ECFSPR 2021 Annual Data Report

European Cystic Fibrosis Society
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Message from ECFSPR Director

We are proud to present the 2021 Annual Report from the European Cystic Fibrosis Society Patient Registry (ECFSPR). With its vibrant new design and expanded and updated content, it reflects the importance and richness of the resource at our disposal, and we warmly invite you to read the report and use the data. The new look introduced here has been adopted by both the ECFSPR and the ECFS Clinical Trials Network (CTN) (differentiated by their own recognisable colour schemes) and will also be introduced to other ECFS projects and working groups.

For the first time since the inception of the Registry, the Annual Report includes longitudinal data analyses on the more important variables such as lung function, microbiology, and drug utilisation in Europe. The results reflect the improved state of health in people with cystic fibrosis (pwCF) in Europe since the introduction of CFTR modulators and strengthens the hope of the CF community that such a highly efficient therapy will be available for all people with CF one day.

Geographical coverage has been further increased in 2021 through the tremendous efforts of our partners and stakeholders; 40 countries and 54,043 consenting people with CF are now participating in the ECFSPR. The epidemiological data are provided by national CF registries and individual CF centres throughout Europe and neighbouring countries. For more than 10 years the ECFSPR has been collaborating closely with these centres and national registries to ensure that the data are as complete and high quality as possible. Improving data quality has been our constant focus, and not only because we need to provide a reliable and comprehensive picture of clinical outcomes in CF across Europe, but also because the CF community is now represented, through these data, in registry-based pharmacovigilance studies. The first and extremely interesting results of these large Europe-wide, real world evidence projects will be presented at the ECFS Annual Congress in Vienna in June 2023.

Our continuous collaboration with CF Europe and the national patient organisations guarantees that registry data are used to benefit the community and we are grateful to all the people with CF, and their families, throughout Europe, and beyond, for their willingness to participate in the European CF Patient Registry.

I would like to thank the ECFSPR staff, the Executive and Scientific Committees, and all the people who contribute voluntarily to our working groups and the numerous projects undertaken by the Registry, as well as our sponsors, our software partner and all the supporters who provide services and financial aid to make the ECFSPR possible and sustainable.

Sincerely,

Andreas Jung,

ECFSPR Director

To the people with cystic fibrosis

This report is about you and how cystic fibrosis (CF) affects you and other people all over Europe. The report is based on information collected by individual CF centres and the national CF registries that participate in the European Cystic Fibrosis Society Patient Registry (ECFSPR). We have tried to make the presentation of this data as clear as possible and hope that you will find the report interesting and easy to understand.

With each ECFSPR Annual Report we publish a separate At-a-Glance report containing key information from the report, specifically for the people with CF and their families, and anyone wishing to know a little more about the disease: www.ecfs.eu/projects/ecfs-patient-registry/annual-reports. Interactive maps with country-specific information are available on the homepage of our website: www.ecfs.eu/ecfspr.

We continue to develop country posters with information and basic statistics from the Registry for display in CF centres. The posters are published online at www.ecfs.eu/ecfspr/posters. The data in the posters will be regularly updated.

News, updates, and other interesting information are regularly posted on social media. Find us on:

- Facebook www.facebook.com/EuropeanCysticFibrosisPatientRegistry/,
- Twitter @ECFSRegistry,
- Instagram www.instagram.com/ecfspr/,
- LinkedIn www.linkedin.com/company/84849296/admin/.

We will continue to work with patient organisations on increasing awareness of the Registry among people with CF and their families. If you have suggestions on how we can improve or if anything is unclear, you are welcome to contact us by email at ecfs-pr@uzleuven.be.

To discuss the results from your country presented in this report we encourage you to contact your CF centre. For more information about the Registry please visit the patient-dedicated page on our website www.ecfs.eu/projects/ecfs-patient-registry/information-about-ecfspr-cf-patients.

Information on how we handle your data and how you can exercise your rights is available in the Privacy Notice www.ecfs.eu/sites/default/files/general-content-files/working-groups/ecfs-patient-registry/Privacy%20notice_Update_ECFSPR_vs%205_0.pdf.

Introduction

The European Cystic Fibrosis Society Patient Registry (ECFSPR)

The ECFSPR collects demographic and clinical data of consenting people with cystic fibrosis from Europe and neighbouring countries. Data is collected using a common set of variables and definitions, and is sent to the ECFSPR in one of the following ways:

National CF registries (or individual centres with local databases) extract data from their own database and import the data into the secure, online ECFSPR data-collection software.

Individual centres enter data directly into the ECFSPR software.

Collection of data at a local level must be approved by local data protection authorities in accordance with European data protection legislation. Data stored in the central database is pseudonymised, and only year/ month of birth and randomised centre and patient codes are used as identifiers.

Data is available for scientific purposes on application. All requests are reviewed by the ECFSPR Scientific Committee, and, based on their recommendation, the country coordinators in the Steering Group (composed of national representatives of the countries that contribute data to the ECFSPR) decide if the data from their country can be used for a request; this decision is final. Requests originating from Industry are also reviewed by the ECFS Clinical Trials Network. All applications must meet the European and individual country data protection legislation regarding patient anonymity.

For more information, please visit our website www.ecfs.eu/ecfspr.

General Considerations

It is possible that some national registries use data definitions and parameters that do not fully correspond to those employed by the ECFSPR, either because some types of information are not collected, or they are collected by the national registry using a different method. When the national registries upload their data they are asked to state whether their variable definitions meet those of the ECFSPR or not. Where major discrepancies between the definitions occur, those variables have been omitted from the annual report for that country; in the case of minor discrepancies an explanatory footnote has been added to the graphs and tables. For example, the ECFSPR collects information on chronic Pseudomonas aeruginosa infection according to the modified Leeds criteria, and/or the presence of elevated anti-Pseudomonas antibodies (see Appendix 3, page 152). If a country defines chronic Pseudomonas aeruginosa as “the presence of more than four positive cultures in 6 months”, the data of this variable would be included in the annual report since the definition is much closer to the ECFSPR definition and a footnote would be added to the relevant tables and graphs.

If a country does not collect a certain variable, we have omitted that country from the relevant graphs in the report; all of the data, however, is presented in the tables. The same applies for countries where the information for a variable is missing for more than 10% of the people with CF. The countries with less than 5 individuals in an age group (e.g. less than 5 adults) are excluded from both the graphs and the tables. The number of missing values is important when interpreting the results, since it is impossible to know if a person with CF with a missing value for a given complication has this complication or not, meaning given frequencies are less accurate. For example, in a country where 7% of the people with CF have liver disease but for 20% the information on liver disease is unknown/missing, the true frequency of liver disease will be anything between 7 and 27%.

You will find some differences between the findings of the national registries’ own reports and the ECFSPR report. This is because some variable values are recoded or computed in different ways. For example, some national registries compute the age of the individual at the date of the annual visit and consider 16 years as the cut-off for adult age. The ECFSPR computes the age at FEV1/height/weight measurement and the age at follow-up (the end of the year) and

considers 18 years as the cut-off for adult age. Another example: for lung function values such as FEV1 the raw data values, reported in litres, are not informative unless they are expressed in relation to the age, sex, and height of the individual. We therefore needed to transform the raw values into new variables in order to compare lung function between people with CF in different countries. We used common reference populations for all data when calculating the values as a percentage of predicted from the raw data. Slightly different values can be obtained when using another reference population on the same raw data. It is important to use a common method of calculation when comparing different countries, just as the national registries choose a common method of calculation when they compare the individual centres in that country.

The estimated coverage, i.e. the percentage of people with CF included in the national registry or national data presented by the country, varies; see table 1.1, page 11. These differences can influence how the data is interpreted, and we therefore advise comparisons to be made only between countries with similar coverage.

The date of the database that is used to create the tables and graphs in this report is 30 March 2023.

Summary of data report

Outcome		Females		Males		Total	
PwCF registered in the ECFSPR	n (%)	25765	(47.7)	28278	(52.3)	54043	(100)
Age at follow-up (years) (pwCF alive on 31/12/2021)	median (25^{th} pctl-75^{th} pctl)	19.2	(10.0-31.4)	20.3	(10.4-32.8)	19.8	(10.1-32.1)
Patients ≥ 18 years (pwCF alive on 31/12/2021)	n (%)	13500	(52.8)	15486	(55.1)	28986	(54.0)
Age at diagnosis (months)*	Median (25^{th} pctl-75^{th} pctl)	3.6	(1.2-31.9)	3.6	(1.2-30.0)	3.6	(1.2-31.1)
PwCF with at least one F508del allele recorded*	n (%)	19495	(80.3)	21334	(80.3)	40829	(80.3)
PwCF living with lung transplant**	n (%)	1463	(6.0)	1406	(5.3)	2869	(5.6)
PwCF living with liver transplant**	n (%)	108	(0.4)	230	(0.9)	338	(0.7)
PwCF deceased in 2021***	n (%)	175	(0.7)	171	(0.6)	346	(0.7)
Age at death (years)***	median (25^{th} pctl-75^{th} pctl)	34.0	(25.0-44.0)	32.0	(21.0-43.0)	33.0	(22.0-44.0)

* Only people with CF seen during the year by clinical staff. The total number presented is 51,168.
** Only people with CF alive at 31/12/2021. The total number of the CF population presented is 50,852.
*** Only people with CF seen during the year. For the United Kingdom, all individuals with a confirmed diagnosis of CF were included (N=10,907). The total number presented is 51,901.

Data report

1. Demographics

The ECFSPR has continuously been increasing its coverage during the recent years. Only few countries in Europe had not contributed to the ECFSPR in 2021, and we are in constant talks with the remaining countries to welcome them to the European registry. In some countries, still not all people with CF have joined the ECFSPR. We are inviting all CF centres to participate in the registry, and we are confident that, over the next years, several more centres will be joining. The National Coordinators that have been appointed by their country are involved in this process and support their centres in becoming a new ECFSPR member.

National registries as well as countries with centres that directly enter their data in our data collection software called ECFSTracker contribute to the ECFSPR. This chapter gives information on coverage as well as on age and sex distribution in Europe and in the participating countries. In countries with a lower coverage, age distribution and mean age of the people with CF might be skewed if not all CF centres for children and adults have already joined the data collection. For details, please refer to the information given in the footnotes of the tables and graphs.

1. Demographics

Figure 1.1 Map of countries that contributed data to the ECFSPR for the year 2021.

Marked in turquoise are the countries that contributed 2021 data.

1. Demographics

Table 1.1 Number of people with CF in year 2021, by country.

Country	People with CF registered, not lost to follow-up	People with CF seen	Estimated coverage
Albania	121	84	>80%
Armenia	26	24	>70%
Austria	877	864	>90%
Belarus*	148	148	90%
Belgium*	1387	1371	>90%
Bulgaria	208	203	87%
Croatia**	148	140	>95%
Cyprus	34	28	>80%
Czech Republic*	681	661	99%
Denmark*	561	541	99%
Finland	97	96	90%
France*	7136	7136	>90%
Georgia	92	88	>80%
Germany*	6789	6784	80%
Greece*	618	572	80%
Hungary*	508	459	98%
Iceland	14	14	>90%
Ireland*	1325	1294	89%
Israel**	584	522	>95%
Italy*	5994	5977	98%
Latvia	47	45	>90%
Lithuania	41	40	70%
Luxembourg[1]	28	23	60%
Rep of Moldova	56	49	>90%
The Netherlands*	1596	1580	95%
North Macedonia	147	130	>90%
Norway*	344	341	85%
Poland	1430	1313	84%
Portugal**	366	352	>95%
Romania	268	248	54%
Russian Federation*	3844	2541	88%
Serbia	228	194	>90%
Slovak Republic**	295	265	>90%
Slovenia	118	116	>95%
Spain	2532	2401	83%
Sweden*	765	731	>95%
Switzerland**	1047	1036	>99%
Turkey	2385	2370	>60%
Ukraine	251	213	23%
United Kingdom[2]*	10907	10174	99%
Total	54043	51168	

* Countries with an established national CF registry.
** These countries are defined as a national registry since all centres in the country participate in the ECFSPR.
Note: Luxembourg: An adult centre didn't provide data for year 2021.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

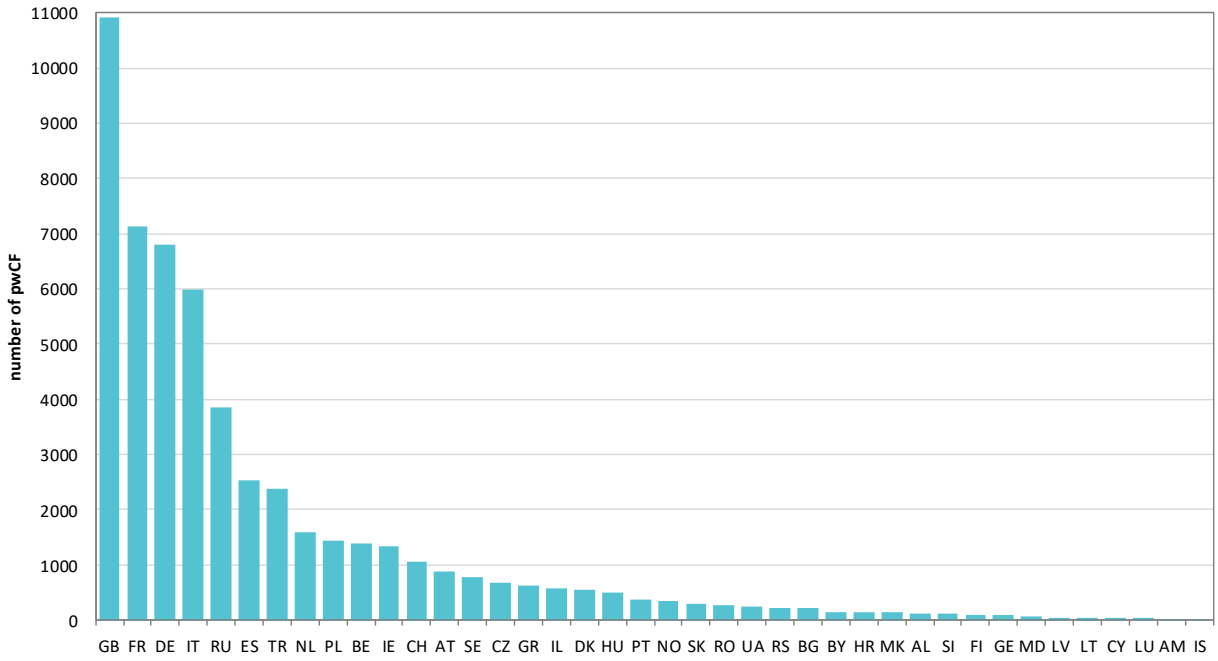
The column "People with CF registered, not lost to follow-up" displays the individuals with CF that attend centres and those who were not seen by clinical staff during the year but are known to be alive that year.

The column "People with CF seen" presents only the individuals with CF who have attended the clinic during the year. The column "Estimated coverage 2021" shows the estimated percentage of people with CF living in that country who are included in the national registry / national data collection as reported by the country. Some countries may have one individual centre that includes almost all people with CF, such as Latvia and Serbia.

1. Demographics

Figure 1.2 The number of people with CF registered in the ECFSPR varies across countries and continues to grow.

Number of people with CF registered in the ECFSR in 2021.



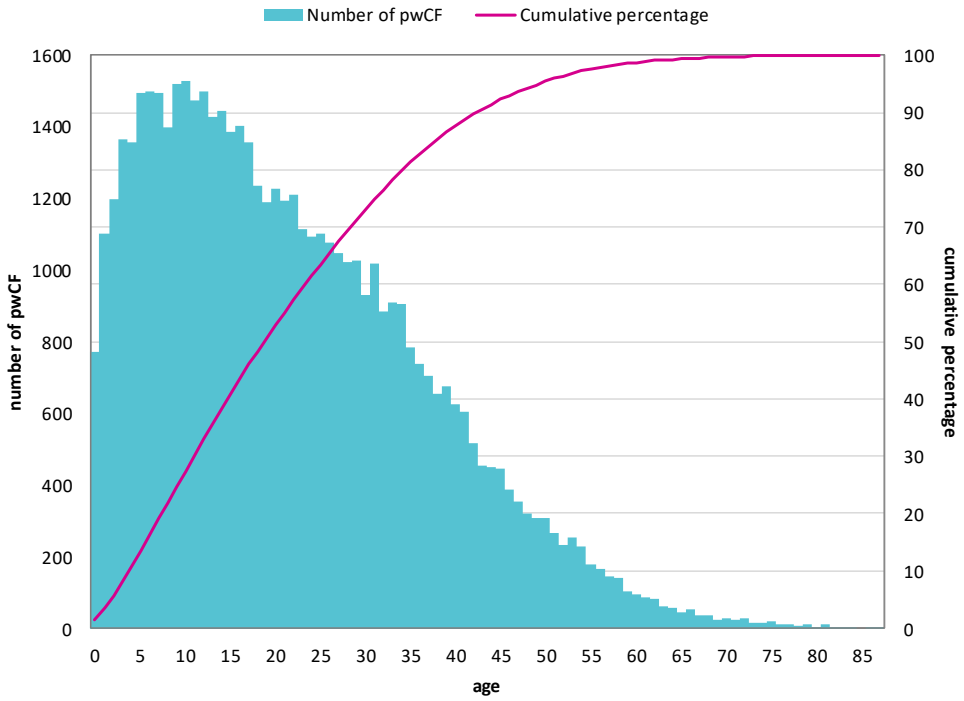
Each vertical bar shows the number of registered people with CF (excluding lost to follow-up) living in that country in 2021. Please refer to table 1.1 for the coverage in each country.

Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

1. Demographics

Figure 1.3 *Age distribution demonstrates a sharp decline from the third decade of life.*

Age at follow-up distribution. People with CF alive on 31/12/2021.

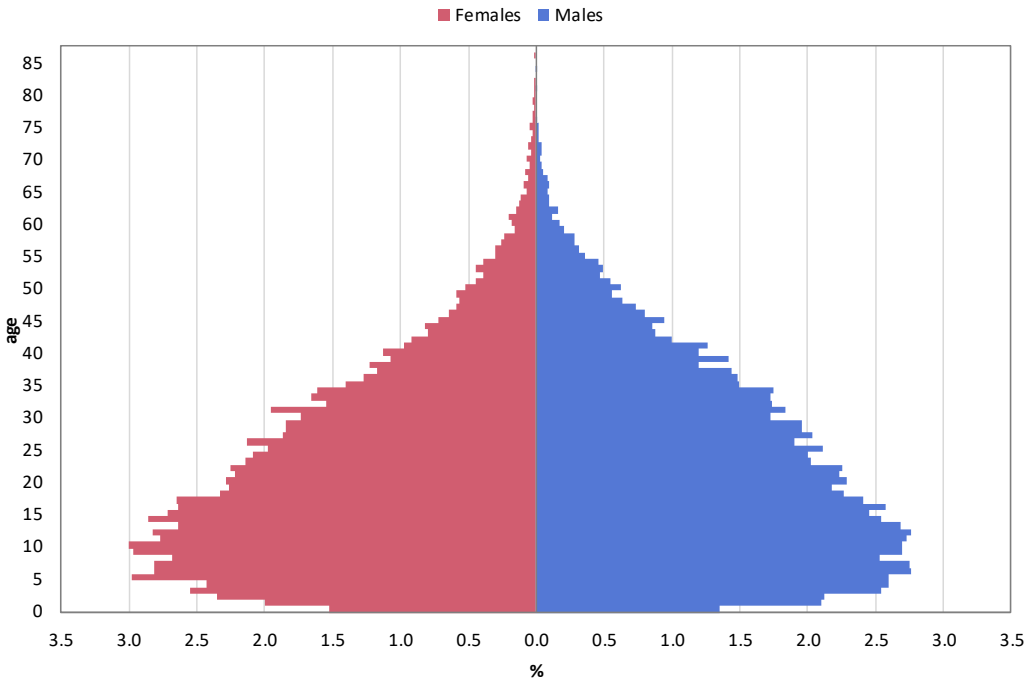


Each vertical bar shows the number of people with CF of that age alive in 2021. The cumulative percentage (the pink line) describes how many people with CF (as a percentage) are below a certain age (e.g. 50% of the people with CF are younger than 19 years of age).

1. Demographics

Figure 1.4 *Age distribution is remarkably skewed towards childhood and adolescence in CF.*

Distribution of age at follow up by sex.



The pyramid shows the percentage of people with CF of different ages as horizontal bars. The right side of the pyramid (blue) shows, how many males with CF (as a percentage) are of a certain age, and the left side (red) shows the same for females. The lower percentage of children with CF at the bottom of the pyramid is a result of the fact that some children have not yet been diagnosed. In 2021 the mean age at diagnosis is 0.8 years (see table 2.1).

1. Demographics

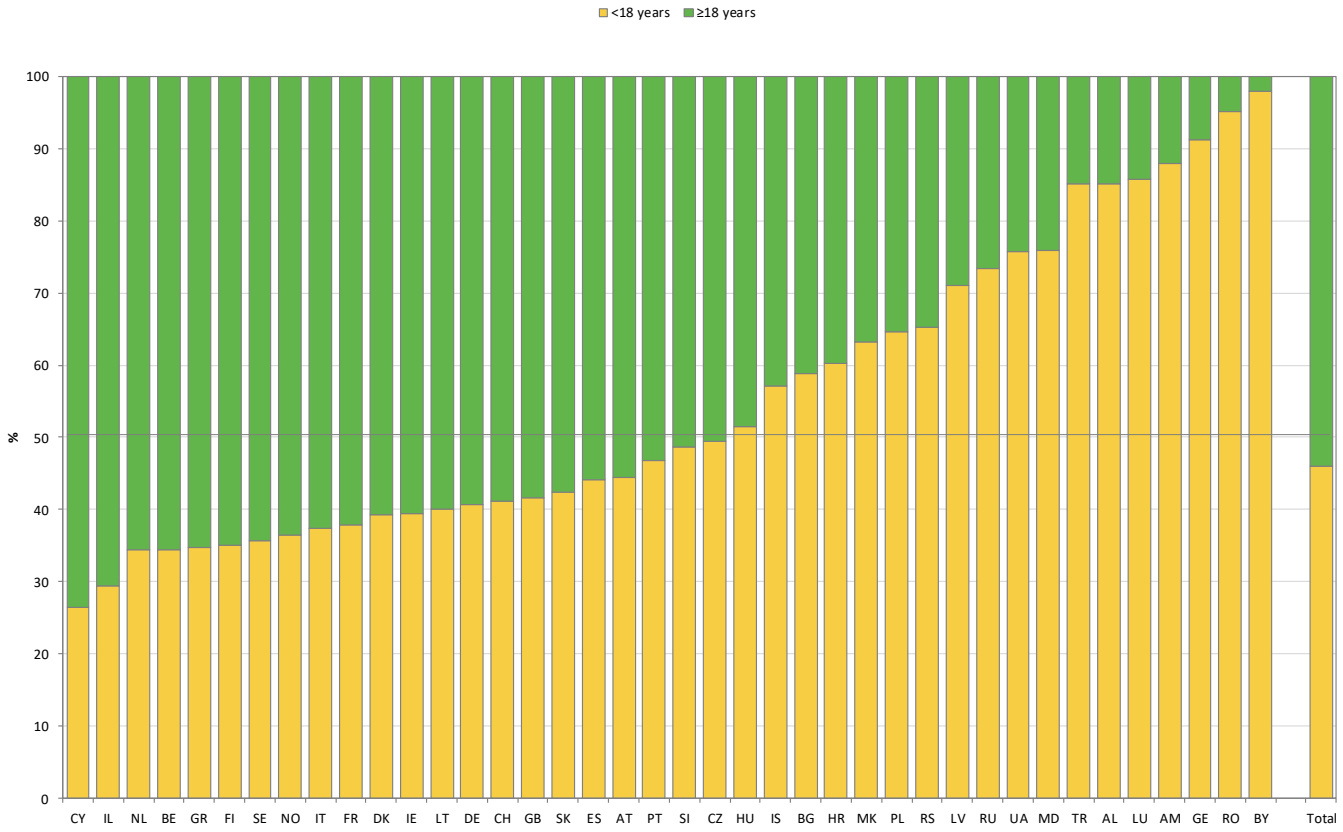
Table 1.2 Proportion of children (<18 years) and adults (≥18 years), by country and overall. People with CF alive on 31/12/2021.

Country	Children (<18 years)		Adults (≥18 years)	
	Number	%	Number	%
Albania	103	85.1	18	14.9
Armenia	22	88.0	3	12.0
Austria	387	44.4	485	55.6
Belarus	145	98.0	3	2.0
Belgium	473	34.4	903	65.6
Bulgaria	119	58.9	83	41.1
Croatia	88	60.3	58	39.7
Cyprus	9	26.5	25	73.5
Czech Republic	334	49.5	341	50.5
Denmark	218	39.3	337	60.7
Finland	34	35.0	63	64.9
France	2685	37.8	4410	62.2
Georgia	83	91.2	8	8.8
Germany	2750	40.7	4000	59.3
Greece	214	34.7	403	65.3
Hungary	257	51.4	243	48.6
Iceland	8	57.1	6	42.9
Ireland	519	39.5	796	60.5
Israel	171	29.3	412	70.7
Italy	2233	37.3	3746	62.6
Latvia	32	71.1	13	28.9
Lithuania	16	40.0	24	60.0
Luxembourg	24	85.7	4	14.3
Rep of Moldova	41	75.9	13	24.1
The Netherlands	544	34.4	1039	65.6
North Macedonia	93	63.3	54	36.7
Norway	125	36.4	218	63.6
Poland	915	64.6	502	35.4
Portugal	170	46.8	193	53.2
Romania	253	95.1	13	4.9
Russian Federation	2797	73.3	1017	26.7
Serbia	147	65.3	78	34.7
Slovak Republic	124	42.3	169	57.7
Slovenia	57	48.7	60	51.3
Spain	1111	44.1	1407	55.9
Sweden	271	35.6	490	64.4
Switzerland	428	41.1	614	58.9
Turkey	2006	85.1	352	14.9
Ukraine	187	75.7	60	24.3
United Kingdom	4518	41.7	6323	58.3
Total	24711	46.0	28986	54.0

1. Demographics

Figure 1.5 The proportion of adults with CF varies considerably between European countries.

Proportion of children and adults, by country and overall. People with CF alive on 31/12/2021.



Note: Luxembourg: An adult centre didn't provide data for year 2021.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

The yellow vertical bar shows the percentage of children with CF living in that country in 2021, the green vertical bar shows the percentage of adults with CF living in that country in 2021. Overall (see "Total") in the ECFSPR there are more adults than children.

1. Demographics

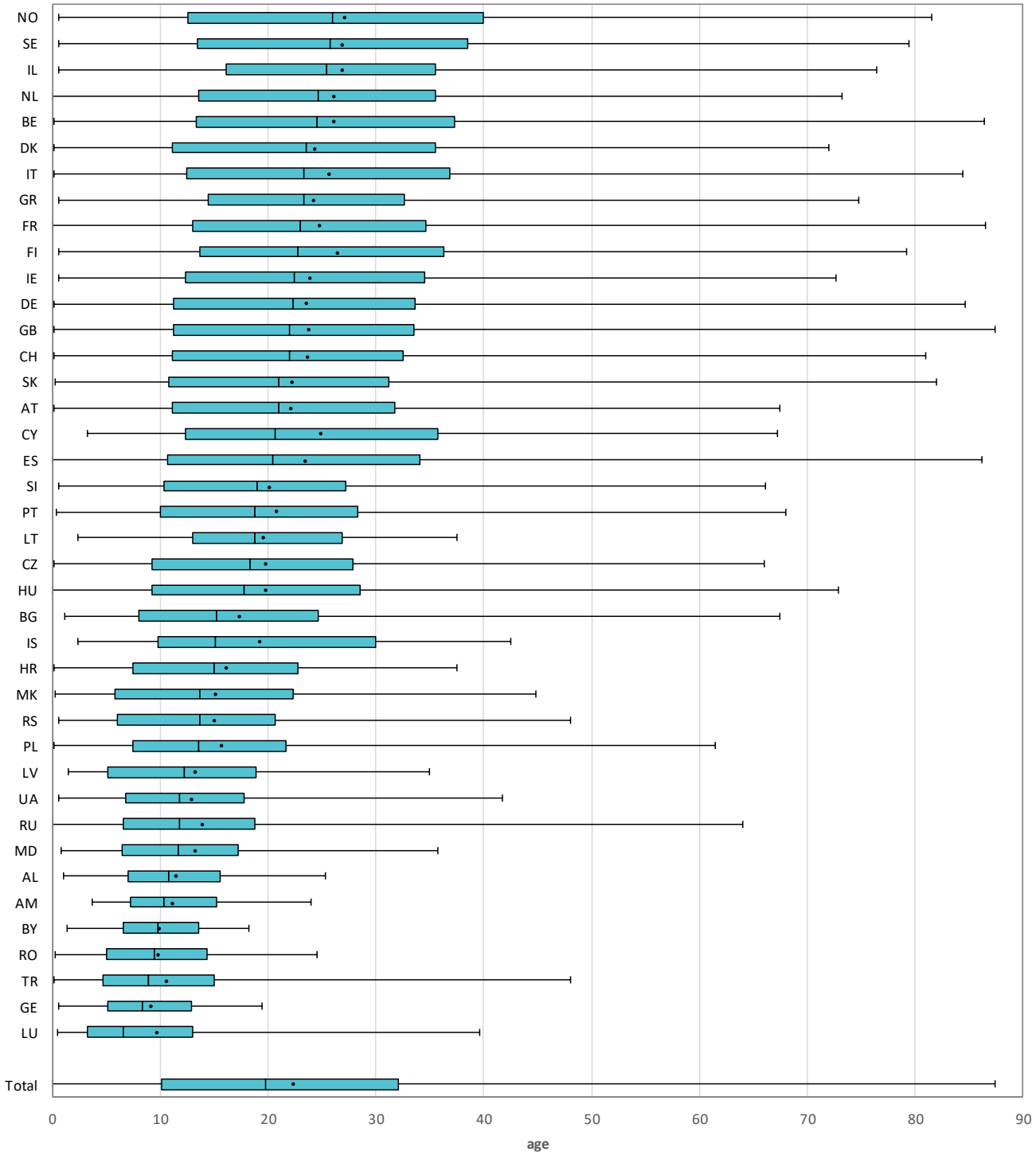
Table 1.3 Age at follow-up: descriptive statistics, by country and overall. People with CF alive on 31/12/2021.

Country	Number	Mean (average age)	Min (age of the youngest pwCF)	25th pctl (25% of the pwCF are younger than this age)	Median (half the pwCF are younger than this age)	75th pctl (75% of the pwCF are younger than this age)	Max (age of the oldest pwCF)
Albania	121	11.4	1.0	7.0	10.8	15.5	25.3
Armenia	25	11.1	3.7	7.2	10.3	15.2	24.0
Austria	872	22.1	0.1	11.1	21.0	31.7	67.5
Belarus	148	9.9	1.3	6.5	9.8	13.5	18.2
Belgium	1376	26.1	0.1	13.3	24.5	37.3	86.4
Bulgaria	202	17.3	1.1	8.0	15.2	24.6	67.5
Croatia	146	16.1	0.1	7.4	15.0	22.8	37.5
Cyprus	34	24.9	3.2	12.3	20.6	35.7	67.2
Czech Republic	675	19.7	0.1	9.2	18.3	27.9	66.0
Denmark	555	24.3	0.1	11.1	23.5	35.5	72.0
Finland	97	26.4	0.5	13.6	22.8	36.3	79.2
France	7095	24.7	0.0	13.0	23.0	34.6	86.6
Georgia	91	9.1	0.6	5.1	8.3	12.9	19.4
Germany	6750	23.5	0.1	11.2	22.3	33.6	84.7
Greece	617	24.2	0.5	14.4	23.3	32.6	74.8
Hungary	500	19.8	0.0	9.2	17.8	28.5	72.9
Iceland	14	19.2	2.3	9.8	15.1	30.0	42.5
Ireland	1315	23.9	0.6	12.3	22.4	34.5	72.7
Israel	583	26.8	0.6	16.1	25.4	35.5	76.5
Italy	5979	25.6	0.1	12.4	23.3	36.8	84.5
Latvia	45	13.2	1.4	5.1	12.2	18.9	35.0
Lithuania	40	19.5	2.3	13.0	18.8	26.8	37.5
Luxembourg	28	9.6	0.4	3.2	6.5	13.0	39.6
Rep of Moldova	54	13.2	0.8	6.4	11.6	17.2	35.7
The Netherlands	1583	26.1	0.0	13.5	24.6	35.5	73.2
North Macedonia	147	15.1	0.2	5.8	13.7	22.3	44.8
Norway	343	27.1	0.5	12.5	26.0	39.9	81.6
Poland	1417	15.6	0.1	7.4	13.5	21.6	61.5
Portugal	363	20.8	0.3	10.0	18.8	28.3	68.0
Romania	266	9.8	0.2	5.0	9.4	14.3	24.5
Russian Fed.	3814	13.9	0.0	6.6	11.8	18.7	64.0
Serbia	225	15.0	0.5	6.0	13.6	20.6	48.1
Slovak Republic	293	22.2	0.2	10.8	21.0	31.2	82.0
Slovenia	117	20.1	0.6	10.3	19.0	27.2	66.1
Spain	2518	23.4	0.0	10.7	20.4	34.1	86.2
Sweden	761	26.9	0.5	13.4	25.8	38.5	79.5
Switzerland	1042	23.6	0.1	11.1	22.0	32.5	81.0
Turkey	2358	10.5	0.1	4.7	8.9	15.0	48.0
Ukraine	247	12.9	0.5	6.8	11.8	17.8	41.7
United Kingdom	10841	23.7	0.1	11.2	22.0	33.5	87.4
Total	53697	22.3	0.0	10.1	19.8	32.1	87.4

1. Demographics

Figure 1.6 *The mean age of the CF population is not homogenous in Europe and depends on the country or region of residence.*

Age at follow-up: box-plot, by country and overall. People with CF alive on 31/12/2021.



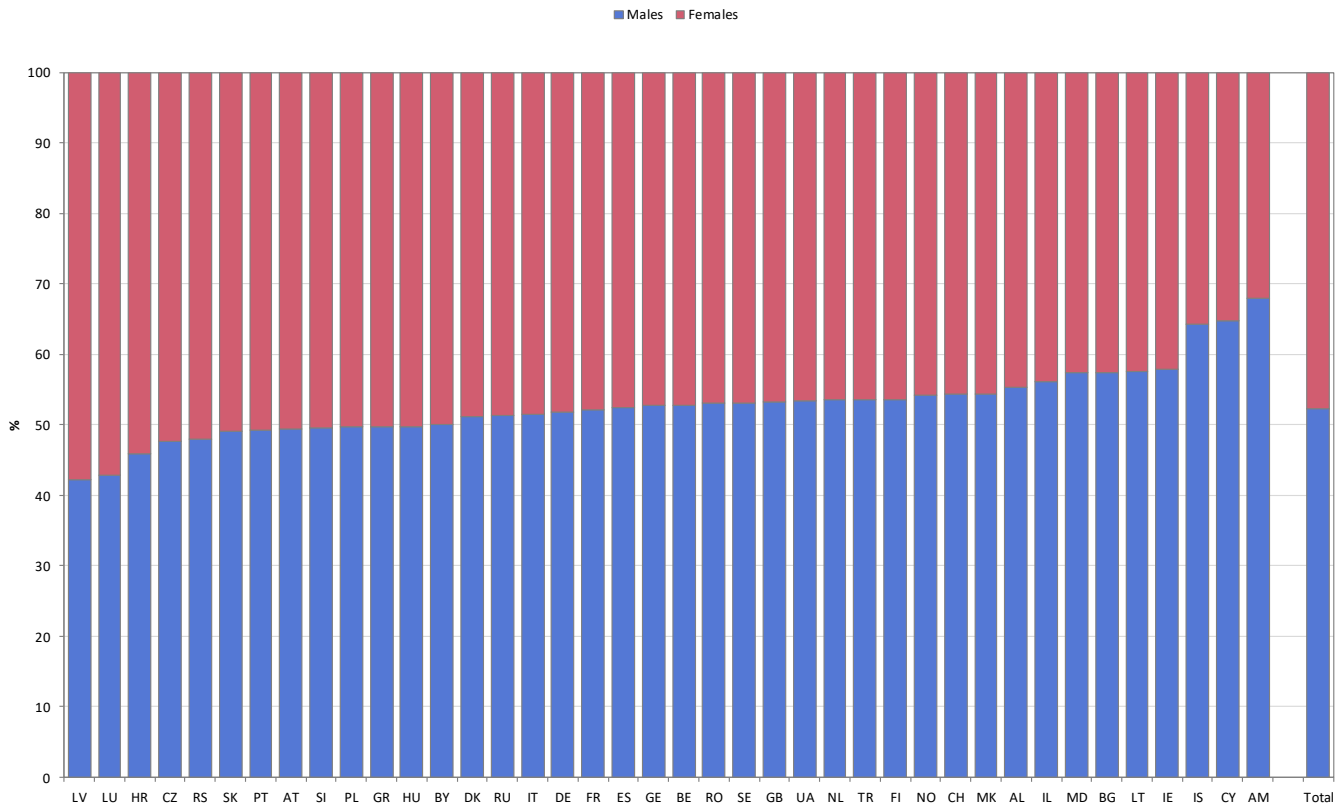
Note: Luxembourg: An adult centre didn't provide data for year 2021.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This box-plot is a graphic representation of the age at follow-up detailed in table 1.3. For each country the vertical borders of the box are the first and third quartile, the dash (vertical black line crossing the box) is the median, the black dot is the mean and the whiskers (lines with a T-shaped end) are the minimum and the maximum.

1. Demographics

Figure 1.7 *Sex distribution is comparatively homogenous throughout Europe except for a few countries.*

Sex distribution, by country and overall. People with CF alive on 31/12/2021.



Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

Sex distribution of the CF population. Overall (see "Total") in the ECFSPR there are slightly more males than females with CF.

2. Diagnosis

In the following tables and figures, the age at diagnosis and information on newborn screening are shown. Especially in children and adolescents, the age at diagnosis is strongly influenced by the presence or absence of a national CF newborn screening program. Information on the proportion of people with CF diagnosed by newborn screening per country is therefore depicted as well. In some cases, meconium ileus might trigger further investigations to exclude or diagnose CF, even though its prevalence differs considerably between the countries, as highlighted in a table below.

In this chapter and the following ones, only people with CF seen during the year are presented.

2. Diagnosis

Table 2.1 Age at diagnosis (in years): descriptive statistics, by country and overall. All children and adolescents (<18 years) seen in 2021.

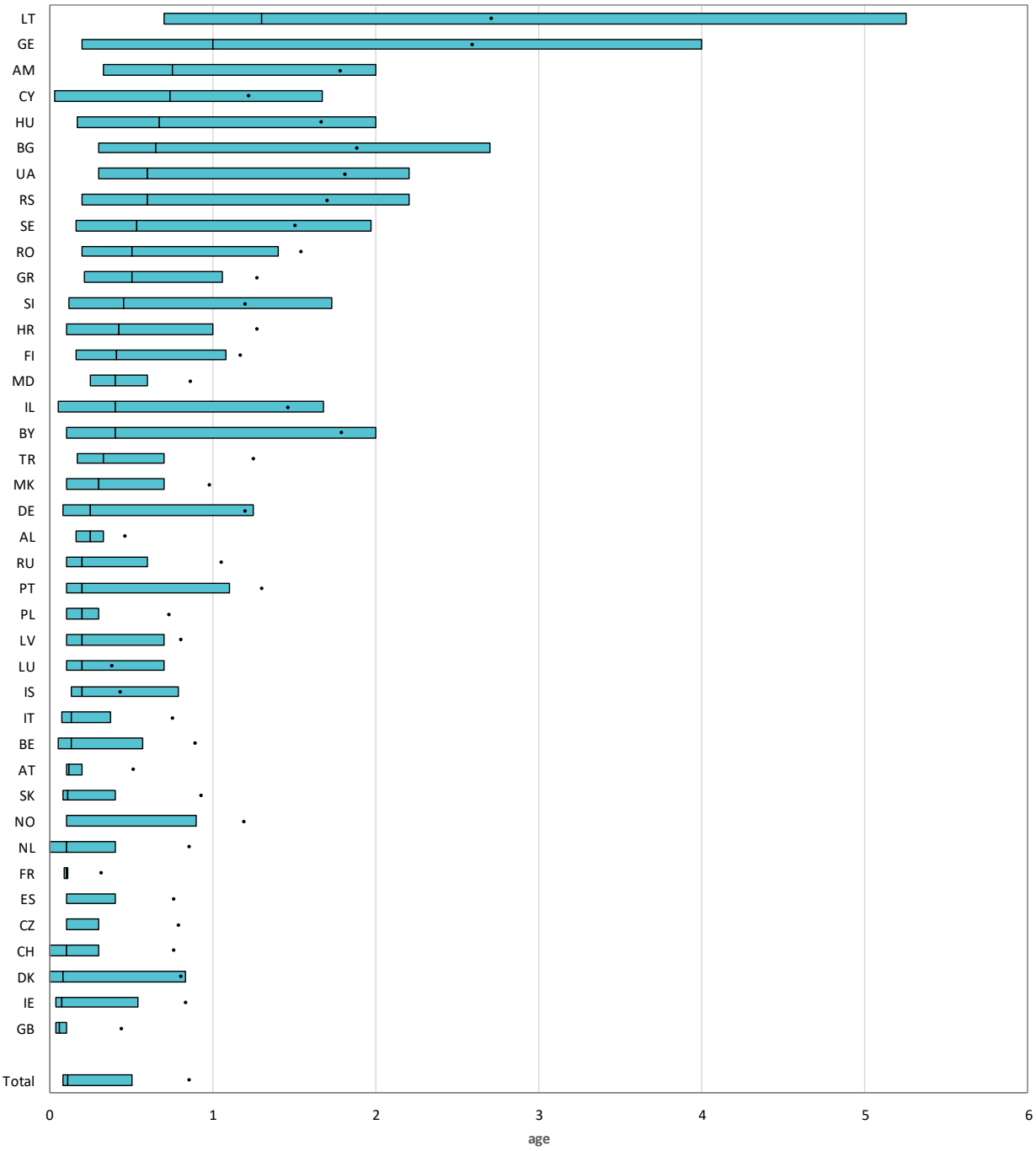
Country	Number	Number of missing	Mean (average age)	Min (age of the youngest patient)	25th pctl (25% of the patients are younger than this age)	Median (half the patients are younger than this age)	75th pctl (75% of the patients are younger than this age)	Max (age of the oldest patient)
Albania	80	0	0.5	0.0	0.2	0.2	0.3	4.0
Armenia	21	0	1.8	0.1	0.3	0.7	2.0	6.2
Austria	377	9	0.5	0.0	0.1	0.1	0.2	16.9
Belarus	145	0	1.8	0.0	0.1	0.4	2.0	15.0
Belgium	467	1	0.9	0.0	0.0	0.1	0.6	14.8
Bulgaria	112	3	1.9	0.0	0.3	0.6	2.7	17.4
Croatia	78	4	1.3	0.0	0.1	0.4	1.0	9.8
Cyprus	7	1	1.2	0.0	0.0	0.7	1.7	4.8
Czech Republic	328	1	0.8	0.0	0.1	0.1	0.3	16.6
Denmark	218	0	0.8	0.0	0.0	0.1	0.8	8.2
Finland	34	0	1.2	0.0	0.2	0.4	1.1	7.5
France	2663	22	0.3	0.0	0.1	0.1	0.1	15.7
Georgia	78	1	2.6	0.0	0.2	1.0	4.0	15.1
Germany	2688	60	1.2	0.0	0.1	0.2	1.2	17.1
Greece	193	21	1.3	0.0	0.2	0.5	1.1	17.6
Hungary	224	6	1.7	0.1	0.2	0.7	2.0	14.0
Iceland	8	0	0.4	0.0	0.1	0.2	0.8	1.2
Ireland	516	2	0.8	0.0	0.0	0.1	0.5	12.7
Israel	156	5	1.5	0.0	0.0	0.4	1.7	13.0
Italy	2185	43	0.7	0.0	0.1	0.1	0.4	15.5
Latvia	31	0	0.8	0.0	0.1	0.2	0.7	4.7
Lithuania	15	0	2.7	0.4	0.7	1.3	5.2	7.8
Luxembourg	19	0	0.4	0.0	0.1	0.2	0.7	1.4
Rep of Moldova	35	0	0.9	0.1	0.2	0.4	0.6	6.0
The Netherlands	533	5	0.8	0.0	0.0	0.1	0.4	16.5
North Macedonia	83	0	1.0	0.0	0.1	0.3	0.7	7.9
Norway	125	0	1.2	0.0	0.1	0.1	0.9	15.2
Poland	852	10	0.7	0.0	0.1	0.2	0.3	15.9
Portugal	164	5	1.3	0.0	0.1	0.2	1.1	13.6
Romania	227	9	1.5	0.0	0.2	0.5	1.4	12.0
Russian Fed.	2027	2	1.0	0.0	0.1	0.2	0.6	16.9
Serbia	126	0	1.7	0.0	0.2	0.6	2.2	15.8
Slovak Republic	97	23	0.9	0.0	0.1	0.1	0.4	17.4
Slovenia	56	0	1.2	0.0	0.1	0.4	1.7	5.6
Spain	1071	4	0.8	0.0	0.1	0.1	0.4	16.0
Sweden	267	3	1.5	0.0	0.2	0.5	2.0	12.8
Switzerland	405	19	0.8	0.0	0.0	0.1	0.3	17.0
Turkey	1994	0	1.2	0.0	0.2	0.3	0.7	16.1
Ukraine	161	2	1.8	0.0	0.3	0.6	2.2	12.0
United Kingdom	4210	1	0.4	0.0	0.0	0.1	0.1	15.7
Total	23076	262	0.8	0.0	0.1	0.1	0.5	17.6

Note: For Cyprus, Greece and the Slovak Republic the information on age at diagnosis is missing for more than 10% of the people with CF.

2. Diagnosis

Figure 2.1 *Age at diagnosis in children and adolescents depends on various factors, including availability of a newborn screening programme.*

Age at diagnosis (in years): boxplot, by country and overall. All children and adolescents (<18 yrs) seen in 2021.



Note: For Cyprus, Greece and the Slovak Republic the information on age at diagnosis is missing for more than 10% of the children.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This boxplot is a graphic representation of the age at diagnosis as detailed in table 2.1. For each country the vertical borders of the box are the first and third quartiles, the dash (vertical black line crossing the box) is the median, the black dot is the mean. The whiskers that are the minimum and the maximum values are not shown because the maximum values are really high for some countries and this would have shrunk the boxes at the left side of the graph.

2. Diagnosis

Table 2.2 Age at diagnosis (in years): descriptive statistics, by country and overall. All adults (≥18 years) seen in 2021.

