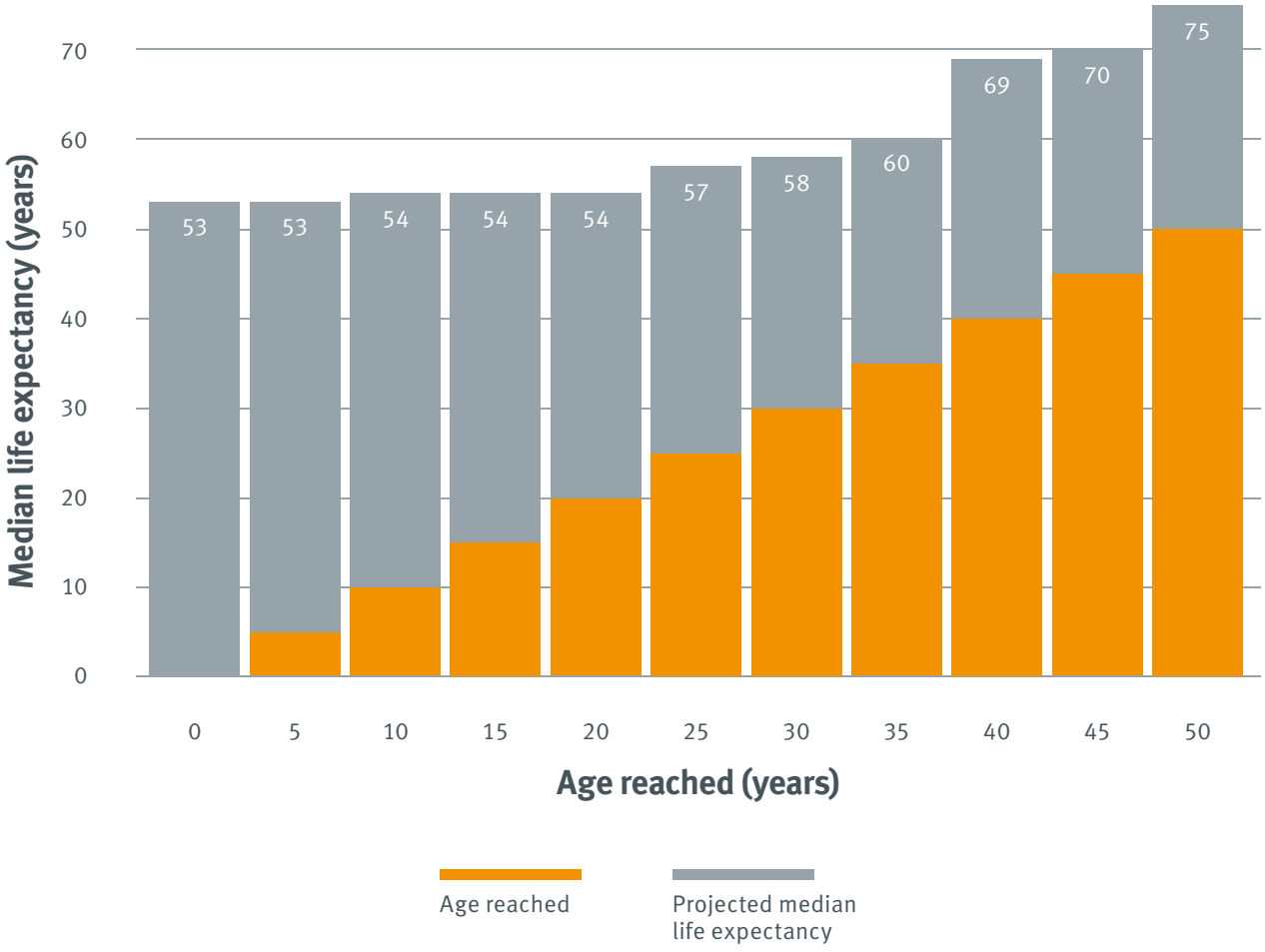

Fig. 23: Projected median life expectancy for Cystic Fibrosis patients 2014 – 2018

Structure of care

11a. Size of the participating centers

87 centers participated in the Cystic Fibrosis Registry in the reporting year 2019. 44 centers cared for less than 50 patients and 44 centers cared for more than 50 patients. Over 84% of the patients documented in the Registry are cared for in these centers.