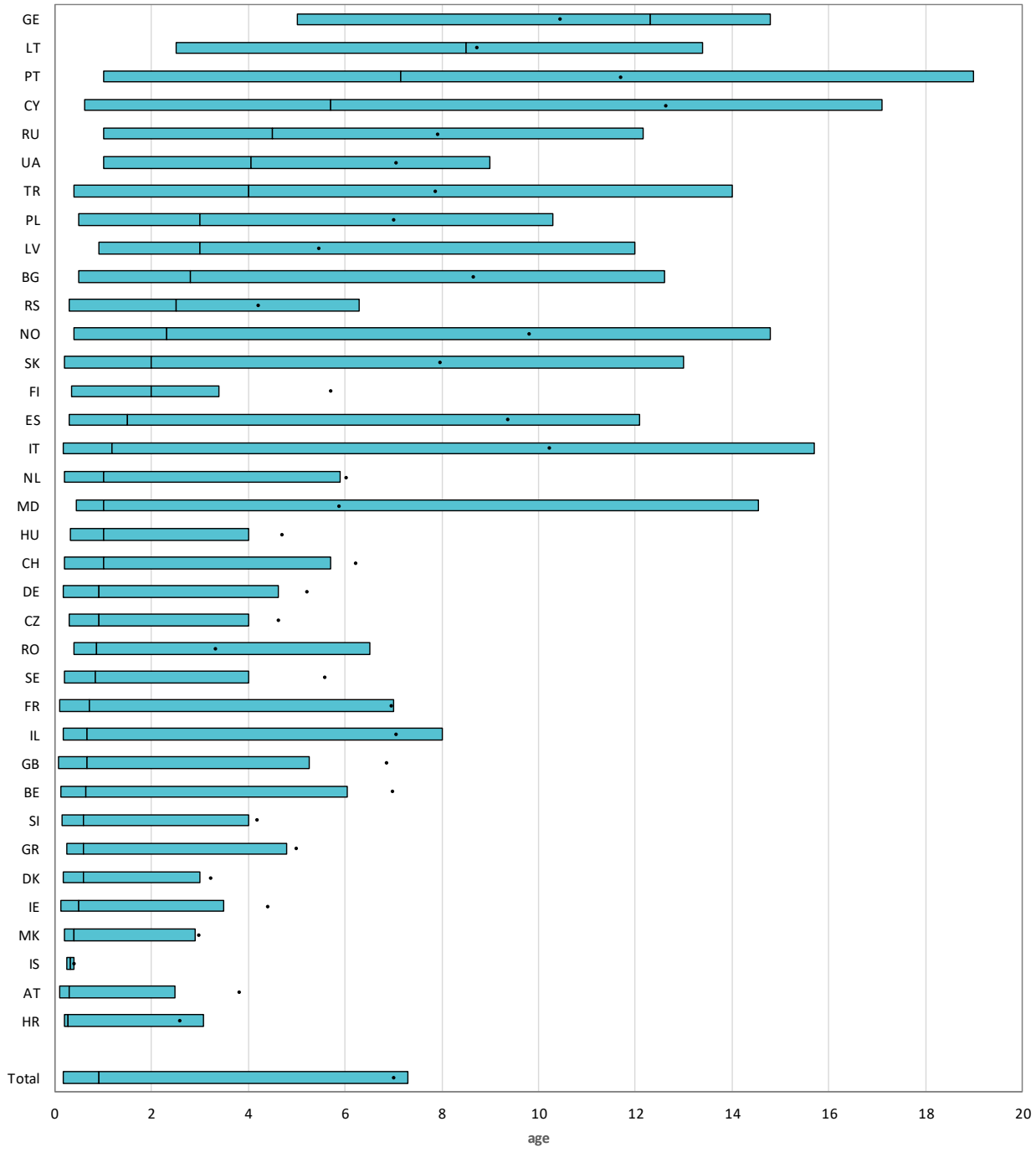
Country	Number	Number of missing	Mean (average age)	Min (age of the youngest pwCF)	25th pctl (25% of the pwCF are younger than this age)	Median (half the pwCF are younger than this age)	75th pctl (75% of the pwCF are younger than this age)	Max (age of the oldest pwCF)
Austria	409	64	3.8	0.0	0.1	0.3	2.5	58.6
Belgium	890	2	7.0	0.0	0.1	0.6	6.0	82.6
Bulgaria	81	1	8.7	0.1	0.5	2.8	12.6	64.3
Croatia	52	4	2.6	0.1	0.2	0.3	3.1	22.0
Cyprus	19	1	12.6	0.1	0.6	5.7	17.1	66.1
Czech Republic	321	5	4.6	0.0	0.3	0.9	4.0	53.9
Denmark	316	1	3.2	0.0	0.2	0.6	3.0	42.7
Finland	40	22	5.7	0.0	0.3	2.0	3.4	50.3
France	4368	42	7.0	0.0	0.1	0.7	7.0	81.2
Georgia	7	1	10.4	1.5	5.0	12.3	14.8	16.3
Germany	3817	180	5.2	0.0	0.2	0.9	4.6	72.2
Greece	318	39	5.0	0.0	0.2	0.6	4.8	54.9
Hungary	218	3	4.7	0.1	0.3	1.0	4.0	31.0
Iceland	6	0	0.4	0.1	0.2	0.3	0.4	1.0
Ireland	763	3	4.4	0.0	0.1	0.5	3.5	65.6
Israel	357	3	7.0	0.0	0.2	0.7	8.0	57.0
Italy	3662	72	10.2	0.0	0.2	1.2	15.7	77.6
Latvia	12	0	5.5	0.1	0.9	3.0	12.0	14.0
Lithuania	23	1	8.7	0.0	2.5	8.5	13.4	24.0
Rep of Moldova	12	0	5.9	0.3	0.4	1.0	14.5	19.0
The Netherlands	933	96	6.0	0.0	0.2	1.0	5.9	66.0
North Macedonia	47	0	3.0	0.0	0.2	0.4	2.9	29.2
Norway	209	6	9.8	0.0	0.4	2.3	14.8	69.0
Poland	433	5	7.0	0.0	0.5	3.0	10.3	54.1
Portugal	174	6	11.7	0.0	1.0	7.1	19.0	58.0
Romania	10	0	3.3	0.0	0.4	0.8	6.5	14.6
Russian Fed.	480	2	7.9	0.0	1.0	4.5	12.1	59.5
Serbia	63	2	4.2	0.1	0.3	2.5	6.3	20.0
Slovak Republic	139	4	7.9	0.0	0.2	2.0	13.0	59.0
Slovenia	57	2	4.2	0.0	0.1	0.6	4.0	37.5
Spain	1283	29	9.4	0.0	0.3	1.5	12.1	75.0
Sweden	451	6	5.6	0.0	0.2	0.8	4.0	70.6
Switzerland	511	96	6.2	0.0	0.2	1.0	5.7	75.0
Turkey	349	0	7.9	0.0	0.4	4.0	14.0	43.6
Ukraine	46	0	7.0	0.1	1.0	4.0	9.0	38.5
United Kingdom	5927	0	6.8	0.0	0.1	0.7	5.2	81.3
Total	26816	698	7.0	0.0	0.2	0.9	7.3	82.6

Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table, but the people are included in the total number.
For Austria, Georgia, Greece, Hungary, The Netherlands, and Switzerland the information on age at diagnosis is missing for more than 10% of the people with CF.

2. Diagnosis

Figure 2.2 *For adults, the age at diagnosis reflects national differences in the diagnostic approach over the last decades.*

Age at diagnosis (in years): boxplot, by country and overall. All adults seen in 2021.



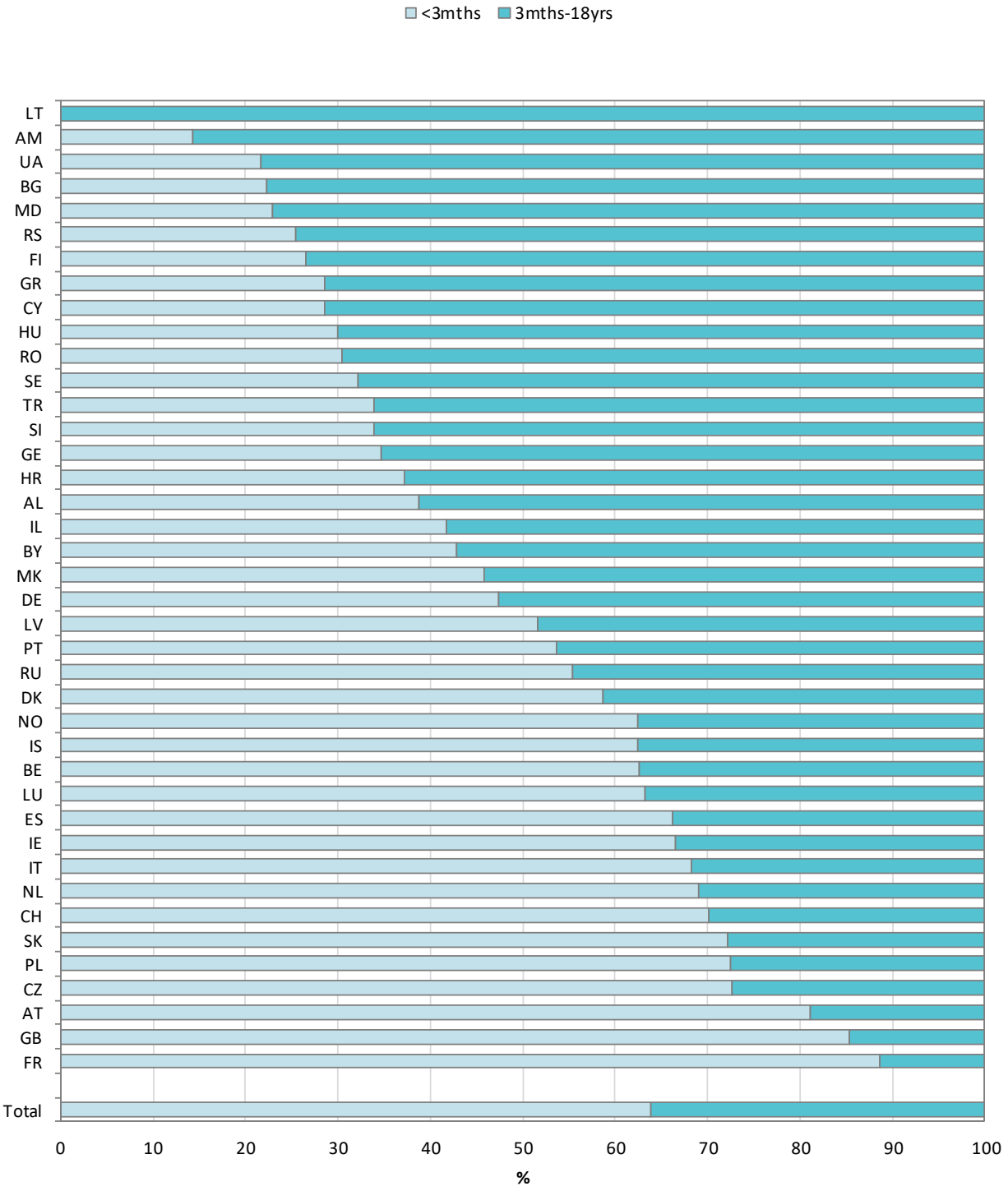
Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the figure, but the people are included in the total number.
For Austria, Georgia, Greece, Hungary, The Netherlands, and Switzerland the information on age at diagnosis is missing for more than 10% of the people with CF.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This boxplot is a graphic representation of age at diagnosis as detailed in table 2.2. For each country the vertical borders of the box are the first and third quartiles, the dash (vertical black line crossing the box) is the median, the black dot is the mean. The whiskers that are the minimum and the maximum values are not shown because the maximum values are really high for some countries and this would have shrunk the boxes at the left side of the graph.

2. Diagnosis

Figure 2.3 *With the implementation of newborn screening programmes, age at diagnosis has shifted to the first 3 months of life in many countries.*

Proportion of children with CF diagnosed at younger than 3 months, between 3 months and 18 years, and older than 18 years, by country and overall. All children with CF seen in 2021.



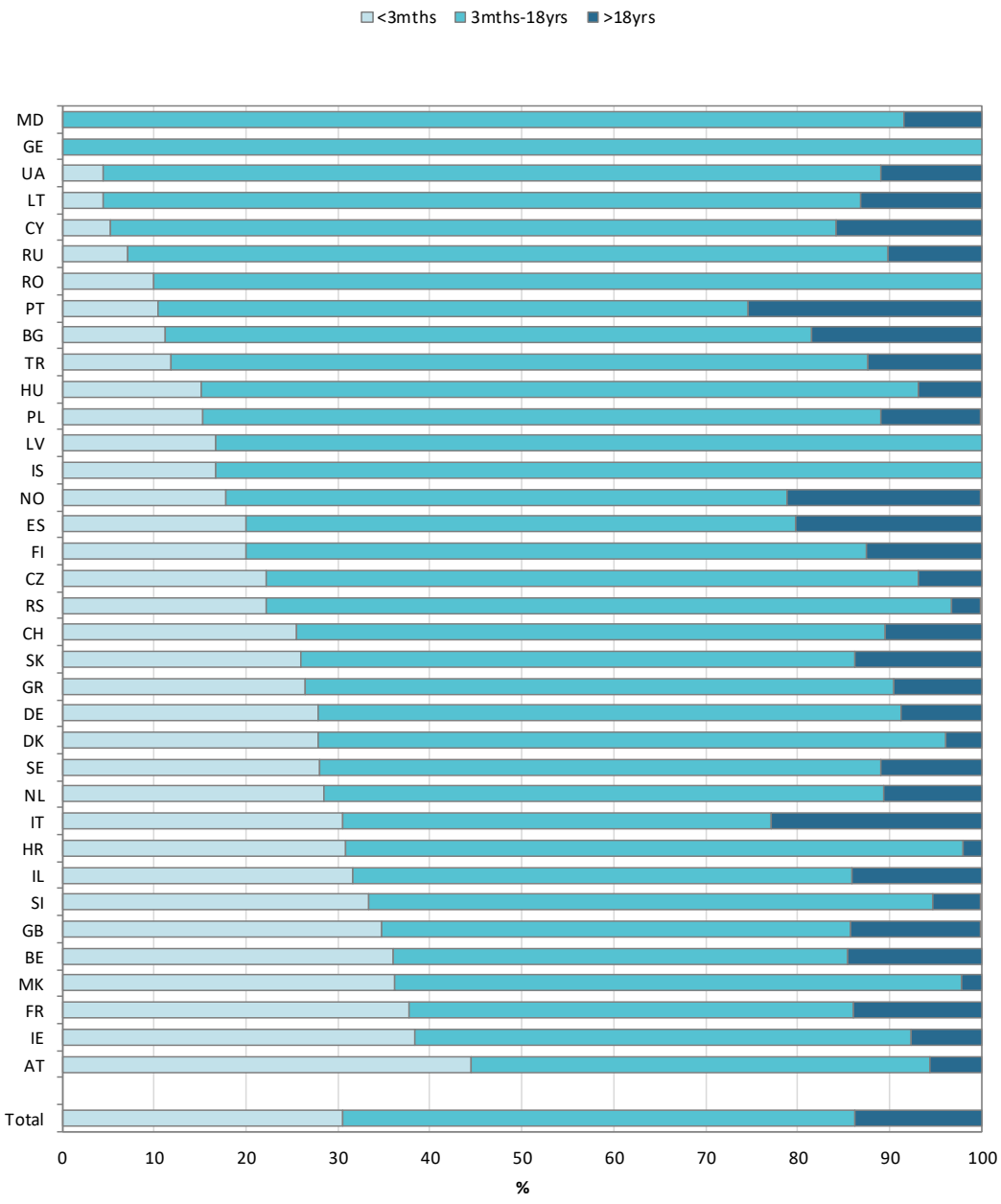
Note: For Cyprus, Greece, and Slovak Republic the information on age at diagnosis is missing for more than 10% of the children.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the percentage of children with CF according to the age at diagnosis. Light turquoise represents individuals diagnosed at younger than 3 months, turquoise shows those diagnosed between 3 months and 18 years. The bars sum to 100%.

2. Diagnosis

Figure 2.4 *With the implementation of newborn screening programmes, age at diagnosis has shifted to the first 3 months of life in many countries.*

Proportion of adults with CF diagnosed at younger than 3 months, between 3 months and 18 years, and older than 18 years, by country and overall. All adults with CF seen in 2021.



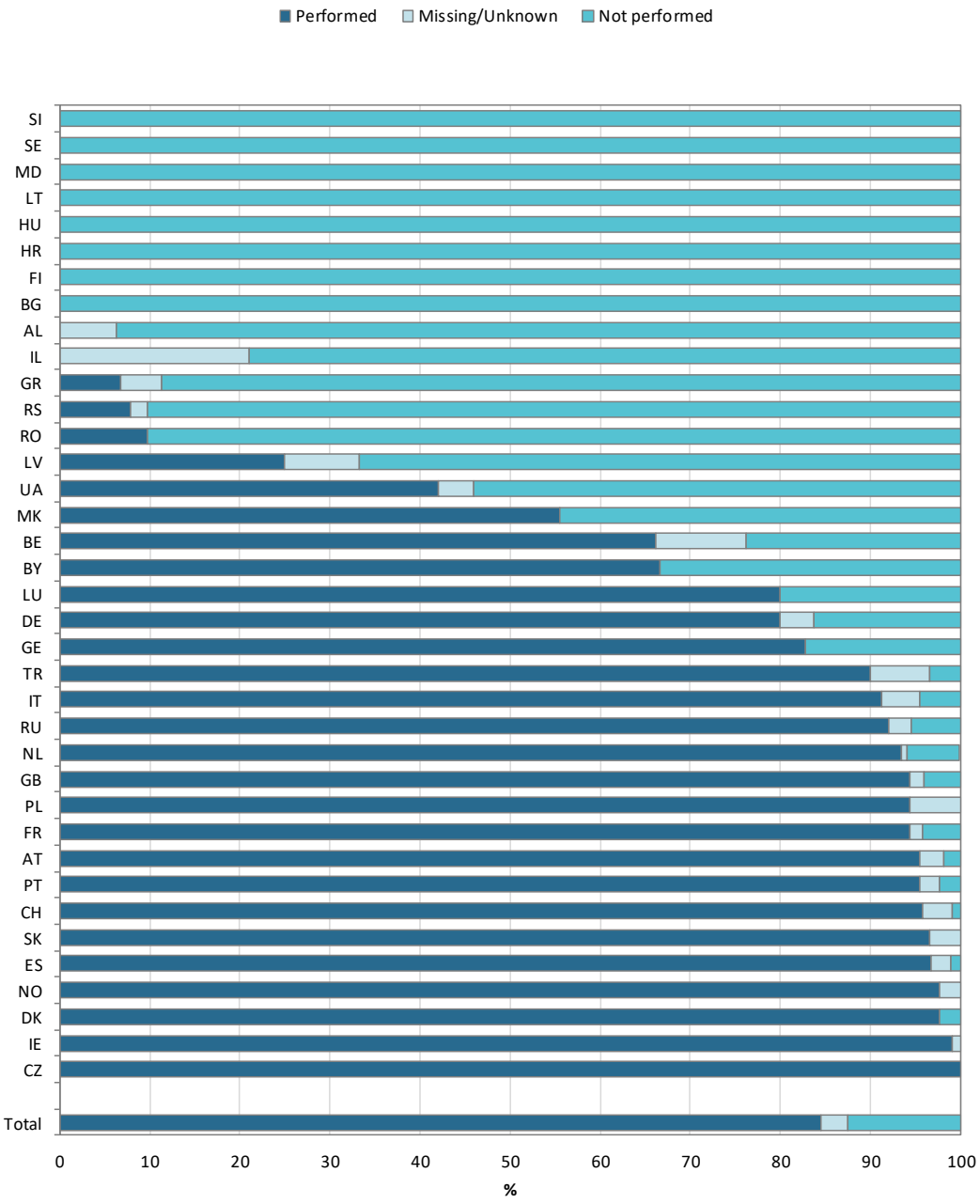
Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table, but the people are included in the total number.
For Austria, Georgia, Greece, Hungary, The Netherlands, and Switzerland the information on age at diagnosis is missing for more than 10% of the people with CF.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the percentage of adults with CF according to the age at diagnosis. Light turquoise represents individuals diagnosed at younger than 3 months, turquoise shows those diagnosed between 3 months and 18 years, and the dark blue represents individuals diagnosed at older than 18 years. The bars sum to 100%.

2. Diagnosis

Figure 2.5 *The proportion of young children with CF diagnosed through newborn screening has increased in many countries over the years.*

Proportion of children with CF who underwent neonatal screening, by country and overall. Children 5 years old or younger seen in 2021.



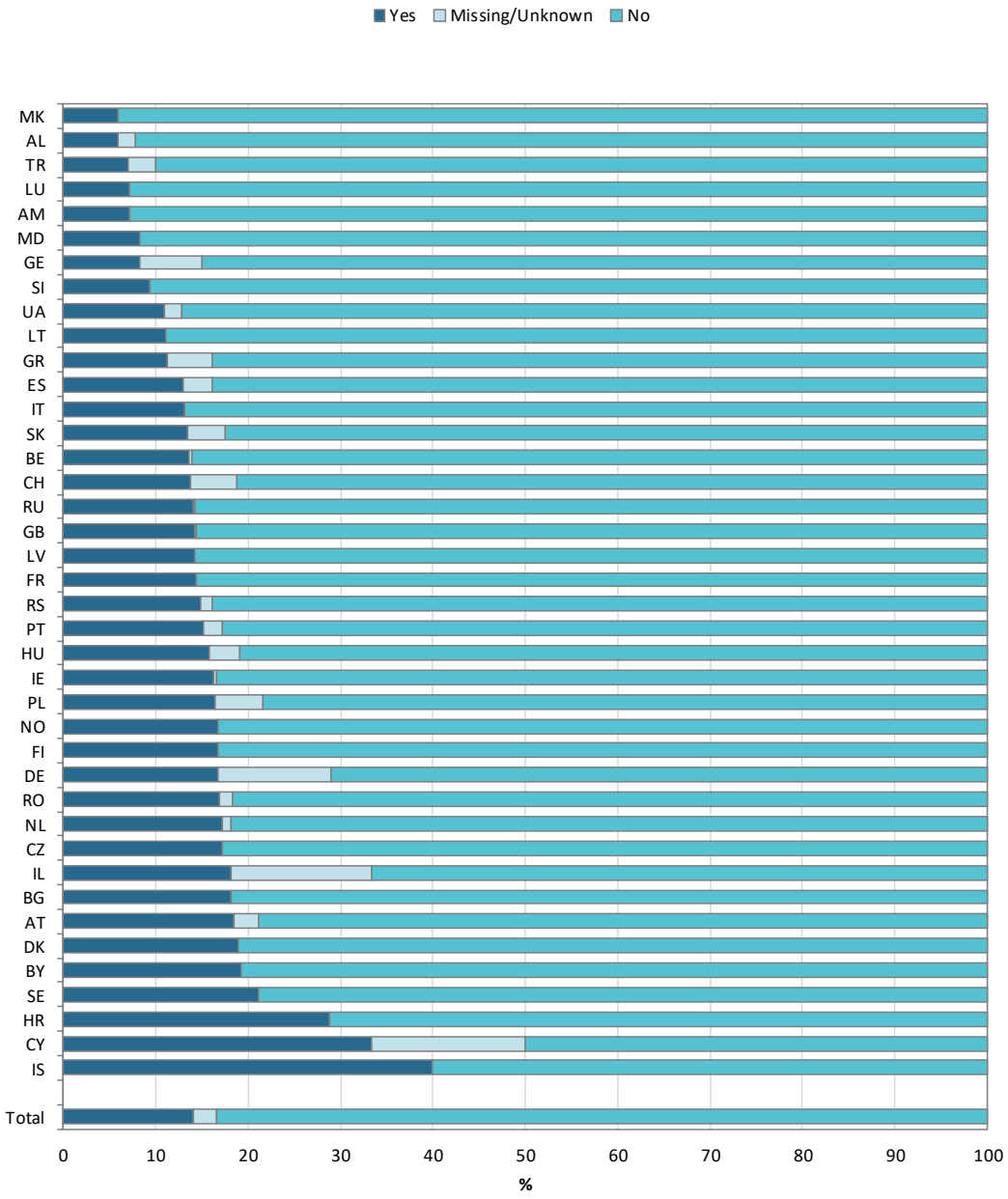
Note: Armenia, Cyprus and Iceland have <5 children 5 years old or younger seen in 2021 and are excluded from the graph.
Note: For Belgium and Israel the information on neonatal screening is missing for more than 10% of the children ≤5 years old.
For France and the United Kingdom positive answers ("neonatal screening performed") are reported only when neonatal screening is one of the factors that led to CF diagnosis.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the percentage of children with CF at the age of 5 years or younger in 2021 who were screened at birth. Dark blue represents neonatal screening "done", turquoise "not done". This graph shows that, in the five years before 2021, in many countries people with CF underwent newborn screening, and that in some countries there is no neonatal screening programme. In total, 85% of all children 5 years old or younger registered in the ECFSPR in 2021 were screened at birth.

2. Diagnosis

Figure 2.6 *Meconium ileus at birth is not rare and may be the first symptom of CF detected in newborns.*

People with CF with meconium ileus, by country and overall. People with CF aged 10 years or younger.



Note: For Cyprus, Germany and Israel the information on meconium ileus is missing for more than 10% of the children ≤10 years old.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the percentage of children with CF at the age of 10 years or younger in 2021 who had meconium ileus at birth. Dark blue horizontal represents meconium ileus “yes”, turquoise is “no”.

3. Genetics

Cystic fibrosis is caused by pathogenic variants of the 'CFTR' gene. At least one variant on each copy or allele is inherited from the mother and from the father. If the variants on both alleles are the same, the person is said to be homozygous for this variant. If these are two different variants, the person is considered to be heterozygous.

We supplied the countries with a list of the 1600 most common variants based on the Cystic Fibrosis Mutation Database (CFTR1). If an individual with CF had a variant that was not present in the database, the name of the variant can be provided as free text. During the data cleaning process, genotypes not on our list were checked for obvious misspellings or alternative names and, if identified as a known variant, they were renamed. There are different naming conventions for variants, and in this report we use the original variant name (legacy name), if it exists, since more than 90% of the variants in the CFTR1 database use this nomenclature.

Please note that, although not presented in the report, information on complex alleles is also captured and available.

If DNA analysis to look for CFTR variants has never been done, we asked the countries to report "Not done". If DNA analysis has been done, but only one or no variants were found, we asked the countries to report this as "Unknown" for the unidentified variants.

How DNA testing is carried out, differs from country to country; some use standard kits to test only a limited number of the most common variants (e.g. 28), while other countries perform DNA-analyses of the whole gene until the variant is detected.

3. Genetics

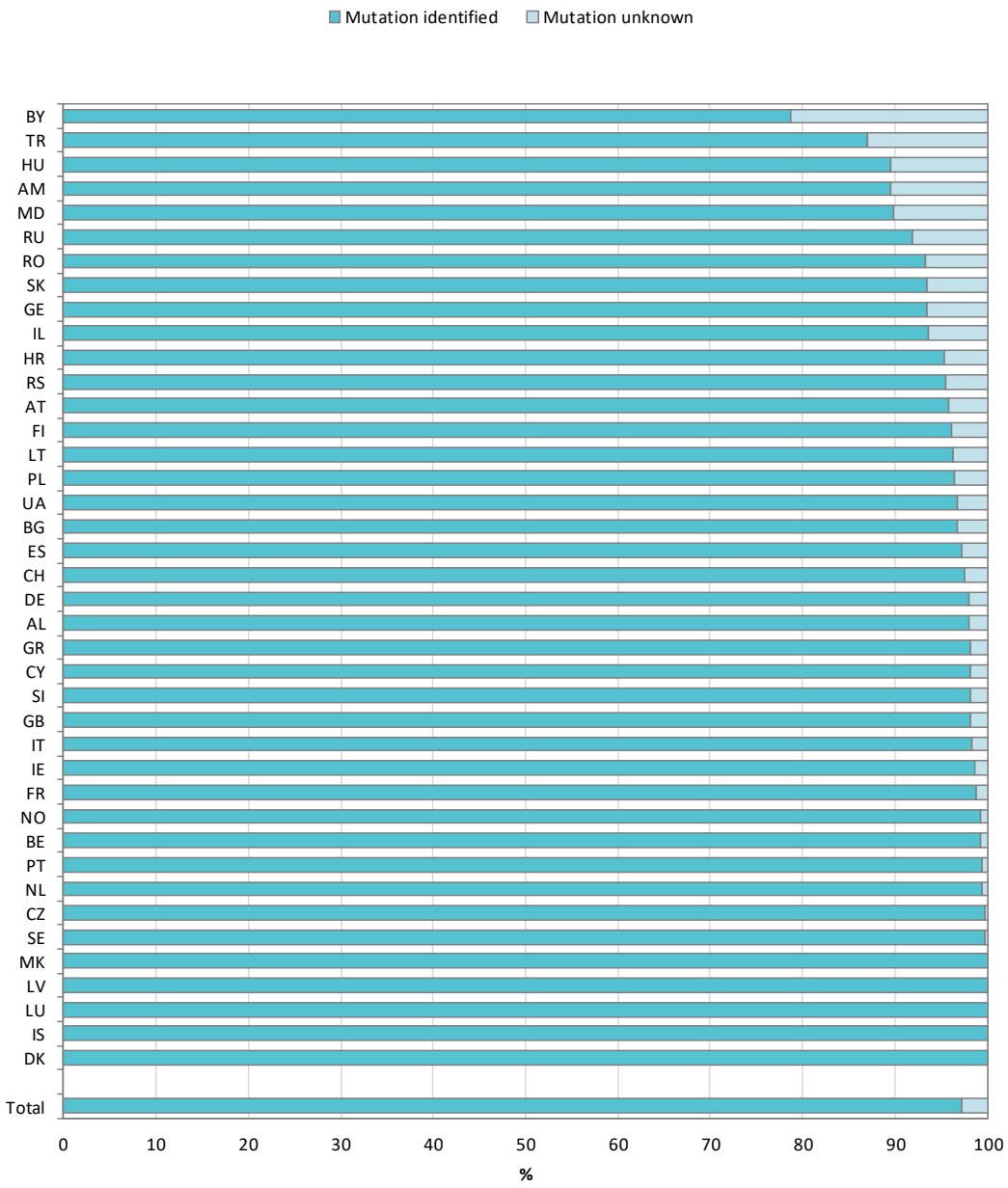
Table 3.1 Proportion of people with CF with DNA analysis and the result of this, by country and overall. All people with CF seen in 2021.

Country	Genotyping				Among genotyping done			
	Not done		Done		At least one variant unknown		Two variants identified	
	Number	%	Number	%	Number	%	Number	%
Albania	7	8.3	77	91.7	3	3.9	74	96.1
Armenia	0	0.0	24	100	5	20.8	19	79.2
Austria	1	0.1	863	99.9	53	6.1	810	93.9
Belarus	0	0.0	148	100	44	29.7	104	70.3
Belgium	0	0.0	1371	100	15	1.1	1356	98.9
Bulgaria	0	0.0	203	100	11	5.4	192	94.6
Croatia	0	0.0	140	100	11	7.9	129	92.1
Cyprus	0	0.0	28	100	1	3.6	27	96.4
Czech Republic	1	0.1	660	99.8	4	0.6	656	99.4
Denmark	0	0.0	541	100	0	0.0	541	100
Finland	6	6.2	90	93.7	5	5.6	85	94.4
France	0	0.0	7136	100	125	1.7	7011	98.2
Georgia	11	12.5	77	87.5	8	10.4	69	89.6
Germany	20	0.3	6764	99.7	193	2.8	6571	97.1
Greece	4	0.7	568	99.3	20	3.5	548	96.5
Hungary	0	0.0	459	100	82	17.9	377	82.1
Iceland	0	0.0	14	100	0	0.0	14	100
Ireland	0	0.0	1294	100	31	2.4	1263	97.6
Israel	3	0.6	519	99.4	44	8.5	475	91.5
Italy	1	0.0	5976	100	165	2.8	5811	97.2
Latvia	0	0.0	45	100	0	0.0	45	100
Lithuania	0	0.0	40	100	3	7.5	37	92.5
Luxembourg	0	0.0	23	100	0	0.0	23	100
Rep of Moldova	0	0.0	49	100	7	14.3	42	85.7
The Netherlands	11	0.7	1569	99.3	15	1.0	1554	99.0
North Macedonia	1	0.8	129	99.2	0	0.0	129	100
Norway	0	0.0	341	100	3	0.9	338	99.1
Poland	1	0.1	1312	99.9	70	5.3	1242	94.7
Portugal	0	0.0	352	100	3	0.8	349	99.1
Romania	1	0.4	247	99.6	28	11.3	219	88.7
Russian Federation	119	4.7	2422	95.3	336	13.9	2086	86.1
Serbia	3	1.5	191	98.4	16	8.4	175	91.6
Slovak Republic	0	0.0	265	100	28	10.6	237	89.4
Slovenia	2	1.7	114	98.3	4	3.5	110	96.5
Spain	1	0.0	2400	100	117	4.9	2283	95.1
Sweden	0	0.0	731	100	3	0.4	728	99.6
Switzerland	4	0.4	1032	99.6	37	3.6	995	96.4
Turkey	90	3.8	2280	96.2	399	17.5	1881	82.5
Ukraine	0	0.0	213	100	12	5.6	201	94.4
United Kingdom	32	0.3	10142	99.7	308	3.0	9834	97.0
Total	319	0.6	50849	99.4	2209	4.3	48640	95.7

3. Genetics

Figure 3.1 *Most of the people with CF in Europe have two identified CFTR variants.*

Proportion of identified variants, by country and overall. Only people with CF with DNA analysis



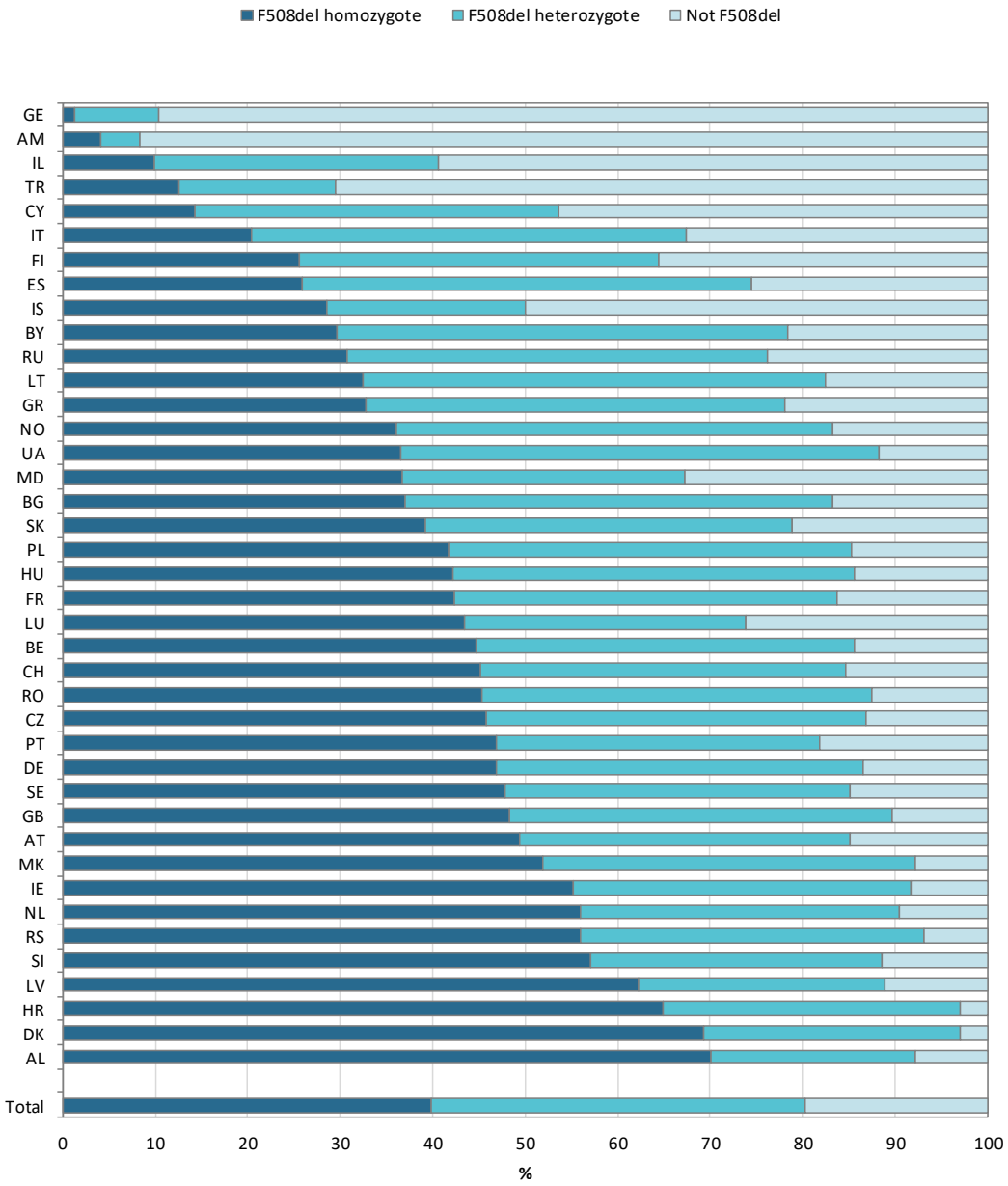
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the percentage of variants identified (dark turquoise) and not identified (light turquoise) through DNA analysis variants, by country and overall. One “allele” means one of the two inherited CFTR genes. The number of variants non-identified on one of the 2 alleles varies greatly from country to country. This is partly due to the different approaches to DNA testing. Overall, more than 2.8% of variants remain unidentified after DNA analysis, leaving 4.3% of the people with CF with at least one unidentified variant.

3. Genetics

Figure 3.2 *The prevalence of the F508del variant varies considerably between the countries in Europe, which has major impact on CFTR modulator eligibility.*

Prevalence of F508del homozygous and heterozygous people with CF, by country and overall. All people with CF seen in 2021.



Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

F508del is the name of the most commonly occurring CFTR variant in the world. People with CF who carry two F508del variants are often described as having “classic CF”, but other combinations of variants may cause the same degree of disease. We have grouped the people with CF in F508del homozygous (people who have two F508del variants), F508del heterozygous (people who have one F508del variant and another known variant, that is not F508del), and people with CF who do not have a F508del variant. Only people with CF for whom the genotype is known have been included in this graph. “Unknown” variants have been classified as “other”, since F508del is included in all genotyping kits and would have been identified. Please note that the genotype grouping in this graph does not reflect the severity of the disease in the countries.

3. Genetics

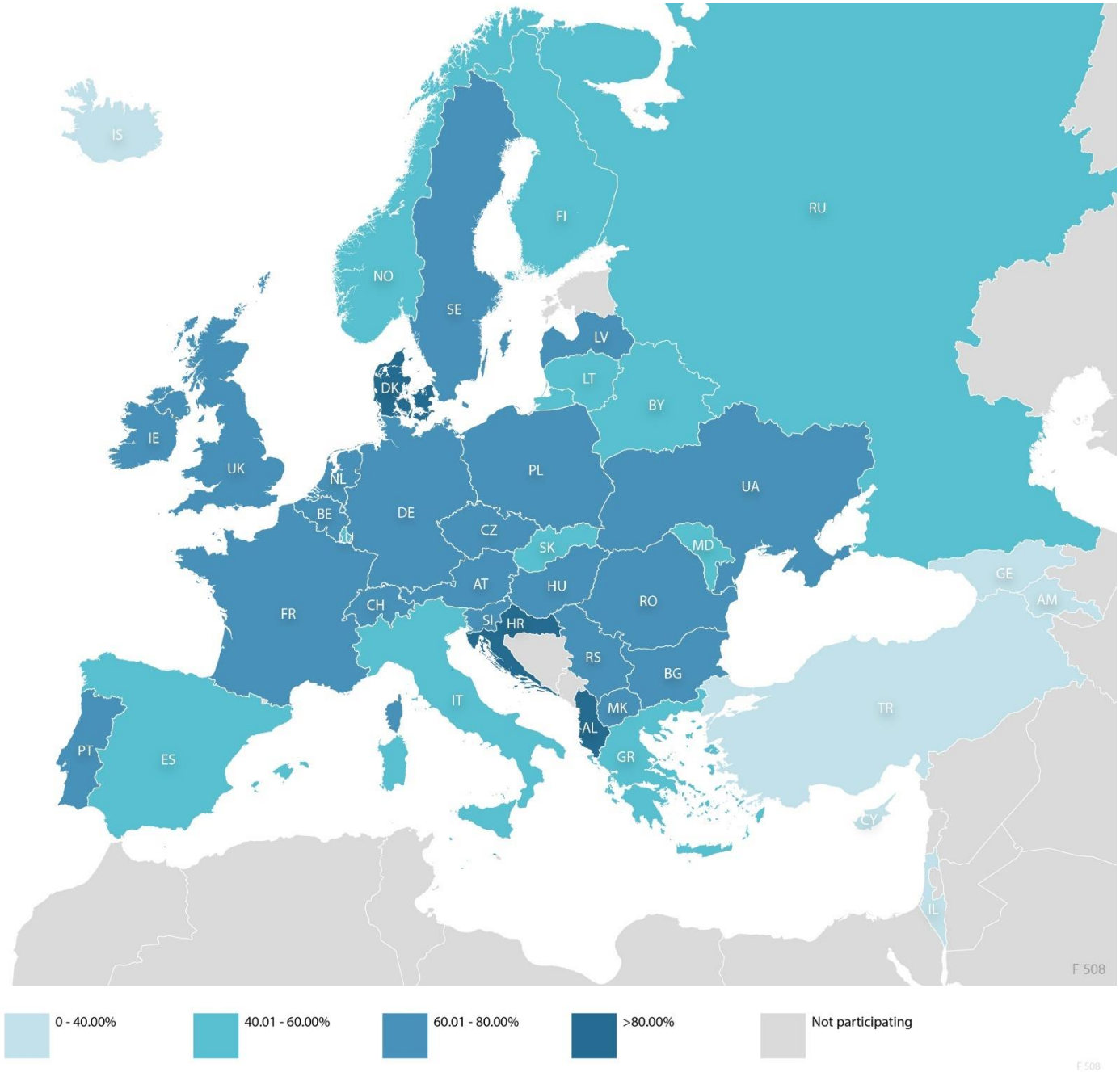
Table 3.2 Allelic frequencies of the 19 most common variants in the ECFSPR database.

Variant name	Number of alleles with the variant	Percentage of those tested	Country with highest allele frequency for the variant
F508del	60987	59.97	Denmark (83.2%)
G542X	2808	2.76	Armenia (8.3%)
N1303K	2245	2.76	Iceland (46.4%)
G551D	1256	1.24	Ireland (8.4%)
2789+5G->A	1101	1.08	Turkey (2.9%)
W1282X	1088	1.07	Israel (22.5%)
R117H	1002	0.99	Ireland (3.2%)
3849+10kbC->T	1001	0.98	Lithuania (8.8%)
CFTRdele2,3	967	0.95	Belarus (11.2%)
1717-1G->A	884	0.87	Switzerland (2.8%)
R553X	846	0.83	Lithuania (7.5%)
2183AA->G	732	0.72	Armenia (10.4%)
D1152H	686	0.67	Israel (5.8%)
621+1G->T	660	0.65	Greece (6.4%)
R347P	583	0.57	Luxembourg (6.5%)
G85E	572	0.56	Israel (2.6%)
1677delTA	542	0.53	Georgia (46.9%)
3272-26A->G	534	0.53	Belgium (2.1%)
R1162X	520	0.51	Slovenia (5.3%)

This table presents the allelic frequency of the 19 most commonly occurring variants found in the ECFSPR database. The last column indicates in which country this particular variant is found most frequently. F508del is, by far, the most common variant.

3. Genetics

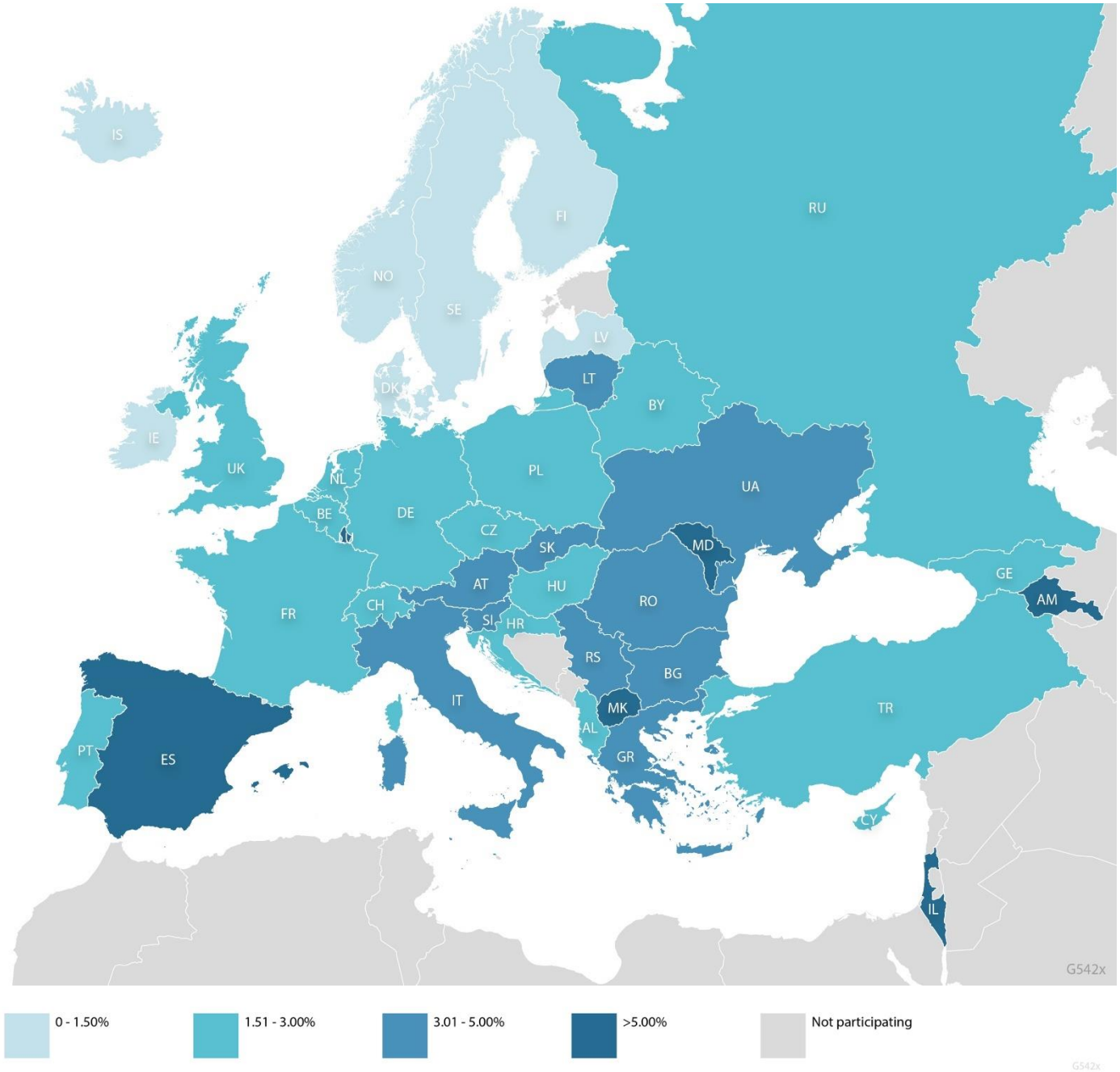
Figure 3.3 Geographical distribution of F508del variant.



Although this variant is the most common in all countries, the highest frequency occurs in the north of Europe, in Denmark (83.2%), Albania (81.2) and Croatia (81.1%).

3. Genetics

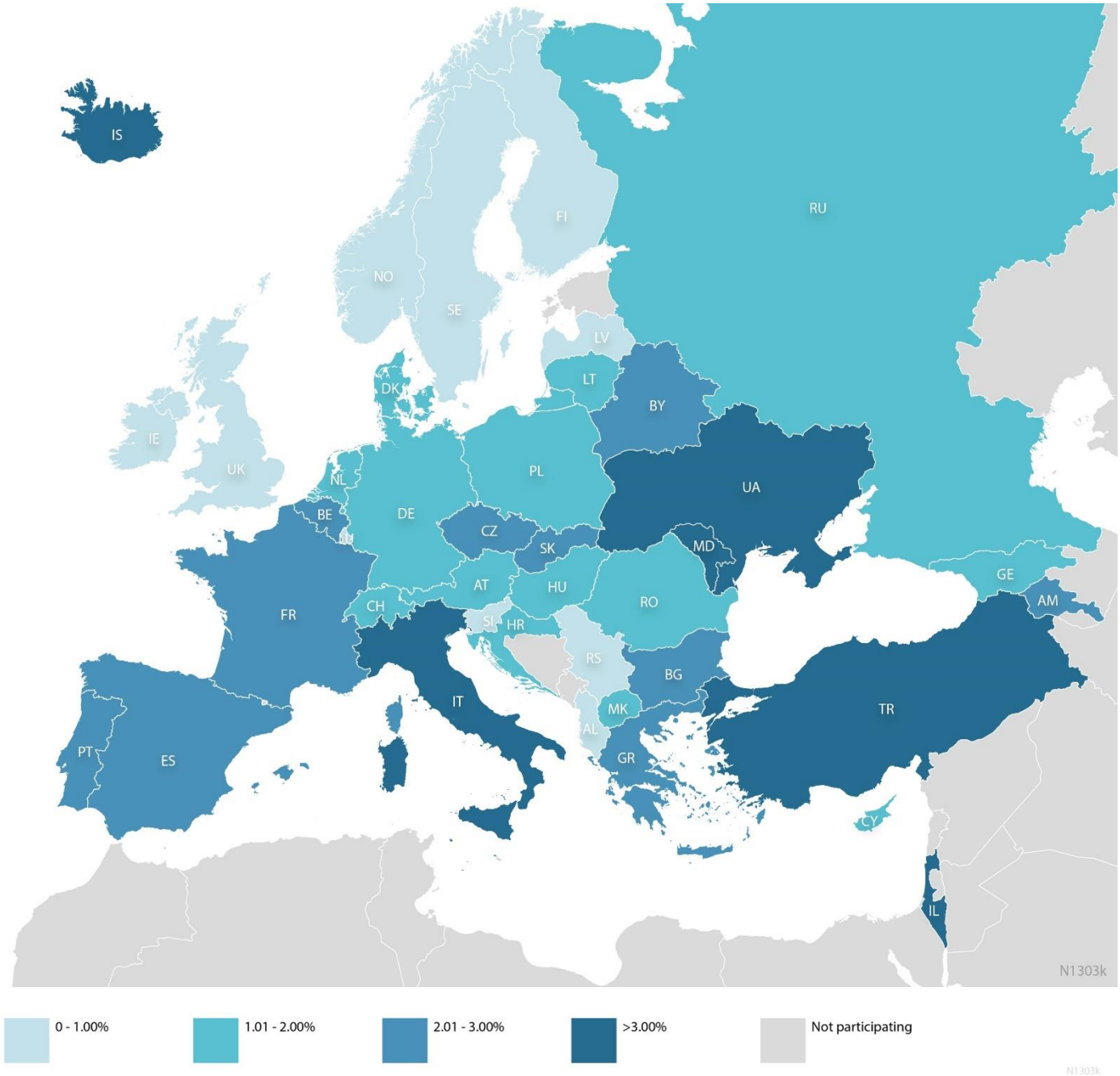
Figure 3.4 Geographical distribution of G542X variant.



This variant is most frequent in Southern Europe, with the highest allele frequency in Armenia (8.3%), whereas it is very rarely found in Ireland, the Scandinavian.

3. Genetics

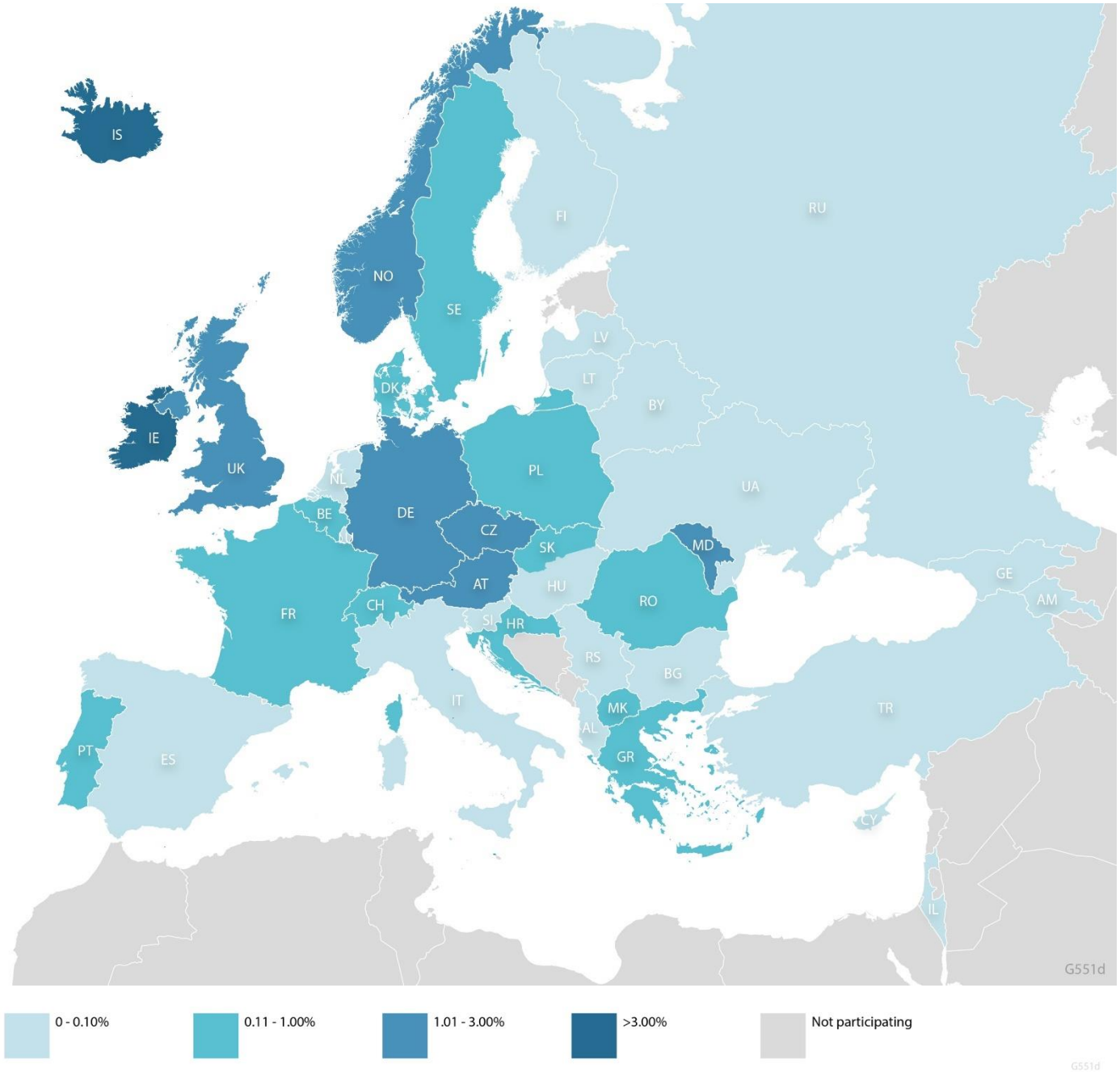
Figure 3.5 Geographical distribution of N1303K variant.



This variant is most frequent in Iceland (46.4%). This is an exception in the Northern Europe where it is otherwise rare, and much more frequent in the countries of Southern and Eastern Europe.

3. Genetics

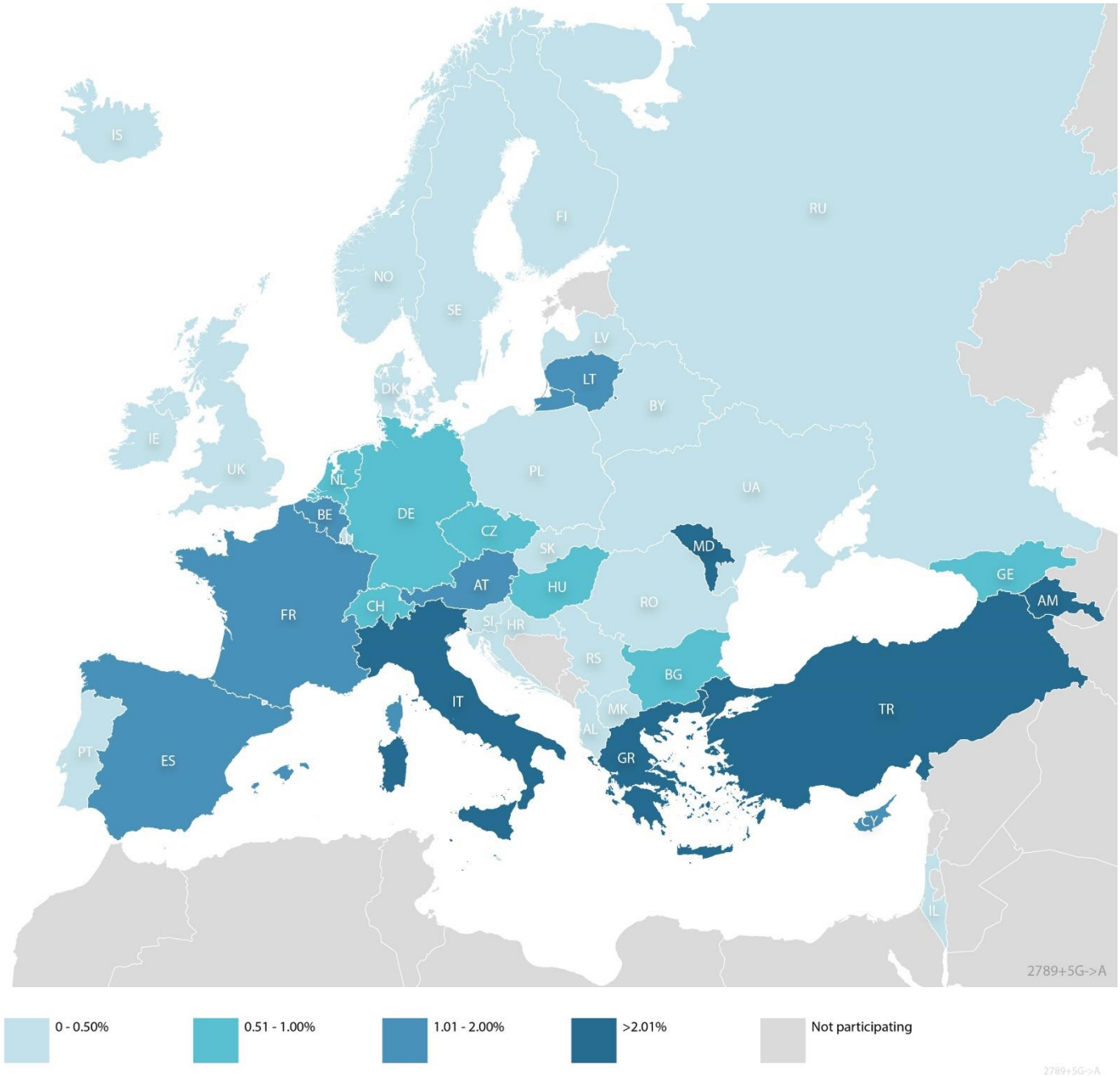
Figure 3.6 Geographical distribution of G551D variant.



This variant is most frequent in Ireland (8.3%) and in the north of Europe whereas it is rare in Eastern and Southern Europe.

3. Genetics

Figure 3.7 Geographical distribution of 2789+5G->A variant.



This variant is most frequent in Turkey (2.9) and in Southern Europe, whereas it is less common in Eastern Europe.

4. Lung function

Lung function, or lung capacity, is measured by spirometry, a test which calculates how much air can be forced out of the lungs in one breath. The FEV_1 (Forced Expiratory $Volume_1$) is measured in litres but the lung capacity is normally expressed as a percentage of the expected (or predicted) value (FEV_1%). The predicted value is determined from healthy individuals of the same sex, height and age and is called the reference population.

To calculate the FEV_1% for this report we used the Global Lung Function Initiative equations described by Quanjer PH et al. (for the full reference, refer to Appendix 3, page 171). This is the global reference for spirometry, and it has been agreed, as part of the CF global harmonisation project, that this is the best way to present lung function.

A FEV_1% of 100 means that the lung function measurement is equal to the mean lung function measurement of people of the same age, sex, and height of the healthy reference population.

Spirometry requires a certain amount of coordination, and usually cannot be performed reliably and consistently until a person with CF is about five to six years of age. Therefore, we have computed FEV_1% values only for people with CF who are aged 6 years or older.

We asked the countries to report the best FEV_1 recorded throughout the year (from the best FEV_1% computed at the CF centres).

We excluded people from the analyses of FEV_1 who have had one or more lung transplants, since their lung function does not reflect the severity of their CF lung disease. Moreover, we also excluded people with CF who had a liver or other transplantation since follow-up data for them is sometimes missing.

4. Lung function

Table 4.1 FEV_1% of predicted of children and adolescents: descriptive statistics, by country and overall. People with CF aged 6-17 years who have never had transplant.

Country	Number	Number of missing	Mean (average FEV1% value)	Min (lowest FEV1% value)	25th pctl (25% of the pwCF have a FEV1% lower than the value)	Median (half the pwCF have a FEV1% lower than the value)	75th pctl (75% of the pwCF have a FEV1% lower than the value)	Max (highest FEV1% value)
Albania	48	8	97.7	88.3	93.9	98.0	100.8	105.2
Armenia	5	12	86.9	65.4	76.0	94.4	96.7	101.9
Austria	270	1	98.1	45.3	90.2	99.2	107.2	136.0
Belarus	48	27	77.5	25.6	66.8	80.2	92.1	115.1
Belgium	322	13	97.6	38.0	90.1	98.4	109.0	147.0
Bulgaria	70	3	85.0	29.7	71.5	90.6	98.9	126.1
Croatia	46	3	77.3	34.5	67.0	79.3	89.5	128.1
Cyprus	5	0	94.3	61.0	81.1	102.8	111.4	115.1
Czech Republic	188	17	97.9	32.0	91.5	98.6	108.9	129.2
Denmark	124	0	100.8	36.2	92.0	101.1	111.0	134.9
Finland	26	0	89.3	35.0	76.2	90.0	105.2	127.6
France	1876	76	94.2	19.8	85.0	95.4	105.5	181.8
Germany	1801	39	96.7	23.9	88.1	98.0	106.8	146.4
Greece	165	5	99.2	42.8	90.0	99.4	112.1	143.1
Hungary	83	7	81.6	22.3	71.1	85.3	95.2	129.3
Iceland	6	0	101.2	84.8	91.9	101.9	111.5	115.2
Ireland	367	31	93.3	30.8	86.4	95.8	102.1	131.2
Israel	142	4	89.8	28.2	83.2	92.8	101.1	123.6
Italy	1503	90	97.7	24.8	88.3	99.2	110.1	143.6
Latvia	19	1	90.0	36.3	85.8	97.0	102.9	111.9
Lithuania	7	1	77.3	41.5	50.0	82.5	102.8	108.7
Luxembourg	9	0	92.0	43.8	87.0	96.5	104.2	115.5
Rep of Moldova	13	13	67.5	17.4	43.1	78.2	90.7	116.9
The Netherlands	392	2	93.2	46.9	84.0	94.1	103.6	135.2
North Macedonia	47	4	84.4	49.4	74.1	82.7	96.1	124.3
Norway	83	2	95.9	44.0	87.3	98.1	105.8	120.0
Poland	526	58	90.1	19.5	81.5	93.8	102.9	135.4
Portugal	120	8	85.2	29.0	73.8	88.3	98.1	119.4
Romania	115	42	86.1	32.2	74.8	88.2	100.0	134.2
Russian Fed.	1032	363	82.6	13.5	67.8	84.2	98.6	174.4
Serbia	73	3	83.1	31.8	72.3	88.6	97.0	111.4
Slovak Republic	93	0	93.4	21.9	83.5	95.2	103.5	136.2
Slovenia	43	0	97.3	54.2	91.7	99.8	105.7	124.4
Spain	767	27	93.1	27.6	83.7	94.5	105.6	137.1
Sweden	195	3	92.9	47.2	82.7	94.4	102.8	163.6
Switzerland	296	4	97.7	41.2	89.4	98.7	107.4	133.5
Turkey	700	482	82.1	19.8	70.0	84.9	97.7	135.9
Ukraine	84	21	88.1	22.9	78.4	90.6	100.7	148.9
United Kingdom	2851	171	95.7	19.6	87.2	96.4	105.4	174.7
Total	14560	1541	93.3	13.5	83.9	95.4	105.2	181.8

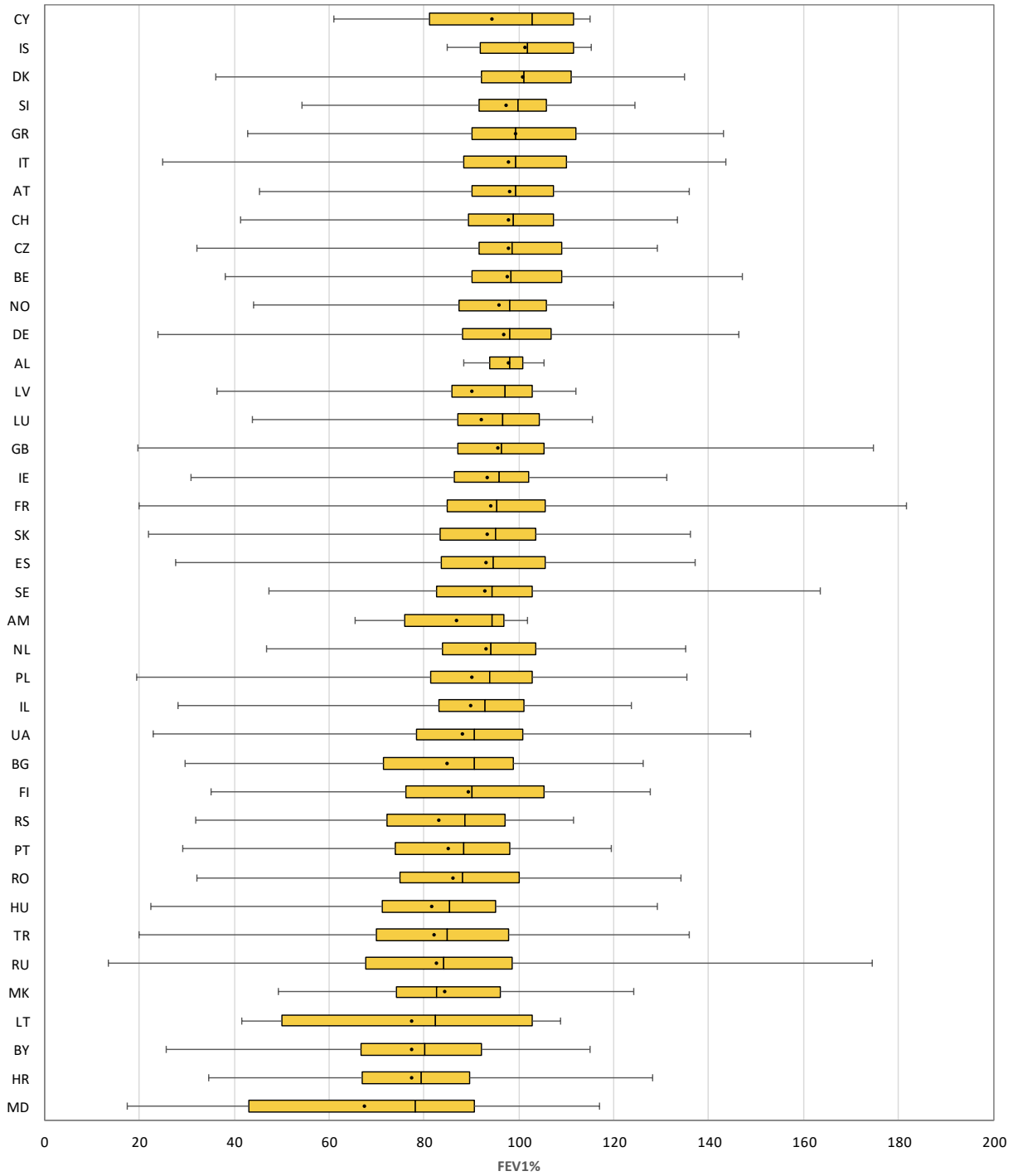
Note: Georgia has <5 individuals aged 6-17 years with FEV1 measurement and is excluded from the table.
Note: The United Kingdom reports FEV_1 from the annual review, which might no be the best FEV_1 of the year, and, in some cases, the FEV_1 measurement could be from the previous calendar year.

This table shows some descriptive statistics for FEV_1 in children and young people, expressed as % of predicted. Note that people with CF who have had a transplant and children below 6 years of age have been excluded from the analyses.

4. Lung function

Figure 4.1 *Median FEV1 of young children and adolescents with CF <18 years of age is >80% in almost all countries in Europe.*

FEV1% of predicted: boxplot by country.



Note: Georgia has <5 individuals aged 6-17 years at the date of FEV_1 measurement and is excluded from the graph.
The United Kingdom reports FEV_1 from the annual review, which might no be the best FEV_1 of the year, and, in some cases, the FEV_1 measurement could be from the previous calendar year.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This boxplot is a graphic representation of the FEV_1 in children and adolescents with CF, expressed as % of predicted, detailed in table 4.1. For each country, the vertical borders of the box are the first and third quartiles, the dash (vertical black line crossing the yellow box) is the median, the black dot is the mean, and the whiskers (vertical lines with a T-shaped end) are the minimum and the maximum.

4. Lung function

Table 4.2 FEV_1% of predicted of adults: descriptive statistics, by country. People with CF (>18 years) who have never had a transplant.

Country	Number	Number of missing	Mean (average age)	Min (age of the youngest pwCF)	25th pctl (25% of the pwCF are younger than this age)	Median (half the pwCF are younger than this age)	75th pctl (75% of the pwCF are younger than this age)	Max (age of the oldest pwCF)
Austria	372	2	78.7	21.7	61.7	80.8	95.8	136.3
Belgium	683	13	78.5	18.8	61.7	79.2	96.0	147.3
Bulgaria	68	13	63.8	21.5	44.0	65.5	83.9	109.8
Croatia	40	1	63.4	15.8	42.0	63.0	78.7	106.3
Cyprus	13	4	69.7	36.6	59.3	62.6	87.8	101.4
Czech Republic	267	4	73.7	18.9	55.0	77.7	92.2	121.5
Denmark	279	0	88.3	28.5	71.9	93.7	104.7	136.6
Finland	48	0	71.9	30.0	50.6	78.1	91.6	108.5
France	3383	47	75.0	11.9	57.3	76.3	92.7	161.0
Germany	3531	55	74.4	14.7	55.9	75.5	93.6	145.0
Greece	262	18	75.3	25.6	55.3	78.2	92.9	137.6
Hungary	146	12	55.7	16.8	35.0	54.2	77.3	113.0
Iceland	5	0	80.8	64.8	67.0	85.0	88.1	98.9
Ireland	631	31	74.1	18.9	56.7	77.1	92.0	135.4
Israel	335	2	74.7	26.2	60.3	78.0	89.1	124.3
Italy	2957	201	77.3	14.5	58.1	79.1	96.4	139.9
Latvia	12	1	63.3	18.3	38.4	76.1	83.0	97.1
Lithuania	22	0	59.5	19.9	31.7	62.3	83.5	100.4
The Netherlands	889	3	71.6	18.6	54.4	71.9	87.8	128.2
North Macedonia	39	2	61.7	21.2	46.1	62.2	81.1	109.6
Norway	166	1	70.6	16.7	53.2	75.5	89.5	135.0
Poland	364	20	65.8	15.5	46.3	66.6	83.4	128.5
Portugal	125	6	67.1	18.1	51.0	68.5	82.7	127.2
Russian Fed.	259	165	55.4	16.1	35.0	53.1	72.4	132.8
Serbia	58	1	57.1	20.9	38.2	59.6	72.4	97.3
Slovak Republic	129	0	69.1	13.0	56.6	70.8	84.8	133.6
Slovenia	39	1	71.7	25.6	46.5	73.1	98.3	121.9
Spain	1021	37	72.3	18.5	53.6	72.2	90.7	146.1
Sweden	356	7	74.6	12.1	59.4	75.8	90.3	128.0
Switzerland	514	2	75.3	25.0	56.4	76.0	93.1	131.1
Turkey	190	137	65.2	16.7	42.2	65.9	87.5	117.5
Ukraine	38	6	62.2	20.1	41.3	63.6	80.6	110.9
United Kingdom	5234	208	74.8	6.4	57.4	76.9	92.4	163.6
Total	22490	1011	74.3	6.4	56.2	75.8	92.7	163.6

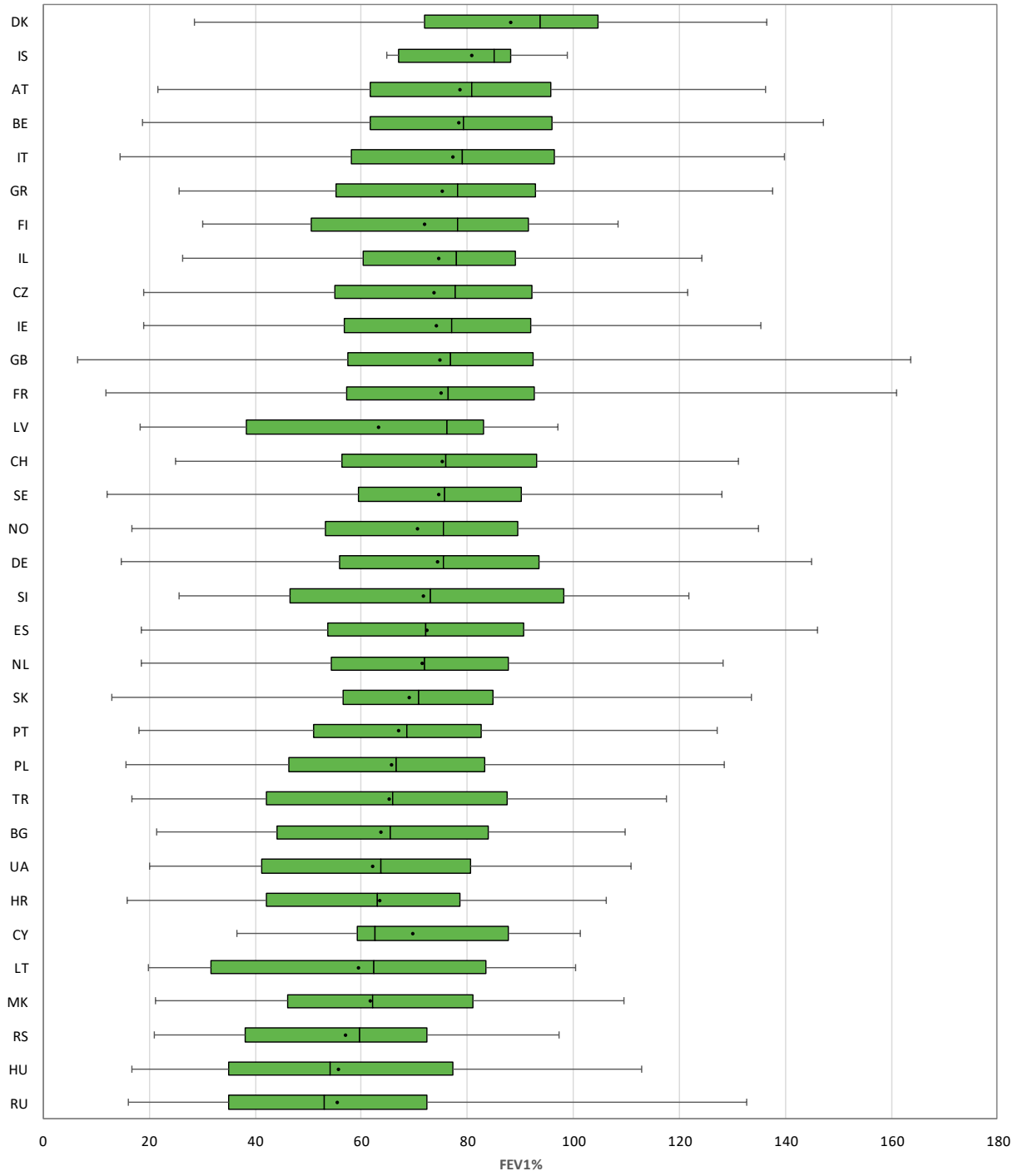
Note: Albania, Armenia, Belarus, Georgia, Luxembourg, Rep of Moldova, Romania have <5 adults with FEV_1 measurement and are excluded from the table, but the people are included in the total number.
Note: The United Kingdom reports FEV_1 from the annual review, which might no be the best FEV_1 of the year, and, in some cases, the FEV_1 measurement could be from the previous calendar year

This table shows some descriptive statistics for FEV_1 in adults with CF, expressed as the % of predicted. Note that adults who have had a transplant have been excluded from the analyses.

4. Lung function

Figure 4.2 Median FEV1 of adults with CF varies between <60% and >90% depending on the country.

FEV1% of predicted: descriptive statistics, by country.



Note: Albania, Armenia, Belarus, Georgia, Luxembourg, Rep of Moldova and Romania have <5 adults with FEV1 measurement and are excluded from the graph.
Note The United Kingdom reports FEV_1 from the annual review, which might no be the best FEV_1 of the year, and, in some cases, the FEV_1 measurement could be from the previous calendar year
Note:: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This boxplot is a graphic representation of the FEV_1 in adults, expressed as the % of predicted detailed in table 4.2. For each country the vertical borders of the box are the first and third quartiles, the dash (vertical black line crossing the green box) is the median, the black dot is the mean, and the whiskers (vertical lines with a T-shaped end) are the minimum and the maximum.

4. Lung function

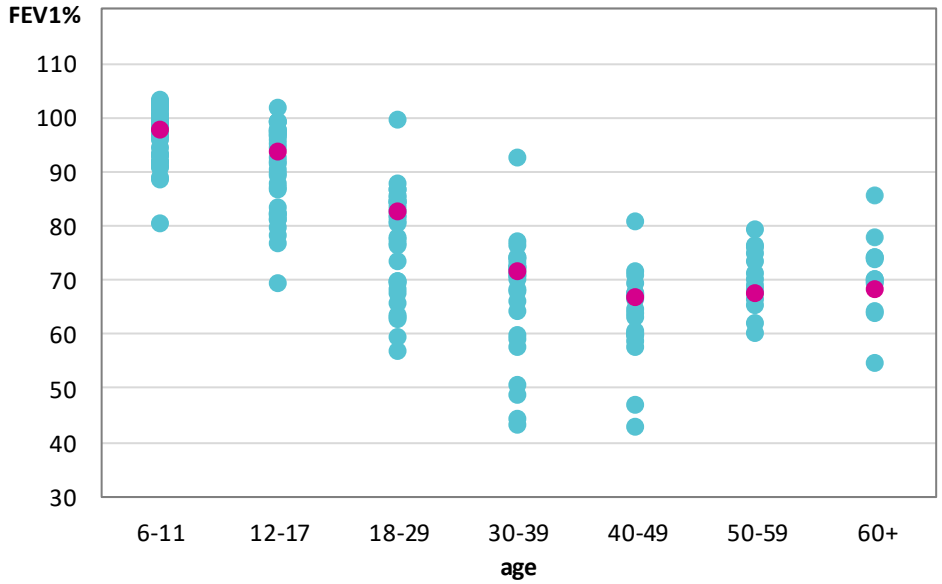
Table 4.3 *FEV_1% of predicted: descriptive statistics by age group (people with CF aged 6 years or older) who have never had a transplant.*

Age at FEV_1 measurement	Number	Number of missing	Mean (average age)	Min (age of the youngest pwCF)	25th pctl (25% of the pwCF are younger than this age)	Median (half the pwCF are younger than this age)	75th pctl (75% of the pwCF are younger than this age)	Max (age of the oldest pwCF)
6-11	7161	1044	96.1	20.9	87.2	97.3	106.8	181.8
12-17	7399	497	90.6	13.5	81.2	93.3	103.6	152.0
18-29	11161	543	79.3	13.0	63.5	82.3	96.6	163.6
30-39	6101	256	70.8	6.4	52.4	71.1	88.8	151.5
40-49	3158	129	67.8	11.9	49.1	66.4	86.0	156.1
50-59	1457	62	67.6	12.1	47.8	67.2	85.0	139.3
60+	613	21	68.1	20.8	48.4	67.9	85.3	142.1

This table shows FEV1% by age group for the total dataset. The median values reported in this table are shown as pink dots in Figure 4.3.

Figure 4.3 *Lung function declines between the third and fifth decade of life but stabilises in older people with CF.*

Median FEV1% of predicted by age group and by country.



Note: We excluded from the graph those age groups where the number of individuals was <10.

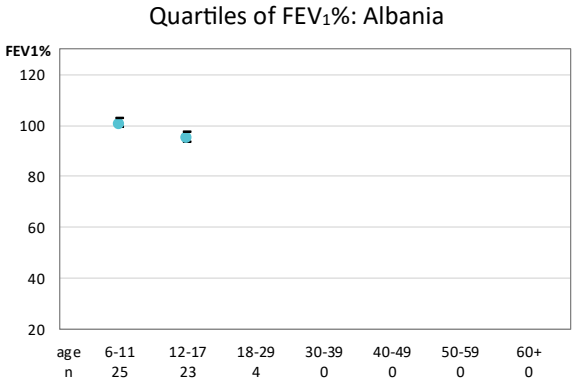
This graph shows the median FEV_1% (the value that separates the highest and lowest half of the people with CF) by age group. Each country median is represented by a dot (in turquoise) and the overall median is in pink. The general pattern shows that the FEV_1% slowly decreases until the age of 40-49, and then levels out. The people in the older age groups are people that survived and may therefore have a less severe form of the disease. There is considerable variation amongst the countries.

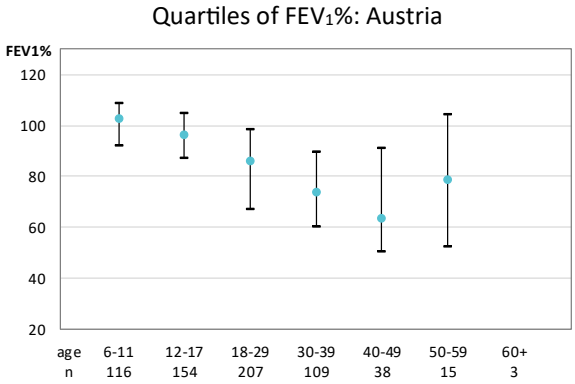
4. Lung function

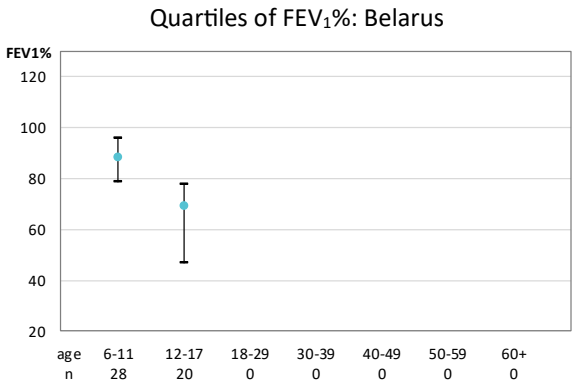
Figure 4.4 *Lung function decline over time in adults with CF still poses a challenge in Europe.*

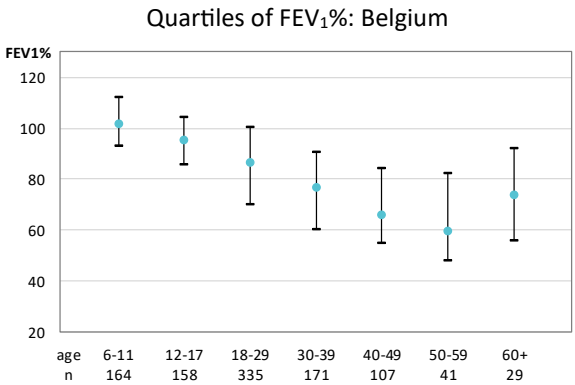
Quartiles of FEV1% of predicted by age group and by country. People with CF aged 6 years or older and who have never had a transplant.

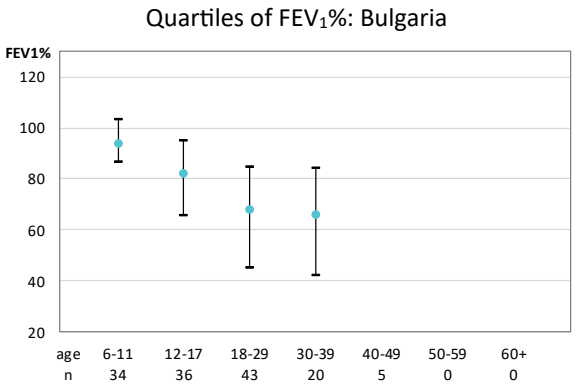
The figures below show the FEV_1% in different age groups, separately for each country. The dot shows the median, and the whiskers show the 25th and 75th percentiles (the median, the 25th percentile and the 75th percentile are collectively named "quartiles"). We did not calculate quartiles where the number of people with CF is <10 in a given age group, so there are no dots for those age groups (the number of people with CF in each age group is shown below the horizontal axis). We therefore excluded Armenia, Georgia, Iceland, Luxembourg and the Republic of Moldova from the graphs because none of the age groups had more than 10 people with CF.

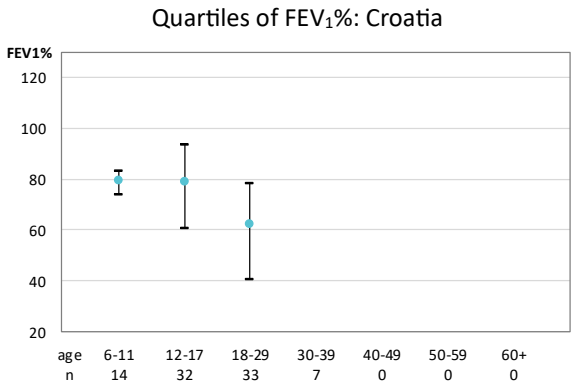








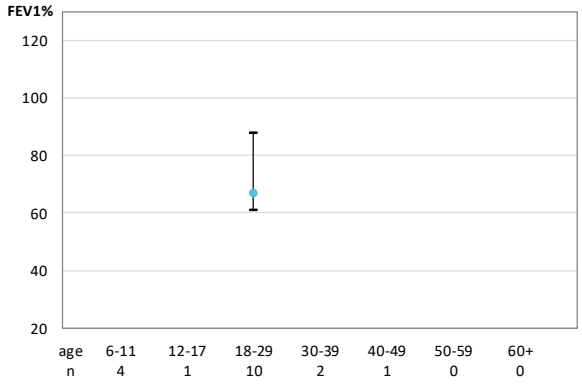




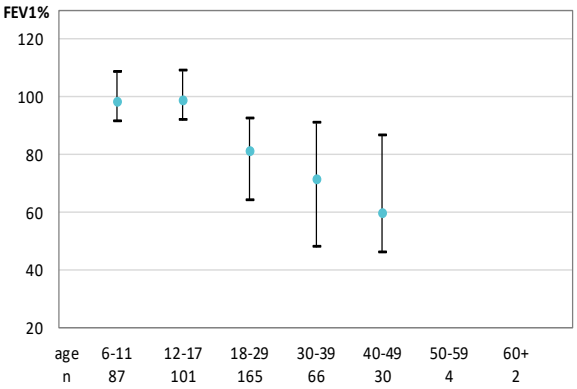
4. Lung function

[figure 4.4 continued]

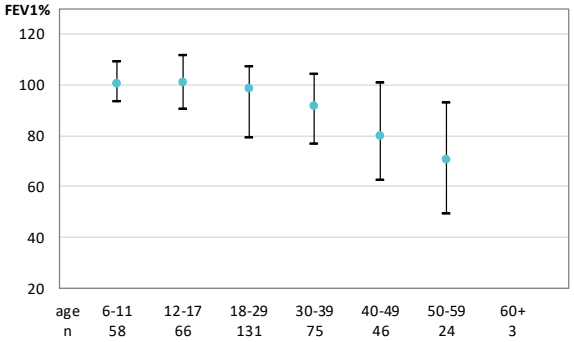
Quartiles of FEV₁%: Cyprus



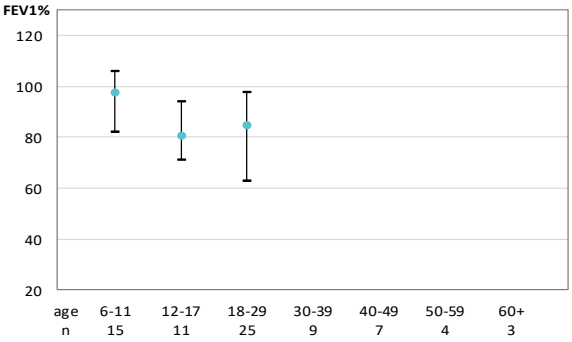
Quartiles of FEV₁%: Czech Republic



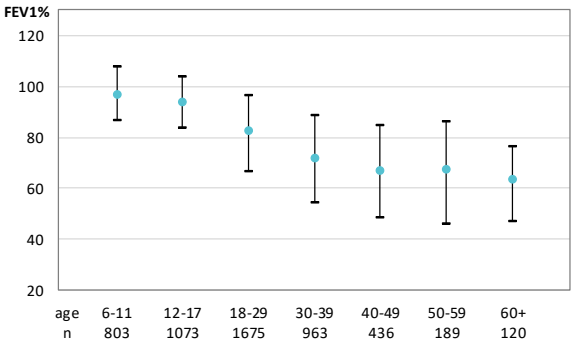
Quartiles of FEV₁%: Denmark



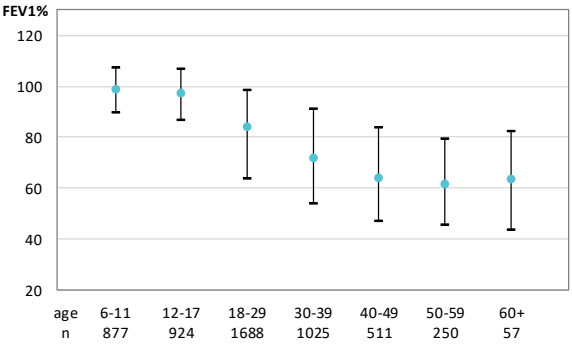
Quartiles of FEV₁%: Finland



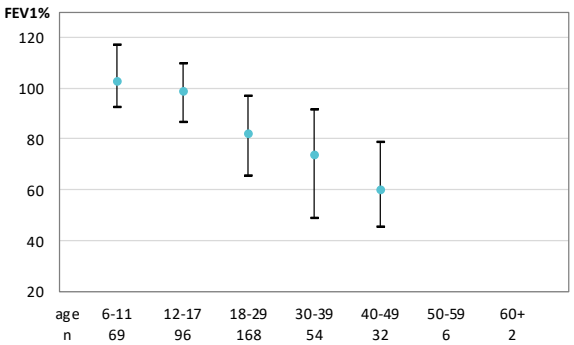
Quartiles of FEV₁%: France



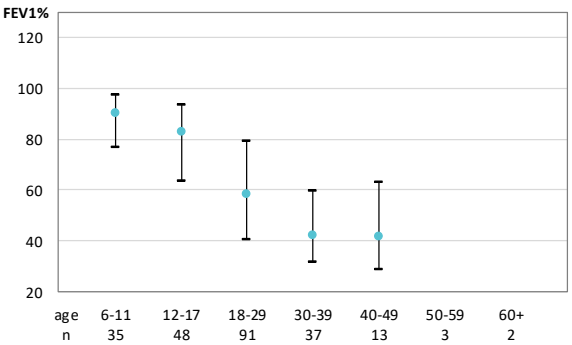
Quartiles of FEV₁%: Germany



Quartiles of FEV₁%: Greece



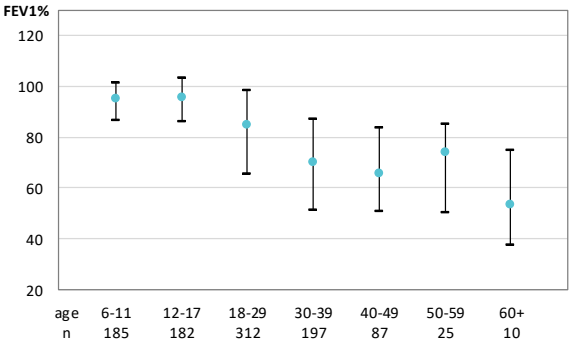
Quartiles of FEV₁%: Hungary



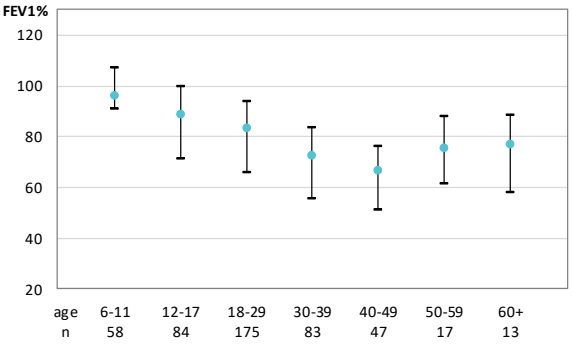
4. Lung function

[figure 4.4 continued]

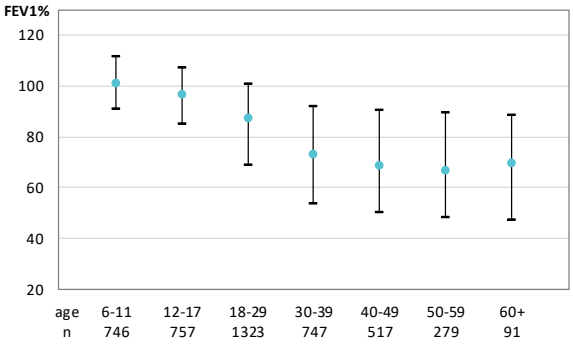
Quartiles of FEV$_1$%: Ireland



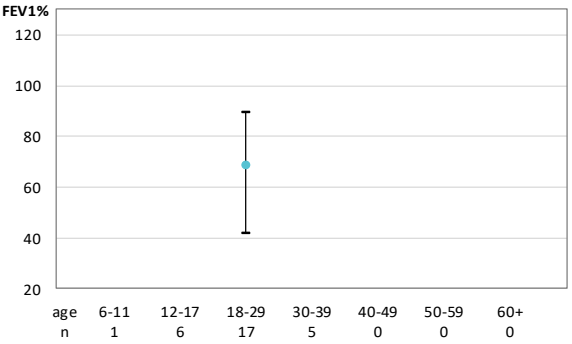
Quartiles of FEV$_1$%: Israel



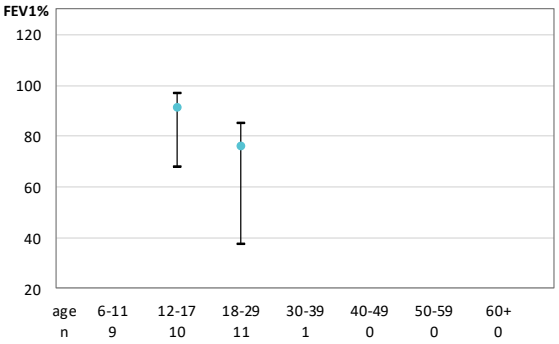
Quartiles of FEV$_1$%: Italy



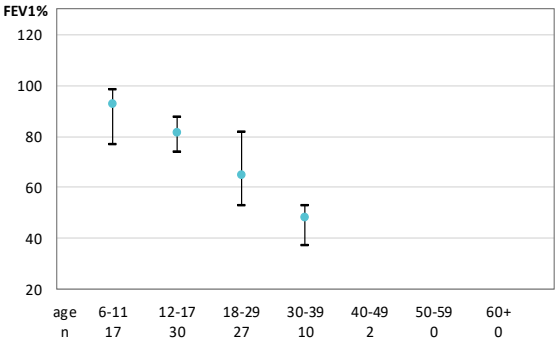
Quartiles of FEV$_1$%: Lithuania



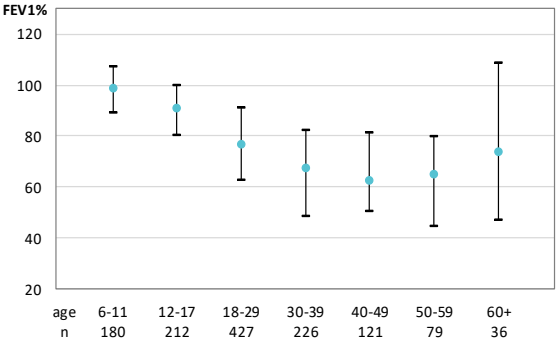
Quartiles of FEV$_1$%: Latvia



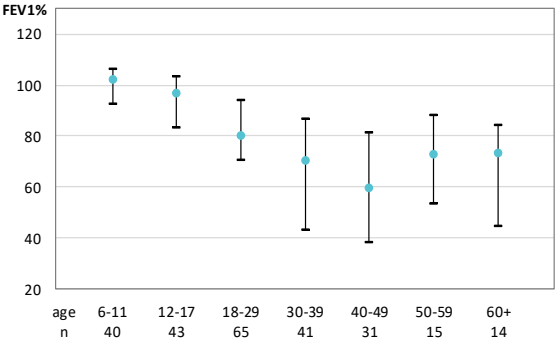
Quartiles of FEV$_1$%: North Macedonia



Quartiles of FEV$_1$%: The Netherlands



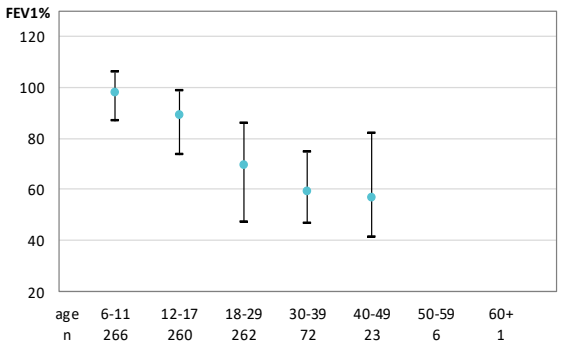
Quartiles of FEV$_1$%: Norway



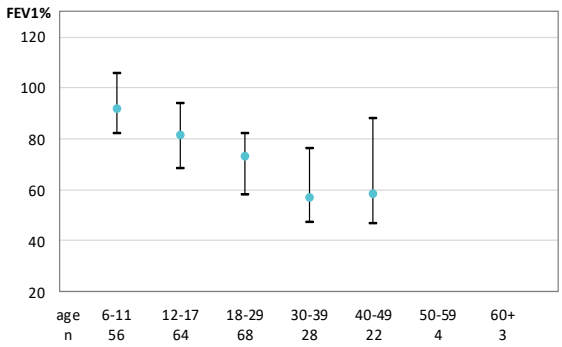
4. Lung function

[figure 4.4 continued]

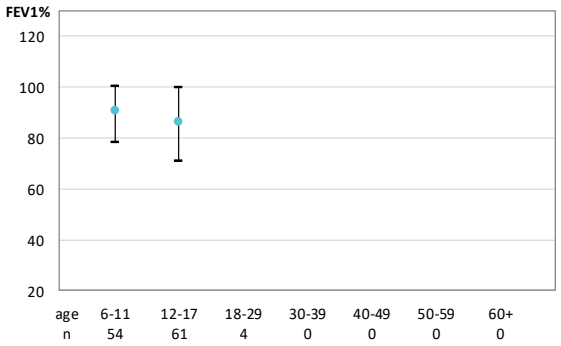
Quartiles of FEV$_1$%: Poland



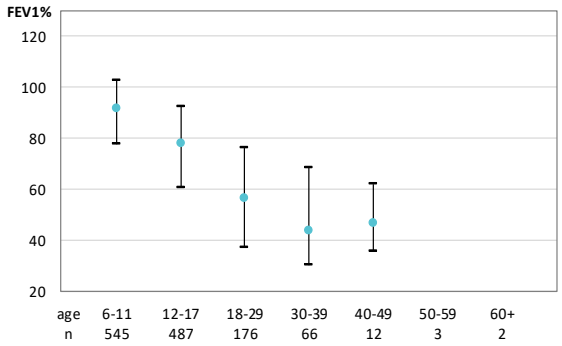
Quartiles of FEV$_1$%: Portugal



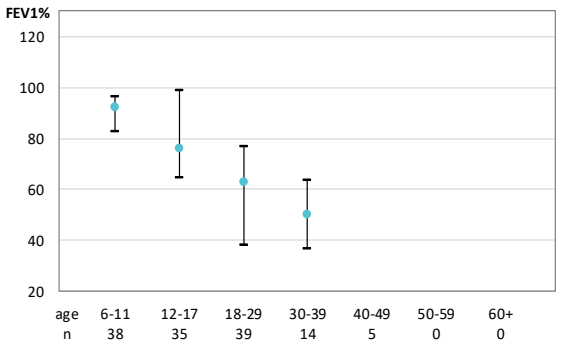
Quartiles of FEV$_1$%: Romania



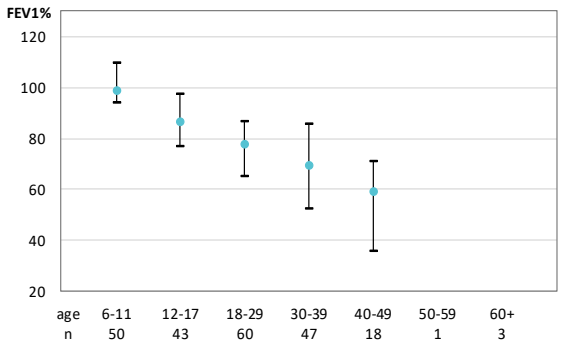
Quartiles of FEV1%: Russian Federation



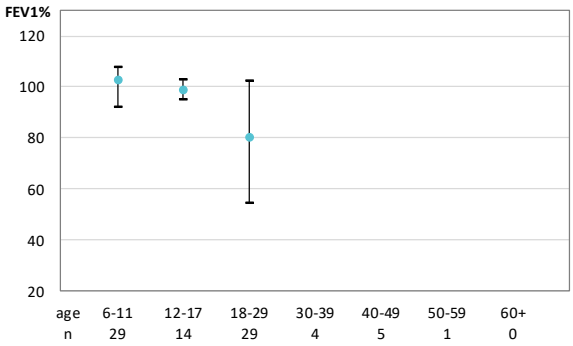
Quartiles of FEV$_1$%: Serbia



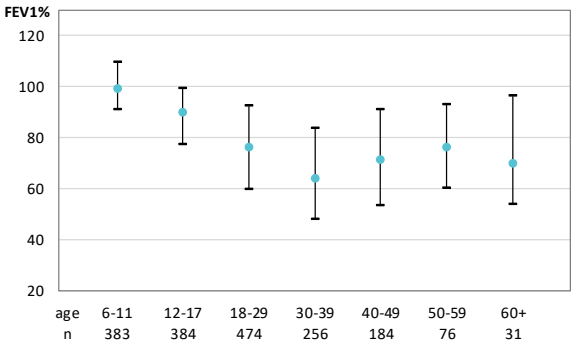
Quartiles of FEV$_1$%: Slovak Republic



Quartiles of FEV$_1$%: Slovenia



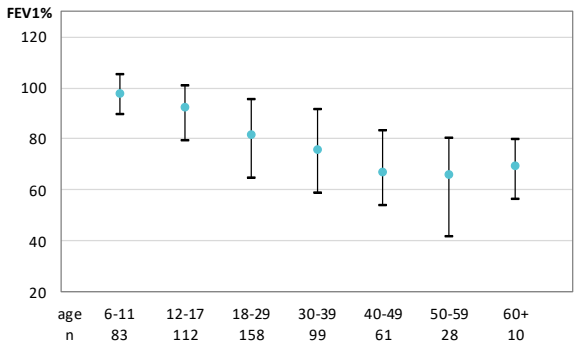
Quartiles of FEV$_1$%: Spain



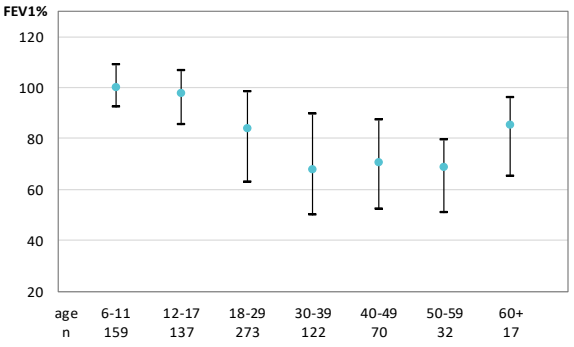
4. Lung function

[figure 4.4 continued]