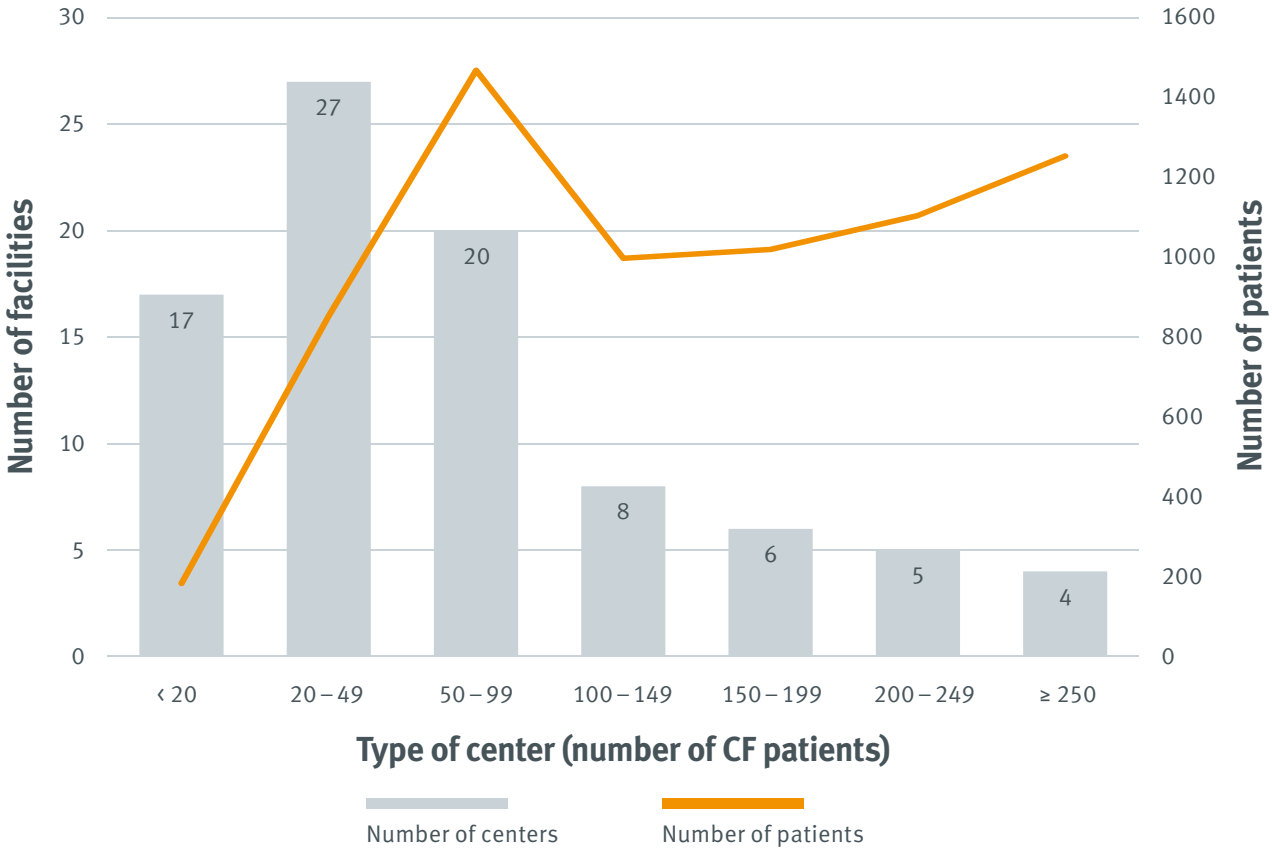

Fig. 24: Number of documented Cystic Fibrosis patients and number of centers 2019

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Structure of care

11b. Outpatient care

All patients with annual data in 2019 (n=6463) were included in the following evaluations.

	0 – 5 years	6 – 11 years	12 – 17 years	18 – 29 years	30 – 39 years	≥ 40 years	Total
Physiotherapy *in the outpatient clinic*	64,2	67,2	67,9	49,8	40,5	39,0	53,8
Nutritional therapy *in the outpatient clinic*	59,1	48,4	45,3	27,1	21,7	20,9	35,3
Psychosocial support *in the outpatient clinic*	47,4	46,0	50,5	37,3	26,2	25,6	38,3
Anxiety and depression screening	–	–	18,7	26,8	23,6	22,4	23,6[1]
Imaging							
Thorax	50,6	58,1	58,0	55,2	48,8	51,3	53,8
Abdomen	63,2	63,6	63,4	46,4	45,8	45,8	53,3
Bone density measurement	0,1	0,7	2,8	9,5	11,1	16,7	7,2
Laboratory	87,4	90,0	92,4	93,8	94,9	94,4	92,5
Rehabilitation stay	5,7	10,3	9,4	5,7	7,8	10,3	7,8
oGT-test *for patients without diabetes mellitus*	–	13,1	41,1	31,8	30,0	23,6	23,8[2]