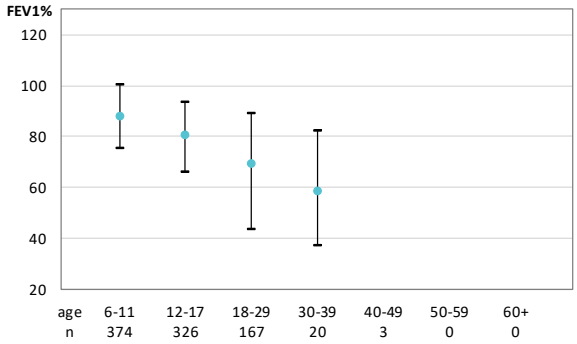
Quartiles of FEV_1%: Sweden



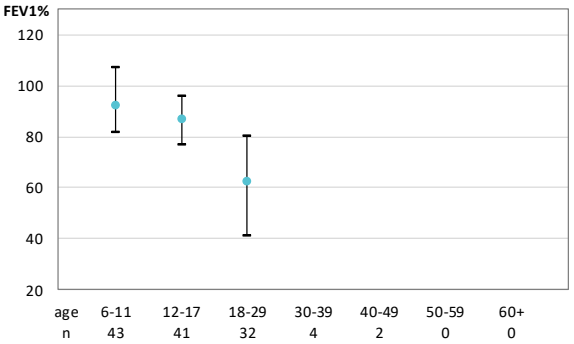
Quartiles of FEV_1%: Switzerland



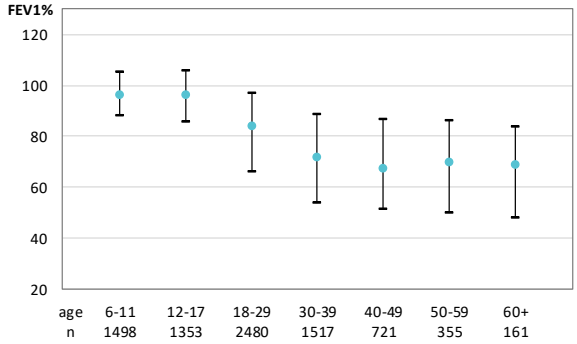
Quartiles of FEV_1%: Turkey



Quartiles of FEV_1%: Ukraine



Quartiles of FEV_1%: United Kingdom

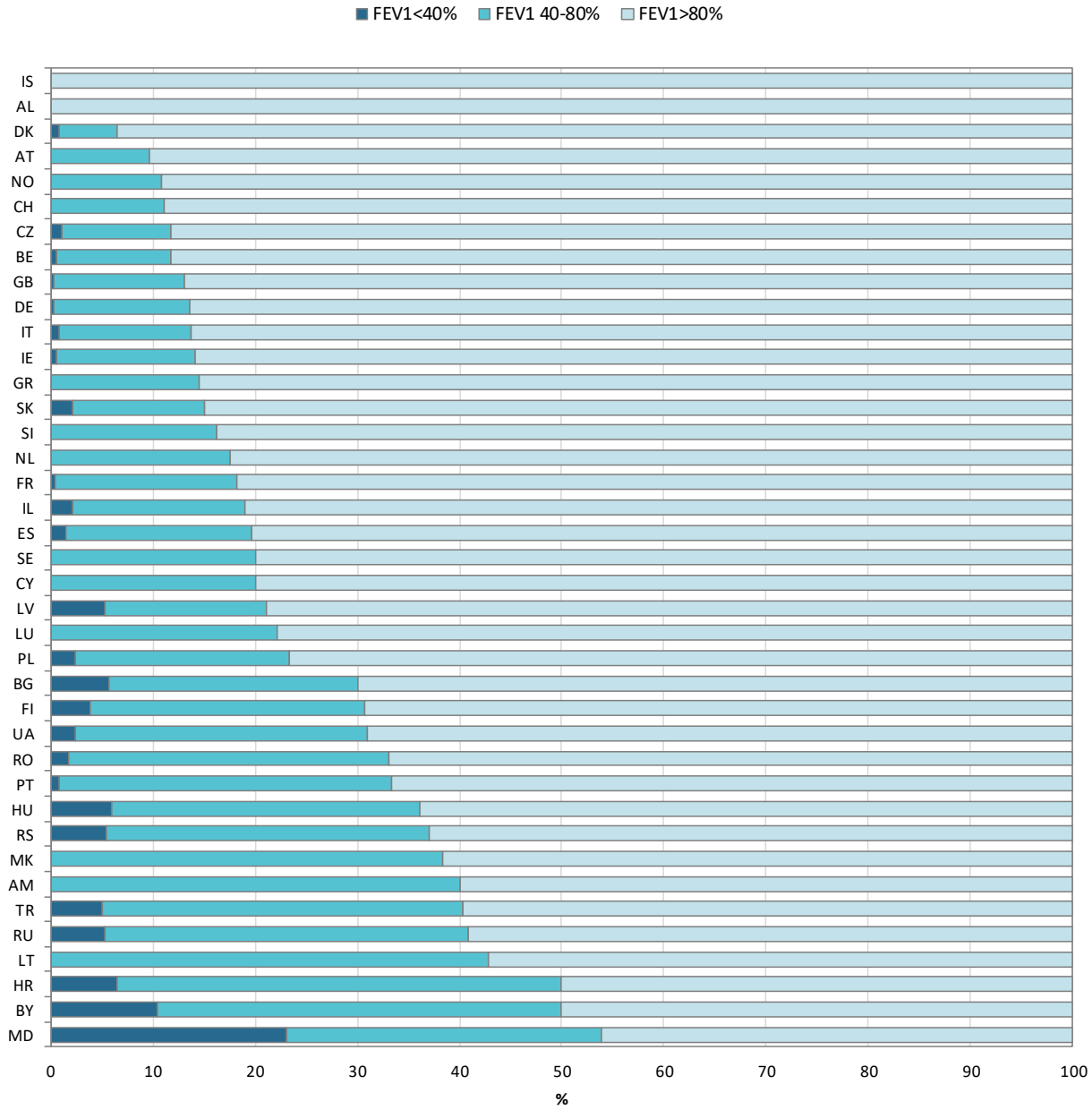


Note: The United Kingdom reports FEV_1 from the annual review, which might no be the best FEV_1 of the year, and, in some cases, the FEV_1 measurement could be from the previous calendar year.

4. Lung function

Figure 4.5 *The majority of all children and adolescents with CF in Europe have a FEV_1 of over 80% predicted.*

FEV1% of predicted according to severity group and age group, by country. Children and adolescents with CF aged 6 – 17 years who have never had a transplant.



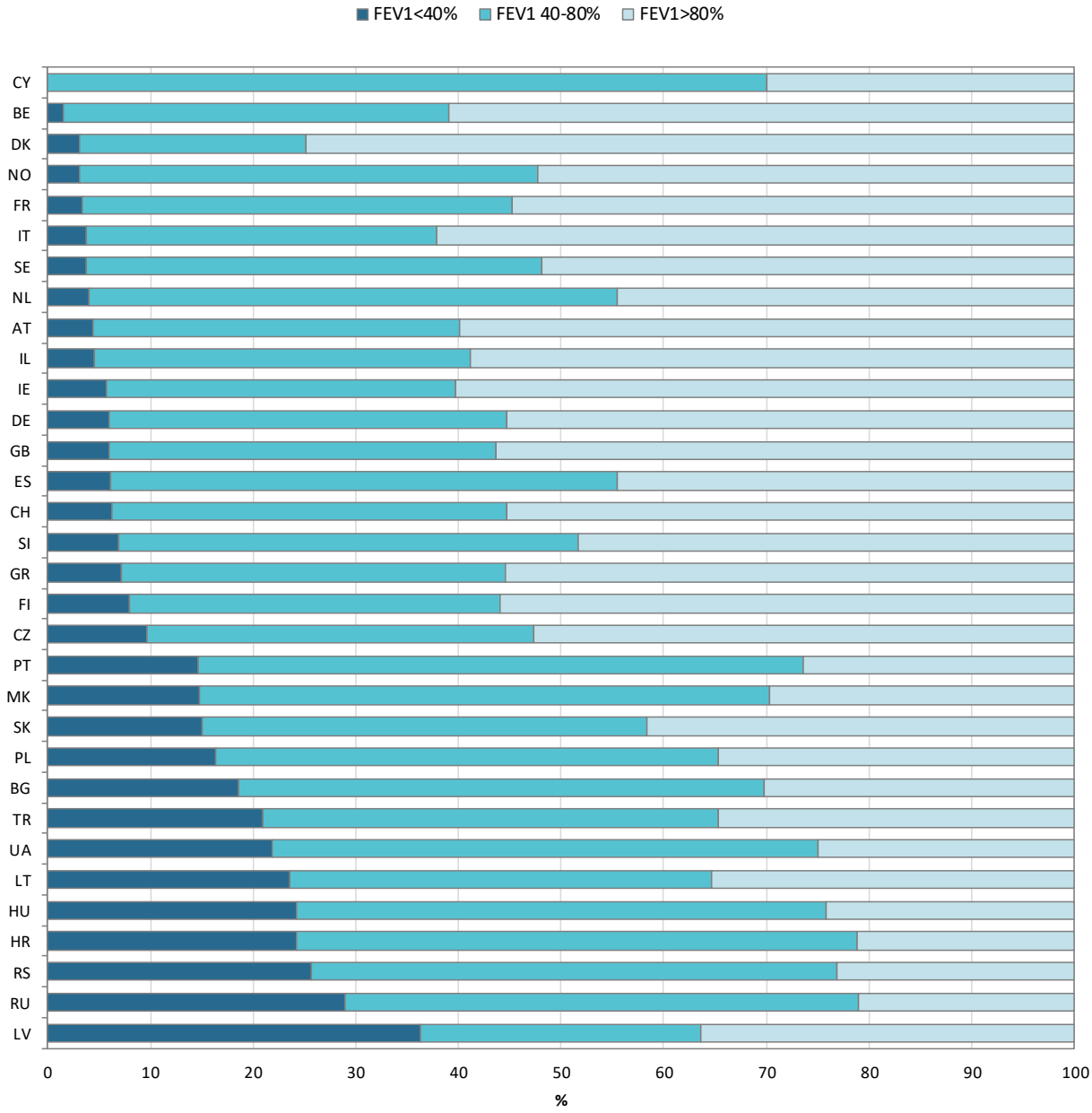
Note: Georgia has <5 people with CF aged 6-17 years at FEV1 measurement and is excluded from the graph.
Note: The United Kingdom reports FEV_1 from the annual review, which might no be the best FEV_1 of the year, and, in some cases, the FEV_1 measurement could be from the previous calendar year.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

Figures 4.5, 4.6 and 4.7 show the FEV_1% by severity group, by country and overall. People with CF with an FEV_1% higher than 80% are generally considered to have mild lung disease, those with a FEV_1% between 80% and 40% moderate lung disease, and those with a FEV_1 lower than 40% severe lung disease. However, since a 10-year-old child with a lung function of 50% has considerably worse lung disease than a 50-year-old with the same FEV_1%, and the age distribution is not the same in all countries, we have chosen to present children (Figure 4.5) and adults (Figure 4.6 and 4.7) separately.

4. Lung function

Figure 4.6 *In the majority of countries, the proportion of young adults with CF with a FEV1 below 40% predicted is less than 10-20%.*

FEV1% of predicted according to severity group and age group, by country. Adults with CF aged 18 – 29 years who have never had a transplant.

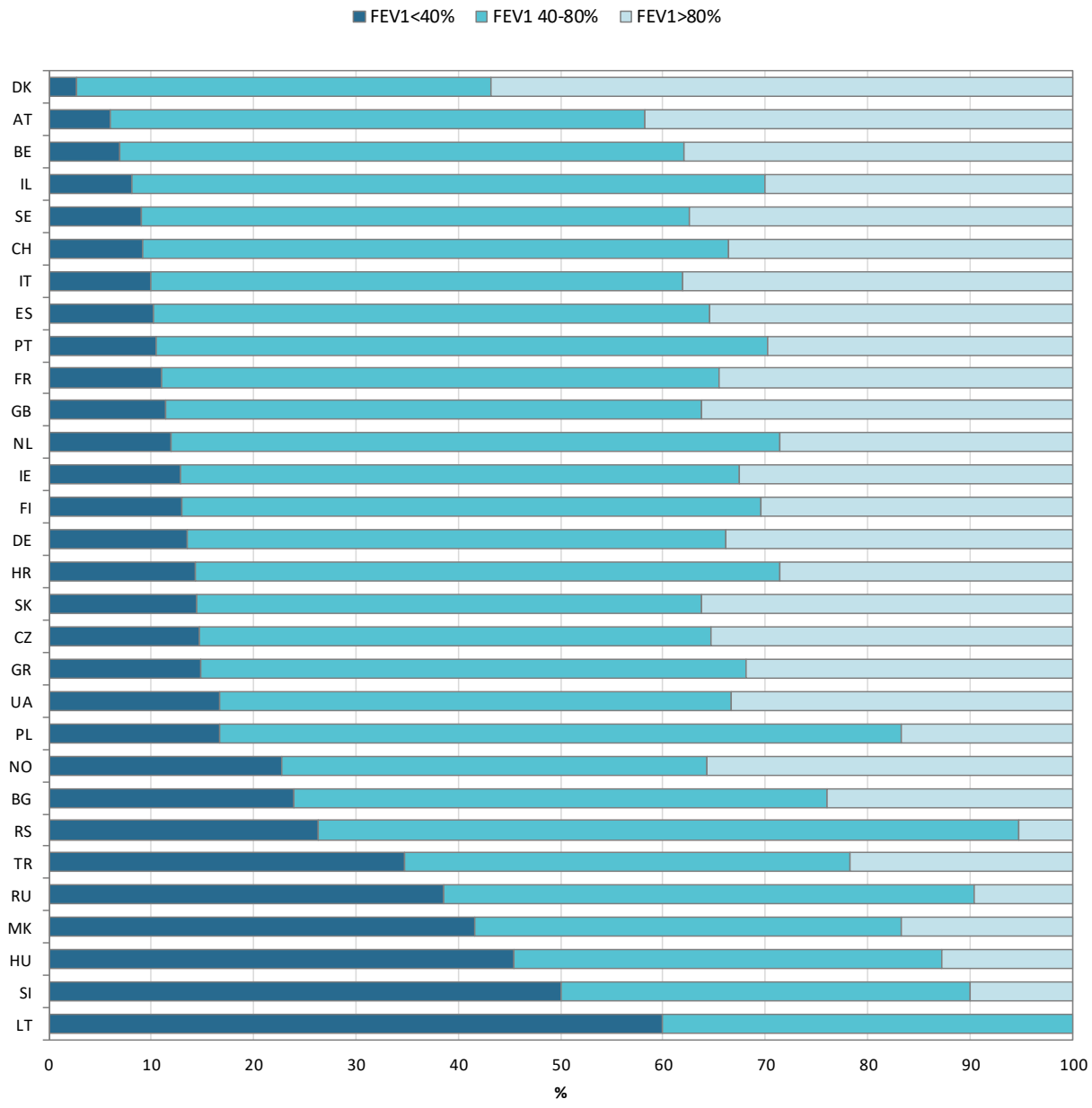


Note: Albania, Armenia, Belarus, Georgia, Iceland, Luxembourg, Rep of Moldova, and Romania have <5 people aged 18-29 years with FEV_1 measurement and are excluded from the graph.
Note: The United Kingdom reports FEV_1 from the annual review, which might no be the best FEV_1 of the year, and, in some cases, the FEV_1 measurement could be from the previous calendar year.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

4. Lung function

Figure 4.7 *In the majority of countries, most adults with CF aged 30 years or older have a FEV_1 between 40% and 80%.*

FEV_1% of predicted according to severity group and age group, by country and overall. Adults with CF aged 30 years or older who have never had a transplant.



Note: Albania, Armenia, Belarus, Cyprus, Georgia, Iceland, Latvia, Luxembourg, Rep of Moldova, and Romania have <5 people aged 30 years or more with FEV_1 measurement and are excluded from the graph.
Note: The United Kingdom reports FEV_1 from the annual review, which might no be the best FEV_1 of the year, and, in some cases, the FEV_1 measurement could be from the previous calendar year.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

5. Microbiology

We collected data on a number of infections common in CF and whether infection is chronic or not chronic/intermittent (with the exception of non-tuberculous mycobacteria where we asked only if the pathogen was found at any time during the follow-up year).

In the microbiology category, there are discrepancies between the ECFSPR definition of chronicity and those of some national registries. The ECFSPR definition of chronic infection (modified Leeds criteria for chronic infection, applied also to gram negative bacteria, see Appendix 3, page 171) is as follows:

The individual should be defined as chronically infected if he/she fulfils the criteria now or has done in recent years and the physician has no reason to believe the status has changed, when:

>50% of respiratory samples collected during the last 12 months are positive; at least 4 samples were collected during that period;

and/or

significantly raised bacteria-specific antibodies according to local laboratories are present.

When minor differences exist, the alternative definition is in a footnote; when differences are major, or if the variable is not collected at all, the variable has been set to missing for that country.

5. Microbiology

Table 5.1 Prevalence of Pseudomonas aeruginosa in people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)								Adults (≥18 years)							
	Missing/ Unknown		No		Yes, chronic		Yes, not chronic/ intermittent		Missing/ Unknown		No		Yes, chronic		Yes, not chronic/ intermittent	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Albania	1	1.2	43	53.7	16	20.0	20	25.0								
Armenia	0	0.0	13	59.1	7	31.8	2	9.1								
Austria	3	0.8	306	80.1	26	6.8	47	12.3	1	0.3	194	50.3	159	41.2	32	8.3
Belarus	0	0.0	113	78.5	31	21.5	0	0.0								
Belgium	0	0.0	375	80.6	32	6.9	58	12.5	12	1.7	391	55.1	228	32.1	79	11.1
Bulgaria	1	0.8	75	63.6	39	33.0	3	2.5	0	0.0	27	32.5	53	63.9	3	3.6
Croatia	5	6.2	48	59.3	15	18.5	13	16.0	0	0.0	10	20.4	34	69.4	5	10.2
Cyprus	0	0.0	4	50.0	2	25.0	2	25.0	1	5.3	8	42.1	5	26.3	5	26.3
Czech Rep.	13	3.9	268	81.5	17	5.2	31	9.4	11	3.9	151	53.2	90	31.7	32	11.3
Denmark	0	0.0	191	87.2	8	3.6	20	9.1	0	0.0	165	58.5	95	33.7	22	7.8
Finland	0	0.0	29	87.9	4	12.1	0	0.0	0	0.0	27	55.1	22	44.9	0	0.0
France	0	0.0	2039	76.3	188	7.0	444	16.6	0	0.0	1776	50.5	1195	34.0	545	15.5
Georgia	2	2.5	53	66.2	20	25.0	5	6.2	0	0.0	5	62.5	3	37.5	0	0.0
Germany	35	1.3	2232	81.7	263	9.6	201	7.4	133	3.6	1576	43.0	1816	49.6	139	3.8
Greece	1	0.5	184	88.0	22	10.5	2	1.0	14	4.1	93	27.3	233	68.5	0	0.0
Hungary	135	100	0	0.0	0	0.0	0	0.0	166	100	0	0.0	0	0.0	0	0.0
Iceland	0	0.0	6	75.0	1	12.5	1	12.5	0	0.0	5	83.3	1	16.7	0	0.0
Ireland	7	1.4	468	90.9	12	2.3	28	5.4	51	7.6	424	62.8	157	23.3	43	6.4
Israel	7	4.3	106	65.8	23	14.3	25	15.5	20	5.7	134	38.5	160	46.0	34	9.8
Italy	3	0.1	1640	74.0	160	7.2	412	18.6	7	0.2	1670	48.6	1279	37.2	481	14.0
Latvia	1	3.2	24	77.4	5	16.1	1	3.2	0	0.0	9	64.3	5	35.7	0	0.0
Lithuania	0	0.0	11	73.3	2	13.3	2	13.3	1	4.0	13	52.0	5	20.0	6	24.0
Luxembourg	0	0.0	16	84.2	1	5.3	2	10.5								
Rep Moldova	1	2.7	15	40.5	16	43.2	5	13.5	0	0.0	2	16.7	10	83.3	0	0.0
Netherlands	12	2.2	465	86.3	52	9.6	10	1.9	62	6.7	436	47.2	316	34.2	110	11.9
N Macedonia	0	0.0	61	73.5	14	16.9	8	9.6	0	0.0	10	22.2	30	66.7	5	11.1
Norway	1	0.8	115	92.0	2	1.6	7	5.6	12	6.8	106	59.9	51	28.8	8	4.5
Poland	8	0.9	673	78.3	88	10.2	90	10.5	12	2.8	162	38.3	217	51.3	32	7.6
Portugal	5	3.0	110	65.5	29	17.3	24	14.3	5	3.1	92	57.1	48	29.8	16	9.9
Romania	9	3.8	140	58.8	64	26.9	25	10.5	0	0.0	4	40.0	6	60.0	0	0.0
Russian Fed.	21	1.0	1158	56.9	502	24.7	353	17.3	16	3.3	185	38.5	242	50.3	38	7.9
Serbia	0	0.0	71	55.9	26	20.5	30	23.6	3	4.6	16	24.6	36	55.4	10	15.4
Slovak Rep.	0	0.0	99	82.5	5	4.2	16	13.3	2	1.4	71	51.1	52	37.4	14	10.1
Slovenia	0	0.0	41	75.9	1	1.8	12	22.2	5	11.9	19	45.2	7	16.7	11	26.2
Spain	17	1.6	760	70.8	121	11.3	175	16.3	36	3.2	585	52.5	407	36.5	86	7.7
Sweden	4	1.5	205	76.8	25	9.4	33	12.4	18	4.8	132	35.4	187	50.1	36	9.6
Switzerland	4	0.9	353	83.8	20	4.7	44	10.4	21	3.9	290	54.3	148	27.7	75	14.0
Turkey	47	2.3	1515	75.6	250	12.5	192	9.6	10	2.9	162	46.4	127	36.4	50	14.3
Ukraine	7	4.3	64	39.0	58	35.4	35	21.3	0	0.0	7	14.3	37	75.5	5	10.2
United Kingdom	2	0.0	3397	80.8	202	4.8	604	14.4	4	0.1	3565	63.3	959	17.0	1100	19.5
Total	352	1.5	17486	75.4	2369	10.2	2982	12.9	623	2.5	12528	50.9	8424	34.2	3025	12.3

Note: Albania, Armenia, Belarus, and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.

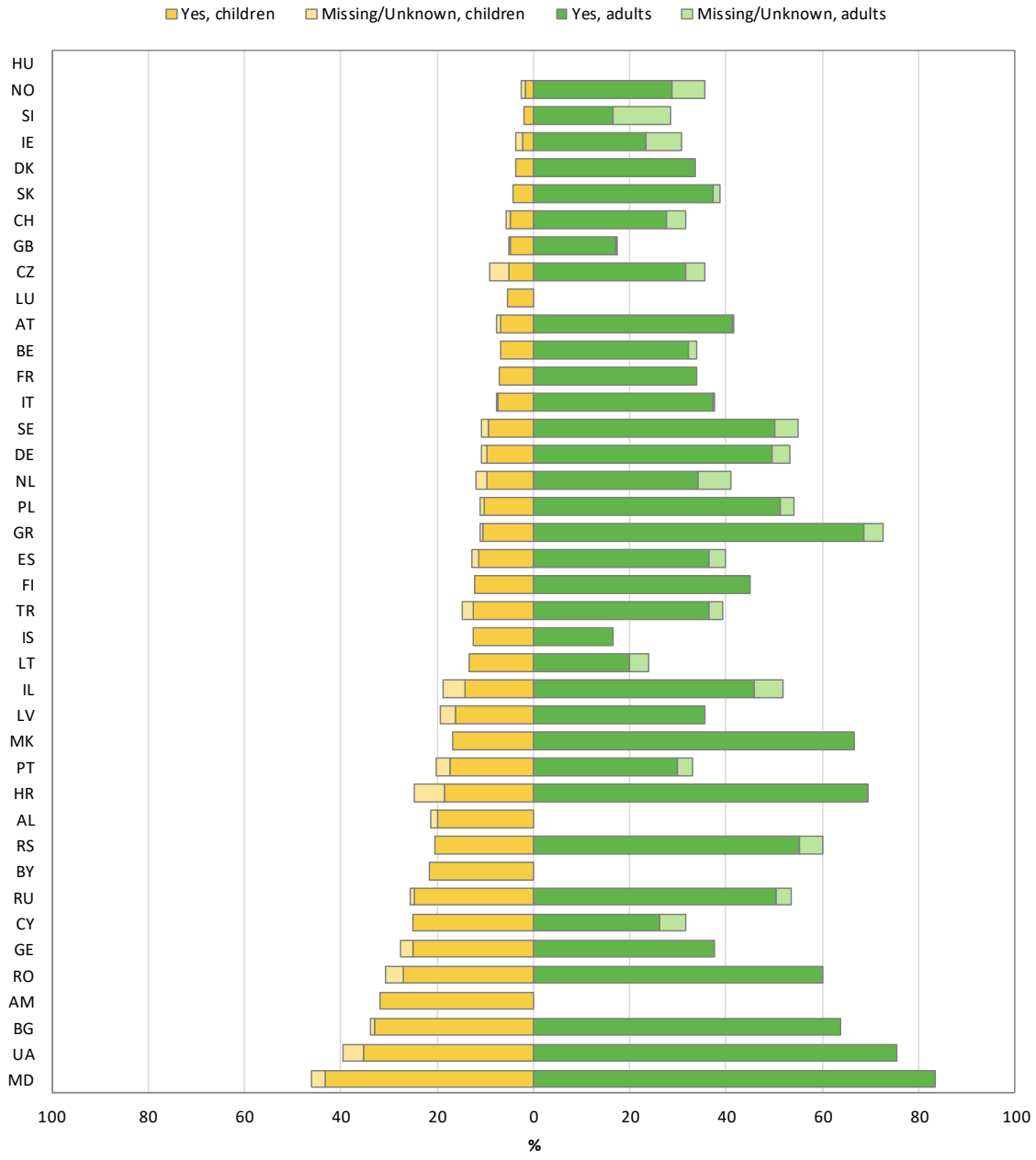
Note: Ireland, Italy: chronicity for Pseudomonas aeruginosa is defined as: at least 3 or more positive isolates during the last 12 months preceding the last reported culture in 2021.
The United Kingdom: chronicity for Pseudomonas aeruginosa is defined as: 3 or more positive isolates during the 12 months preceding the last annual review.

Table 5.1 shows, separately by country, and overall, the frequency of chronic *Pseudomonas aeruginosa* in children and adults. The number of missing values is included.

5. Microbiology

Figure 5.1 *Pseudomonas aeruginosa, together with Staphylococcus aureus and Haemophilus influenzae, is the predominant respiratory pathogen in people with CF, though prevalence varies between age and countries.*

Prevalence of Chronic Pseudomonas aeruginosa in people with CF seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information is missing for more than 10% of the children/adults. Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: Ireland and Italy: chronicity for Pseudomonas aeruginosa is defined as: at least 3 or more positive isolates during the last 12 months preceding the last reported culture in 2021.
The United Kingdom: chronicity for Pseudomonas aeruginosa is defined as: 3 or more positive isolates during the 12 months preceding the last annual review.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph represents the percentage of people with chronic *Pseudomonas aeruginosa* infection (in dark colours) and the percentage of people where information on chronic *Pseudomonas aeruginosa* infection is missing/unknown (in light colours). The bars on the left of the graph represent children and the bars on the right represent adults. This is a frequent infection, but prevalence varies considerably between countries.

5. Microbiology

Table 5.2 Prevalence of Burkholderia cepacia complex species in people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)								Adults (≥18 years)							
	Missing/ Unknown		No		Yes, chronic		Yes, not chronic/ intermittent		Missing/ Unknown		No		Yes, chronic		Yes, not chronic/ intermittent	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Albania	1	1.2	79	98.7	0	0.0	0	0.0								
Armenia	2	9.1	20	90.9	0	0.0	0	0.0								
Austria	5	1.3	373	97.6	2	0.5	2	0.5	4	1.0	360	93.3	21	5.4	1	0.3
Belarus	0	0.0	141	97.9	3	2.1	0	0.0								
Belgium	0	0.0	458	98.5	4	0.9	3	0.6	12	1.7	667	93.9	19	2.7	12	1.7
Bulgaria	1	0.8	117	99.1	0	0.0	0	0.0	0	0.0	83	100	0	0.0	0	0.0
Croatia	6	7.4	74	91.4	0	0.0	1	1.2	1	2.0	48	98.0	0	0.0	0	0.0
Cyprus	0	0.0	8	100	0	0.0	0	0.0	1	5.3	18	94.7	0	0.0	0	0.0
Czech Rep.	13	3.9	314	95.4	2	0.6	0	0.0	11	3.9	239	84.1	34	12.0	0	0.0
Denmark	0	0.0	218	99.5	0	0.0	1	0.5	0	0.0	260	92.2	21	7.4	1	0.3
Finland	0	0.0	33	100	0	0.0	0	0.0	0	0.0	49	100	0	0.0	0	0.0
France	0	0.0	2633	98.6	15	0.6	23	0.9	0	0.0	3411	97.0	72	2.0	33	0.9
Georgia	11	13.7	69	86.2	0	0.0	0	0.0	1	12.5	7	87.5	0	0.0	0	0.0
Germany	31	1.1	2679	98.1	14	0.5	7	0.3	118	3.2	3421	93.4	112	3.1	13	0.3
Greece	3	1.4	206	98.6	0	0.0	0	0.0	58	17.1	282	82.9	0	0.0	0	0.0
Hungary	135	100	0	0.0	0	0.0	0	0.0	166	100	0	0.0	0	0.0	0	0.0
Iceland	0	0.0	7	87.5	0	0.0	1	12.5	0	0.0	6	100	0	0.0	0	0.0
Ireland	7	1.4	503	97.7	2	0.4	3	0.6	51	7.6	598	88.6	9	1.3	17	2.5
Israel	9	5.6	152	94.4	0	0.0	0	0.0	28	8.0	314	90.2	6	1.7	0	0.0
Italy	3	0.1	2202	99.4	5	0.2	5	0.2	8	0.2	3326	96.8	86	2.5	17	0.5
Latvia	1	3.2	30	96.8	0	0.0	0	0.0	0	0.0	13	92.9	1	7.1	0	0.0
Lithuania	0	0.0	14	93.3	1	6.7	0	0.0	1	4.0	21	84.0	3	12.0	0	0.0
Luxembourg	0	0.0	19	100	0	0.0	0	0.0								
Rep Moldova	37	100	0	0.0	0	0.0	0	0.0	12	100	0	0.0	0	0.0	0	0.0
Netherlands	9	1.7	524	97.2	6	1.1	0	0.0	57	6.2	847	91.7	18	1.9	2	0.2
N Macedonia	0	0.0	80	96.4	2	2.4	1	1.2	0	0.0	45	100	0	0.0	0	0.0
Norway	1	0.8	123	98.4	1	0.8	0	0.0	16	9.0	155	87.6	4	2.3	2	1.1
Poland	9	1.0	841	97.9	5	0.6	4	0.5	13	3.1	384	90.8	22	5.2	4	0.9
Portugal	6	3.6	158	94.0	2	1.2	2	1.2	9	5.6	139	86.3	12	7.4	1	0.6
Romania	15	6.3	223	93.7	0	0.0	0	0.0	1	10.0	9	90.0	0	0.0	0	0.0
Russian Fed.	21	1.0	1945	95.6	46	2.3	22	1.1	17	3.5	422	87.7	37	7.7	5	1.0
Serbia	0	0.0	116	91.3	6	4.7	5	3.9	3	4.6	49	75.4	9	13.8	4	6.1
Slovak Rep.	0	0.0	119	99.2	0	0.0	1	0.8	2	1.4	127	91.4	8	5.8	2	1.4
Slovenia	0	0.0	54	100	0	0.0	0	0.0	9	21.4	33	78.6	0	0.0	0	0.0
Spain	13	1.2	1040	96.9	15	1.4	5	0.5	38	3.4	996	89.4	69	6.2	11	1.0
Sweden	3	1.1	263	98.5	1	0.4	0	0.0	0	0.0	359	96.2	11	2.9	3	0.8
Switzerland	2	0.5	416	98.8	0	0.0	3	0.7	23	4.3	494	92.5	11	2.1	6	1.1
Turkey	48	2.4	1948	97.2	6	0.3	2	0.1	9	2.6	337	96.6	2	0.6	1	0.3
Ukraine	7	4.3	149	90.8	6	3.7	2	1.2	0	0.0	46	93.9	3	6.1	0	0.0
United Kingdom	2	0.0	4157	98.9	0	0.0	46	1.1	4	0.1	5421	96.3	0	0.0	203	3.6
Total	401	1.7	22505	97.0	144	0.6	139	0.6	674	2.7	22998	93.5	590	2.4	338	1.4

Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.

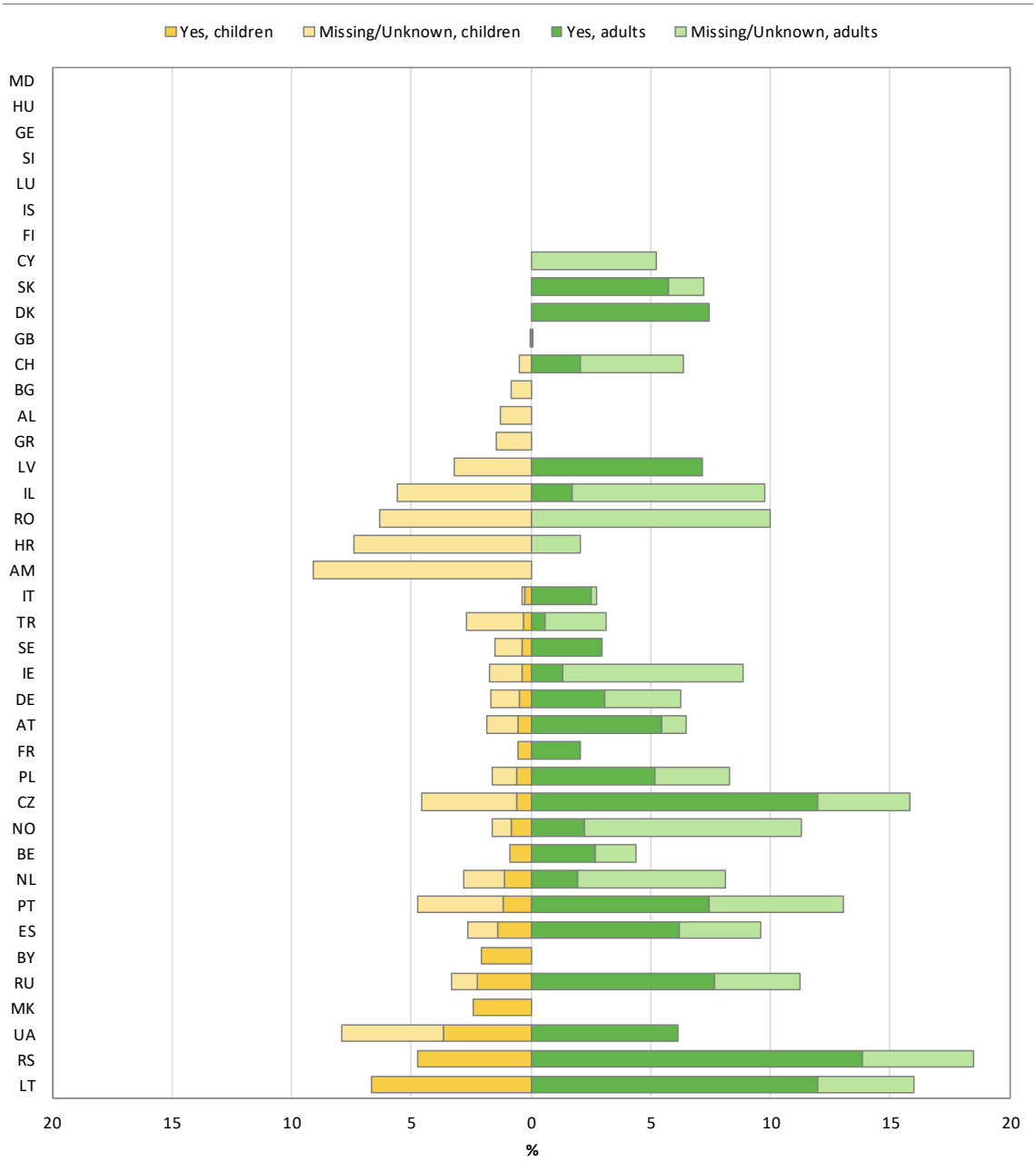
Note: Ireland and Italy: chronicity for *Burkholderia cepacia complex* is defined as: at least 3 or more positive isolates during the last 12 months preceding the last reported culture in 2021.
The United Kingdom: chronicity for *Burkholderia cepacia complex* is not collected.

Table 5.2 shows, separately by country, and overall, the frequency *Burkholderia cepacia complex species* in children and adults. The number of missing values is included. The identification rate may be influenced by differences in culture techniques employed.

5. Microbiology

Figure 5.2 *In some countries, Burkholderia cepacia complex spp. belong to the emerging respiratory pathogens with increasing prevalence.*

Prevalence of Burkholderia cepacia complex species in people with CF seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information is missing for more than 10% of the children/adults. Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: Ireland and Italy: chronicity for *Burkholderia cepacia complex* is defined as: at least 3 or more positive isolates during the last 12 months preceding the last reported culture in 2021.
The United Kingdom: chronicity for *Burkholderia cepacia complex* is not collected.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph represents the percentage of people with *Burkholderia cepacia* complex species infection (in dark colours) and the percentage of people where information on *Burkholderia cepacia* complex species infection is missing/unknown (in light colours). The bars on the left of the graph represent children, while the bars on the right represent adults. This infection is much less frequent than *Pseudomonas aeruginosa* (note the different scale on the horizontal axis), and there is also some variation among countries.

5. Microbiology

Table 5.3 Prevalence of Haemophilus influenzae in people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)								Adults (≥18 years)							
	Missing/ Unknown		No		Yes, chronic		Yes, not chronic/ intermittent		Missing/ Unknown		No		Yes, chronic		Yes, not chronic/ intermittent	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Albania	4	5.0	76	95.0	0	0.0	0	0.0								
Armenia	3	13.6	18	81.8	0	0.0	1	4.5								
Austria	2	0.5	295	77.2	11	2.9	74	19.4	5	1.3	335	86.8	9	2.3	37	9.6
Belarus	0	0.0	129	89.6	15	10.4	0	0.0								
Belgium	0	0.0	337	72.5	0	0.0	128	27.5	12	1.7	614	86.5	0	0.0	84	11.8
Bulgaria	1	0.8	108	91.5	1	0.8	8	6.8	0	0.0	79	95.2	1	1.2	3	3.6
Croatia	5	6.2	71	87.6	0	0.0	5	6.2	1	2.0	46	93.9	0	0.0	2	4.1
Cyprus	0	0.0	0	0.0	3	37.5	5	62.5	1	5.3	5	26.3	5	26.3	8	42.1
Czech Rep.	17	5.2	273	83.0	36	10.9	3	0.9	9	3.2	271	95.4	4	1.4	0	0.0
Denmark	0	0.0	140	63.9	11	5.0	68	31.0	0	0.0	232	82.3	3	1.1	47	16.7
Finland	0	0.0	32	97.0	1	3.0	0	0.0	0	0.0	48	98.0	1	2.0	0	0.0
France	0	0.0	2308	86.4	0	0.0	363	13.6	0	0.0	3162	89.9	0	0.0	354	10.1
Georgia	12	15.0	68	85.0	0	0.0	0	0.0	1	12.5	7	87.5	0	0.0	0	0.0
Germany	31	1.1	2291	83.9	0	0.0	409	15.0	121	3.3	3368	91.9	0	0.0	175	4.8
Greece	2	1.0	193	92.3	0	0.0	14	6.7	57	16.8	267	78.5	0	0.0	16	4.7
Hungary	135	100	0	0.0	0	0.0	0	0.0	166	100	0	0.0	0	0.0	0	0.0
Iceland	0	0.0	5	62.5	0	0.0	3	37.5	0	0.0	6	100	0	0.0	0	0.0
Ireland	7	1.4	467	90.7	1	0.2	40	7.8	51	7.6	613	90.8	0	0.0	11	1.6
Israel	11	6.8	136	84.5	5	3.1	9	5.6	26	7.5	308	88.5	5	1.4	9	2.6
Italy	3	0.1	1944	87.8	39	1.8	229	10.3	7	0.2	3340	97.2	30	0.9	60	1.7
Latvia	1	3.2	24	77.4	2	6.4	4	12.9	0	0.0	11	78.6	1	7.1	2	14.3
Lithuania	0	0.0	15	100	0	0.0	0	0.0	2	8.0	23	92.0	0	0.0	0	0.0
Luxembourg	0	0.0	13	68.4	1	5.3	5	26.3								
Rep Moldova	2	5.4	35	94.6	0	0.0	0	0.0	0	0.0	12	100	0	0.0	0	0.0
Netherlands	9	1.7	444	82.4	82	15.2	4	0.7	72	7.8	769	83.2	79	8.5	4	0.4
N Macedonia	0	0.0	81	97.6	0	0.0	2	2.4	0	0.0	45	100	0	0.0	0	0.0
Norway	1	0.8	81	64.8	1	0.8	42	33.6	15	8.5	144	81.4	2	1.1	16	9.0
Poland	9	1.0	729	84.9	6	0.7	115	13.4	14	3.3	391	92.4	1	0.2	17	4.0
Portugal	4	2.4	132	78.6	1	0.6	31	18.4	8	5.0	141	87.6	4	2.5	8	5.0
Romania	15	6.3	221	92.9	0	0.0	2	0.8	1	10.0	9	90.0	0	0.0	0	0.0
Russian Fed.	21	1.0	1925	94.6	28	1.4	60	2.9	17	3.5	456	94.8	2	0.4	6	1.2
Serbia	1	0.8	25	19.7	52	40.9	49	38.6	3	4.6	28	43.1	8	12.3	26	40.0
Slovak Rep.	1	0.8	110	91.7	2	1.7	7	5.8	2	1.4	133	95.7	2	1.4	2	1.4
Slovenia	0	0.0	35	64.8	7	13.0	12	22.2	9	21.4	31	73.8	0	0.0	2	4.8
Spain	15	1.4	931	86.8	10	0.9	117	10.9	43	3.9	1012	90.8	9	0.8	50	4.5
Sweden	3	1.1	227	85.0	9	3.4	28	10.5	0	0.0	329	88.2	29	7.8	15	4.0
Switzerland	3	0.7	339	80.5	10	2.4	69	16.4	23	4.3	480	89.9	14	2.6	17	3.2
Turkey	173	8.6	1783	89.0	21	1.0	27	1.3	20	5.7	317	90.8	5	1.4	7	2.0
Ukraine	7	4.3	148	90.2	3	1.8	6	3.7	0	0.0	49	100	0	0.0	0	0.0
United Kingdom	2	0.0	3809	90.6	0	0.0	394	9.4	4	0.1	5481	97.4	0	0.0	143	2.5
Total	500	2.2	19998	86.2	358	1.5	2333	10.1	690	2.8	22573	91.8	215	0.9	1122	4.6

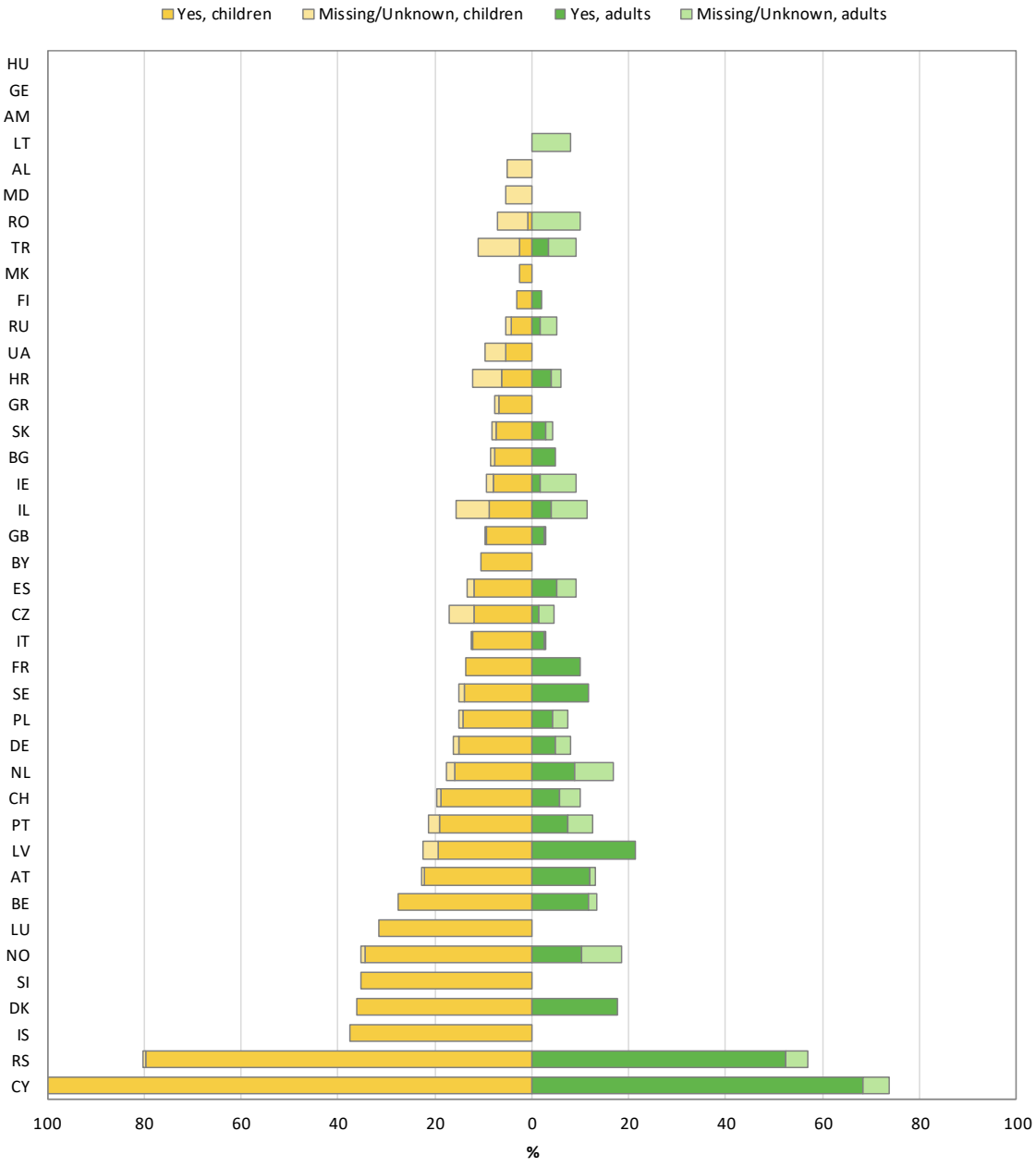
Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.
Belgium, France, Germany and UK: chronicity for Haemophilus influenza is not collected.
Note: Ireland and Italy: chronicity for Haemophilus influenzae is defined as: at least 3 or more positive isolates during the last 12 months preceding the last reported culture in 2021.

Table 5.3 shows, separately by country, and overall, the frequency of *Haemophilus influenzae* in children and adults. The number of missing values is included.

5. Microbiology

Figure 5.3 *Haemophilus influenzae, together with Pseudomonas aeruginosa and Staphylococcus aureus, is the predominant respiratory pathogen in people with CF, though prevalence varies between age and countries.*

Prevalence of Haemophilus influenzae in people with CF seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information is missing for more than 10% of the children/adults. Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: Belgium, France, Germany and United Kingdom: chronicity for Haemophilus influenza is not collected.
Ireland and Italy: chronicity for Haemophilus influenzae is defined as: at least 3 or more positive isolates during the last 12 months preceding the last reported culture in 2021.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph represents the percentage of people with *Haemophilus influenzae* infection (in dark colours) and the percentage of people where information on *Haemophilus influenzae* infection is missing/unknown (in light colours). The horizontal bars on the left of the graph represent children, while the bars on the right represent adults. This infection is as frequent as *Pseudomonas aeruginosa* infection with a similar degree of variation between the countries.