Table 26: Cystic Fibrosis patients with outpatient care (frequencies in %) 2019; [1] with respect to Cystic Fibrosis patients 12 years and older; [2] with respect to Cystic Fibrosis patients 6 years and older

Structure of care

11c. CF-relevant hospitalisations

Age (years)	Number of CF-relevant hospitalisations per patient						
	0	1	2	3	4	5+	unknown
0 – 5	67,7	18,8	4,9	2,3	0,6	0,2	5,6
6 – 11	68,6	15,6	5,1	2,0	0,3	0,8	7,5
12 – 17	58,5	17,1	7,2	3,8	2,4	1,8	9,2
18 – 29	57,5	19,2	6,9	4,9	2,1	2,7	6,7
30 – 39	66,4	18,5	7,3	4,2	1,7	1,0	1,0
≥ 40	67,6	19,2	7,2	2,7	1,8	1,2	0,2
Total	63,4	18,2	6,5	3,6	1,6	1,5	5,2
< 18	64,8	17,2	5,8	2,7	1,1	1,0	7,5
≥ 18	62,4	19,0	7,1	4,2	1,9	1,9	3,6

Table 27: Number of CF-relevant hospitalisations per patient (frequencies in %) 2019

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Overview of Registry requests

Receipt	Applicant	Institution	Subject / Title	Status
2017	Dittrich	University of Heidelberg	Referenzperzentilen für FEV1 und BMI in Cystic Fibrosis	Waiting list
2017	Schwarz	Charité Medical University Berlin	Art4Fun / diseases associated with mould	Completed – Published
2017	Prinz	University of Ulm	Cystic Fibrosis and glucose tolerance	Completed – Published
2017	Grehn	Charité Medical University Berlin	Arthropathy in patients with Cystic Fibrosis	Under evaluation
2017	Chiesi Farmaceutici S.p.A	–	Chiesi Quinsair PASS	Ongoing
2018	Ballmann	Clinic for Children and Adolescents Rostock University Medical Center	Diabetes special evaluation	Completed
2018	Hogardt	Frankfurt University Hospital	Prevalence of the B. cepacia complex in CF patients	Completed – Published (MIQ)
2018	Vertex Pharmaceuticals	–	TEZ / IVA PASS	Study in progress
2019	Steindor / Ringshausen	Essen University Hospital / Hanover Medical School	NTM in CF patients in Germany	Under preparation
2019	Moos-Thiele	Mukoviszidose e. V.	Control group from the Registry for verification of the representation of the Muko.fit group	Under preparation
2019	Hebestreit	Würzburg University Clinic	Control group from the Registry for verification of the representation of the VEMSE population	Under evaluation
2019	Nährig / Schulte-Hubbert	University of Munich Medical Centre / Dresden University Hospital	Data analysis for antibiotic inhalation therapy in CF patients with chron. Pseudomonas infection	Under evaluation
2019	Stanke	Hanover Medical School	Genetic predictors for severe CF in European twins and siblings	Under preparation
2019	Hogardt	Frankfurt University Hospital	Molecular epidemiology of Mycobacterium abscessus in CF patients from Germany	Under preparation
2020	Verte Pharmaceuticals (Germany) GmbH	–	Clinical benefit dossier assessment of triple therapy	Completed
2020	Eickmeier	Frankfurt University Hospital	Patient science for the research of rare diseases – a civic science study taking Cystic Fibrosis as an example	Under preparation
2020	Müller	University of Siegen	Influence of hormonal contraceptives on pneumonias in CF patients	Under preparation
2020	Vertex Pharmaceuticals (Germany) GmbH	–	Clinical benefit dossier assessment of triple therapy – indication extension	Under evaluation
2020	Vertex Pharmaceuticals	–	Triple Therapie PASS Vertex	Under preparation