5. Microbiology

Table 5.4 Prevalence of Staphylococcus aureus in people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)								Adults (≥18 years)							
	Missing/ Unknown		No		Yes, chronic		Yes, not chronic/ intermittent		Missing/ Unknown		No		Yes, chronic		Yes, not chronic/ intermittent	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Albania	1	1.2	35	43.7	8	10.0	36	45.0								
Armenia	0	0.0	0	0.0	5	22.7	17	77.3								
Austria	2	0.5	65	17.0	216	56.5	99	25.9	2	0.5	97	25.1	225	58.3	62	16.1
Belarus	0	0.0	73	50.7	71	49.3	0	0.0								
Belgium	0	0.0	171	36.8	223	48.0	71	15.3	12	1.7	254	35.8	348	49.0	96	13.5
Bulgaria	2	1.7	69	58.5	11	9.3	36	30.5	0	0.0	62	74.7	3	3.6	18	21.7
Croatia	5	6.2	19	23.5	36	44.4	21	25.9	1	2.0	10	20.4	27	55.1	11	22.4
Cyprus	0	0.0	4	50.0	3	37.5	1	12.5	1	5.3	10	52.6	5	26.3	3	15.8
Czech Rep.	13	3.9	74	22.5	123	37.4	119	36.2	11	3.9	87	30.6	130	45.8	56	19.7
Denmark	0	0.0	64	29.2	57	26.0	98	44.7	0	0.0	124	44.0	70	24.8	88	31.2
Finland	0	0.0	18	54.5	15	45.4	0	0.0	0	0.0	17	34.7	32	65.3	0	0.0
France	0	0.0	652	24.4	1243	46.5	776	29.0	0	0.0	1469	41.8	1368	38.9	679	19.3
Georgia	4	5.0	36	45.0	2	2.5	38	47.5	0	0.0	5	62.5	1	12.5	2	25.0
Germany	33	1.2	646	23.6	1123	41.1	929	34.0	122	3.3	1181	32.2	1754	47.9	607	16.6
Greece	6	2.9	115	55.0	86	41.1	2	1.0	22	6.5	174	51.2	144	42.3	0	0.0
Hungary	135	100	0	0.0	0	0.0	0	0.0	166	100	0	0.0	0	0.0	0	0.0
Iceland	0	0.0	3	37.5	2	25.0	3	37.5	0	0.0	2	33.3	3	50.0	1	16.7
Ireland	7	1.4	244	47.4	155	30.1	109	21.2	51	7.6	382	56.6	142	21.0	100	14.8
Israel	8	5.0	54	33.5	57	35.4	42	26.1	22	6.3	174	50.0	81	23.3	71	20.4
Italy	3	0.1	653	29.5	937	42.3	622	28.1	7	0.2	1512	44.0	1252	36.4	666	19.4
Latvia	1	3.2	2	6.4	20	64.5	8	25.8	0	0.0	5	35.7	8	57.1	1	7.1
Lithuania	0	0.0	3	20.0	7	46.7	5	33.3	0	0.0	9	36.0	11	44.0	5	20.0
Luxembourg	0	0.0	3	15.8	12	63.2	4	21.0								
Rep Moldova	1	2.7	0	0.0	32	86.5	4	10.8	0	0.0	1	8.3	11	91.7	0	0.0
Netherlands	9	1.7	206	38.2	233	43.2	91	16.9	53	5.7	416	45.0	344	37.2	111	12.0
N.Macedonia	0	0.0	64	77.1	12	14.5	7	8.4	0	0.0	27	60.0	11	24.4	7	15.6
Norway	1	0.8	36	28.8	61	48.8	27	21.6	10	5.6	71	40.1	77	43.5	19	10.7
Poland	7	0.8	170	19.8	478	55.6	204	23.7	15	3.5	104	24.6	242	57.2	62	14.7
Portugal	6	3.6	64	38.1	61	36.3	37	22.0	7	4.3	63	39.1	73	45.3	18	11.2
Romania	14	5.9	167	70.2	17	7.1	40	16.8	1	10.0	8	80.0	1	10.0	0	0.0
Russian Fed.	21	1.0	698	34.3	1074	52.8	241	11.8	17	3.5	225	46.8	212	44.1	27	5.6
Serbia	1	0.8	24	18.9	71	55.9	31	24.4	3	4.6	20	30.8	26	40.0	16	24.6
Slovak Rep.	0	0.0	64	53.3	27	22.5	29	24.2	2	1.4	69	49.6	44	31.6	24	17.3
Slovenia	0	0.0	1	1.8	49	90.7	4	7.4	7	16.7	11	26.2	18	42.9	6	14.3
Spain	12	1.1	381	35.5	385	35.9	295	27.5	42	3.8	509	45.7	446	40.0	117	10.5
Sweden	18	6.7	8	3.0	68	25.5	173	64.8	39	10.5	49	13.1	168	45.0	117	31.4
Switzerland	3	0.7	99	23.5	221	52.5	98	23.3	22	4.1	247	46.2	189	35.4	76	14.2
Turkey	50	2.5	1380	68.9	345	17.2	229	11.4	10	2.9	210	60.2	80	22.9	49	14.0
Ukraine	7	4.3	32	19.5	87	53.0	38	23.2	0	0.0	13	26.5	31	63.3	5	10.2
United Kingdom	2	0.0	3222	76.6	377	9.0	604	14.4	4	0.1	4081	72.5	443	7.9	1100	19.5
Total	372	1.6	9619	41.5	8010	34.5	5188	22.4	649	2.6	11701	47.6	8026	32.6	4224	17.2

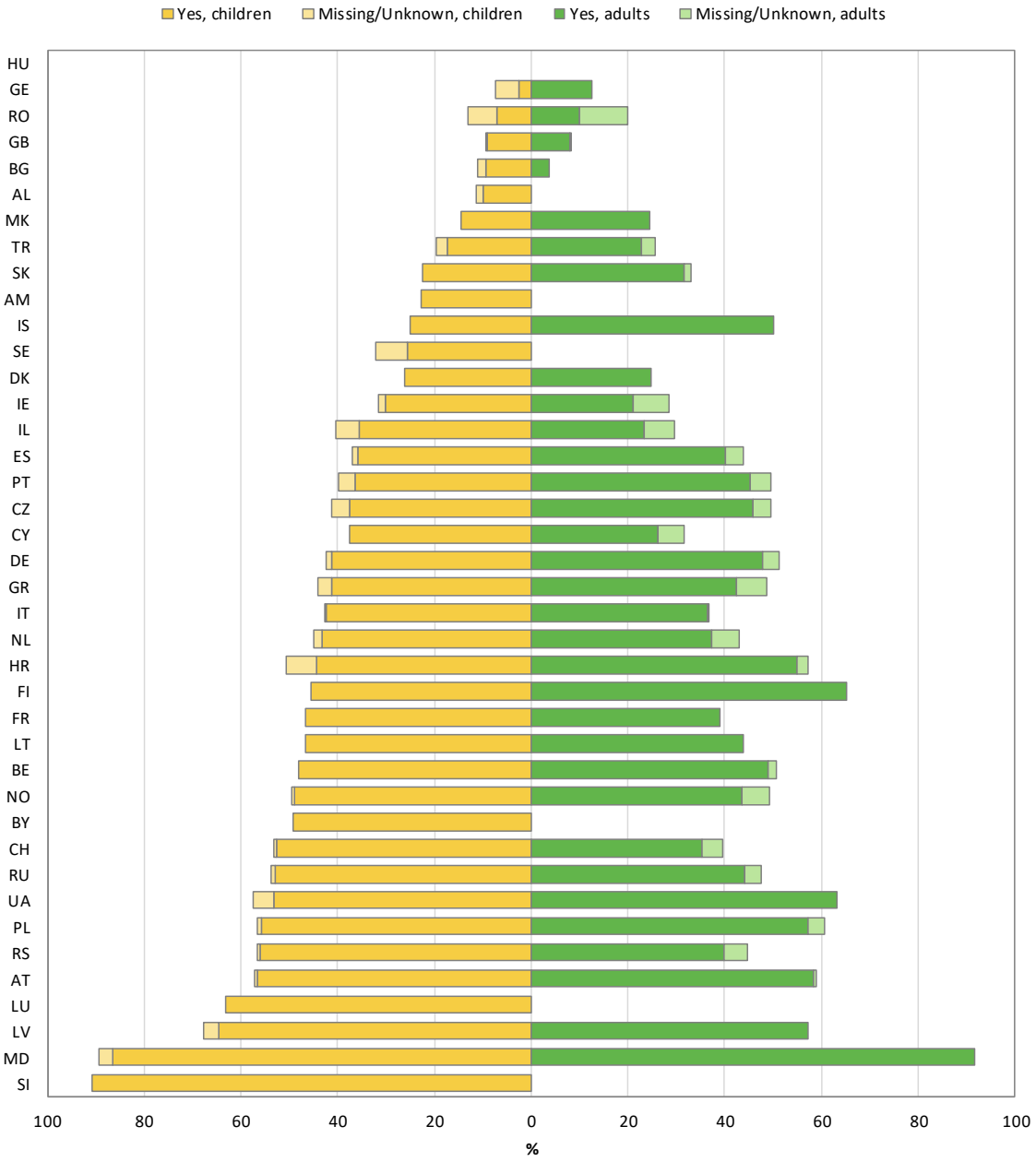
Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.
Belgium: chronic Staphylococcus Aureus: Variable is not collected as such, but chronicity is derived comparing the information of the current year and the year before.
Ireland and Italy: chronicity for Staphylococcus Aureus is defined as: at least 3 or more positive isolates during the last 12 months preceding the last reported culture in 2021.
The United Kingdom: chronicity for Staphylococcus Aureus is defined as: 3 or more positive isolates during the 12 months preceding last annual review.

Table 5.4 shows the frequency of *Staphylococcus aureus* in children and adults, by country and overall. The number of missing values is included.

5. Microbiology

Figure 5.4 *Haemophilus influenzae, together with Pseudomonas aeruginosa and Staphylococcus influenzae, is the predominant respiratory pathogen in people with CF, though prevalence varies between age and countries.*

Prevalence of Staphylococcus aureus in people with CF seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information is missing for more than 10% of the children/adults. Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.

Note: Belgium: chronic Staphylococcus Aureus: Variable is not collected as such, but chronicity is derived comparing the information of the current year and the year before.
Ireland and Italy: chronicity for Staphylococcus Aureus is defined as: at least 3 or more positive isolates during the last 12 months preceding the last reported culture in 2021.
The United Kingdom: chronicity for Staphylococcus Aureus is defined as: 3 or more positive isolates during the 12 months preceding the last annual review.

Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph represents the percentage of people with *Staphylococcus aureus* infection (in dark colours) and the percentage of people where information on *Staphylococcus aureus* infection is missing/unknown (in light colours). The horizontal bars on the left of the graph refer to children, while the horizontal bars on the right refer to adults. This infection is as frequent as *Pseudomonas aeruginosa* infection with a similar degree of variation between the countries.

5. Microbiology

Table 5.5 Prevalence of methicillin-resistant Staphylococcus aureus (MRSA) in people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)								Adults (≥18 years)							
	Missing/ Unknown		No		Yes, chronic		Yes, not chronic/ intermittent		Missing/ Unknown		No		Yes, chronic		Yes, not chronic/ intermittent	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Albania	2	2.5	66	82.5	1	1.2	11	13.7								
Armenia	15	68.2	7	31.8	0	0.0	0	0.0								
Austria	3	0.8	372	97.4	3	0.8	4	1.0	4	1.0	370	95.8	6	1.5	6	1.5
Belarus	0	0.0	142	98.6	2	1.4	0	0.0								
Belgium	0	0.0	456	98.1	3	0.6	6	1.3	12	1.7	649	91.4	34	4.8	15	2.1
Bulgaria	1	0.8	115	97.5	2	1.7	0	0.0	0	0.0	83	100	0	0.0	0	0.0
Croatia	5	6.2	75	92.6	0	0.0	1	1.2	2	4.1	45	91.8	0	0.0	2	4.1
Cyprus	0	0.0	5	62.5	1	12.5	2	25.0	1	5.3	16	84.2	0	0.0	2	10.5
Czech Rep.	13	3.9	312	94.8	3	0.9	1	0.3	11	3.9	263	92.6	5	1.8	5	1.8
Denmark	0	0.0	219	100	0	0.0	0	0.0	0	0.0	282	100	0	0.0	0	0.0
Finland	0	0.0	32	97.0	1	3.0	0	0.0	0	0.0	47	95.9	2	4.1	0	0.0
France	0	0.0	2590	97.0	33	1.2	48	1.8	0	0.0	3267	92.9	153	4.3	96	2.7
Georgia	14	17.5	66	82.5	0	0.0	0	0.0	3	37.5	5	62.5	0	0.0	0	0.0
Germany	35	1.3	2614	95.7	53	1.9	29	1.1	132	3.6	3296	90.0	193	5.3	43	1.2
Greece	1	0.5	180	86.1	0	0.0	28	13.4	59	17.3	247	72.6	0	0.0	34	10.0
Hungary	2	1.5	128	94.8	5	3.7	0	0.0	1	0.6	160	96.4	5	3.0	0	0.0
Iceland	0	0.0	8	100	0	0.0	0	0.0	1	16.7	4	66.7	0	0.0	1	16.7
Ireland	7	1.4	494	95.9	2	0.4	12	2.3	51	7.6	595	88.1	3	0.4	26	3.8
Israel	8	5.0	141	87.6	3	1.9	9	5.6	28	8.0	301	86.5	7	2.0	12	3.4
Italy	3	0.1	1993	90.0	96	4.3	123	5.5	7	0.2	3139	91.3	125	3.6	166	4.8
Latvia	1	3.2	29	93.5	0	0.0	1	3.2	0	0.0	14	100	0	0.0	0	0.0
Lithuania	1	6.7	14	93.3	0	0.0	0	0.0	1	4.0	24	96.0	0	0.0	0	0.0
Luxembourg	0	0.0	19	100	0	0.0	0	0.0								
Rep.Moldova	1	2.7	36	97.3	0	0.0	0	0.0	0	0.0	12	100	0	0.0	0	0.0
Netherlands	9	1.7	526	97.6	3	0.6	1	0.2	107	11.6	803	86.9	11	1.2	3	0.3
N.Macedonia	0	0.0	61	73.5	5	6.0	17	20.5	0	0.0	35	77.8	5	11.1	5	11.1
Norway	1	0.8	123	98.4	0	0.0	1	0.8	15	8.5	157	88.7	2	1.1	3	1.7
Poland	11	1.3	823	95.8	18	2.1	7	0.8	14	3.3	386	91.2	17	4.0	6	1.4
Portugal	5	3.0	150	89.3	4	2.4	9	5.4	5	3.1	142	88.2	5	3.1	9	5.6
Romania	17	7.1	175	73.5	20	8.4	26	10.9	1	10.0	6	60.0	2	20.0	1	10.0
Russian Fed.	21	1.0	1911	93.9	58	2.8	44	2.2	17	3.5	443	92.1	13	2.7	8	1.7
Serbia	1	0.8	104	81.9	6	4.7	16	12.6	3	4.6	54	83.1	5	7.7	3	4.6
Slovak Rep.	1	0.8	115	95.8	2	1.7	2	1.7	2	1.4	127	91.4	6	4.3	4	2.9
Slovenia	0	0.0	50	92.6	3	5.6	1	1.8	9	21.4	31	73.8	1	2.4	1	2.4
Spain	13	1.2	1010	94.1	18	1.7	32	3.0	38	3.4	1000	89.8	44	3.9	32	2.9
Sweden	3	1.1	257	96.2	0	0.0	7	2.6	0	0.0	369	98.9	3	0.8	1	0.3
Switzerland	5	1.2	406	96.4	5	1.2	5	1.2	22	4.1	503	94.2	2	0.4	7	1.3
Turkey	51	2.5	1719	85.8	116	5.8	118	5.9	9	2.6	306	87.7	17	4.9	17	4.9
Ukraine	7	4.3	144	87.8	6	3.7	7	4.3	0	0.0	47	95.9	2	4.1	0	0.0
United Kingdom	2	0.0	4112	97.8	0	0.0	91	2.2	4	0.1	5528	98.2	0	0.0	96	1.7
Total	259	1.1	21799	94.0	472	2.0	659	2.8	560	2.3	22767	92.5	669	2.7	604	2.5

Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.

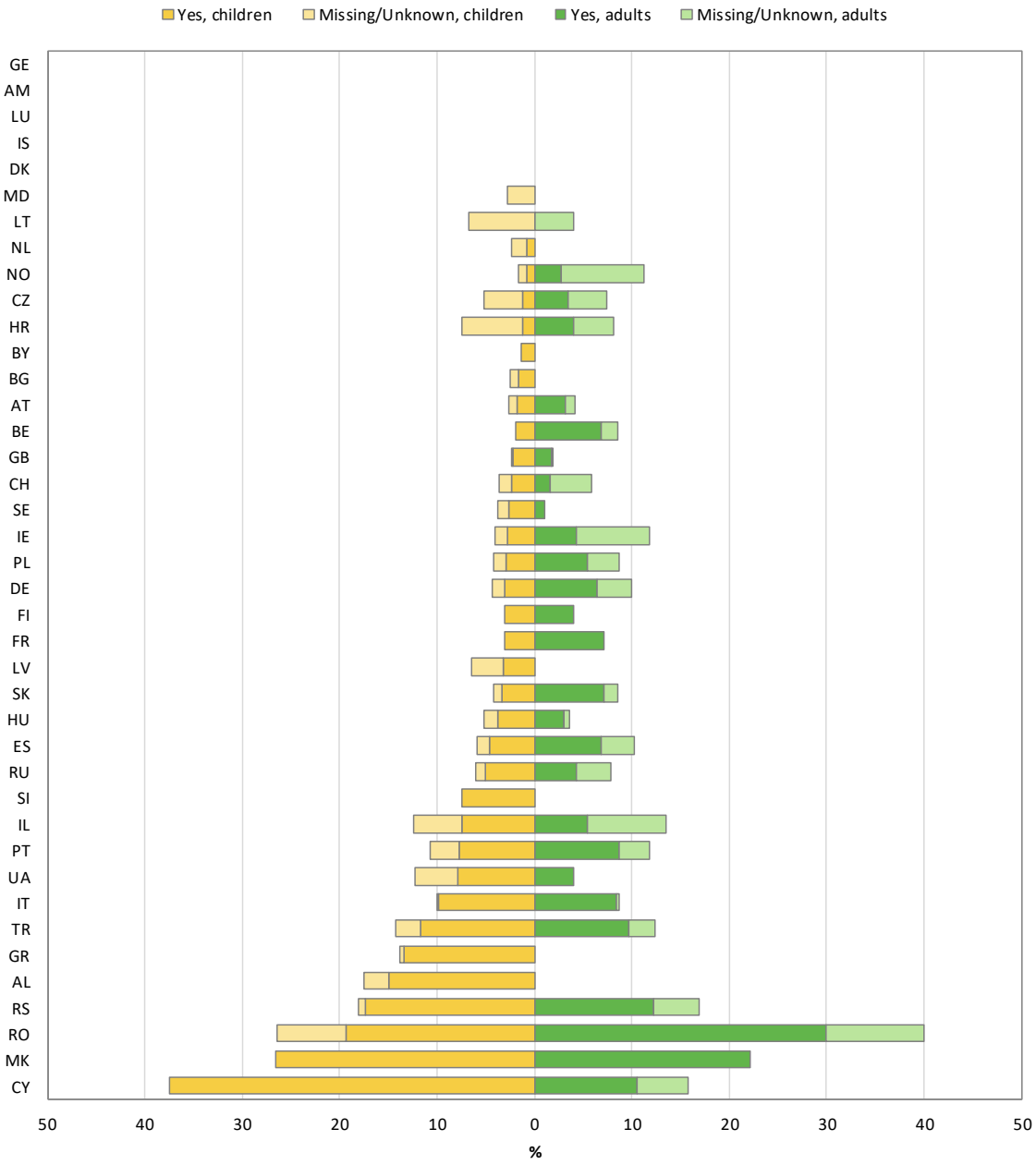
Note: Ireland and Italy: chronicity for methicillin-resistant Staphylococcus Aureus is defined as: at least 3 or more positive isolates during the last 12 months preceding the last reported culture in 2021.
The United Kingdom: chronicity for methicillin-resistant Staphylococcus Aureus is not collected.

Table 5.5 shows the frequency of methicillin-resistant *Staphylococcus aureus* in children and adults, by country and overall. The number of missing values is included.

5. Microbiology

Figure 5.5 *Prevalence of methicillin-resistant Staphylococcus aureus (MRSA) in the airways is very heterogeneous in people with CF throughout Europe.*

Prevalence of methicillin-resistant Staphylococcus aureus (MRSA) in people with CF seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information is missing for more than 10% of the children/adults. Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: Ireland and Italy: chronicity for methicillin-resistant Staphylococcus Aureus is defined as: at least 3 or more positive isolates during the last 12 months preceding the last reported culture in 2021.
The United Kingdom: chronicity for methicillin-resistant Staphylococcus Aureus is not collected.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph represents the percentage of people with methicillin-resistant *Staphylococcus aureus* (MRSA) infection (in dark colours) and the percentage of people where information on methicillin-resistant *Staphylococcus aureus* infection is missing/unknown (in light colours). The horizontal bars on the left of the graph refer to children, while the horizontal bars on the right refer to adults.

5. Microbiology

Table 5.6 Prevalence of Stenotrophomonas maltophilia in people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)								Adults (≥18 years)							
	Missing/ Unknown		No		Yes, chronic		Yes, not chronic/ intermittent		Missing/ Unknown		No		Yes, chronic		Yes, not chronic/ intermittent	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Albania	2	2.5	73	91.2	1	1.2	4	5.0								
Armenia	16	72.7	6	27.3	0	0.0	0	0.0								
Austria	2	0.5	335	87.7	13	3.4	32	8.4	3	0.8	338	87.6	29	7.5	16	4.1
Belarus	0	0.0	141	97.9	3	2.1	0	0.0								
Belgium	0	0.0	405	87.1	0	0.0	60	12.9	12	1.7	617	86.9	0	0.0	81	11.4
Bulgaria	1	0.8	114	96.6	0	0.0	3	2.5	0	0.0	81	97.6	0	0.0	2	2.4
Croatia	5	6.2	64	79.0	2	2.5	10	12.3	2	4.1	43	87.8	0	0.0	4	8.2
Cyprus	0	0.0	6	75.0	0	0.0	2	25.0	1	5.3	18	94.7	0	0.0	0	0.0
Czech Rep.	14	4.3	307	93.3	7	2.1	1	0.3	11	3.9	266	93.7	6	2.1	1	0.3
Denmark	0	0.0	190	86.8	5	2.3	24	11.0	0	0.0	234	83.0	12	4.3	36	12.8
Finland	0	0.0	33	100	0	0.0	0	0.0	0	0.0	46	93.9	3	6.1	0	0.0
France	0	0.0	2380	89.1	54	2.0	237	8.9	0	0.0	3131	89.0	107	3.0	278	7.9
Georgia	18	22.5	62	77.5	0	0.0	0	0.0	3	37.5	5	62.5	0	0.0	0	0.0
Germany	31	1.1	2513	92.0	38	1.4	149	5.5	118	3.2	3201	87.4	210	5.7	135	3.7
Greece	1	0.5	200	95.7	0	0.0	8	3.8	55	16.2	266	78.2	0	0.0	19	5.6
Hungary	0	0.0	128	94.8	7	5.2	0	0.0	0	0.0	163	98.2	3	1.8	0	0.0
Iceland	0	0.0	6	75.0	0	0.0	2	25.0	1	16.7	5	83.3	0	0.0	0	0.0
Ireland	7	1.4	485	94.2	2	0.4	21	4.1	51	7.6	605	89.6	1	0.1	18	2.7
Israel	9	5.6	136	84.5	1	0.6	15	9.3	28	8.0	302	86.8	5	1.4	13	3.7
Italy	3	0.1	1998	90.2	26	1.2	188	8.5	7	0.2	3191	92.8	72	2.1	167	4.9
Latvia	1	3.2	25	80.6	1	3.2	4	12.9	0	0.0	11	78.6	2	14.3	1	7.1
Lithuania	0	0.0	14	93.3	0	0.0	1	6.7	1	4.0	20	80.0	1	4.0	3	12.0
Luxembourg	0	0.0	17	89.5	1	5.3	1	5.3								
Rep.Moldova	37	100	0	0.0	0	0.0	0	0.0	12	100	0	0.0	0	0.0	0	0.0
Netherlands	30	5.6	476	88.3	30	5.6	3	0.6	76	8.2	746	80.7	83	9.0	19	2.1
N.Macedonia	0	0.0	81	97.6	0	0.0	2	2.4	0	0.0	42	93.3	0	0.0	3	6.7
Norway	1	0.8	98	78.4	2	1.6	24	19.2	13	7.3	124	70.1	12	6.8	28	15.8
Poland	9	1.0	812	94.5	3	0.3	35	4.1	13	3.1	381	90.1	10	2.4	19	4.5
Portugal	4	2.4	147	87.5	2	1.2	15	8.9	6	3.7	140	87.0	6	3.7	9	5.6
Romania	17	7.1	219	92.0	0	0.0	2	0.8	1	10.0	9	90.0	0	0.0	0	0.0
Russian Fed.	21	1.0	1923	94.5	36	1.8	54	2.6	16	3.3	448	93.1	5	1.0	12	2.5
Serbia	1	0.8	105	82.7	2	1.6	19	15.0	3	4.6	56	86.1	1	1.5	5	7.7
Slovak Rep.	1	0.8	117	97.5	0	0.0	2	1.7	2	1.4	125	89.9	4	2.9	8	5.8
Slovenia	0	0.0	49	90.7	2	3.7	3	5.6	9	21.4	30	71.4	1	2.4	2	4.8
Spain	10	0.9	990	92.3	8	0.7	65	6.1	40	3.6	977	87.7	34	3.0	63	5.7
Sweden	3	1.1	248	92.9	4	1.5	12	4.5	0	0.0	344	92.2	18	4.8	11	2.9
Switzerland	2	0.5	399	94.8	4	0.9	16	3.8	20	3.7	464	86.9	19	3.6	31	5.8
Turkey	49	2.4	1935	96.6	4	0.2	16	0.8	10	2.9	332	95.1	1	0.3	6	1.7
Ukraine	7	4.3	145	88.4	3	1.8	9	5.5	0	0.0	47	95.9	0	0.0	2	4.1
United Kingdom	2	0.0	3963	94.2	0	0.0	240	5.7	4	0.1	5354	95.1	0	0.0	270	4.8
Total	304	1.3	21345	92.0	261	1.1	1279	5.5	519	2.1	22173	90.1	646	2.6	1262	5.1

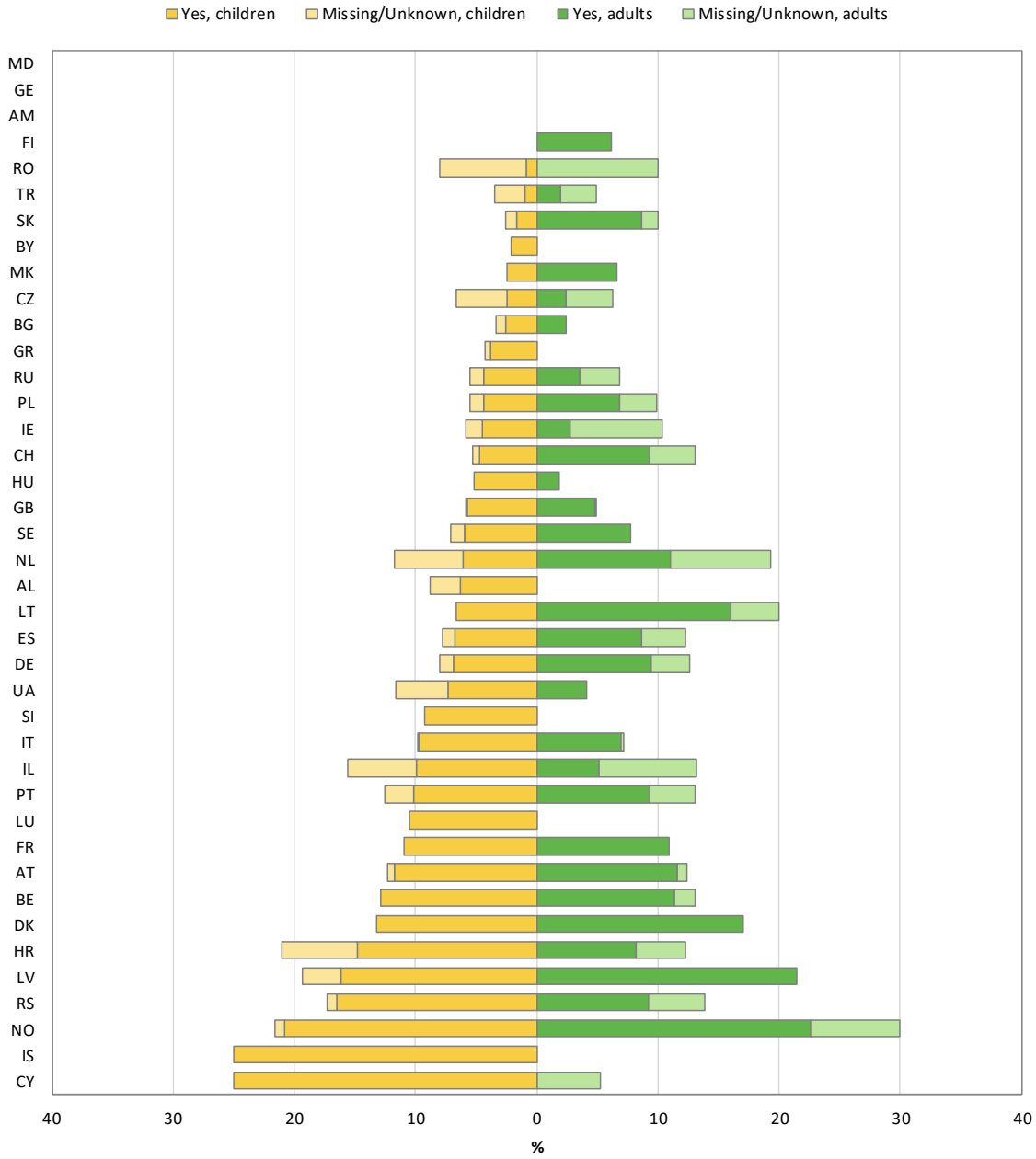
Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.

Note: Ireland and Italy: chronicity for Stenotrophomonas maltophilia is defined as: at least 3 or more positive isolates during the last 12 months preceding the last reported culture in 2021.
The United Kingdom: chronicity for Stenotrophomonas maltophilia is not collected.

5. Microbiology

Figure 5.6 *In the majority of countries, Stenotrophomonas Maltophilia can be cultured in a significant number of airway samples in children and adults with CF.*

Prevalence of Stenotrophomonas maltophilia in people with CF seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information is missing for more than 10% of the children/adults. Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: Ireland and Italy: chronicity for Stenotrophomonas maltophilia is defined as: at least 3 or more positive isolates during the last 12 months preceding the last reported culture in 2021.
The United Kingdom: chronicity for Stenotrophomonas maltophilia is not collected.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph represents the percentage of people with *Stenotrophomonas maltophilia* infection (in dark colours) and the percentage of people where information on *Stenotrophomonas maltophilia* infection is missing/unknown (in light colours). The horizontal bars on the left of the graph refer to children, while the horizontal bars on the right refer to adults.

5. Microbiology

Table 5.7 Prevalence of Achromobacter species infection in people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)								Adults (≥18 years)							
	Missing/ Unknown		No		Yes, chronic		Yes, not chronic/ intermittent		Missing/ Unknown		No		Yes, chronic		Yes, not chronic/ intermittent	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Albania	2	2.5	78	97.5	0	0.0	0	0.0								
Armenia	16	72.7	6	27.3	0	0.0	0	0.0								
Austria	3	0.8	368	96.3	5	1.3	6	1.6	3	0.8	361	93.5	16	4.1	6	1.5
Belarus	0	0.0	138	95.8	6	4.2	0	0.0								
Belgium	0	0.0	437	94.0	0	0.0	28	6.0	12	1.7	625	88.0	0	0.0	73	10.3
Bulgaria	1	0.8	113	95.8	2	1.7	2	1.7	0	0.0	83	100	0	0.0	0	0.0
Croatia	5	6.2	74	91.4	0	0.0	2	2.5	2	4.1	47	95.9	0	0.0	0	0.0
Cyprus	0	0.0	8	100	0	0.0	0	0.0	1	5.3	16	84.2	1	5.3	1	5.3
Czech Rep.	14	4.3	310	94.2	3	0.9	2	0.6	9	3.2	261	91.9	11	3.9	3	1.1
Denmark	0	0.0	208	95.0	2	0.9	9	4.1	0	0.0	250	88.6	19	6.7	13	4.6
Finland	0	0.0	33	100	0	0.0	0	0.0	0	0.0	49	100	0	0.0	0	0.0
France	0	0.0	2529	94.7	0	0.0	142	5.3	0	0.0	3202	91.1	0	0.0	314	8.9
Georgia	18	22.5	62	77.5	0	0.0	0	0.0	3	37.5	5	62.5	0	0.0	0	0.0
Germany	31	1.1	2645	96.8	24	0.9	31	1.1	118	3.2	3309	90.3	185	5.0	52	1.4
Greece	1	0.5	201	96.2	0	0.0	7	3.3	57	16.8	255	75.0	0	0.0	28	8.2
Hungary	0	0.0	132	97.8	3	2.2	0	0.0	2	1.2	140	84.3	24	14.5	0	0.0
Iceland	0	0.0	8	100	0	0.0	0	0.0	0	0.0	4	66.7	2	33.3	0	0.0
Ireland	7	1.4	501	97.3	2	0.4	5	1.0	51	7.6	611	90.5	1	0.1	12	1.8
Israel	9	5.6	146	90.7	1	0.6	5	3.1	29	8.3	294	84.5	9	2.6	16	4.6
Italy	3	0.1	2119	95.7	32	1.4	61	2.7	7	0.2	3144	91.5	176	5.1	110	3.2
Latvia	1	3.2	28	90.3	2	6.4	0	0.0	0	0.0	11	78.6	2	14.3	1	7.1
Lithuania	1	6.7	13	86.7	0	0.0	1	6.7	1	4.0	23	92.0	1	4.0	0	0.0
Luxembourg	0	0.0	19	100	0	0.0	0	0.0								
Rep.Moldova	37	100	0	0.0	0	0.0	0	0.0	12	100	0	0.0	0	0.0	0	0.0
Netherlands	10	1.9	517	95.9	9	1.7	3	0.6	73	7.9	810	87.7	39	4.2	2	0.2
N.Macedonia	0	0.0	83	100	0	0.0	0	0.0	0	0.0	45	100	0	0.0	0	0.0
Norway	1	0.8	120	96.0	1	0.8	3	2.4	16	9.0	151	85.3	0	0.0	10	5.6
Poland	11	1.3	833	97.0	5	0.6	10	1.2	14	3.3	373	88.2	22	5.2	14	3.3
Portugal	4	2.4	153	91.1	3	1.8	8	4.8	6	3.7	137	85.1	7	4.3	11	6.8
Romania	17	7.1	218	91.6	0	0.0	3	1.3	2	20.0	8	80.0	0	0.0	0	0.0
Russian Fed.	21	1.0	1902	93.5	73	3.6	38	1.9	16	3.3	409	85.0	43	8.9	13	2.7
Serbia	1	0.8	114	89.8	2	1.6	10	7.9	3	4.6	59	90.8	1	1.5	2	3.1
Slovak Rep.	2	1.7	115	95.8	0	0.0	3	2.5	2	1.4	129	92.8	4	2.9	4	2.9
Slovenia	0	0.0	52	96.3	0	0.0	2	3.7	10	23.8	31	73.8	0	0.0	1	2.4
Spain	14	1.3	1020	95.1	19	1.8	20	1.9	45	4.0	965	86.6	78	7.0	26	2.3
Sweden	3	1.1	259	97.0	3	1.1	2	0.7	0	0.0	356	95.4	13	3.5	4	1.1
Switzerland	2	0.5	415	98.6	2	0.5	2	0.5	21	3.9	497	93.1	10	1.9	6	1.1
Turkey	172	8.6	1809	90.3	5	0.2	18	0.9	19	5.4	319	91.4	5	1.4	6	1.7
Ukraine	7	4.3	147	89.6	4	2.4	6	3.7	0	0.0	46	93.9	0	0.0	3	6.1
United Kingdom	2	0.0	4137	98.4	0	0.0	66	1.6	4	0.1	5448	96.8	0	0.0	176	3.1
Total	416	1.8	22070	95.2	208	0.9	495	2.1	539	2.2	22485	91.4	669	2.7	907	3.7

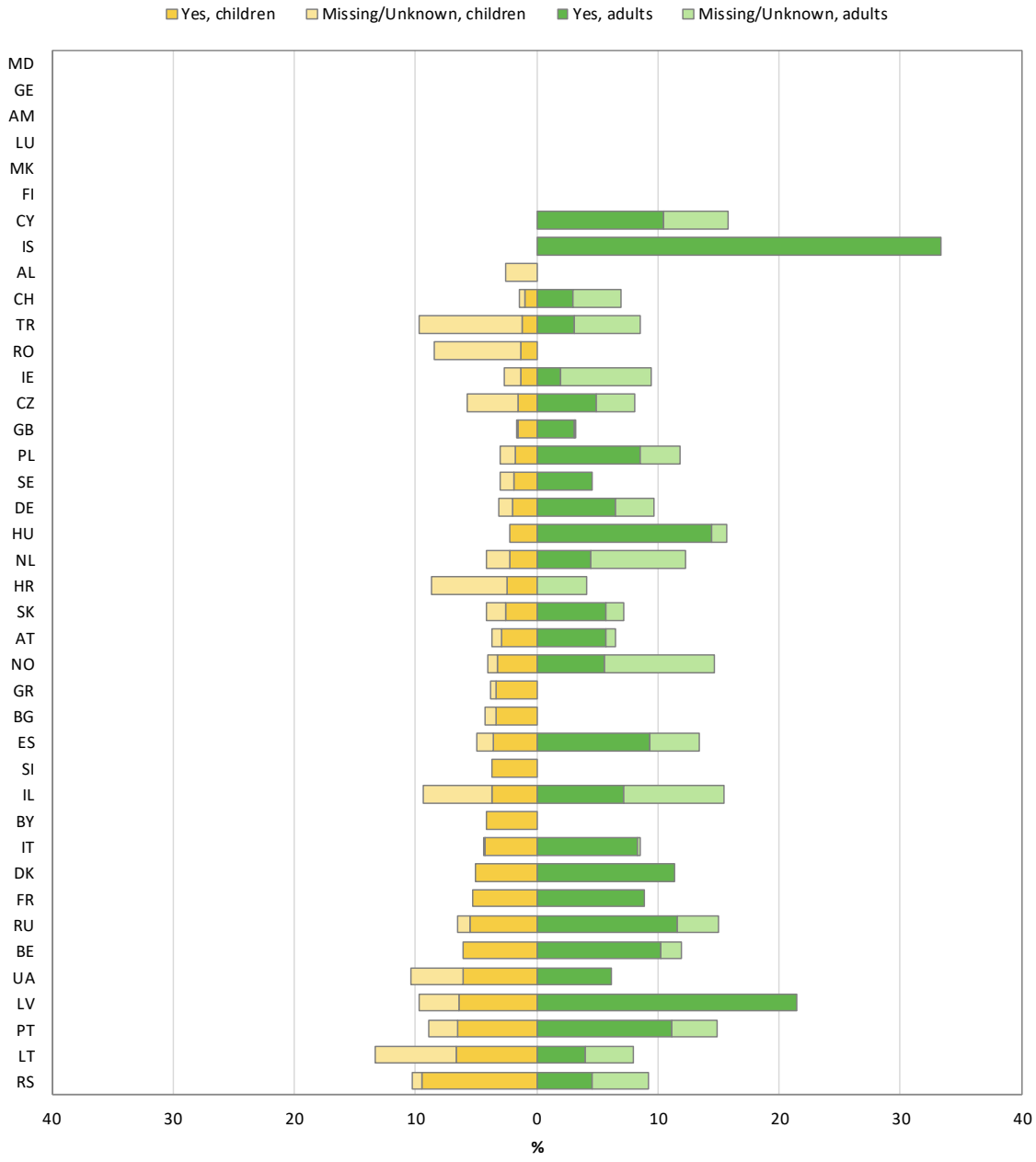
Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.

Note: France: chronicity for Achromobacter species is not collected.
Ireland and Italy: chronicity for Achromobacter species is defined as: at least 3 or more positive isolates during the last 12 months preceding the last reported culture in 2021.
The United Kingdom: chronicity for Achromobacter species is not collected.

5. Microbiology

Figure 5.7 *Achromobacter spp. can be found in up to 20% of the airways of people with CF, with a higher prevalence in adults.*

Prevalence of Achromobacter species infection in people with CF seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information is missing for more than 10% of the children/adults. Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: France: chronicity for Achromobacter species is not collected.
Ireland and Italy: chronicity for Achromobacter species is defined as: at least 3 or more positive isolates during the last 12 months preceding the last reported culture in 2021.
The United Kingdom: chronicity for Achromobacter species is not collected.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph represents the percentage of people with *Achromobacter species* infection (in dark colours) and the percentage of people where information on *Achromobacter species* infection is missing/unknown (in light colours). The horizontal bars on the left of the graph represent to children, while those on the right represent adults.

5. Microbiology

Table 5.8 Prevalence of non-tuberculous mycobacteria in people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No		Yes		Missing/ Unknown		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	2	2.5	77	96.2	1	1.2						
Armenia	14	63.6	8	36.4	0	0.0						
Austria	5	1.3	367	96.1	10	2.6	63	16.3	300	77.7	23	6.0
Belarus	144	100	0	0.0	0	0.0						
Belgium	0	0.0	461	99.1	4	0.9	12	1.7	681	95.9	17	2.4
Bulgaria	117	99.1	1	0.8	0	0.0	81	97.6	0	0.0	2	2.4
Croatia	6	7.4	75	92.6	0	0.0	1	2.0	48	98.0	0	0.0
Cyprus	0	0.0	8	100	0	0.0	1	5.3	16	84.2	2	10.5
Czech Republic	244	74.2	80	24.3	5	1.5	52	18.3	223	78.5	9	3.2
Denmark	0	0.0	218	99.5	1	0.5	0	0.0	273	96.8	9	3.2
Finland	0	0.0	32	97.0	1	3.0	0	0.0	40	81.6	9	18.4
France	0	0.0	2606	97.6	65	2.4	0	0.0	3332	94.8	184	5.2
Georgia	17	21.2	63	78.7	0	0.0	2	25.0	6	75.0	0	0.0
Germany	2241	82.1	465	17.0	25	0.9	2547	69.5	997	27.2	120	3.3
Greece	93	44.5	116	55.5	0	0.0	163	47.9	168	49.4	9	2.6
Hungary	3	2.2	131	97.0	1	0.7	1	0.6	154	92.8	11	6.6
Iceland	0	0.0	8	100	0	0.0	0	0.0	6	100	0	0.0
Ireland	7	1.4	507	98.4	1	0.2	51	7.6	622	92.1	2	0.3
Israel	10	6.2	140	87.0	11	6.8	32	9.2	278	79.9	38	10.9
Italy	3	0.1	2201	99.4	11	0.5	7	0.2	3404	99.0	26	0.8
Latvia	2	6.4	29	93.5	0	0.0	0	0.0	14	100	0	0.0
Lithuania	1	6.7	14	93.3	0	0.0	1	4.0	24	96.0	0	0.0
Luxembourg	6	31.6	13	68.4	0	0.0						
Rep of Moldova	37	100	0	0.0	0	0.0	12	100	0	0.0	0	0.0
The Netherlands	209	38.8	323	59.9	7	1.3	158	17.1	725	78.5	41	4.4
North Macedonia	1	1.2	82	98.8	0	0.0	0	0.0	45	100	0	0.0
Norway	39	31.2	83	66.4	3	2.4	42	23.7	125	70.6	10	5.6
Poland	267	31.1	590	68.7	2	0.2	104	24.6	311	73.5	8	1.9
Portugal	51	30.4	115	68.4	2	1.2	11	6.8	138	85.7	12	7.4
Romania	14	5.9	223	93.7	1	0.4	1	10.0	9	90.0	0	0.0
Russian Fed.	30	1.5	1991	97.9	13	0.6	16	3.3	461	95.8	4	0.8
Serbia	1	0.8	125	98.4	1	0.8	3	4.6	62	95.4	0	0.0
Slovak Republic	0	0.0	120	100	0	0.0	2	1.4	134	96.4	3	2.2
Slovenia	0	0.0	54	100	0	0.0	6	14.3	34	80.9	2	4.8
Spain	162	15.1	891	83.0	20	1.9	47	4.2	1002	89.9	65	5.8
Sweden	3	1.1	258	96.6	6	2.2	1	0.3	349	93.6	23	6.2
Switzerland	4	0.9	411	97.6	6	1.4	27	5.1	490	91.8	17	3.2
Turkey	107	5.3	1888	94.2	9	0.4	10	2.9	330	94.6	9	2.6
Ukraine	117	71.3	45	27.4	2	1.2	46	93.9	3	6.1	0	0.0
United Kingdom	4	0.1	4108	97.7	93	2.2	4	0.1	5323	94.6	301	5.3

Note: For non-tuberculous mycobacteria (NTM) the total percentage of missing information is higher than 10%, therefore the totals are excluded from the table.

6. Nutrition

Pancreatic insufficiency is usually defined as the absence of pancreatic enzymes in two stool samples or elevated levels of fat in stools (faecal fat). Since information on faecal fat is rarely collected by the national registries, we therefore applied the information on the use of pancreatic enzymes as an indicator of pancreatic insufficiency.

We collected weight and height measured on the date that the best FEV_1 value (the FEV_1 of the highest FEV_1% predicted of the year) was recorded. For people with CF that did not perform spirometry, the last weight and height measurements of the year were considered. From these raw values we calculated body mass index (BMI). BMI is an effective measurement to illustrate the nutritional status of a person because it describes the weight/height relationship (for example an individual with a low weight is not necessarily underweight if the height is also low). The ECFS Standards of Care guidelines recommend: for adults, a BMI of above 20 kg/m^2; for older children and adolescents, the 50^{th} percentile for BMI; for infants and children up to 2 years of age, weight and height percentiles similar to those for the non-CF population.[1]

Weight, height and BMI were then expressed in terms of z-scores using a reference population of healthy individuals (in this case the US population with reference values issued by the Centre for Disease Control, USA, see Appendix 3, page 171, for details).

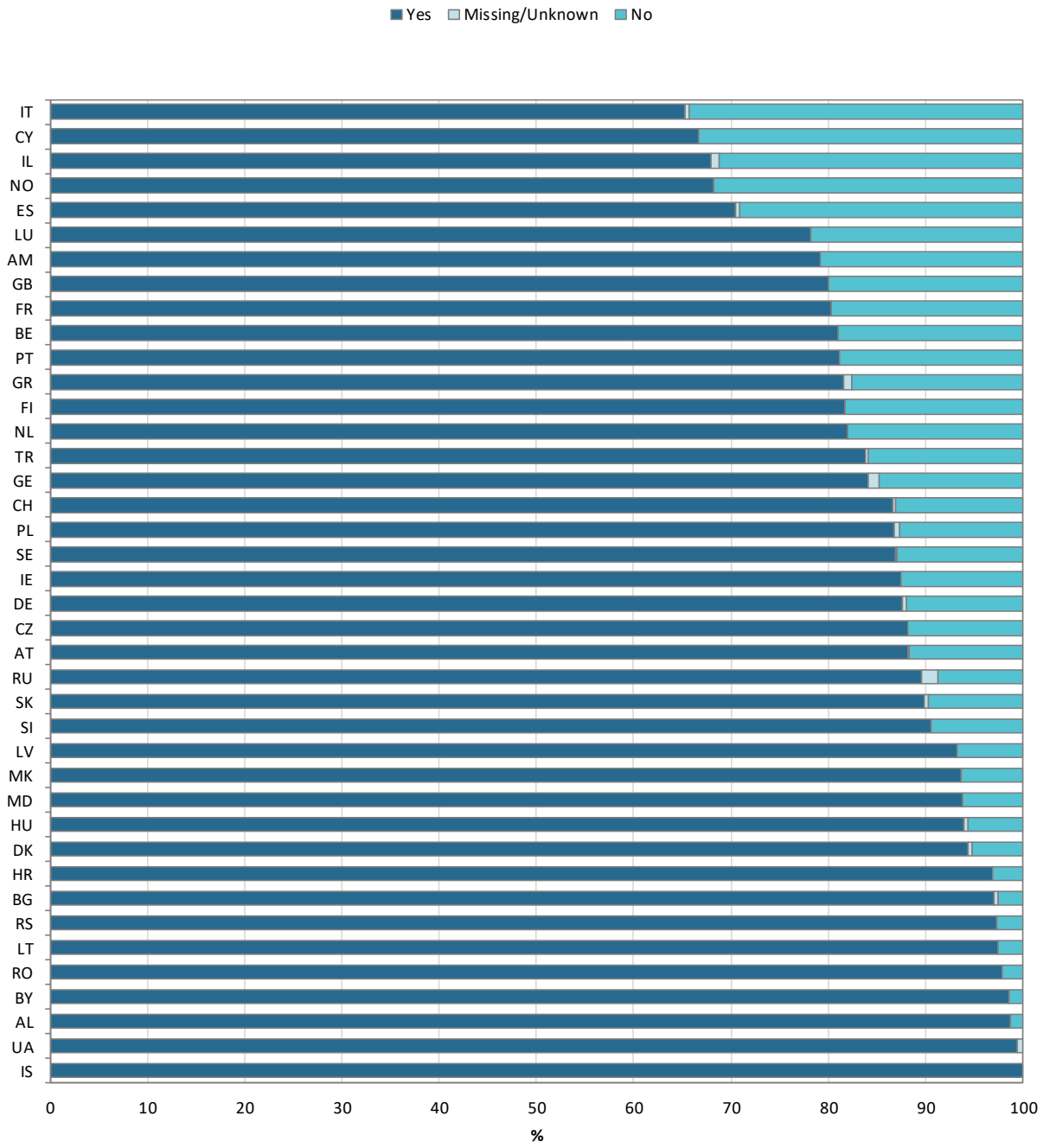
A z-score of 0 means that the height/weight/BMI is equal to the mean height/weight/BMI of people of the same age and sex in the reference population. A z-score of-2 indicates that the height/weight/BMI value is 2 standard deviations below the mean height/weight/BMI of people of the same age and sex in the reference population; a z-score of +2 means that the value is 2 standard deviations above that mean. In the reference population, 95% of all individuals have a z-score for weight between-2 and +2 (the same for height) and it is expected that the same happens for approximately 95% of individuals in a population without conditions that affect weight (or height). The average z-score for a largely healthy population should be very close to zero.

[1] A.R. Smyth et al, JCF 2014;13, S23–S42.

6. Nutrition

Figure 6.1 *In the majority of countries, more than 80% of the people with CF are pancreatic insufficient.*

Use of pancreatic enzymes in 2021 for all people with CF who have never had a transplant, by country.



Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the use of pancreatic enzymes by country. This can be seen as an indication of pancreatic insufficiency.

6. Nutrition

Table 6.1 Z-score for BMI: descriptive statistics by country and overall. All children and adolescents with CF seen in 2021 aged 2-17 years who have never had a transplant.

Country	Number	Mean (average age)	Min (age of the youngest pwCF)	25th pctl (25% of the pwCF are younger than this age)	Median (half the pwCF are younger than this age)	75th pctl (75% of the pwCF are younger than this age)	Max (age of the oldest pwCF)
Albania	66	-0.3	-3.7	-0.8	-0.2	0.3	2.8
Armenia	22	-0.6	-6.0	-1.5	-0.3	0.3	3.6
Austria	360	-0.1	-3.7	-0.7	-0.1	0.5	2.4
Belarus	91	-0.7	-5.9	-1.4	-0.6	0.3	2.9
Belgium	429	-0.2	-4.9	-0.9	-0.2	0.4	2.3
Bulgaria	104	-0.8	-6.3	-1.5	-0.8	0.4	2.2
Croatia	73	-1.1	-7.8	-1.6	-0.9	0.0	2.3
Cyprus	8	-0.2	-3.0	-1.1	-0.4	0.9	2.3
Czech Republic	292	-0.2	-4.1	-0.9	-0.1	0.5	2.2
Denmark	184	-0.1	-3.1	-0.6	-0.1	0.5	2.5
Finland	31	-0.1	-2.3	-0.6	-0.1	0.7	1.4
France	2477	-0.3	-6.7	-0.9	-0.3	0.3	3.3
Germany	2524	-0.2	-17.2	-0.8	-0.1	0.5	3.1
Greece	203	0.2	-4.2	-0.4	0.3	0.9	2.8
Hungary	127	-0.5	-3.6	-1.2	-0.5	0.3	2.1
Iceland	8	0.0	-1.5	-0.1	0.3	0.4	0.6
Ireland	502	0.3	-2.9	-0.2	0.3	0.9	4.0
Israel	159	-0.2	-3.5	-0.9	0.0	0.6	2.7
Italy	2048	0.0	-11.7	-0.7	0.0	0.7	4.3
Latvia	30	-0.4	-2.3	-0.9	-0.3	0.3	1.4
Lithuania	14	-0.9	-2.6	-1.3	-0.9	-0.1	0.9
Luxembourg	18	-0.2	-1.7	-0.9	-0.2	0.6	1.4
Rep of Moldova	32	-1.5	-5.9	-2.5	-1.0	-0.3	2.7
The Netherlands	512	-0.2	-3.5	-0.8	-0.2	0.4	2.2
North Macedonia	73	-0.4	-4.9	-1.4	-0.3	0.3	2.0
Norway	115	-0.1	-2.4	-0.7	-0.1	0.4	1.9
Poland	775	-0.3	-5.1	-0.9	-0.3	0.4	3.6
Portugal	163	-0.3	-3.1	-1.0	-0.3	0.4	2.2
Romania	195	-0.8	-6.3	-1.7	-0.7	0.1	2.3
Russian Fed.	1851	-0.7	-8.0	-1.4	-0.6	0.2	2.9
Serbia	111	-0.6	-6.2	-1.3	-0.3	0.4	2.0
Slovak Republic	115	-0.2	-4.4	-0.8	-0.2	0.4	2.2
Slovenia	54	-0.2	-2.1	-0.7	-0.2	0.3	1.7
Spain	994	-0.2	-5.7	-0.8	-0.1	0.5	3.4
Sweden	263	-0.1	-3.3	-0.7	-0.1	0.6	2.9
Switzerland	394	-0.1	-6.0	-0.7	-0.1	0.5	2.3
Turkey	1770	-0.6	-27.7	-1.4	-0.4	0.5	4.7
Ukraine	142	-1.2	-9.9	-1.7	-1.0	-0.3	2.2
United Kingdom	3869	0.2	-7.9	-0.4	0.3	0.9	5.2
Total	21198	-0.2	-27.7	-0.9	-0.1	0.6	5.2

Note: The United Kingdom: height and weight at date of the annual review is used instead of the date of best FEV_1. If no lung function measurement is reported, the date of the last visit is used.

This table reports the median z-score for BMI, the mean z-score for BMI and other descriptive statistics for children and adolescents aged 2 to 17 years, by country.

6. Nutrition

Table 6.2 BMI: descriptive statistics by country and overall. All adults with CF seen in 2021 aged 18 years or older who have never had a transplant.

Country	Number	Mean (average age)	Min (age of the youngest pwCF)	25th pctl (25% of the pwCF are younger than this age)	Median (half the pwCF are younger than this age)	75th pctl (75% of the pwCF are younger than this age)	Max (age of the oldest pwCF)
Austria	374	22.6	15.6	20.3	21.9	24.2	39.7
Belgium	696	22.8	15.2	20.5	22.3	24.6	38.8
Bulgaria	81	20.7	13.7	18.4	20.0	22.1	39.8
Croatia	41	21.4	14.6	20.2	21.1	22.9	27.8
Cyprus	15	23.5	18.1	21.0	24.3	26.1	27.2
Czech Republic	269	22.5	14.3	20.2	22.1	24.3	34.4
Denmark	279	23.6	16.7	20.8	23.1	25.3	42.8
Finland	48	23.4	14.5	21.9	23.2	24.7	33.9
France	3402	22.3	13.6	20.0	21.7	23.9	46.8
Germany	3574	22.6	13.7	20.3	22.1	24.4	48.6
Greece	277	23.0	14.0	20.8	22.5	24.7	36.6
Hungary	150	20.7	11.6	18.4	20.3	22.8	35.6
Iceland	5	23.6	18.2	21.7	21.8	28.0	28.1
Ireland	567	24.1	15.4	21.4	23.8	26.0	48.0
Israel	335	23.1	14.7	20.7	22.6	25.4	41.4
Italy	3050	22.9	13.3	20.4	22.3	24.6	56.2
Latvia	13	19.0	15.6	17.5	18.6	20.2	23.9
Lithuania	22	20.4	15.1	18.1	19.8	21.6	27.8
Rep of Moldova	12	19.5	15.8	17.7	18.5	21.0	27.8
The Netherlands	891	22.7	14.5	20.5	22.2	24.4	43.5
North Macedonia	41	22.3	16.0	20.3	22.1	24.5	32.8
Norway	167	23.0	16.2	20.4	22.5	24.8	38.9
Poland	382	21.5	12.9	19.1	21.1	23.2	39.6
Portugal	128	22.7	16.0	20.2	22.1	24.1	41.1
Romania	5	18.6	15.6	17.3	17.8	19.8	22.5
Russian Fed.	424	19.7	12.5	17.6	19.2	21.4	35.3
Serbia	59	20.1	14.2	17.6	19.8	22.5	26.2
Slovak Republic	129	21.6	15.2	19.1	21.1	23.2	33.4
Slovenia	39	21.4	13.6	19.6	21.6	23.1	26.3
Spain	1052	23.1	15.2	20.5	22.5	24.8	42.5
Sweden	360	23.0	13.7	20.7	22.3	24.4	41.7
Switzerland	514	22.2	14.2	20.1	21.9	23.8	39.6
Turkey	327	20.8	13.3	18.0	20.3	23.4	31.6
Ukraine	43	19.7	15.8	17.6	19.2	21.4	27.1
United Kingdom	5142	24.2	13.6	21.4	23.6	26.2	58.0
Total	22922	22.9	11.6	20.4	22.4	24.8	58.0

Note: Albania, Armenia, Belarus, Georgia and Luxembourg have <5 adults seen in 2021 with information on height and weight and are excluded from the table, but the people are included in the total number.
Note: The United Kingdom: height and weight at date of the annual review is used instead of the date of best FEV1. If no lung function measurement is reported, the date of the last visit is used.

This table reports the median BMI (expressed as absolute values, not as z-scores), the mean BMI and other descriptive statistics for all adults aged 18 years or older, by country and overall.

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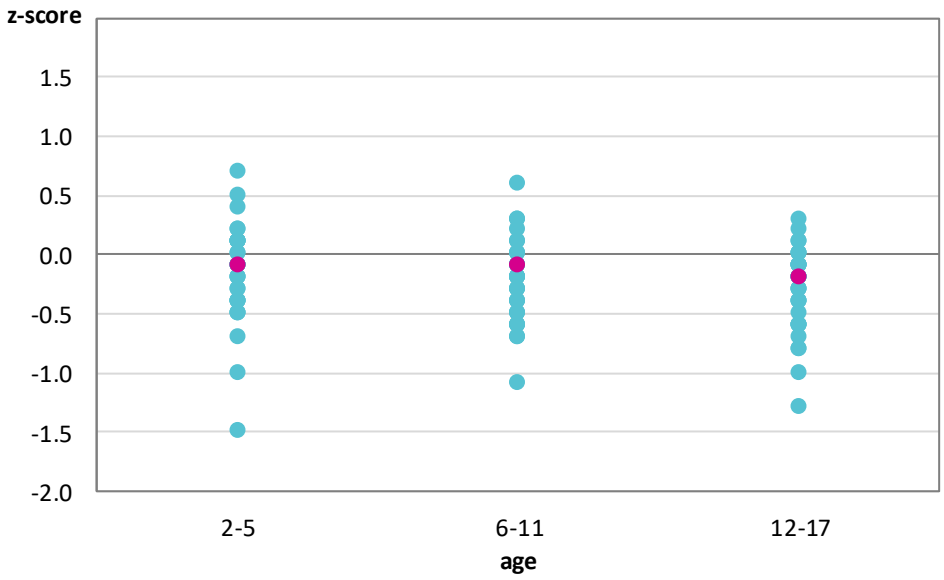
Figure 6.2 *While the median BMI z-score for children and adolescents with CF in Europe is close to normal for all age groups, a lot of variation amongst the countries can be observed.*

Median z-score for BMI by age group and by country. Children and adolescents with CF aged 2-17 years in 2021 who have never had a transplant.



Note: We excluded from the graph those age groups where the number of individuals was <10.

This graph shows the median z-score for BMI (the value that separates the highest and lowest half of the people with CF) by age group. Each country median is represented by a turquoise dot and the median overall for the age group by a pink dot. There is a lot of variation between countries.

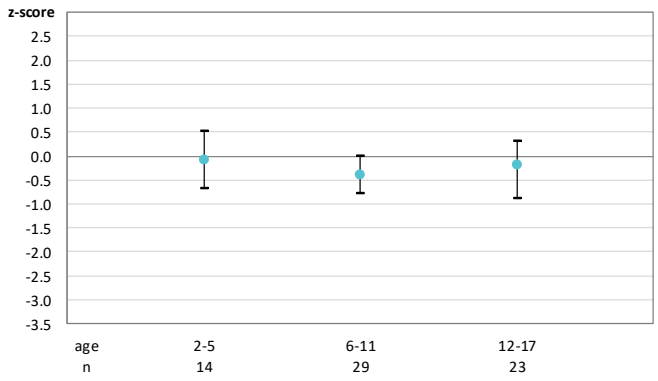
6. Nutrition

Figure 6.3 *The median BMI of children and adolescents with CF is influenced by age and country of residence.*

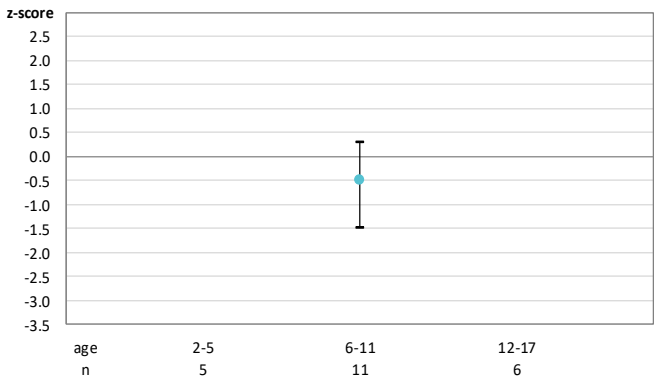
Quartiles of z-scores for BMI by age group and country. Children and adolescents with CF aged 2-17 years in 2021 who have never had a transplant.

The figures below show the z-scores for BMI by country. The dot is the median, and the whiskers show the 25th and 75th percentiles. We did not calculate quartiles where the number of individuals in the age group is <10. Therefore, there are no blue dots for those age groups (the number of people in each age group is shown underneath the horizontal axis). We therefore excluded Cyprus, Iceland, Lithuania and Luxembourg from the graphs because none of the age groups in these countries had more than 10 individuals. Georgia is excluded because no height and weight values were provided.

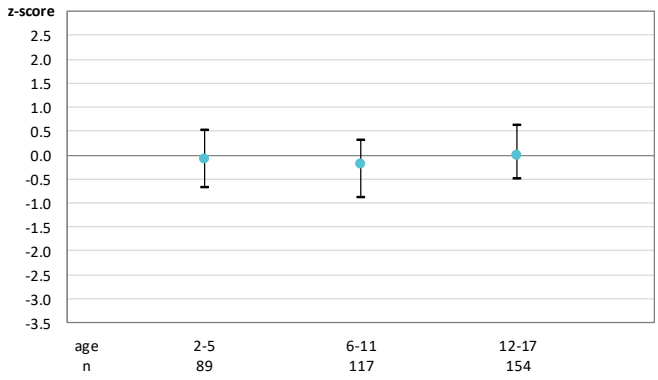
Quartiles of z-scores for BMI: Albania



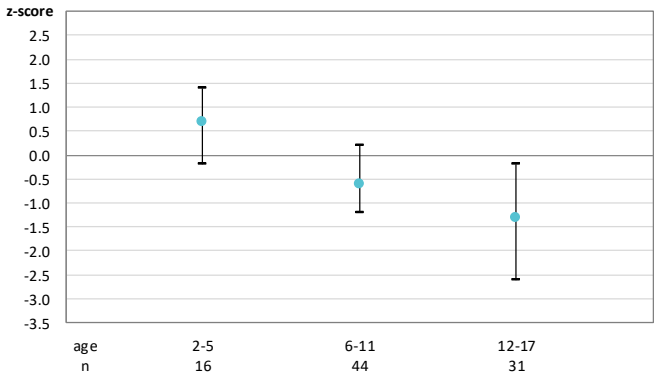
Quartiles of z-scores for BMI: Armenia



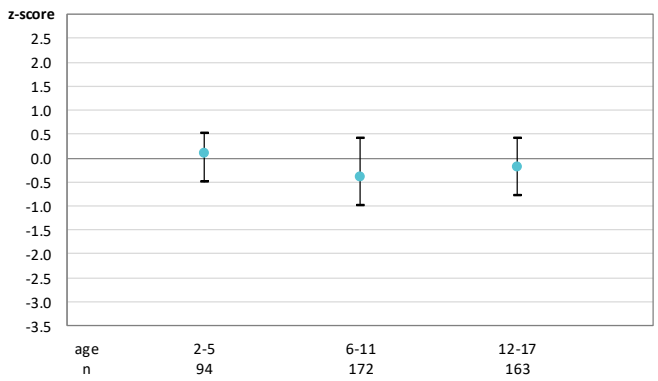
Quartiles of z-scores for BMI: Austria



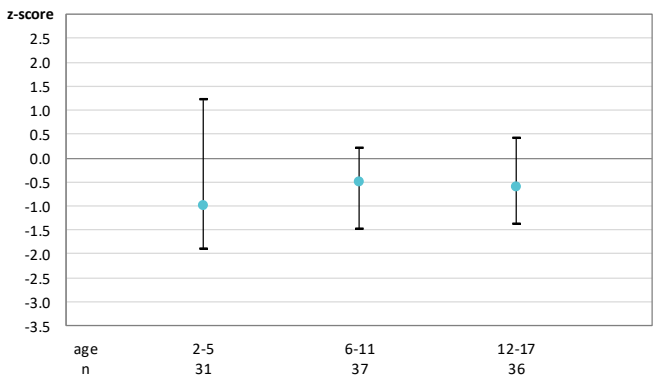
Quartiles of z-scores for BMI: Belarus



Quartiles of z-scores for BMI: Belgium



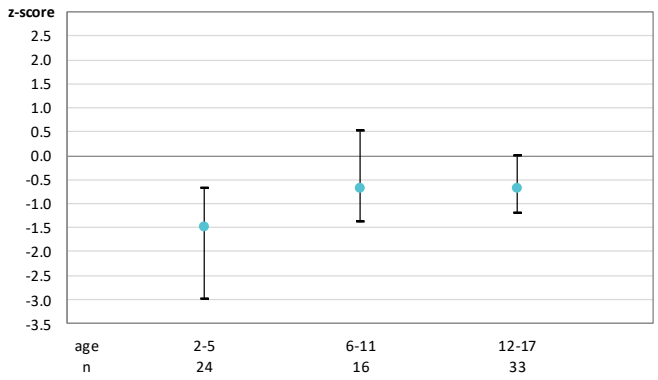
Quartiles of z-scores for BMI: Bulgaria



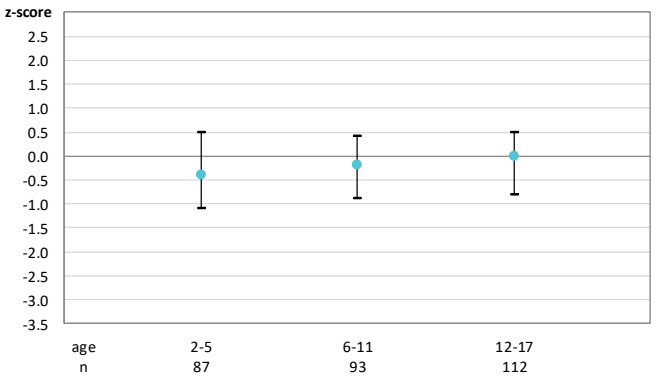
6. Nutrition

[figure 6.3 continued]

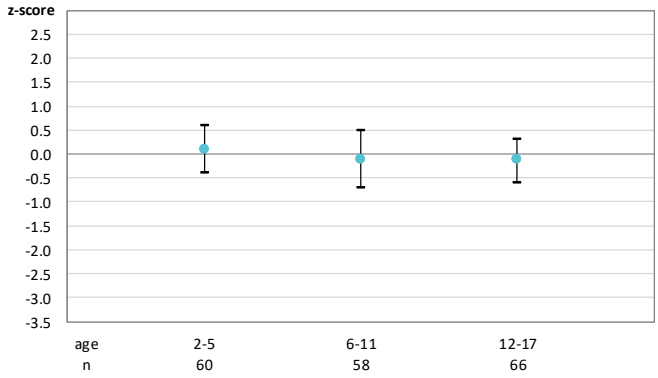
Quartiles of z-scores for BMI: Croatia



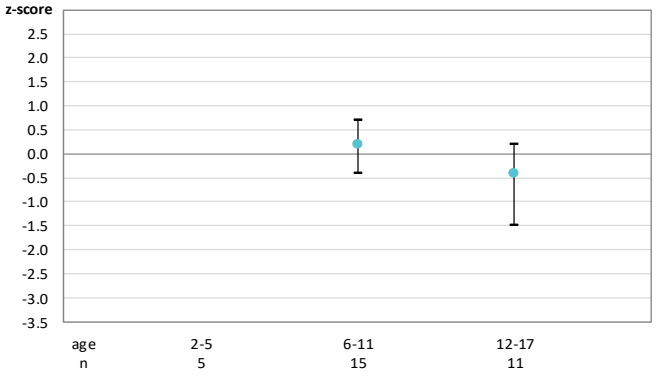
Quartiles of z-scores for BMI: Czech Republic



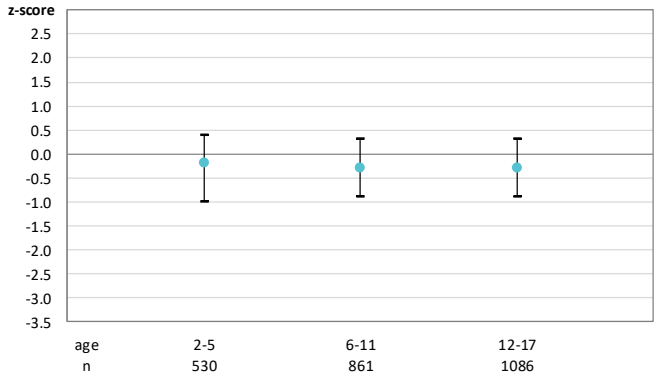
Quartiles of z-scores for BMI: Denmark



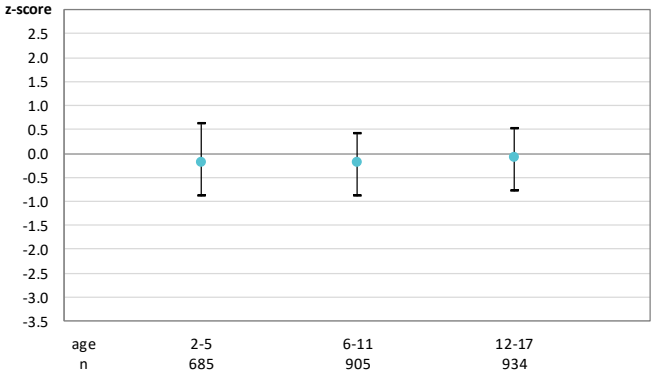
Quartiles of z-scores for BMI: Finland



Quartiles of z-scores for BMI: France



Quartiles of z-scores for BMI: Germany



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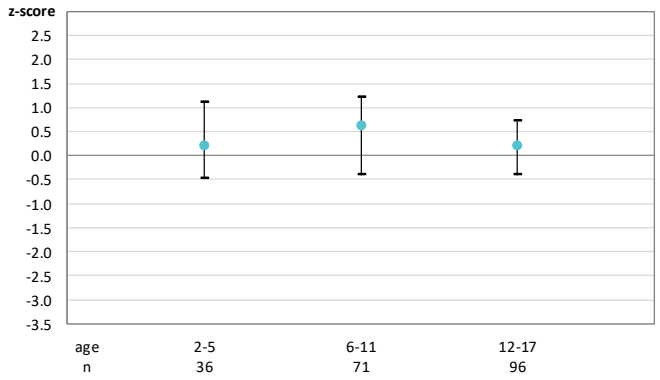
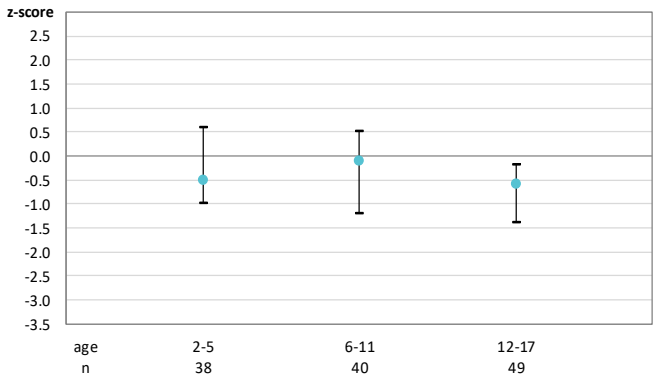
[figure 6.3 continued]

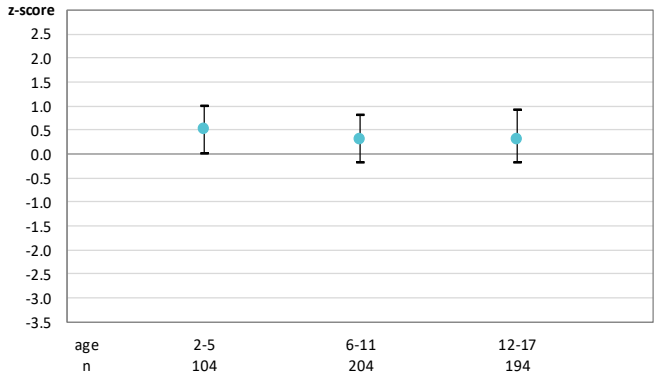
Quartiles of z-scores for BMI: Greece



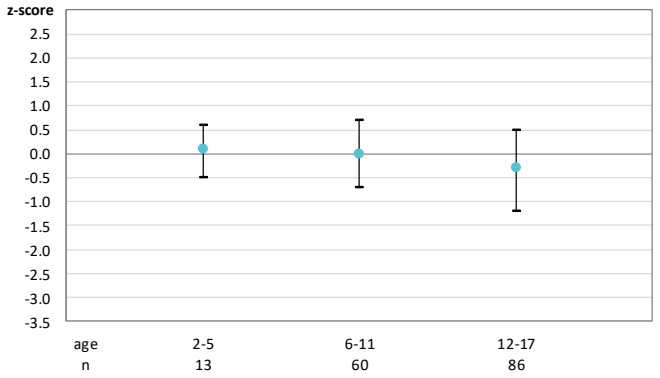
Quartiles of z-scores for BMI: Hungary



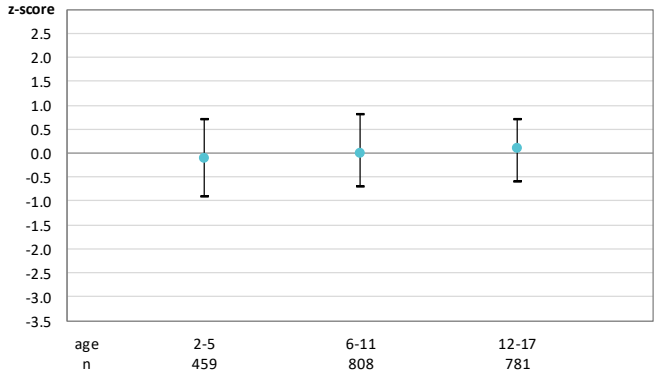
Quartiles of z-scores for BMI: Ireland



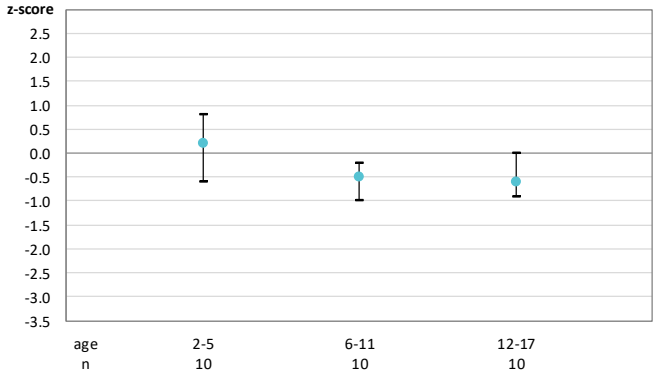
Quartiles of z-scores for BMI: Israel



Quartiles of z-scores for BMI: Italy



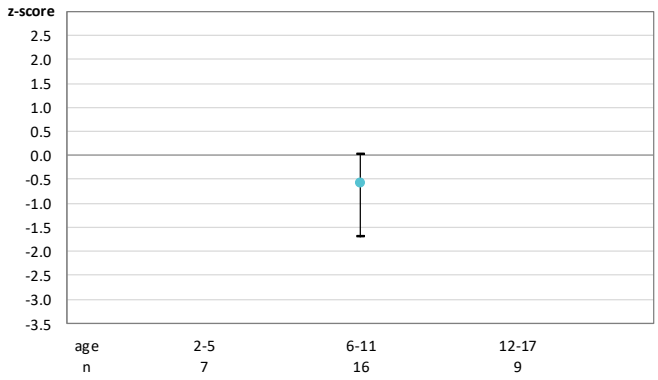
Quartiles of z-scores for BMI: Latvia



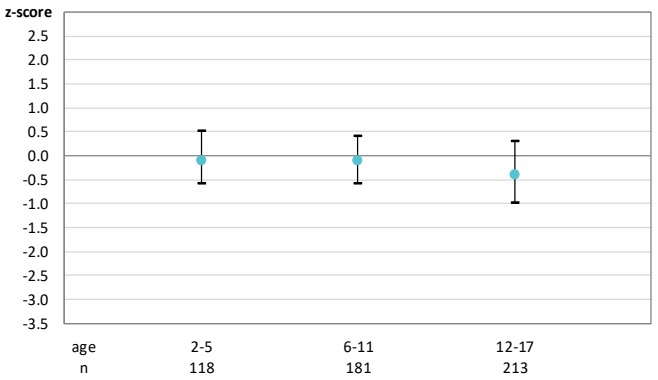
6. Nutrition

[figure 6.3 continued]

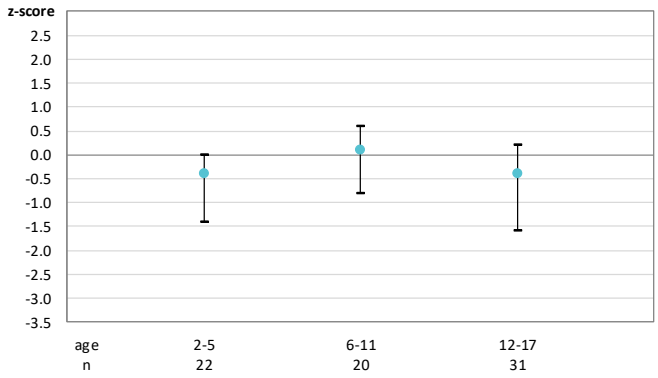
Quartiles of z-scores for BMI: Rep. of Moldova



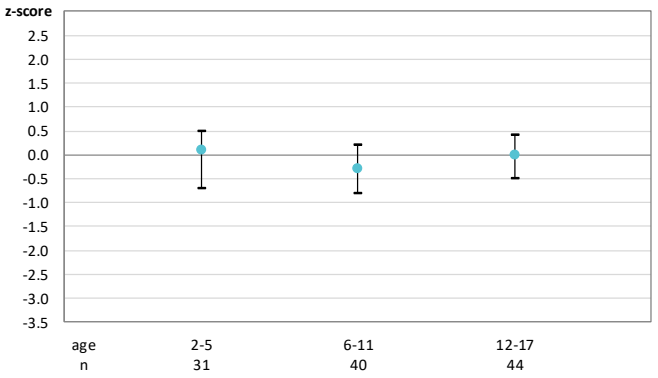
Quartiles of z-scores for BMI: The Netherlands



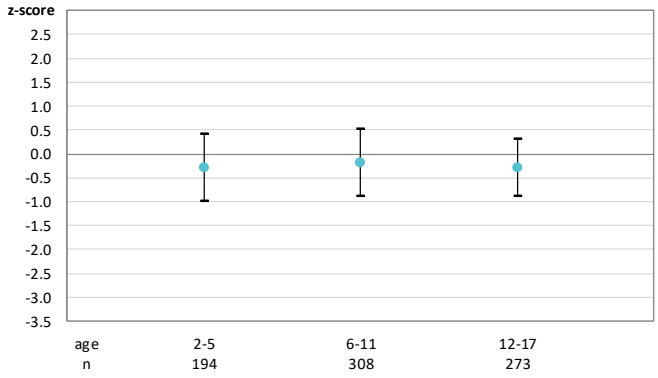
Quartiles of z-scores for BMI: North Macedonia



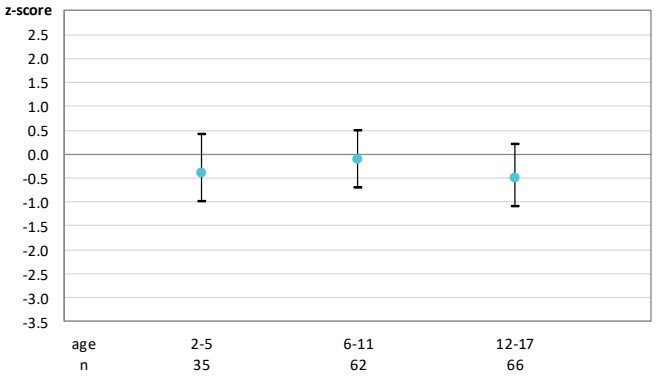
Quartiles of z-scores for BMI: Norway



Quartiles of z-scores for BMI: Poland



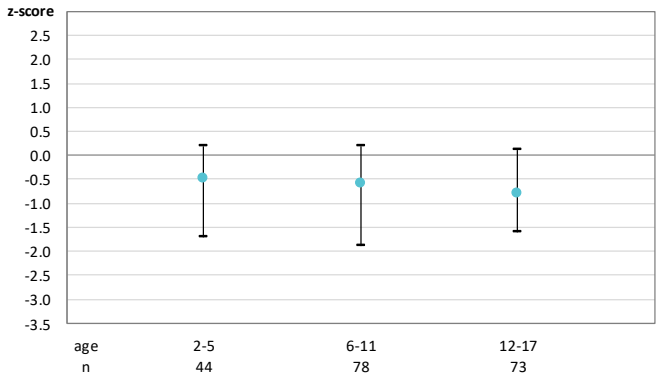
Quartiles of z-scores for BMI: Portugal



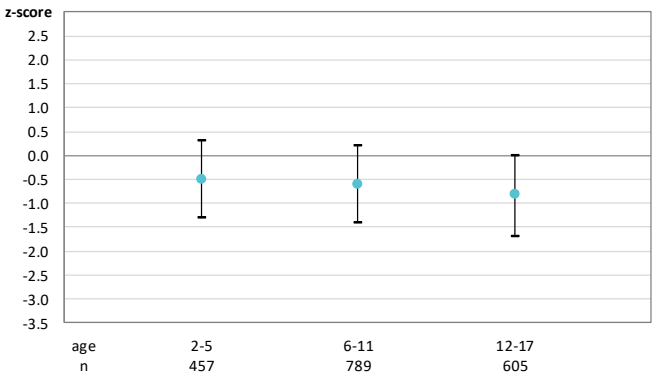
6. Nutrition

[figure 6.3 continued]

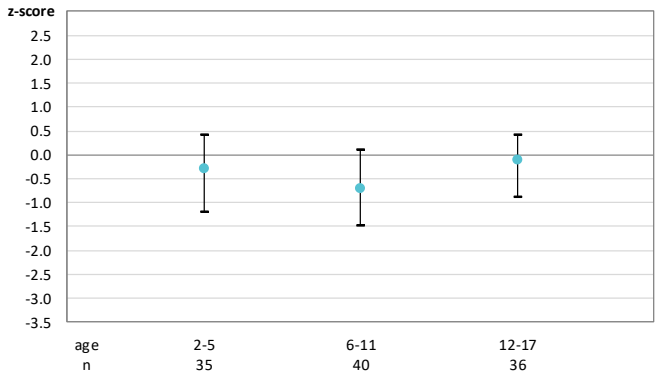
Quartiles of z-scores for BMI: Romania



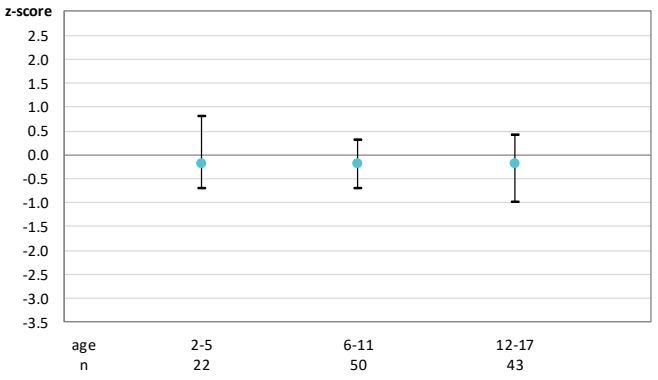
Quartiles of z-scores for BMI: Russian federation



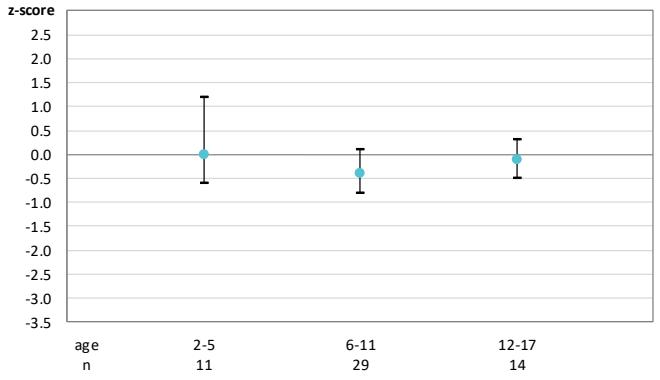
Quartiles of z-scores for BMI: Serbia



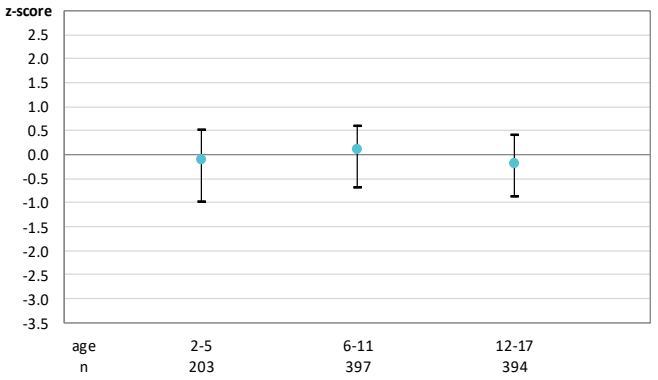
Quartiles of z-scores for BMI: Slovakia



Quartiles of z-scores for BMI: Slovenia



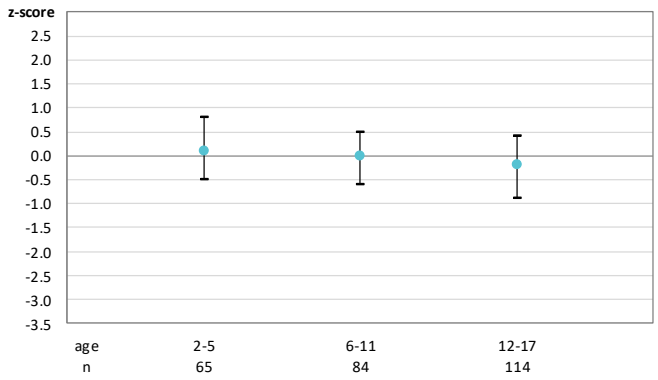
Quartiles of z-scores for BMI: Spain



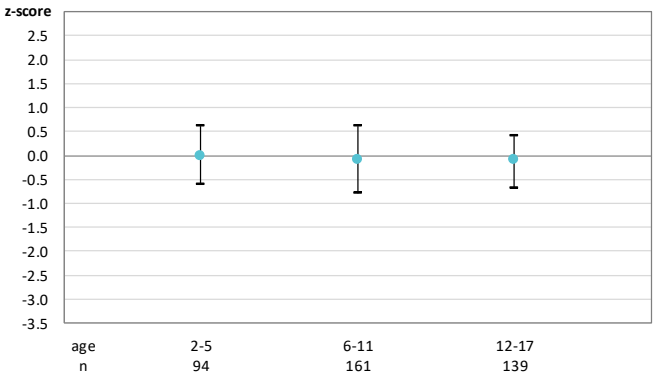
6. Nutrition

[figure 6.3 continued]

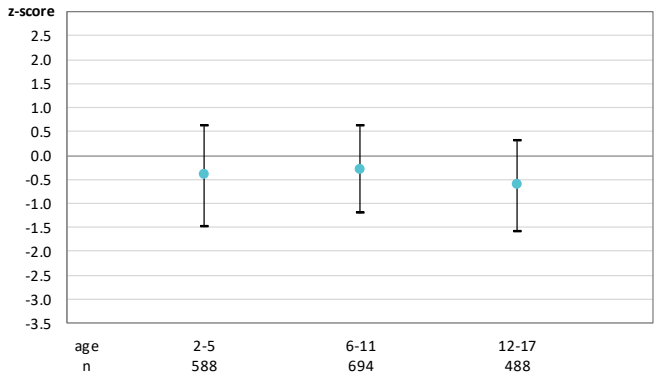
Quartiles of z-scores for BMI: Sweden



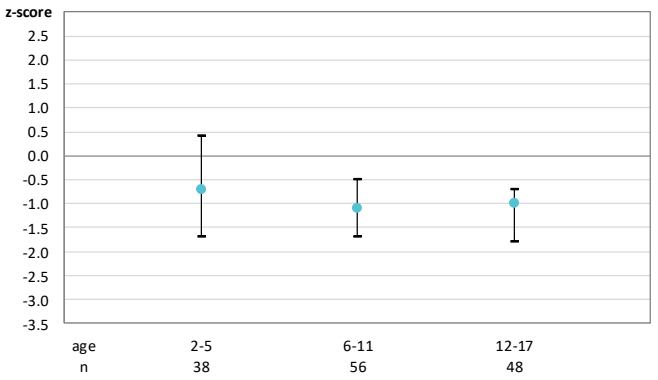
Quartiles of z-scores for BMI: Switzerland



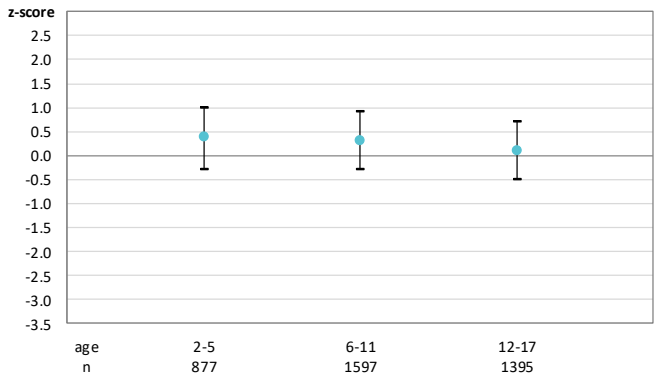
Quartiles of z-scores for BMI: Turkey



Quartiles of z-scores for BMI: Ukraine



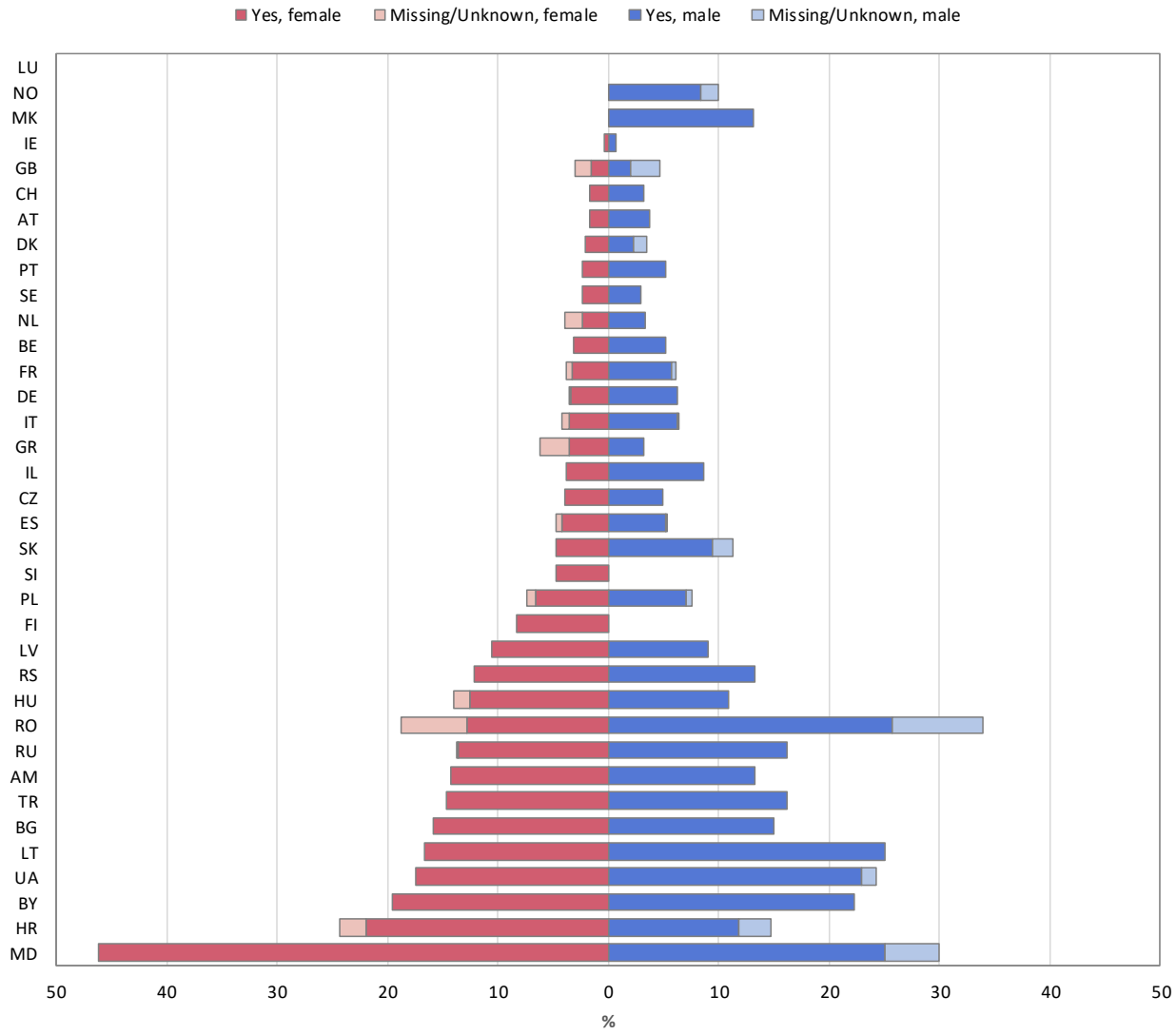
Quartiles of z-scores for BMI: United Kingdom



6. Nutrition

Figure 6.4 *Being underweight is a hallmark clinical feature in children and adolescents with CF. There are considerable differences amongst the countries.*

Proportion of children and adolescents with CF who are underweight (z-score of BMI <-2) by sex and by country; aged 2-17 years in 2021 who have never had a transplant.



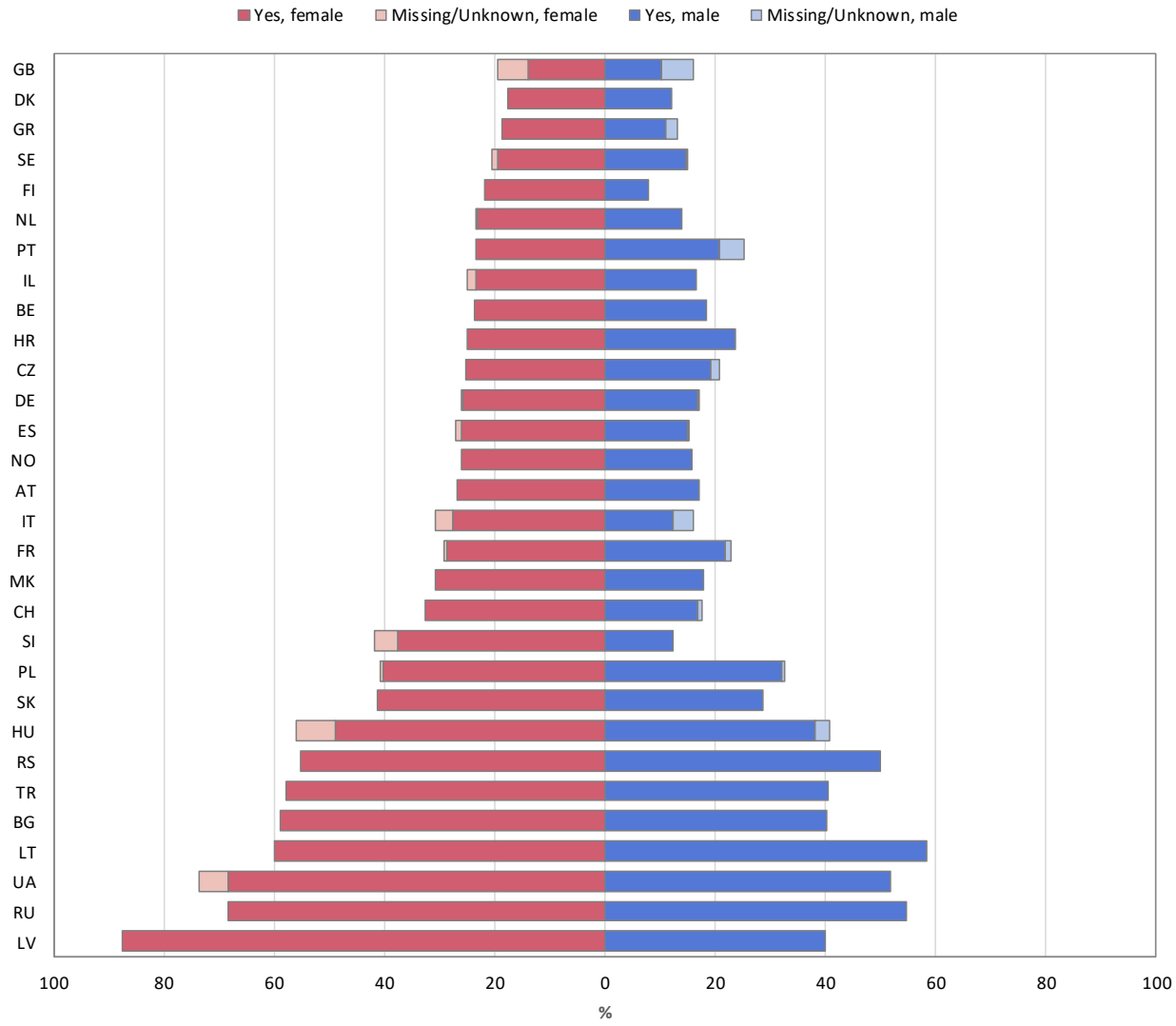
Note: We excluded from the graph the countries for which the information on underweight children and young people is missing for more than 10% of the individuals.
Cyprus and Iceland been excluded from this graph because the number of children in one of the sex groups is less than 5.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

The dark coloured bars (red for females, blue for males) represent the percentage of underweight children in each country. The lighter-coloured bars (light red for females, light blue for males) represent the percentage of missing values on BMI for children and adolescents in each country.