Glossary

Term	Definition
ABPA Allergic bronchopulmonary aspergillosis	Development of an allergic reaction to *Aspergillus fumigatus*.
Anticholinergics	An anticholinergic has a relaxing effect on the smooth musculature and inhibits secretion.
Arthritis	A condition which causes pain and inflammation in the joints.
Arthropathy	A condition which causes pain in the joints.
Pancreas	An organ in the digestive system which produces insulin and digestive enzymes.
ß2-sympathomimetics	Betasympathomimetics are pharmaceutical substances which stimulate the beta receptors of the sympathetic nervous system.
BMI (Body Mass Index)	A measure for evaluating a person's body weight in relation to their height.
Burkholderia cepacia	Burkholderia cepacia is a species of bacterium in the Burkholderia genus. Several of these bacteria are a potential threat to the health of people with Cystic Fibrosis.
CF (Cystic fibrosis)	Mucoviscidosis; Cystic Fibrosis
CFTR Regulator of the transmembrane conductance in Cystic Fibrosis	A protein on the cell surface which controls the sodium and water balance of a cell. The gene which causes Cystic Fibrosis is the blueprint for the CFTR protein. Every person has two copies of the gene for CFTR. Both CFTR genes must be affected by a mutation which causes CF, in order for someone to be born with Cystic Fibrosis.
Enzymes	Biological molecules present in the body (i.e. molecules occurring as metabolic products in the living cell) which support complex reactions such as the digestion of food.
FEV1 one-second capacity	The one-second capacity is the largest-possible quantity of air which can be forced out of the lungs within 1 second. The FEV1 value is part of the pulmonary function and can be measured in a pulmonary function test.
FEV1% predicted	The FEV1% is the percentage value of the average FEV1 which healthy people of the same age, gender and height can achieve. It is normally between 80 – 120%.
Gastroesophageal reflux disease	A chronic symptom of damage caused by gastric acid rising from the gastric mucosa.
Genotype	A characteristic part of the genetic structure of a cell, an organism or an individual.
Haemophilus influenza	Haemophilus influenza is a bacterium which can cause severe illness.
Haemoptysis	Coughing up blood.
Hepatobiliary disease	A liver or biliary disease.

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Term	Definition
Heterozygous	Everyone living with Cystic Fibrosis has two mutations of the gene for CFTR. One mutation is inherited from the mother and one from the father. If both mutations (or genotypes) are different, the person is heterozygous.
Homozygous	Everyone living with Cystic Fibrosis has two mutations of the gene for CFTR. One mutation is inherited from the mother and one from the father. If both mutations (or genotypes) are the same, the person is homozygous.
Interquartile range	The interquartile range is a measure of dispersion in descriptive statistics. If the sample is sorted by size, it indicates the width of the interval in which the mean 50% of the sample elements lie. It shows the difference between the upper and lower quartile: IQR = Q3 - Q1.
Confidence interval	An expectancy range to express how confident we are about our statistical estimates of a clinical measure. It shows a series of results which are likely to include the correct values for the population under study. A narrow confidence interval indicates a more accurate estimate. A wide confidence interval indicates greater uncertainty about the exact value of the measurement, often because only a small group of patients was studied.
Digestive tract / Gastrointestinal tract (GI)	The gastrointestinal tract (GI) is the main part of the digestive system which extends from the oesophagus to the anus. The GI is an organ system responsible for digesting food, absorbing nutrients and excreting faeces.
Median	The middle number when all numbers are arranged from the smallest to the largest number.
Median survival prognosis	A mathematical formula which can be used to predict the age which half the people born with CF today will reach. For example: 50 % of the people born today will reach the age of at least 47. The other 50% of these people will probably die before they reach this age.
Mean value	An average value calculated by adding up all the values and dividing by the number of values.
Average age at death	The average age at death is based on the people with CF who died in one year.
MRSA	Methicillin-resistant Staphylococcus aureus is a bacterial species which is resistant to a series of widely-used antibiotics.
Mutation	A mutation is an alteration to a gene. If both parents of a child are carriers of a mutation which causes Cystic Fibrosis , there is a 25% chance that the child will have CF. There are over 1,400 different mutations of the CFTR gene.
Hepatobiliary disease	Small sacciform growths caused by chronic inflammation of the nasal mucosa.

Term	Definition
Newborn screening	Newborn screening is an examination of newborns which aims to detect congenital diseases at an early stage, e.g. Cystic Fibrosis.
Non-tuberculous mycobacteria (NTM)	A mycobacterium which does not cause tuberculosis but can still be the cause of respiratory tract infections. Several types are known.
Osteopenia	A disease which is less severe than osteoporosis and in which the mineral content of bones is reduced.
Osteoporosis	A condition in which the bones become brittle due to the loss of tissue.
Percentile	A percentile indicates where a value is relative to the rest of the data. If a value is higher than 90% of the rest of the data, it is referred to as the 90th percentile.
Pneumothorax	An accumulation of air in the cavity between the lung and the chest wall which can cause a pulmonary collapse on the affected side.
Prevalence	The total number of people with this disease in the last 12 months.
Pseudomonas aeruginosa	A strain of bacteria which rarely affects healthy people but can lead to a variety of infections in a weakened immune system. These infections often become chronic.
Liver cirrhosis	A chronic liver disease.

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