6. Nutrition

Figure 6. 5 *Being underweight is a hallmark clinical feature in adults with CF. There are considerable differences amongst the countries.*

Proportion of adults with BMI<20 by sex and by country; aged 18 years or older in 2021 who never had a transplant.



Note: We excluded from the graph the countries for which the information on underweight adults is missing for more than 10% of the individuals. Albania, Armenia, Cyprus, Iceland, Luxembourg, Republic of Moldova and Romania been excluded from this graph because the number of adults in one of the sex groups is less than 5.

Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

The dark coloured bars (red for females, blue for males) represent the percentage of underweight adults in each country. The light-coloured bars (light red for females, light blue for males) represent the percentage of missing values on BMI for adults in each country.

7. Respiratory complications and therapies

Common respiratory complications in CF include allergic bronchopulmonary aspergillosis, haemoptysis and pneumothorax. In this chapter, besides data on complications, we report on the use of mucolytics (hypertonic saline, rhDNAse and mannitol), inhaled antibiotics, macrolides, bronchodilators and anti-inflammatories (inhaled and oral steroids). We also present data on the use of intravenous antibiotics, considered a surrogate marker of pulmonary exacerbation, as well as the use of oxygen and non-invasive positive pressure ventilation. We collected information using the generic name of the medication, not the brand name.

The information in this section should not be considered complete, for a number of reasons: national CF registries may use a different definition or different parameters for a complication; data about one or more of the complications are not collected; the status of a given complication is unknown. In the tables we show the number of missing values for the various complications, whereas in the graphs we have included only countries where less than 10% of the data is missing. For a full list of complications and definitions please see Appendix 3, page 171.

7. Respiratory complications and therapies

Table 7.1 *Prevalence of people with CF with at least 1 day on intravenous (IV) antibiotics (for CF-related reasons) at home and in hospital. People with CF seen in 2021, who have never had a transplant, by country and overall.*

Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No days		Yes, at least one day		Missing/ Unknown		No days		Yes, at least one day	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	0	0.0	47	58.7	33	41.2						
Armenia	0	0.0	16	72.7	6	27.3						
Austria	1	0.3	304	79.6	77	20.2	1	0.3	291	75.4	94	24.3
Belarus	0	0.0	72	50.0	72	50.0						
Belgium	0	0.0	357	76.8	108	23.2	0	0.0	511	72.0	199	28.0
Bulgaria	5	4.2	71	60.2	42	35.6	2	2.4	64	77.1	17	20.5
Croatia	0	0.0	55	67.9	26	32.1	0	0.0	23	46.9	26	53.1
Cyprus	0	0.0	7	87.5	1	12.5	3	15.8	14	73.7	2	10.5
Czech Republic	4	1.2	292	88.7	33	10.0	0	0.0	218	76.8	66	23.2
Denmark	0	0.0	188	85.8	31	14.2	0	0.0	199	70.6	83	29.4
Finland	0	0.0	31	93.9	2	6.1	0	0.0	43	87.8	6	12.2
France	23	0.9	2293	85.8	355	13.3	246	7.0	2378	67.6	892	25.4
Georgia	7	8.7	61	76.2	12	15.0	0	0.0	7	87.5	1	12.5
Germany	3	0.1	2443	89.4	285	10.4	12	0.3	3111	84.9	541	14.8
Greece	1	0.5	170	81.3	38	18.2	3	0.9	249	73.2	88	25.9
Hungary	135	100	0	0.0	0	0.0	166	100	0	0.0	0	0.0
Iceland	0	0.0	4	50.0	4	50.0	0	0.0	4	66.7	2	33.3
Ireland	0	0.0	470	91.3	45	8.7	0	0.0	517	76.6	158	23.4
Israel	2	1.2	140	87.0	19	11.8	5	1.4	254	73.0	89	25.6
Italy	173	7.8	1628	73.5	414	18.7	480	14.0	2259	65.7	698	20.3
Latvia	0	0.0	21	67.7	10	32.3	0	0.0	5	35.7	9	64.3
Lithuania	0	0.0	7	46.7	8	53.3	1	4.0	11	44.0	13	52.0
Luxembourg	0	0.0	16	84.2	3	15.8						
Rep of Moldova	1	2.7	17	45.9	19	51.3	0	0.0	3	25.0	9	75.0
The Netherlands	1	0.2	472	87.6	66	12.2	4	0.4	685	74.1	235	25.4
North Macedonia	0	0.0	32	38.5	51	61.4	0	0.0	11	24.4	34	75.6
Norway	2	1.6	109	87.2	14	11.2	2	1.1	123	69.5	52	29.4
Poland	67	7.8	560	65.2	232	27.0	40	9.5	157	37.1	226	53.4
Portugal	0	0.0	152	90.5	16	9.5	0	0.0	126	78.3	35	21.7
Romania	4	1.7	135	56.7	99	41.6	3	30.0	5	50.0	2	20.0
Russian Fed.	111	5.5	985	48.4	938	46.1	23	4.8	166	34.5	292	60.7
Serbia	0	0.0	90	70.9	37	29.1	1	1.5	44	67.7	20	30.8
Slovak Republic	4	3.3	99	82.5	17	14.2	23	16.5	77	55.4	39	28.1
Slovenia	0	0.0	38	70.4	16	29.6	1	2.4	35	83.3	6	14.3
Spain	8	0.7	936	87.2	129	12.0	8	0.7	894	80.2	212	19.0
Sweden	0	0.0	196	73.4	71	26.6	0	0.0	161	43.2	212	56.8
Switzerland	16	3.8	372	88.4	33	7.8	14	2.6	425	79.6	95	17.8
Turkey	3	0.1	1556	77.6	445	22.2	2	0.6	223	63.9	124	35.5
Ukraine	1	0.6	34	20.7	129	78.7	3	6.1	5	10.2	41	83.7
United Kingdom	0	0.0	3385	80.5	820	19.5	0	0.0	4049	71.9	1579	28.1
Total	572	2.5	17861	77.0	4756	20.5	1043	4.2	17355	70.5	6202	25.2

Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.

7. Respiratory complications and therapies

Table 7.2 Prevalence of people with CF with at least 1 day on IV antibiotics (for CF-related reasons) in hospital only. People with CF, who have never had a transplant, by country and overall.

Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No days		Yes, at least one day		Missing/ Unknown		No days		Yes, at least one day	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	0	0.0	47	58.7	33	41.2						
Armenia	0	0.0	16	72.7	6	27.3						
Austria	1	0.3	304	79.6	77	20.2	0	0.0	301	78.0	85	22.0
Belarus	0	0.0	80	55.6	64	44.4						
Belgium	0	0.0	360	77.4	105	22.6	0	0.0	543	76.5	167	23.5
Bulgaria	5	4.2	71	60.2	42	35.6	2	2.4	72	86.7	9	10.8
Croatia	0	0.0	55	67.9	26	32.1	0	0.0	25	51.0	24	49.0
Cyprus	0	0.0	7	87.5	1	12.5	3	15.8	14	73.7	2	10.5
Czech Republic	4	1.2	292	88.7	33	10.0	0	0.0	220	77.5	64	22.5
Denmark	10	4.6	202	92.2	7	3.2	61	21.6	212	75.2	9	3.2
Finland	0	0.0	31	93.9	2	6.1	0	0.0	43	87.8	6	12.2
France	92	3.4	2302	86.2	277	10.4	742	21.1	2416	68.7	358	10.2
Georgia	7	8.7	61	76.2	12	15.0	0	0.0	7	87.5	1	12.5
Germany	185	6.8	2282	83.6	264	9.7	175	4.8	3079	84.0	410	11.2
Greece	1	0.5	170	81.3	38	18.2	10	2.9	252	74.1	78	22.9
Hungary	135	100	0	0.0	0	0.0	166	100	0	0.0	0	0.0
Iceland	0	0.0	4	50.0	4	50.0	0	0.0	4	66.7	2	33.3
Ireland	0	0.0	489	94.9	26	5.0	0	0.0	560	83.0	115	17.0
Israel	2	1.2	144	89.4	15	9.3	4	1.1	300	86.2	44	12.6
Italy	173	7.8	1643	74.2	399	18.0	480	14.0	2301	66.9	656	19.1
Latvia	0	0.0	21	67.7	10	32.3	0	0.0	6	42.9	8	57.1
Lithuania	0	0.0	7	46.7	8	53.3	1	4.0	11	44.0	13	52.0
Luxembourg	0	0.0	16	84.2	3	15.8						
Rep of Moldova	1	2.7	18	48.6	18	48.6	0	0.0	9	75.0	3	25.0
The Netherlands	1	0.2	482	89.4	56	10.4	4	0.4	717	77.6	203	22.0
North Macedonia	0	0.0	32	38.5	51	61.4	0	0.0	11	24.4	34	75.6
Norway	0	0.0	110	88.0	15	12.0	2	1.1	141	79.7	34	19.2
Poland	39	4.5	575	66.9	245	28.5	35	8.3	159	37.6	229	54.1
Portugal	0	0.0	152	90.5	16	9.5	0	0.0	129	80.1	32	19.9
Romania	4	1.7	135	56.7	99	41.6	3	30.0	5	50.0	2	20.0
Russian Fed.	73	3.6	1029	50.6	932	45.8	21	4.4	213	44.3	247	51.3
Serbia	0	0.0	90	70.9	37	29.1	1	1.5	44	67.7	20	30.8
Slovak Republic	4	3.3	99	82.5	17	14.2	23	16.5	82	59.0	34	24.5
Slovenia	0	0.0	38	70.4	16	29.6	1	2.4	35	83.3	6	14.3
Spain	8	0.7	957	89.2	108	10.1	8	0.7	977	87.7	129	11.6
Sweden	232	86.9	34	12.7	1	0.4	373	100	0	0.0	0	0.0
Switzerland	15	3.6	377	89.5	29	6.9	14	2.6	453	84.8	67	12.5
Turkey	3	0.1	1574	78.5	427	21.3	2	0.6	242	69.3	105	30.1
Ukraine	1	0.6	35	21.3	128	78.0	3	6.1	7	14.3	39	79.6
United Kingdom	0	0.0	3469	82.5	736	17.5	0	0.0	4522	80.3	1106	19.6
Total	996	4.3	17810	76.8	4383	18.9	2134	8.7	18120	73.7	4346	17.7

Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.

7. Respiratory complications and therapies

Table 7.3 Prevalence of people with CF with at least 1 day in hospital, for any reason (routine check-up days not included). People with CF seen in 2021, who have never had a transplant, by country and overall.

Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No days		Yes, at least one day		Missing/ Unknown		No days		Yes, at least one day	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	0	0.0	47	58.7	33	41.2						
Armenia	0	0.0	15	68.2	7	31.8						
Austria	0	0.0	234	61.3	148	38.7	1	0.3	280	72.5	105	27.2
Belarus	0	0.0	73	50.7	71	49.3						
Belgium	0	0.0	307	66.0	158	34.0	0	0.0	494	69.6	216	30.4
Bulgaria	5	4.2	56	47.5	57	48.3	2	2.4	70	84.3	11	13.2
Croatia	0	0.0	52	64.2	29	35.8	0	0.0	23	46.9	26	53.1
Cyprus	0	0.0	7	87.5	1	12.5	3	15.8	14	73.7	2	10.5
Czech Republic	4	1.2	248	75.4	77	23.4	0	0.0	211	74.3	73	25.7
Denmark	167	76.3	44	20.1	8	3.6	282	100	0	0.0	0	0.0
Finland	0	0.0	30	90.9	3	9.1	0	0.0	42	85.7	7	14.3
France	197	7.4	1992	74.6	482	18.0	389	11.1	2469	70.2	658	18.7
Georgia	7	8.7	61	76.2	12	15.0	0	0.0	7	87.5	1	12.5
Germany	185	6.8	1907	69.8	639	23.4	170	4.6	2778	75.8	716	19.5
Greece	0	0.0	163	78.0	46	22.0	10	2.9	247	72.6	83	24.4
Hungary	135	100	0	0.0	0	0.0	166	100	0	0.0	0	0.0
Iceland	0	0.0	4	50.0	4	50.0	0	0.0	4	66.7	2	33.3
Ireland	0	0.0	463	89.9	52	10.1	0	0.0	537	79.6	138	20.4
Israel	1	0.6	133	82.6	27	16.8	3	0.9	278	79.9	67	19.2
Italy	0	0.0	1609	72.6	606	27.4	1	0.0	2467	71.8	969	28.2
Latvia	0	0.0	17	54.8	14	45.2	1	7.1	4	28.6	9	64.3
Lithuania	0	0.0	7	46.7	8	53.3	1	4.0	11	44.0	13	52.0
Luxembourg	0	0.0	15	78.9	4	21.0						
Rep of Moldova	1	2.7	18	48.6	18	48.6	0	0.0	9	75.0	3	25.0
The Netherlands	1	0.2	448	83.1	90	16.7	4	0.4	667	72.2	253	27.4
North Macedonia	0	0.0	31	37.3	52	62.6	0	0.0	11	24.4	34	75.6
Norway	2	1.6	95	76.0	28	22.4	4	2.3	125	70.6	48	27.1
Poland	37	4.3	422	49.1	400	46.6	34	8.0	129	30.5	260	61.5
Portugal	0	0.0	138	82.1	30	17.9	0	0.0	123	76.4	38	23.6
Romania	4	1.7	56	23.5	178	74.8	3	30.0	1	10.0	6	60.0
Russian Fed.	97	4.8	962	47.3	975	47.9	23	4.8	209	43.4	249	51.8
Serbia	0	0.0	79	62.2	48	37.8	1	1.5	43	66.1	21	32.3
Slovak Republic	5	4.2	85	70.8	30	25.0	23	16.5	79	56.8	37	26.6
Slovenia	0	0.0	34	63.0	20	37.0	1	2.4	33	78.6	8	19.0
Spain	9	0.8	921	85.8	143	13.3	7	0.6	969	87.0	138	12.4
Sweden	0	0.0	219	82.0	48	18.0	0	0.0	319	85.5	54	14.5
Switzerland	15	3.6	354	84.1	52	12.3	14	2.6	428	80.1	92	17.2
Turkey	3	0.1	1345	67.1	656	32.7	2	0.6	218	62.5	129	37.0
Ukraine	1	0.6	29	17.7	134	81.7	3	6.1	7	14.3	39	79.6
United Kingdom	0	0.0	3069	73.0	1136	27.0	0	0.0	4179	74.2	1449	25.7
Total	876	3.8	15789	68.1	6524	28.1	1148	4.7	17492	71.1	5960	24.2

Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.

7. Respiratory complications and therapies

Table 7.4 Prevalence of allergic bronchopulmonary aspergillosis (ABPA) in all people with CF seen in 2021 who have never had a transplant, by country and overall.

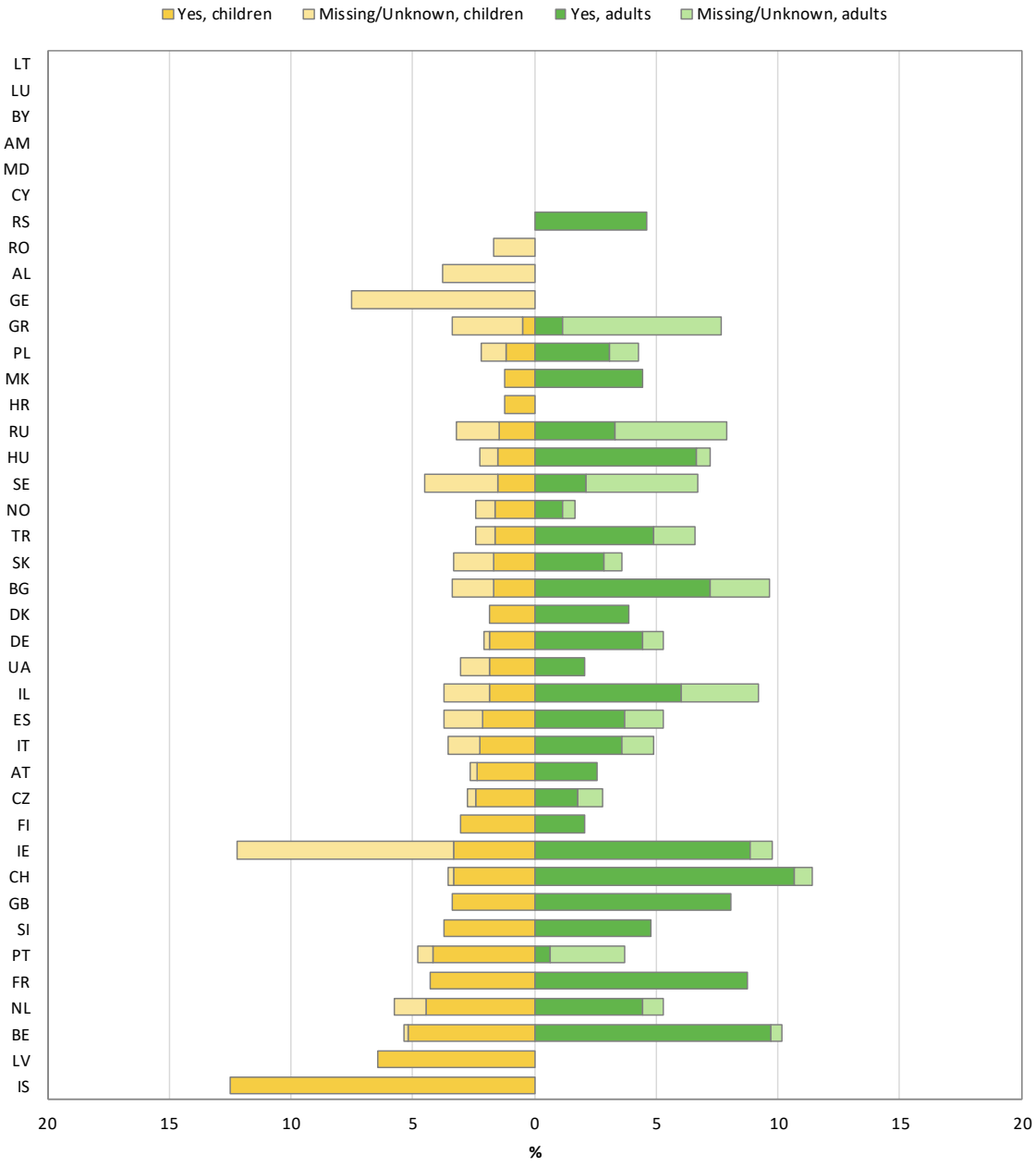
Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No ABPA		Yes, current ABPA		Missing/ Unknown		No ABPA		Yes, current ABPA	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	3	3.7	77	96.2	0	0.0						
Armenia	0	0.0	22	100	0	0.0						
Austria	1	0.3	372	97.4	9	2.4	0	0.0	376	97.4	10	2.6
Belarus	0	0.0	144	100	0	0.0						
Belgium	1	0.2	440	94.6	24	5.2	3	0.4	638	89.9	69	9.7
Bulgaria	2	1.7	114	96.6	2	1.7	2	2.4	75	90.4	6	7.2
Croatia	0	0.0	80	98.8	1	1.2	0	0.0	49	100	0	0.0
Cyprus	0	0.0	8	100	0	0.0	0	0.0	19	100	0	0.0
Czech Republic	1	0.3	320	97.3	8	2.4	3	1.1	276	97.2	5	1.8
Denmark	0	0.0	215	98.2	4	1.8	0	0.0	271	96.1	11	3.9
Finland	0	0.0	32	97.0	1	3.0	0	0.0	48	98.0	1	2.0
France	0	0.0	2557	95.7	114	4.3	0	0.0	3209	91.3	307	8.7
Georgia	6	7.5	74	92.5	0	0.0	1	12.5	7	87.5	0	0.0
Germany	6	0.2	2675	97.9	50	1.8	32	0.9	3470	94.7	162	4.4
Greece	6	2.9	202	96.6	1	0.5	22	6.5	314	92.3	4	1.2
Hungary	1	0.7	132	97.8	2	1.5	1	0.6	154	92.8	11	6.6
Iceland	0	0.0	7	87.5	1	12.5	0	0.0	6	100	0	0.0
Ireland	46	8.9	452	87.8	17	3.3	6	0.9	609	90.2	60	8.9
Israel	3	1.9	155	96.3	3	1.9	11	3.2	316	90.8	21	6.0
Italy	28	1.3	2137	96.5	50	2.3	44	1.3	3269	95.1	124	3.6
Latvia	0	0.0	29	93.5	2	6.4	0	0.0	14	100	0	0.0
Lithuania	2	13.3	12	80.0	1	6.7	0	0.0	25	100	0	0.0
Luxembourg	0	0.0	19	100	0	0.0						
Rep of Moldova	0	0.0	37	100	0	0.0	0	0.0	12	100	0	0.0
The Netherlands	7	1.3	508	94.2	24	4.4	8	0.9	875	94.7	41	4.4
North Macedonia	0	0.0	82	98.8	1	1.2	0	0.0	43	95.6	2	4.4
Norway	1	0.8	122	97.6	2	1.6	1	0.6	174	98.3	2	1.1
Poland	9	1.0	840	97.8	10	1.2	5	1.2	405	95.7	13	3.1
Portugal	1	0.6	160	95.2	7	4.2	5	3.1	155	96.3	1	0.6
Romania	4	1.7	234	98.3	0	0.0	0	0.0	10	100	0	0.0
Russian Fed.	35	1.7	1969	96.8	30	1.5	22	4.6	443	92.1	16	3.3
Serbia	0	0.0	127	100	0	0.0	0	0.0	62	95.4	3	4.6
Slovak Republic	2	1.7	116	96.7	2	1.7	1	0.7	134	96.4	4	2.9
Slovenia	0	0.0	52	96.3	2	3.7	0	0.0	40	95.2	2	4.8
Spain	17	1.6	1033	96.3	23	2.1	18	1.6	1055	94.7	41	3.7
Sweden	8	3.0	255	95.5	4	1.5	17	4.6	348	93.3	8	2.1
Switzerland	1	0.2	406	96.4	14	3.3	4	0.7	473	88.6	57	10.7
Turkey	16	0.8	1956	97.6	32	1.6	6	1.7	326	93.4	17	4.9
Ukraine	2	1.2	159	96.9	3	1.8	0	0.0	48	98.0	1	2.0
United Kingdom	0	0.0	4063	96.6	142	3.4	0	0.0	5173	91.9	455	8.1
Total	209	0.9	22394	96.6	586	2.5	212	0.9	22933	93.2	1455	5.9

Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.

7. Respiratory complications and therapies

Figure 7.1 *ABPA is prevalent in 2-10% of children and adults with CF across Europe.*

Prevalence of allergic bronchopulmonary aspergillosis in children and adults seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information on allergic bronchopulmonary aspergillosis (ABPA) is missing for more than 10% of the people with CF.
Albania, Armenia, Belarus, and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the frequency of allergic bronchopulmonary aspergillosis (ABPA) by country. For the definition of ABPA see Appendix 3 (page 171) the dark colour shows the percentage of people with CF with ABPA, the light colours show the percentage of people with CF for whom this information is missing.

7. Respiratory complications and therapies

Table 7.5 Prevalence of pneumothorax in all people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No		Yes		Missing/ Unknown		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	8	10.0	72	90.0	0	0.0						
Armenia	0	0.0	22	100	0	0.0						
Austria	1	0.3	381	99.7	0	0.0	1	0.3	384	99.5	1	0.3
Belarus	0	0.0	143	99.3	1	0.7						
Belgium	0	0.0	465	100	0	0.0	2	0.3	707	99.6	1	0.1
Bulgaria	2	1.7	116	98.3	0	0.0	2	2.4	81	97.6	0	0.0
Croatia	0	0.0	81	100	0	0.0	0	0.0	49	100	0	0.0
Cyprus	0	0.0	8	100	0	0.0	0	0.0	19	100	0	0.0
Czech Republic	5	1.5	324	98.5	0	0.0	6	2.1	275	96.8	3	1.1
Denmark	0	0.0	219	100	0	0.0	0	0.0	282	100	0	0.0
Finland	0	0.0	33	100	0	0.0	0	0.0	49	100	0	0.0
France	0	0.0	2669	99.9	2	0.1	0	0.0	3505	99.7	11	0.3
Georgia	4	5.0	75	93.7	1	1.2	0	0.0	8	100	0	0.0
Germany	6	0.2	2725	99.8	0	0.0	33	0.9	3615	98.7	16	0.4
Greece	6	2.9	203	97.1	0	0.0	7	2.1	333	97.9	0	0.0
Hungary	1	0.7	134	99.3	0	0.0	2	1.2	163	98.2	1	0.6
Iceland	0	0.0	8	100	0	0.0	0	0.0	6	100	0	0.0
Ireland	0	0.0	515	100	0	0.0	0	0.0	675	100	0	0.0
Israel	4	2.5	157	97.5	0	0.0	9	2.6	339	97.4	0	0.0
Italy	19	0.9	2195	99.1	1	0.0	46	1.3	3388	98.6	3	0.1
Latvia	0	0.0	31	100	0	0.0	0	0.0	14	100	0	0.0
Lithuania	0	0.0	15	100	0	0.0	0	0.0	25	100	0	0.0
Luxembourg	0	0.0	19	100	0	0.0						
Rep of Moldova	0	0.0	37	100	0	0.0	0	0.0	12	100	0	0.0
The Netherlands	0	0.0	539	100	0	0.0	12	1.3	909	98.4	3	0.3
North Macedonia	0	0.0	83	100	0	0.0	0	0.0	45	100	0	0.0
Norway	0	0.0	125	100	0	0.0	2	1.1	174	98.3	1	0.6
Poland	14	1.6	842	98.0	3	0.3	8	1.9	409	96.7	6	1.4
Portugal	3	1.8	164	97.6	1	0.6	3	1.9	157	97.5	1	0.6
Romania	5	2.1	230	96.6	3	1.3	0	0.0	10	100	0	0.0
Russian Fed.	19	0.9	2006	98.6	9	0.4	16	3.3	455	94.6	10	2.1
Serbia	0	0.0	127	100	0	0.0	0	0.0	65	100	0	0.0
Slovak Republic	1	0.8	118	98.3	1	0.8	2	1.4	136	97.8	1	0.7
Slovenia	0	0.0	54	100	0	0.0	0	0.0	42	100	0	0.0
Spain	19	1.8	1052	98.0	2	0.2	18	1.6	1095	98.3	1	0.1
Sweden	8	3.0	259	97.0	0	0.0	17	4.6	356	95.4	0	0.0
Switzerland	1	0.2	420	99.8	0	0.0	4	0.7	530	99.2	0	0.0
Turkey	5	0.2	1994	99.5	5	0.2	4	1.1	340	97.4	5	1.4
Ukraine	0	0.0	164	100	0	0.0	0	0.0	49	100	0	0.0
United Kingdom	0	0.0	4205	100	0	0.0	0	0.0	5616	99.8	12	0.2
Total	131	0.6	23029	99.3	29	0.1	194	0.8	24330	98.9	76	0.3

Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.

7. Respiratory complications and therapies

Table 7.6 Prevalence of haemoptysis major (≥250 ml over the course of a day) in all people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No		Yes		Missing/ Unknown		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	5	6.2	75	93.7	0	0.0						
Armenia	0	0.0	22	100	0	0.0						
Austria	7	1.8	374	97.9	1	0.3	5	1.3	375	97.1	6	1.5
Belarus	0	0.0	143	99.3	1	0.7						
Belgium	2	0.4	461	99.1	2	0.4	2	0.3	694	97.7	14	2.0
Bulgaria	2	1.7	112	94.9	4	3.4	2	2.4	74	89.2	7	8.4
Croatia	0	0.0	81	100	0	0.0	0	0.0	45	91.8	4	8.2
Cyprus	0	0.0	8	100	0	0.0	0	0.0	19	100	0	0.0
Czech Republic	2	0.6	326	99.1	1	0.3	2	0.7	277	97.5	5	1.8
Denmark	0	0.0	217	99.1	2	0.9	0	0.0	277	98.2	5	1.8
Finland	0	0.0	33	100	0	0.0	0	0.0	49	100	0	0.0
France	0	0.0	2667	99.8	4	0.1	0	0.0	3478	98.9	38	1.1
Georgia	5	6.2	74	92.5	1	1.2	1	12.5	7	87.5	0	0.0
Germany	13	0.5	2718	99.5	0	0.0	89	2.4	3571	97.5	4	0.1
Greece	5	2.4	202	96.6	2	1.0	9	2.6	319	93.8	12	3.5
Hungary	4	3.0	127	94.1	4	3.0	2	1.2	156	94.0	8	4.8
Iceland	0	0.0	8	100	0	0.0	1	16.7	5	83.3	0	0.0
Ireland	0	0.0	515	100	0	0.0	0	0.0	675	100	0	0.0
Israel	3	1.9	158	98.1	0	0.0	8	2.3	338	97.1	2	0.6
Italy	18	0.8	2178	98.3	19	0.9	35	1.0	3247	94.5	155	4.5
Latvia	0	0.0	31	100	0	0.0	0	0.0	14	100	0	0.0
Lithuania	0	0.0	15	100	0	0.0	0	0.0	24	96.0	1	4.0
Luxembourg	0	0.0	19	100	0	0.0						
Rep of Moldova	0	0.0	37	100	0	0.0	0	0.0	12	100	0	0.0
The Netherlands	6	1.1	532	98.7	1	0.2	19	2.1	862	93.3	43	4.6
North Macedonia	0	0.0	83	100	0	0.0	0	0.0	45	100	0	0.0
Norway	2	1.6	123	98.4	0	0.0	4	2.3	171	96.6	2	1.1
Poland	11	1.3	846	98.5	2	0.2	7	1.6	394	93.1	22	5.2
Portugal	2	1.2	166	98.8	0	0.0	3	1.9	155	96.3	3	1.9
Romania	8	3.4	229	96.2	1	0.4	0	0.0	10	100	0	0.0
Russian Fed.	28	1.4	2000	98.3	6	0.3	19	3.9	455	94.6	7	1.5
Serbia	0	0.0	127	100	0	0.0	0	0.0	64	98.5	1	1.5
Slovak Republic	2	1.7	117	97.5	1	0.8	1	0.7	122	87.8	16	11.5
Slovenia	0	0.0	54	100	0	0.0	0	0.0	42	100	0	0.0
Spain	18	1.7	1048	97.7	7	0.6	16	1.4	1079	96.9	19	1.7
Sweden	8	3.0	259	97.0	0	0.0	17	4.6	352	94.4	4	1.1
Switzerland	1	0.2	420	99.8	0	0.0	7	1.3	514	96.2	13	2.4
Turkey	6	0.3	1993	99.4	5	0.2	5	1.4	340	97.4	4	1.1
Ukraine	1	0.6	157	95.7	6	3.7	0	0.0	47	95.9	2	4.1
United Kingdom	0	0.0	4205	100	0	0.0	0	0.0	5617	99.8	11	0.2
Total	159	0.7	22960	99.0	70	0.3	254	1.0	23938	97.3	408	1.7

Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.

Note: Germany and the United Kingdom define haemoptysis major > 240 ml.
Ireland: haemoptysis major is defined as haemoptysis massive > 240ml/day or > 100ml/day for several days.

7. Respiratory complications and therapies

Table 7.7 Use of inhaled hypertonic saline (NaCl) >3 consecutive months this year in all people with CF seen in 2021 who have never had a transplant, by country and overall.

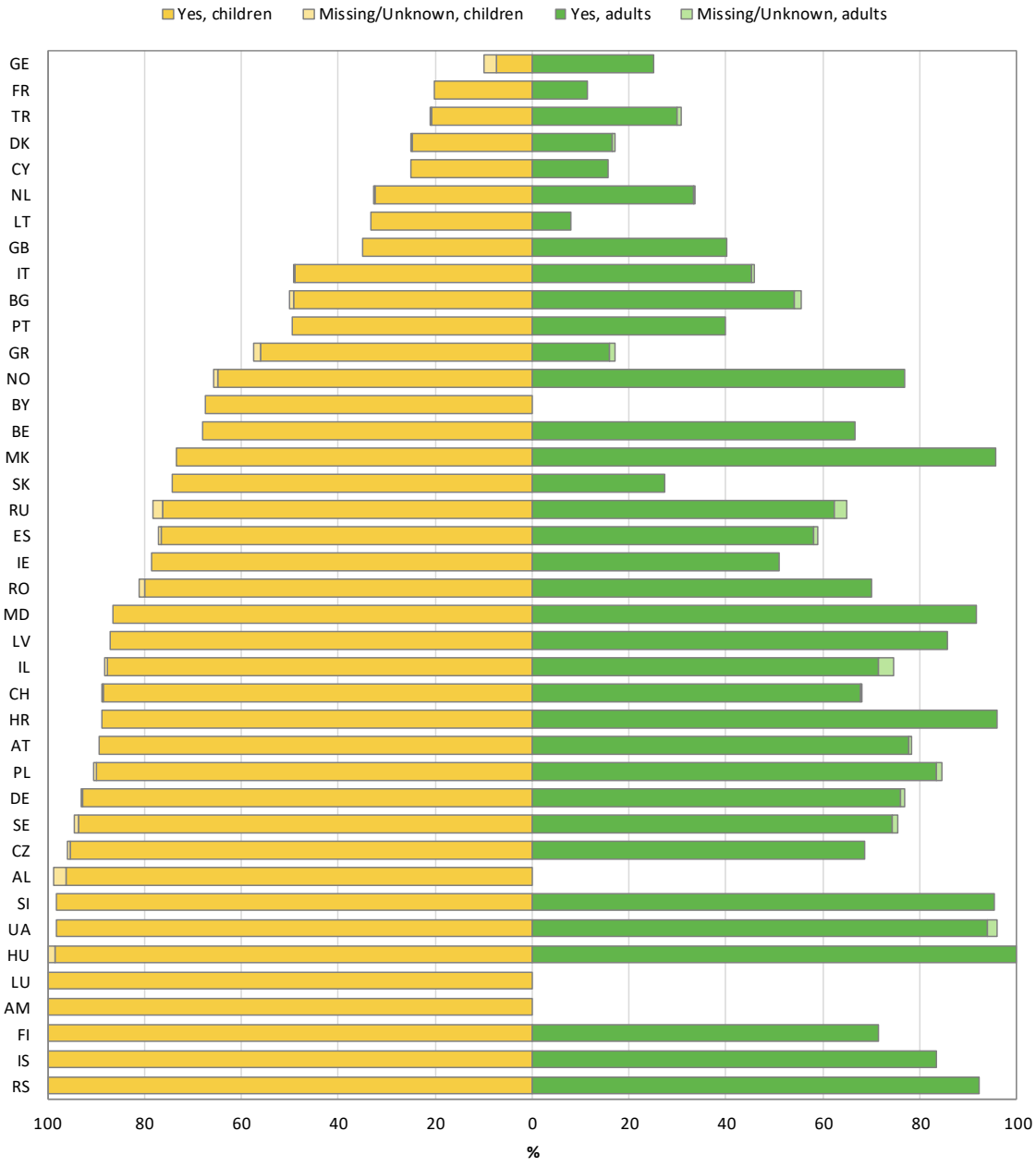
Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No		Yes		Missing/ Unknown		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	2	2.5	1	1.2	77	96.2						
Armenia	0	0.0	0	0.0	22	100						
Austria	0	0.0	41	10.7	341	89.3	2	0.5	84	21.8	300	77.7
Belarus	0	0.0	47	32.6	97	67.4						
Belgium	0	0.0	149	32.0	316	68.0	0	0.0	236	33.2	474	66.8
Bulgaria	1	0.8	59	50.0	58	49.1	1	1.2	37	44.6	45	54.2
Croatia	0	0.0	9	11.1	72	88.9	0	0.0	2	4.1	47	95.9
Cyprus	0	0.0	6	75.0	2	25.0	0	0.0	16	84.2	3	15.8
Czech Republic	1	0.3	14	4.3	314	95.4	0	0.0	89	31.3	195	68.7
Denmark	1	0.5	164	74.9	54	24.7	1	0.3	234	83.0	47	16.7
Finland	0	0.0	0	0.0	33	100	0	0.0	14	28.6	35	71.4
France	0	0.0	2129	79.7	542	20.3	0	0.0	3115	88.6	401	11.4
Georgia	2	2.5	72	90.0	6	7.5	0	0.0	6	75.0	2	25.0
Germany	4	0.1	192	7.0	2535	92.8	26	0.7	852	23.2	2786	76.0
Greece	3	1.4	89	42.6	117	56.0	4	1.2	282	82.9	54	15.9
Hungary	2	1.5	0	0.0	133	98.5	0	0.0	0	0.0	166	100
Iceland	0	0.0	0	0.0	8	100	0	0.0	1	16.7	5	83.3
Ireland	0	0.0	111	21.5	404	78.4	0	0.0	331	49.0	344	51.0
Israel	1	0.6	19	11.8	141	87.6	11	3.2	88	25.3	249	71.5
Italy	8	0.4	1122	50.6	1085	49.0	16	0.5	1862	54.2	1559	45.4
Latvia	0	0.0	4	12.9	27	87.1	0	0.0	2	14.3	12	85.7
Lithuania	0	0.0	10	66.7	5	33.3	0	0.0	23	92.0	2	8.0
Luxembourg	0	0.0	0	0.0	19	100						
Rep of Moldova	0	0.0	5	13.5	32	86.5	0	0.0	1	8.3	11	91.7
The Netherlands	1	0.2	363	67.3	175	32.5	3	0.3	614	66.4	307	33.2
North Macedonia	0	0.0	22	26.5	61	73.5	0	0.0	2	4.4	43	95.6
Norway	1	0.8	43	34.4	81	64.8	0	0.0	41	23.2	136	76.8
Poland	6	0.7	82	9.5	771	89.8	5	1.2	65	15.4	353	83.4
Portugal	0	0.0	85	50.6	83	49.4	0	0.0	97	60.2	64	39.7
Romania	3	1.3	45	18.9	190	79.8	0	0.0	3	30.0	7	70.0
Russian Fed.	40	2.0	442	21.7	1552	76.3	13	2.7	168	34.9	300	62.4
Serbia	0	0.0	0	0.0	127	100	0	0.0	5	7.7	60	92.3
Slovak Republic	0	0.0	31	25.8	89	74.2	0	0.0	101	72.7	38	27.3
Slovenia	0	0.0	1	1.8	53	98.1	0	0.0	2	4.8	40	95.2
Spain	4	0.4	247	23.0	822	76.6	10	0.9	456	40.9	648	58.2
Sweden	2	0.7	15	5.6	250	93.6	4	1.1	92	24.7	277	74.3
Switzerland	2	0.5	47	11.2	372	88.4	1	0.2	171	32.0	362	67.8
Turkey	1	0.0	1585	79.1	418	20.9	3	0.9	242	69.3	104	29.8
Ukraine	0	0.0	3	1.8	161	98.2	1	2.0	2	4.1	46	93.9
United Kingdom	0	0.0	2733	65.0	1472	35.0	0	0.0	3363	59.7	2265	40.2
Total	85	0.4	9987	43.1	13117	56.6	101	0.4	12700	51.6	11799	48.0

Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.
The United Kingdom: the duration of use of inhaled hypertonic saline is not specified.
Note: Inhaled hypertonic saline is reimbursed in most countries except in Albania, Armenia, Bulgaria, Lithuania, the Republic of Moldova, Poland, Romania, the Russian Federation and Serbia. In Ukraine it is reimbursed for children, and in Turkey for children ≥ 6 years.

7. Respiratory complications and therapies

Figure 7.2 *Variation in the use of inhaled hypertonic saline indicates both inequalities and different therapeutic approaches.*

Use of inhaled hypertonic saline in children and adults seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information on inhaled hypertonic saline is missing for more than 10% of the people with CF. Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: United Kingdom: the duration of use of inhaled hypertonic saline is not specified.
Note: Inhaled hypertonic saline is reimbursed in most countries except in Albania, Armenia, Bulgaria, Lithuania, the Republic of Moldova, Poland, Romania, the Russian Federation and Serbia. In Ukraine it is reimbursed for children, and in Turkey for children ≥ 6 years.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the use of inhaled hypertonic saline (≥ 3%) for at least three consecutive months during the survey year. The dark colours indicate the percentage of people with CF taking the medication, the lighter colours show the percentage of people with CF for whom this information is missing.

7. Respiratory complications and therapies

Table 7.8 Use of inhaled rhDNase ≥3 months in all people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No		Yes		Missing/ Unknown		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	0	0.0	77	96.2	3	3.7						
Armenia	0	0.0	14	63.6	8	36.4						
Austria	0	0.0	181	47.4	201	52.6	2	0.5	172	44.6	212	54.9
Belarus	0	0.0	128	88.9	16	11.1						
Belgium	0	0.0	51	11.0	414	89.0	0	0.0	119	16.8	591	83.2
Bulgaria	2	1.7	39	33.0	77	65.2	0	0.0	0	0.0	83	100
Croatia	0	0.0	25	30.9	56	69.1	0	0.0	1	2.0	48	98.0
Cyprus	0	0.0	3	37.5	5	62.5	0	0.0	5	26.3	14	73.7
Czech Republic	1	0.3	163	49.5	165	50.1	0	0.0	45	15.8	239	84.1
Denmark	1	0.5	10	4.6	208	95.0	3	1.1	70	24.8	209	74.1
Finland	0	0.0	8	24.2	25	75.8	0	0.0	11	22.4	38	77.5
France	0	0.0	1278	47.8	1393	52.1	0	0.0	2034	57.8	1482	42.1
Georgia	3	3.7	58	72.5	19	23.7	0	0.0	8	100	0	0.0
Germany	16	0.6	1581	57.9	1134	41.5	36	1.0	1757	47.9	1871	51.1
Greece	3	1.4	31	14.8	175	83.7	4	1.2	115	33.8	221	65.0
Hungary	1	0.7	62	45.9	72	53.3	0	0.0	9	5.4	157	94.6
Iceland	0	0.0	1	12.5	7	87.5	0	0.0	1	16.7	5	83.3
Ireland	0	0.0	269	52.2	246	47.8	0	0.0	262	38.8	413	61.2
Israel	2	1.2	47	29.2	112	69.6	9	2.6	90	25.9	249	71.5
Italy	8	0.4	1247	56.3	960	43.3	17	0.5	1878	54.6	1542	44.9
Latvia	0	0.0	20	64.5	11	35.5	0	0.0	3	21.4	11	78.6
Lithuania	0	0.0	5	33.3	10	66.7	1	4.0	2	8.0	22	88.0
Luxembourg	0	0.0	4	21.0	15	78.9						
Rep of Moldova	0	0.0	36	97.3	1	2.7	0	0.0	12	100	0	0.0
The Netherlands	0	0.0	181	33.6	358	66.4	1	0.1	313	33.9	610	66.0
North Macedonia	0	0.0	37	44.6	46	55.4	0	0.0	1	2.2	44	97.8
Norway	0	0.0	43	34.4	82	65.6	0	0.0	72	40.7	105	59.3
Poland	5	0.6	165	19.2	689	80.2	4	0.9	7	1.6	412	97.4
Portugal	2	1.2	42	25.0	124	73.8	0	0.0	12	7.4	149	92.5
Romania	3	1.3	44	18.5	191	80.2	0	0.0	1	10.0	9	90.0
Russian Fed.	29	1.4	38	1.9	1967	96.7	14	2.9	56	11.6	411	85.4
Serbia	0	0.0	52	40.9	75	59.1	0	0.0	7	10.8	58	89.2
Slovak Republic	0	0.0	38	31.7	82	68.3	0	0.0	27	19.4	112	80.6
Slovenia	0	0.0	50	92.6	4	7.4	0	0.0	23	54.8	19	45.2
Spain	4	0.4	691	64.4	378	35.2	6	0.5	697	62.6	411	36.9
Sweden	2	0.7	177	66.3	88	33.0	5	1.3	245	65.7	123	33.0
Switzerland	1	0.2	281	66.7	139	33.0	2	0.4	239	44.8	293	54.9
Turkey	5	0.2	216	10.8	1783	89.0	2	0.6	43	12.3	304	87.1
Ukraine	0	0.0	25	15.2	139	84.8	1	2.0	6	12.2	42	85.7
United Kingdom	0	0.0	1588	37.8	2617	62.2	0	0.0	1339	23.8	4289	76.2
Total	88	0.4	9006	38.8	14095	60.8	107	0.4	9690	39.4	14803	60.2

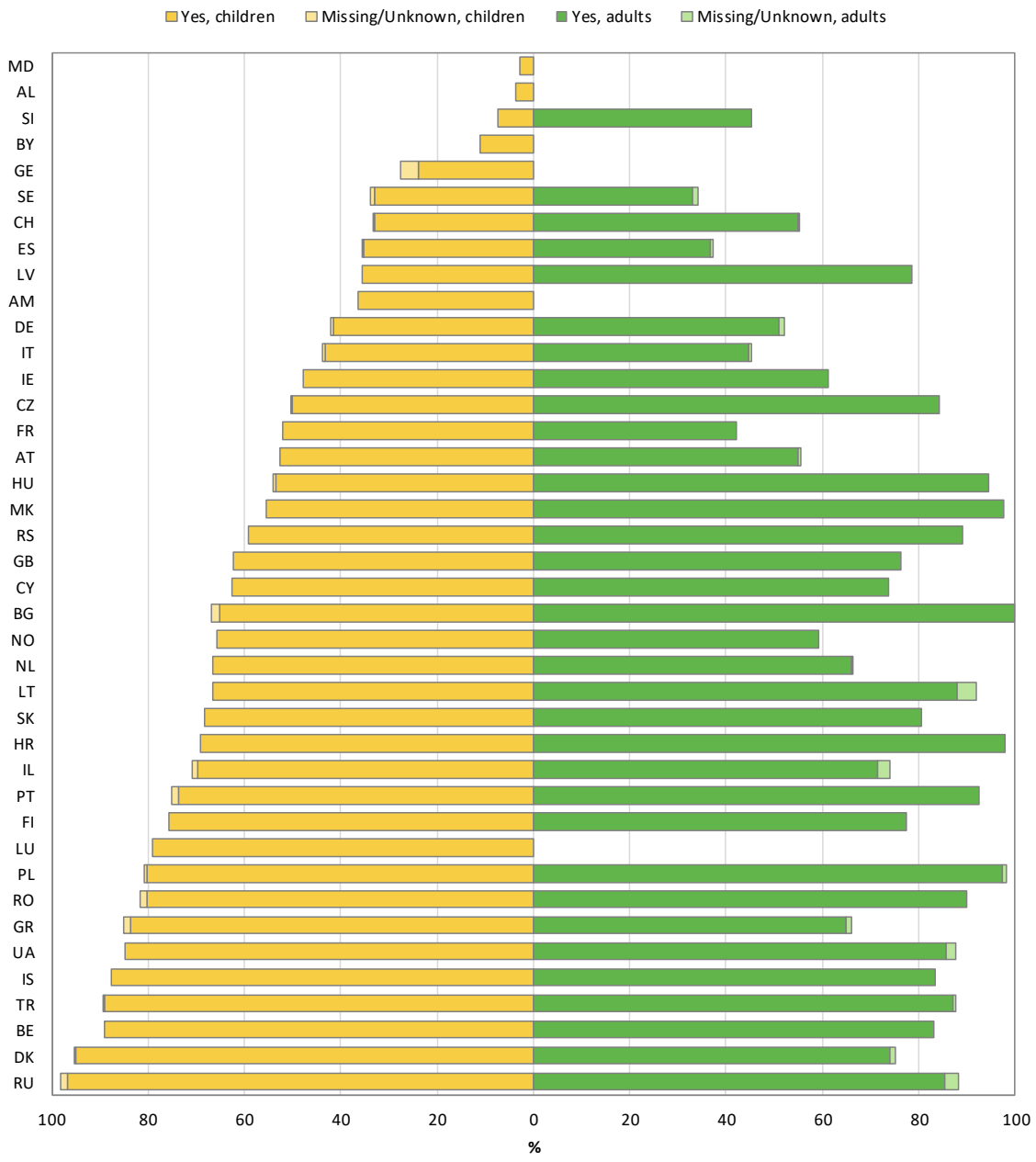
Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.

Note: Inhaled rhDNase is reimbursed in most countries except in Albania, Armenia, the Republic of Moldova. In Bulgaria, Georgia, Germany, Israel, Luxembourg, North Macedonia, Norway, Romania, Spain, Ukraine and the United Kingdom it is reimbursed for people with CF ≥ 5 years; in Latvia it is reimbursed for people with CF ≥ 6 years.

7. Respiratory complications and therapies

Figure 7.3 *Variation in the use of rhDNAse indicates both inequalities in availability and different therapeutic approaches.*

Use of rhDNase in children and adults seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information on inhaled rhDNase is missing for more than 10% of the individuals. Albania, Armenia, Belarus, and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: Inhaled rhDNase is reimbursed in most countries except in Albania, Armenia and the Republic of Moldova. In Bulgaria, Georgia, Germany, Israel, Luxembourg, Macedonia, Norway, Romania, Spain, Ukraine and the United Kingdom it is reimbursed for individuals ≥ 5 years; in Latvia it is reimbursed for individuals ≥ 6 years.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the use of rhDNase as inhalations for at least 3 consecutive months during the survey year. The dark coloured areas of the bar indicate the percentage of individuals with CF taking this drug, the lighter coloured areas show the percentage of individuals for whom this information is missing.

7. Respiratory complications and therapies

Table 7.9 Use of inhaled mannitol ≥3 months in all people with CF seen in 2021 who have never had a transplant, by country.

Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No		Yes		Missing/ Unknown		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	0	0.0	80	100	0	0.0						
Armenia	0	0.0	22	100	0	0.0						
Austria	1	0.3	380	99.5	1	0.3	2	0.5	376	97.4	8	2.1
Belarus	0	0.0	132	91.7	12	8.3						
Belgium	465	100	0	0.0	0	0.0	710	100	0	0.0	0	0.0
Bulgaria	3	2.5	115	97.5	0	0.0	1	1.2	82	98.8	0	0.0
Croatia	0	0.0	81	100	0	0.0	0	0.0	49	100	0	0.0
Cyprus	0	0.0	8	100	0	0.0	0	0.0	19	100	0	0.0
Czech Republic	1	0.3	328	99.7	0	0.0	0	0.0	277	97.5	7	2.5
Denmark	1	0.5	216	98.6	2	0.9	1	0.3	272	96.4	9	3.2
Finland	0	0.0	33	100	0	0.0	0	0.0	49	100	0	0.0
France	2671	100	0	0.0	0	0.0	3516	100	0	0.0	0	0.0
Georgia	2	2.5	78	97.5	0	0.0	0	0.0	7	87.5	1	12.5
Germany	17	0.6	2711	99.3	3	0.1	70	1.9	3411	93.1	183	5.0
Greece	4	1.9	205	98.1	0	0.0	3	0.9	329	96.8	8	2.3
Hungary	135	100	0	0.0	0	0.0	166	100	0	0.0	0	0.0
Iceland	0	0.0	8	100	0	0.0	0	0.0	6	100	0	0.0
Ireland	515	100	0	0.0	0	0.0	675	100	0	0.0	0	0.0
Israel	1	0.6	159	98.8	1	0.6	14	4.0	333	95.7	1	0.3
Italy	8	0.4	2190	98.9	17	0.8	15	0.4	3323	96.7	99	2.9
Latvia	0	0.0	31	100	0	0.0	0	0.0	14	100	0	0.0
Lithuania	0	0.0	15	100	0	0.0	1	4.0	24	96.0	0	0.0
Luxembourg	0	0.0	19	100	0	0.0						
Rep of Moldova	0	0.0	37	100	0	0.0	0	0.0	12	100	0	0.0
The Netherlands	539	100	0	0.0	0	0.0	924	100	0	0.0	0	0.0
North Macedonia	0	0.0	83	100	0	0.0	0	0.0	44	97.8	1	2.2
Norway	1	0.8	123	98.4	1	0.8	0	0.0	177	100	0	0.0
Poland	3	0.3	856	99.6	0	0.0	6	1.4	416	98.3	1	0.2
Portugal	2	1.2	166	98.8	0	0.0	0	0.0	161	100	0	0.0
Romania	2	0.8	236	99.2	0	0.0	0	0.0	10	100	0	0.0
Russian Fed.	30	1.5	1914	94.1	90	4.4	15	3.1	433	90.0	33	6.9
Serbia	0	0.0	127	100	0	0.0	0	0.0	65	100	0	0.0
Slovak Republic	0	0.0	120	100	0	0.0	0	0.0	139	100	0	0.0
Slovenia	0	0.0	54	100	0	0.0	0	0.0	42	100	0	0.0
Spain	6	0.6	1066	99.3	1	0.1	9	0.8	1098	98.6	7	0.6
Sweden	2	0.7	264	98.9	1	0.4	5	1.3	364	97.6	4	1.1
Switzerland	1	0.2	420	99.8	0	0.0	1	0.2	533	99.8	0	0.0
Turkey	1	0.0	1955	97.5	48	2.4	3	0.9	328	94.0	18	5.2
Ukraine	0	0.0	163	99.4	1	0.6	1	2.0	48	98.0	0	0.0
United Kingdom	0	0.0	4201	99.9	4	0.1	0	0.0	5314	94.4	314	5.6

Note: For inhaled mannitol the total percentage of missing information is higher than 10%, therefore the totals are excluded from the table.
Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.
United Kingdom: the duration of use of inhaled mannitol is not specified.
Note: Inhaled mannitol is reimbursed in Austria, Czech Republic, Denmark, Germany (≥ 18 years), Greece (≥ 18 years), Italy (≥ 18 years), Norway, the Russian Federation (depending on the region of residence), Slovenia, Turkey (≥ 6 years) and the United Kingdom (≥ 18 years), but not in the other countries.

7. Respiratory complications and therapies

Table 7.10 Use of inhaled antibiotics ≥3 months in all people with CF seen in 2021 who have never had a transplant, by country and overall.

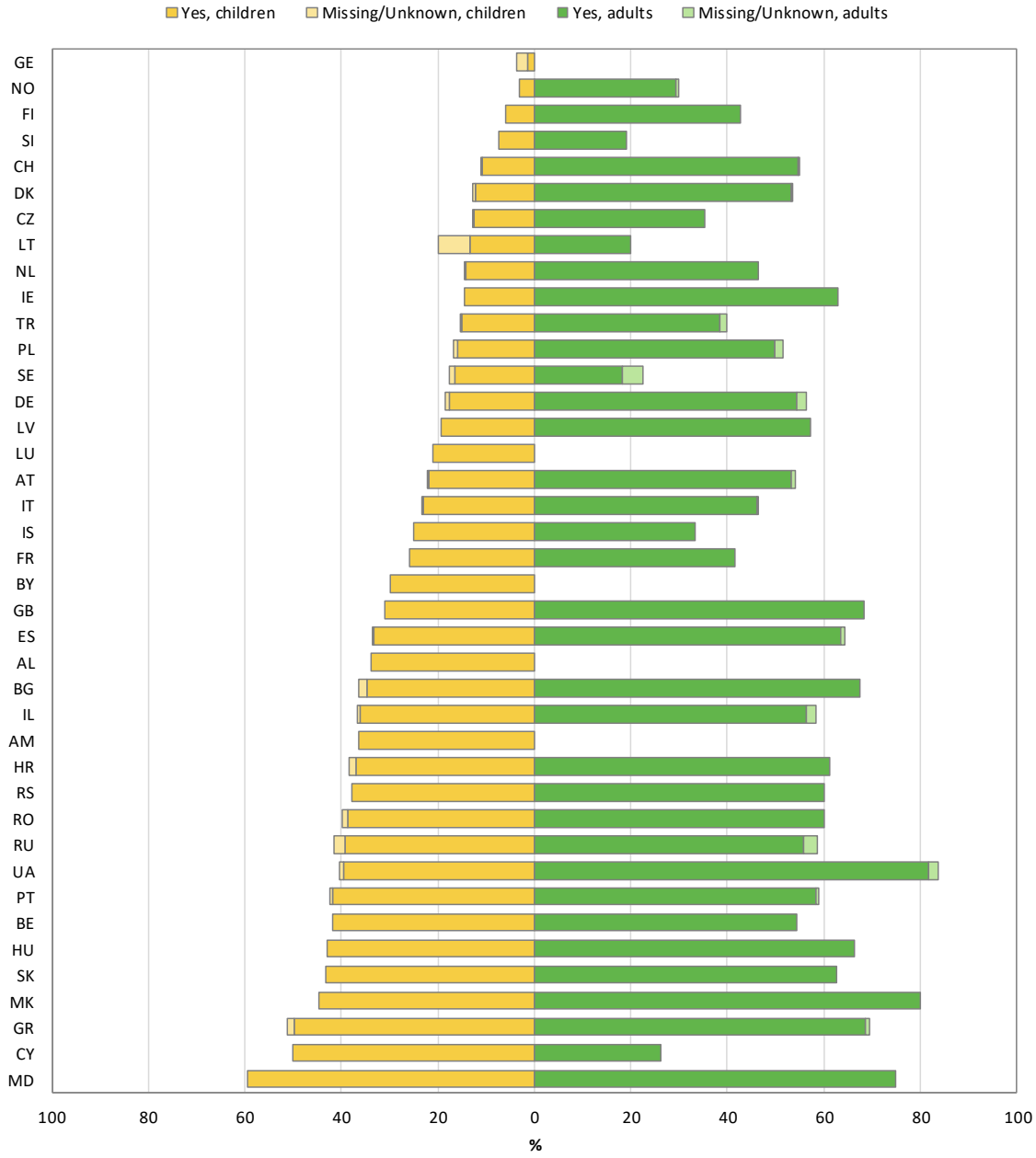
Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No		Yes		Missing/ Unknown		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	0	0.0	53	66.2	27	33.7						
Armenia	0	0.0	14	63.6	8	36.4						
Austria	1	0.3	297	77.7	84	22.0	3	0.8	177	45.8	206	53.4
Belarus	0	0.0	101	70.1	43	29.9						
Belgium	0	0.0	270	58.1	195	41.9	0	0.0	324	45.6	386	54.4
Bulgaria	2	1.7	75	63.6	41	34.7	0	0.0	27	32.5	56	67.5
Croatia	1	1.2	50	61.7	30	37.0	0	0.0	19	38.8	30	61.2
Cyprus	0	0.0	4	50.0	4	50.0	0	0.0	14	73.7	5	26.3
Czech Republic	1	0.3	287	87.2	41	12.5	0	0.0	184	64.8	100	35.2
Denmark	1	0.5	191	87.2	27	12.3	1	0.3	131	46.4	150	53.2
Finland	0	0.0	31	93.9	2	6.1	0	0.0	28	57.1	21	42.9
France	0	0.0	1978	74.0	693	25.9	0	0.0	2049	58.3	1467	41.7
Georgia	2	2.5	77	96.2	1	1.2	0	0.0	8	100	0	0.0
Germany	27	1.0	2227	81.5	477	17.5	65	1.8	1602	43.7	1997	54.5
Greece	3	1.4	102	48.8	104	49.8	3	0.9	104	30.6	233	68.5
Hungary	0	0.0	77	57.0	58	43.0	0	0.0	56	33.7	110	66.3
Iceland	0	0.0	6	75.0	2	25.0	0	0.0	4	66.7	2	33.3
Ireland	0	0.0	441	85.6	74	14.4	0	0.0	250	37.0	425	63.0
Israel	1	0.6	102	63.3	58	36.0	7	2.0	145	41.7	196	56.3
Italy	8	0.4	1696	76.6	511	23.1	16	0.5	1838	53.5	1583	46.1
Latvia	0	0.0	25	80.6	6	19.3	0	0.0	6	42.9	8	57.1
Lithuania	1	6.7	12	80.0	2	13.3	0	0.0	20	80.0	5	20.0
Luxembourg	0	0.0	15	78.9	4	21.0						
Rep of Moldova	0	0.0	15	40.5	22	59.5	0	0.0	3	25.0	9	75.0
The Netherlands	1	0.2	461	85.5	77	14.3	0	0.0	494	53.5	430	46.5
North Macedonia	0	0.0	46	55.4	37	44.6	0	0.0	9	20.0	36	80.0
Norway	0	0.0	121	96.8	4	3.2	1	0.6	124	70.1	52	29.4
Poland	6	0.7	716	83.3	137	15.9	7	1.6	205	48.5	211	49.9
Portugal	1	0.6	97	57.7	70	41.7	1	0.6	66	41.0	94	58.4
Romania	3	1.3	143	60.1	92	38.7	0	0.0	4	40.0	6	60.0
Russian Fed.	47	2.3	1188	58.4	799	39.3	14	2.9	199	41.4	268	55.7
Serbia	0	0.0	79	62.2	48	37.8	0	0.0	26	40.0	39	60.0
Slovak Republic	0	0.0	68	56.7	52	43.3	0	0.0	52	37.4	87	62.6
Slovenia	0	0.0	50	92.6	4	7.4	0	0.0	34	80.9	8	19.0
Spain	1	0.1	715	66.6	357	33.3	8	0.7	397	35.6	709	63.6
Sweden	3	1.1	220	82.4	44	16.5	16	4.3	289	77.5	68	18.2
Switzerland	1	0.2	375	89.1	45	10.7	2	0.4	240	44.9	292	54.7
Turkey	2	0.1	1699	84.8	303	15.1	5	1.4	210	60.2	134	38.4
Ukraine	1	0.6	98	59.8	65	39.6	1	2.0	8	16.3	40	81.6
United Kingdom	0	0.0	2901	69.0	1304	31.0	0	0.0	1777	31.6	3851	68.4
Total	114	0.5	17123	73.8	5952	25.7	150	0.6	11132	45.2	13318	54.1

Note: Albania, Armenia, Belarus, and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the individuals are included in the total number.
United Kingdom: the duration of use of inhaled antibiotics is not specified.
Note: Inhaled antibiotics are reimbursed in all countries. In Armenia only Gentamycin and in Romania only Tobi and Colobreath are reimbursed.

7. Respiratory complications and therapies

Figure 7.4 *Despite the increasing number of people with CF who have access to CFTR modulators, inhaled antibiotics are still an important therapeutic strategy in the prevention of pulmonary exacerbations, especially in adults with CF.*

Use of inhaled antibiotics in children and adults seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information on inhaled antibiotics is missing for more than 10% of the people with CF. Albania, Armenia, Belarus, and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: United Kingdom: the duration of use of inhaled antibiotics is not specified.
Note: Inhaled antibiotics are reimbursed in all countries. In Armenia only Gentamycin and in Romania only Tobi and Colobreath are reimbursed,.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the use of inhaled antibiotics (of any kind) for at least three months during the survey year. The dark area of the bar shows the percentage of people with CF taking inhaled antibiotics, the lighter area shows the percentage of people with CF for whom this information is missing.

7. Respiratory complications and therapies

Table 7.11 Use of inhaled bronchodilators >3 months in all people with CF seen in 2021 who have never had a transplant, by country and overall.

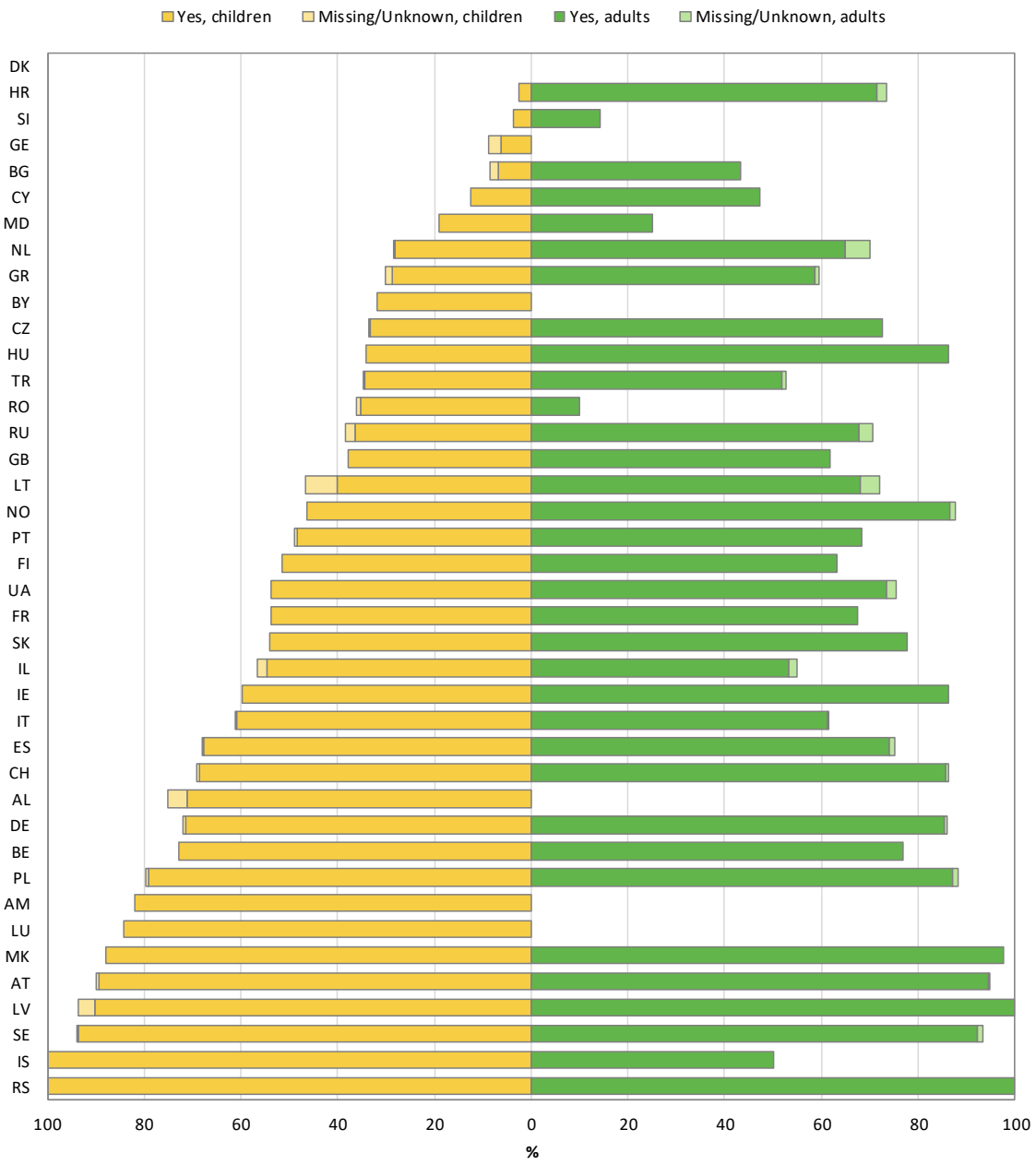
Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No		Yes		Missing/ Unknown		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	3	3.7	20	25.0	57	71.2						
Armenia	0	0.0	4	18.2	18	81.8						
Austria	2	0.5	39	10.2	341	89.3	1	0.3	20	5.2	365	94.6
Belarus	0	0.0	98	68.1	46	31.9						
Belgium	0	0.0	126	27.1	339	72.9	0	0.0	164	23.1	546	76.9
Bulgaria	2	1.7	108	91.5	8	6.8	0	0.0	47	56.6	36	43.4
Croatia	0	0.0	79	97.5	2	2.5	1	2.0	13	26.5	35	71.4
Cyprus	0	0.0	7	87.5	1	12.5	0	0.0	10	52.6	9	47.4
Czech Republic	1	0.3	219	66.6	109	33.1	0	0.0	78	27.5	206	72.5
Denmark	219	100	0	0.0	0	0.0	282	100	0	0.0	0	0.0
Finland	0	0.0	16	48.5	17	51.5	0	0.0	18	36.7	31	63.3
France	0	0.0	1232	46.1	1439	53.9	0	0.0	1140	32.4	2376	67.6
Georgia	2	2.5	73	91.2	5	6.2	0	0.0	8	100	0	0.0
Germany	12	0.4	768	28.1	1951	71.4	28	0.8	509	13.9	3127	85.3
Greece	3	1.4	146	69.9	60	28.7	3	0.9	138	40.6	199	58.5
Hungary	0	0.0	89	65.9	46	34.1	0	0.0	23	13.9	143	86.1
Iceland	0	0.0	0	0.0	8	100	0	0.0	3	50.0	3	50.0
Ireland	0	0.0	208	40.4	307	59.6	0	0.0	93	13.8	582	86.2
Israel	3	1.9	70	43.5	88	54.7	6	1.7	157	45.1	185	53.2
Italy	9	0.4	858	38.7	1348	60.9	15	0.4	1320	38.4	2102	61.2
Latvia	1	3.2	2	6.4	28	90.3	0	0.0	0	0.0	14	100
Lithuania	1	6.7	8	53.3	6	40.0	1	4.0	7	28.0	17	68.0
Luxembourg	0	0.0	3	15.8	16	84.2						
Rep of Moldova	0	0.0	30	81.1	7	18.9	0	0.0	9	75.0	3	25.0
The Netherlands	2	0.4	386	71.6	151	28.0	47	5.1	278	30.1	599	64.8
North Macedonia	0	0.0	10	12.0	73	87.9	0	0.0	1	2.2	44	97.8
Norway	0	0.0	67	53.6	58	46.4	2	1.1	22	12.4	153	86.4
Poland	5	0.6	174	20.3	680	79.2	4	0.9	50	11.8	369	87.2
Portugal	1	0.6	86	51.2	81	48.2	0	0.0	51	31.7	110	68.3
Romania	2	0.8	152	63.9	84	35.3	0	0.0	9	90.0	1	10.0
Russian Fed.	40	2.0	1255	61.7	739	36.3	13	2.7	142	29.5	326	67.8
Serbia	0	0.0	0	0.0	127	100	0	0.0	0	0.0	65	100
Slovak Republic	0	0.0	55	45.8	65	54.2	0	0.0	31	22.3	108	77.7
Slovenia	0	0.0	52	96.3	2	3.7	0	0.0	36	85.7	6	14.3
Spain	4	0.4	342	31.9	727	67.7	12	1.1	277	24.9	825	74.1
Sweden	1	0.4	16	6.0	250	93.6	4	1.1	25	6.7	344	92.2
Switzerland	2	0.5	130	30.9	289	68.6	2	0.4	74	13.9	458	85.8
Turkey	1	0.0	1312	65.5	691	34.5	3	0.9	165	47.3	181	51.9
Ukraine	0	0.0	76	46.3	88	53.7	1	2.0	12	24.5	36	73.5
United Kingdom	0	0.0	2617	62.2	1588	37.8	0	0.0	2143	38.1	3485	61.9
Total	316	1.4	10933	47.1	11940	51.5	425	1.7	7075	28.8	17100	69.5

Note: Albania, Armenia, Belarus, and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.
Note: United Kingdom: the duration of use of bronchodilators is not specified.
Note: Inhaled bronchodilators are reimbursed in most countries except in Bulgaria and Serbia.

7. Respiratory complications and therapies

Figure 7.5 *Bronchodilators are used as widespread supportive treatment in many countries in Europe.*

Use of bronchodilators in children and adults seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information on the use of bronchodilators is missing for more than 10% of the people with CF. Albania, Armenia, Belarus, and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: United Kingdom: the duration of use of bronchodilators is not specified.
Note: Inhaled bronchodilators are reimbursed in most countries except in Bulgaria and Serbia. In Ukraine they are reimbursed for children.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the use of bronchodilators for at least three months during the survey year. This is the most widely used inhaled medication, but there are significant differences in frequency of use amongst the countries. The dark area of the bar indicates the percentage of people with CF taking bronchodilators, the lighter area shows the percentage of people with CF for whom this information is missing.

7. Respiratory complications and therapies

Table 7.12 Use of macrolides ≥3 months in all people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No		Yes		Missing/ Unknown		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	5	6.2	70	87.5	5	6.2						
Armenia	0	0.0	14	63.6	8	36.4						
Austria	3	0.8	375	98.2	4	1.0	3	0.8	361	93.5	22	5.7
Belarus	0	0.0	110	76.4	34	23.6						
Belgium	0	0.0	253	54.4	212	45.6	0	0.0	295	41.5	415	58.4
Bulgaria	2	1.7	111	94.1	5	4.2	0	0.0	77	92.8	6	7.2
Croatia	0	0.0	50	61.7	31	38.3	1	2.0	14	28.6	34	69.4
Cyprus	0	0.0	4	50.0	4	50.0	0	0.0	10	52.6	9	47.4
Czech Republic	1	0.3	318	96.7	10	3.0	0	0.0	265	93.3	19	6.7
Denmark	0	0.0	212	96.8	7	3.2	0	0.0	194	68.8	88	31.2
Finland	0	0.0	32	97.0	1	3.0	0	0.0	43	87.8	6	12.2
France	0	0.0	2064	77.3	607	22.7	0	0.0	2162	61.5	1354	38.5
Georgia	2	2.5	51	63.7	27	33.7	0	0.0	4	50.0	4	50.0
Germany	38	1.4	2590	94.8	103	3.8	93	2.5	2837	77.4	734	20.0
Greece	3	1.4	124	59.3	82	39.2	4	1.2	223	65.6	113	33.2
Hungary	0	0.0	102	75.6	33	24.4	0	0.0	143	86.1	23	13.9
Iceland	0	0.0	4	50.0	4	50.0	0	0.0	2	33.3	4	66.7
Ireland	0	0.0	398	77.3	117	22.7	0	0.0	274	40.6	401	59.4
Israel	1	0.6	116	72.0	44	27.3	6	1.7	191	54.9	151	43.4
Italy	9	0.4	1821	82.2	385	17.4	15	0.4	2307	67.1	1115	32.4
Latvia	0	0.0	29	93.5	2	6.4	0	0.0	13	92.9	1	7.1
Lithuania	0	0.0	15	100	0	0.0	1	4.0	22	88.0	2	8.0
Luxembourg	0	0.0	15	78.9	4	21.0						
Rep of Moldova	1	2.7	30	81.1	6	16.2	0	0.0	12	100	0	0.0
The Netherlands	1	0.2	498	92.4	40	7.4	0	0.0	490	53.0	434	47.0
North Macedonia	0	0.0	76	91.6	7	8.4	0	0.0	20	44.4	25	55.6
Norway	2	1.6	121	96.8	2	1.6	4	2.3	150	84.7	23	13.0
Poland	11	1.3	729	84.9	119	13.8	10	2.4	288	68.1	125	29.5
Portugal	4	2.4	118	70.2	46	27.4	0	0.0	87	54.0	74	46.0
Romania	1	0.4	208	87.4	29	12.2	0	0.0	8	80.0	2	20.0
Russian Fed.	62	3.0	1519	74.7	453	22.3	14	2.9	300	62.4	167	34.7
Serbia	0	0.0	116	91.3	11	8.7	0	0.0	48	73.8	17	26.1
Slovak Republic	0	0.0	73	60.8	47	39.2	1	0.7	66	47.5	72	51.8
Slovenia	0	0.0	54	100	0	0.0	0	0.0	33	78.6	9	21.4
Spain	5	0.5	828	77.2	240	22.4	18	1.6	548	49.2	548	49.2
Sweden	1	0.4	235	88.0	31	11.6	4	1.1	274	73.5	95	25.5
Switzerland	1	0.2	400	95.0	20	4.7	2	0.4	341	63.9	191	35.8
Turkey	1	0.0	1879	93.8	124	6.2	3	0.9	288	82.5	58	16.6
Ukraine	0	0.0	58	35.4	106	64.6	1	2.0	8	16.3	40	81.6
United Kingdom	0	0.0	3858	91.7	347	8.2	0	0.0	2652	47.1	2976	52.9
Total	154	0.7	19678	84.9	3357	14.5	180	0.7	15058	61.2	9362	38.1

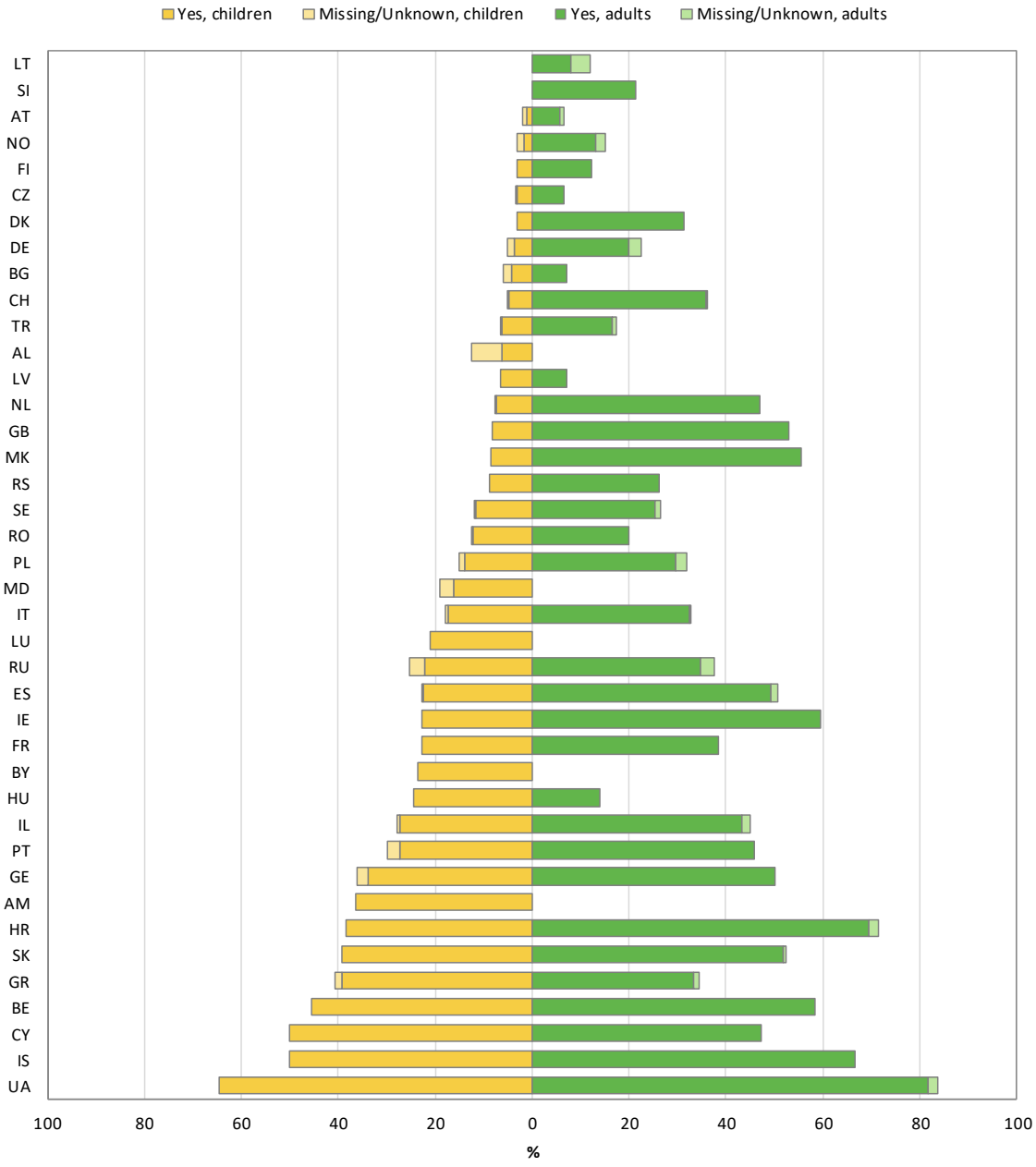
Note: Albania, Armenia, Belarus, and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but they are included in the total number.

Note: Macrolides are reimbursed in most countries except in Bulgaria and Serbia. In the Republic of Moldova, they are reimbursed for children.

7. Respiratory complications and therapies

Figure 7.6 *Azithromycin, a surrogate marker of chronic Pseudomonas infection, is widely used throughout Europe, mostly by adults with CF.*

Use of macrolides in children and adults seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information on the use of macrolides is missing for more than 10% of the people. Albania, Armenia, Belarus, and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: Macrolides are reimbursed in most countries except in Bulgaria and Serbia. In the Republic of Moldova, they are reimbursed for children.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the use of macrolides (e.g. azithromycin) for at least 3 months during 2021. Macrolides are antibiotics but taken continuously they can also modulate the immune system, probably due to their anti-inflammatory properties. Clinical studies have shown that people with chronic Pseudomonas aeruginosa infection benefit from continuous azithromycin treatment with regard to lung function and pulmonary exacerbation rates. The dark area of the bar indicates the percentage of people with CF taking this medication, the lighter area shows the percentage of people with CF for whom this information is missing.

7. Respiratory complications and therapies

Table 7.13 Use of oxygen ≥3 months in all people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No		Yes		Missing/ Unknown		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	1	1.2	79	98.7	0	0.0						
Armenia	0	0.0	20	90.9	2	9.1						
Austria	2	0.5	377	98.7	3	0.8	4	1.0	365	94.6	17	4.4
Belarus	0	0.0	139	96.5	5	3.5						
Belgium	0	0.0	460	98.9	5	1.1	1	0.1	685	96.5	24	3.4
Bulgaria	2	1.7	115	97.5	1	0.8	0	0.0	76	91.6	7	8.4
Croatia	0	0.0	80	98.8	1	1.2	0	0.0	45	91.8	4	8.2
Cyprus	0	0.0	8	100	0	0.0	0	0.0	19	100	0	0.0
Czech Republic	1	0.3	328	99.7	0	0.0	0	0.0	280	98.6	4	1.4
Denmark	0	0.0	219	100	0	0.0	0	0.0	280	99.3	2	0.7
Finland	0	0.0	33	100	0	0.0	0	0.0	48	98.0	1	2.0
France	0	0.0	2661	99.6	10	0.4	0	0.0	3379	96.1	137	3.9
Georgia	3	3.7	75	93.7	2	2.5	0	0.0	8	100	0	0.0
Germany	9	0.3	2717	99.5	5	0.2	44	1.2	3342	91.2	278	7.6
Greece	4	1.9	201	96.2	4	1.9	3	0.9	331	97.3	6	1.8
Hungary	0	0.0	126	93.3	9	6.7	0	0.0	116	69.9	50	30.1
Iceland	0	0.0	8	100	0	0.0	0	0.0	6	100	0	0.0
Ireland	0	0.0	513	99.6	2	0.4	0	0.0	625	92.6	50	7.4
Israel	2	1.2	158	98.1	1	0.6	8	2.3	331	95.1	9	2.6
Italy	8	0.4	2193	99.0	14	0.6	17	0.5	3233	94.1	187	5.4
Latvia	0	0.0	31	100	0	0.0	0	0.0	12	85.7	2	14.3
Lithuania	0	0.0	14	93.3	1	6.7	2	8.0	23	92.0	0	0.0
Luxembourg	0	0.0	19	100	0	0.0						
Rep of Moldova	0	0.0	35	94.6	2	5.4	0	0.0	11	91.7	1	8.3
The Netherlands	1	0.2	537	99.6	1	0.2	0	0.0	903	97.7	21	2.3
North Macedonia	0	0.0	83	100	0	0.0	0	0.0	41	91.1	4	8.9
Norway	1	0.8	123	98.4	1	0.8	0	0.0	175	98.9	2	1.1
Poland	7	0.8	849	98.8	3	0.3	7	1.6	385	91.0	31	7.3
Portugal	1	0.6	163	97.0	4	2.4	0	0.0	152	94.4	9	5.6
Romania	1	0.4	232	97.5	5	2.1	0	0.0	10	100	0	0.0
Russian Fed.	27	1.3	1962	96.5	45	2.2	16	3.3	422	87.7	43	8.9
Serbia	0	0.0	125	98.4	2	1.6	0	0.0	59	90.8	6	9.2
Slovak Republic	1	0.8	118	98.3	1	0.8	0	0.0	129	92.8	10	7.2
Slovenia	0	0.0	54	100	0	0.0	0	0.0	42	100	0	0.0
Spain	5	0.5	1063	99.1	5	0.5	8	0.7	1065	95.6	41	3.7
Sweden	1	0.4	263	98.5	3	1.1	3	0.8	364	97.6	6	1.6
Switzerland	3	0.7	417	99.0	1	0.2	4	0.7	501	93.8	29	5.4
Turkey	1	0.0	1957	97.6	46	2.3	3	0.9	309	88.5	37	10.6
Ukraine	0	0.0	148	90.2	16	9.8	1	2.0	41	83.7	7	14.3
United Kingdom	0	0.0	4152	98.7	53	1.3	0	0.0	5304	94.2	324	5.8
Total	81	0.3	22855	98.6	253	1.1	121	0.5	23129	94.0	1350	5.5

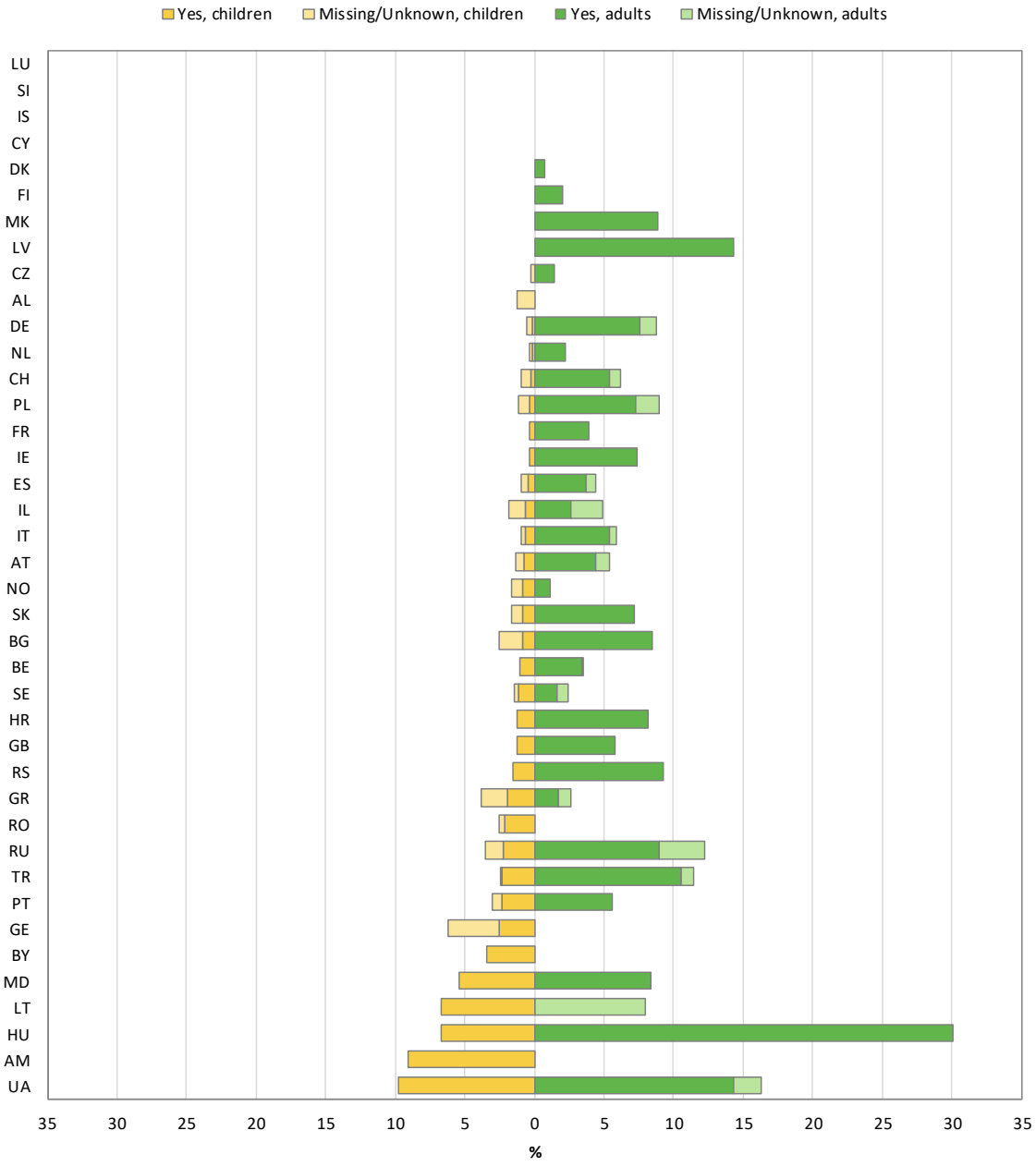
Note: Albania, Armenia, Belarus, and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but they are included in the total number.

Note: Oxygen therapy is reimbursed in most countries except in Bulgaria, the Republic of Moldova and Serbia. In Armenia and Georgia it is only reimbursed if the individual is hospitalised.

7. Respiratory complications and therapies

Figure 7.7 *Oxygen treatment reflecting severe lung disease is prescribed in up to 15% of people with CF, mostly in the adult population.*

Use of oxygen in children and adults seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information on the use of oxygen is missing for more than 10% of the people. Albania, Armenia, Belarus, and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: Oxygen therapy is reimbursed in most countries except in Bulgaria, the Republic of Moldova and Serbia. In Armenia and Georgia it is only reimbursed if the individual is hospitalised.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the use of oxygen for at least 3 months during 2021. Oxygen is used for severe lung disease. The dark area of the bar indicates the percentage of people with CF using supplementary oxygen, the lighter area shows the percentage of people for whom this information is missing.

7. Respiratory complications and therapies

Table 7.14 Use of non-invasive positive pressure ventilation (NIPPV) ≥3 months in all people with CF seen in 2021 who have never had a transplant, by country.

Country	Children (<18 years)								Adults (≥18 years)							
	Missing/ Unknown		No		Yes, BiPAP (Bilevel Positive Airways Pressure)		Yes, CPAP (Continuous Positive Airways Pressure)		Missing/ Unknown		No		Yes, BiPAP (Bilevel Positive Airways Pressure)		Yes, CPAP (Continuous Positive Airways Pressure)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Albania	1	1.2	79	98.7	0	0.0	0	0.0								
Armenia	0	0.0	22	100	0	0.0	0	0.0								
Austria	0	0.0	382	100	0	0.0	0	0.0	2	0.5	382	99.0	0	0.0	2	0.5
Belarus	0	0.0	141	97.9	0	0.0	3	2.1								
Belgium	0	0.0	461	99.1	3	0.6	1	0.2	0	0.0	701	98.7	8	1.1	1	0.1
Bulgaria	2	1.7	116	98.3	0	0.0	0	0.0	0	0.0	81	97.6	0	0.0	2	2.4
Croatia	0	0.0	81	100	0	0.0	0	0.0	0	0.0	49	100	0	0.0	0	0.0
Cyprus	0	0.0	8	100	0	0.0	0	0.0	0	0.0	19	100	0	0.0	0	0.0
Czech Rep.	1	0.3	328	99.7	0	0.0	0	0.0	0	0.0	284	100	0	0.0	0	0.0
Denmark	0	0.0	218	99.5	0	0.0	1	0.5	1	0.3	274	97.2	0	0.0	7	2.5
Finland	0	0.0	33	100	0	0.0	0	0.0	0	0.0	48	98.0	0	0.0	1	2.0
France	2671	100	0	0.0	0	0.0	0	0.0	3516	100	0	0.0	0	0.0	0	0.0
Georgia	3	3.7	76	95.0	0	0.0	1	1.2	0	0.0	8	100	0	0.0	0	0.0
Germany	12	0.4	2716	99.4	1	0.0	2	0.1	85	2.3	3548	96.8	18	0.5	13	0.3
Greece	4	1.9	203	97.1	2	1.0	0	0.0	4	1.2	333	97.9	3	0.9	0	0.0
Hungary	135	100	0	0.0	0	0.0	0	0.0	166	100	0	0.0	0	0.0	0	0.0
Iceland	0	0.0	8	100	0	0.0	0	0.0	0	0.0	6	100	0	0.0	0	0.0
Ireland	0	0.0	506	98.2	6	1.2	3	0.6	0	0.0	620	91.8	52	7.7	3	0.4
Israel	4	2.5	157	97.5	0	0.0	0	0.0	13	3.7	325	93.4	9	2.6	1	0.3
Italy	179	8.1	2024	91.4	4	0.2	8	0.4	494	14.4	2800	81.5	19	0.5	124	3.6
Latvia	0	0.0	31	100	0	0.0	0	0.0	0	0.0	13	92.9	0	0.0	1	7.1
Lithuania	1	6.7	14	93.3	0	0.0	0	0.0	2	8.0	23	92.0	0	0.0	0	0.0
Luxembourg	0	0.0	19	100	0	0.0	0	0.0								
Rep. Moldova	0	0.0	37	100	0	0.0	0	0.0	0	0.0	12	100	0	0.0	0	0.0
Netherlands	1	0.2	538	99.8	0	0.0	0	0.0	0	0.0	922	99.8	2	0.2	0	0.0
N. Macedonia	0	0.0	83	100	0	0.0	0	0.0	0	0.0	45	100	0	0.0	0	0.0
Norway	1	0.8	123	98.4	0	0.0	1	0.8	2	1.1	174	98.3	0	0.0	1	0.6
Poland	5	0.6	854	99.4	0	0.0	0	0.0	7	1.6	409	96.7	7	1.6	0	0.0
Portugal	1	0.6	163	97.0	4	2.4	0	0.0	0	0.0	154	95.6	6	3.7	1	0.6
Romania	3	1.3	234	98.3	1	0.4	0	0.0	0	0.0	10	100	0	0.0	0	0.0
Russian Fed.	25	1.2	2004	98.5	0	0.0	5	0.2	14	2.9	460	95.6	5	1.0	2	0.4
Serbia	0	0.0	125	98.4	2	1.6	0	0.0	0	0.0	62	95.4	3	4.6	0	0.0
Slovak Rep.	1	0.8	118	98.3	0	0.0	1	0.8	0	0.0	137	98.6	2	1.4	0	0.0
Slovenia	0	0.0	54	100	0	0.0	0	0.0	0	0.0	42	100	0	0.0	0	0.0
Spain	3	0.3	1070	99.7	0	0.0	0	0.0	11	1.0	1091	97.9	3	0.3	9	0.8
Sweden	7	2.6	258	96.6	2	0.7	0	0.0	13	3.5	355	95.2	5	1.3	0	0.0
Switzerland	2	0.5	418	99.3	1	0.2	0	0.0	3	0.6	529	99.1	0	0.0	2	0.4
Turkey	1	0.0	1962	97.9	41	2.0	0	0.0	3	0.9	330	94.6	16	4.6	0	0.0
Ukraine	0	0.0	164	100	0	0.0	0	0.0	1	2.0	48	98.0	0	0.0	0	0.0
United Kingdom	0	0.0	4185	99.5	0	0.0	20	0.5	0	0.0	5518	98.0	0	0.0	110	1.9

Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but they are included in the total number.
Germany reports all people with CF on NIPPV as Continuous Positive Airways Pressure (CPAP).
Note: For non-invasive positive pressure ventilation (NIPPV) the total percentage of missing information is higher than 10%, therefore the totals are excluded from the table.
Note: NIPPV is reimbursed in most countries except in Albania, Armenia, Belarus, Bulgaria, Hungary, North Macedonia, the Republic of Moldova, Serbia and Ukraine.

7. Respiratory complications and therapies

Table 7.15 Use of inhaled steroids >3 months in all people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No		Yes		Missing/ Unknown		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	1	1.2	71	88.7	8	10.0						
Armenia	0	0.0	19	86.4	3	13.6						
Austria	1	0.3	362	94.8	19	5.0	2	0.5	299	77.5	85	22.0
Belarus	0	0.0	111	77.1	33	22.9						
Belgium	0	0.0	294	63.2	171	36.8	0	0.0	263	37.0	447	63.0
Bulgaria	2	1.7	111	94.1	5	4.2	0	0.0	53	63.9	30	36.1
Croatia	0	0.0	75	92.6	6	7.4	1	2.0	25	51.0	23	46.9
Cyprus	0	0.0	7	87.5	1	12.5	0	0.0	10	52.6	9	47.4
Czech Republic	1	0.3	265	80.5	63	19.1	0	0.0	133	46.8	151	53.2
Denmark	1	0.5	168	76.7	50	22.8	3	1.1	173	61.3	106	37.6
Finland	0	0.0	25	75.8	8	24.2	0	0.0	30	61.2	19	38.8
France	0	0.0	1336	50.0	1335	50.0	0	0.0	1418	40.3	2098	59.7
Georgia	4	5.0	74	92.5	2	2.5	0	0.0	8	100	0	0.0
Germany	27	1.0	2260	82.7	444	16.3	51	1.4	1996	54.5	1617	44.1
Greece	3	1.4	166	79.4	40	19.1	3	0.9	237	69.7	100	29.4
Hungary	135	100	0	0.0	0	0.0	166	100	0	0.0	0	0.0
Iceland	0	0.0	7	87.5	1	12.5	0	0.0	6	100	0	0.0
Ireland	0	0.0	443	86.0	72	14.0	0	0.0	405	60.0	270	40.0
Israel	1	0.6	100	62.1	60	37.3	7	2.0	187	53.7	154	44.2
Italy	9	0.4	1771	79.9	435	19.6	16	0.5	2202	64.1	1219	35.5
Latvia	0	0.0	25	80.6	6	19.3	0	0.0	12	85.7	2	14.3
Lithuania	0	0.0	14	93.3	1	6.7	1	4.0	22	88.0	2	8.0
Luxembourg	0	0.0	12	63.2	7	36.8						
Rep of Moldova	0	0.0	30	81.1	7	18.9	0	0.0	10	83.3	2	16.7
The Netherlands	1	0.2	454	84.2	84	15.6	0	0.0	507	54.9	417	45.1
North Macedonia	0	0.0	81	97.6	2	2.4	0	0.0	28	62.2	17	37.8
Norway	3	2.4	115	92.0	7	5.6	0	0.0	131	74.0	46	26.0
Poland	7	0.8	743	86.5	109	12.7	7	1.6	263	62.2	153	36.2
Portugal	0	0.0	119	70.8	49	29.2	0	0.0	110	68.3	51	31.7
Romania	2	0.8	222	93.3	14	5.9	0	0.0	10	100	0	0.0
Russian Fed.	28	1.4	1841	90.5	165	8.1	14	2.9	379	78.8	88	18.3
Serbia	0	0.0	108	85.0	19	15.0	0	0.0	28	43.1	37	56.9
Slovak Republic	0	0.0	62	51.7	58	48.3	0	0.0	40	28.8	99	71.2
Slovenia	0	0.0	50	92.6	4	7.4	0	0.0	42	100	0	0.0
Spain	6	0.6	779	72.6	288	26.8	7	0.6	529	47.5	578	51.9
Sweden	2	0.7	232	86.9	33	12.4	4	1.1	172	46.1	197	52.8
Switzerland	1	0.2	341	81.0	79	18.8	2	0.4	300	56.2	232	43.4
Turkey	1	0.0	1676	83.6	327	16.3	3	0.9	267	76.5	79	22.6
Ukraine	0	0.0	142	86.6	22	13.4	2	4.1	37	75.5	10	20.4
United Kingdom	0	0.0	3646	86.7	559	13.3	0	0.0	4475	79.5	1153	20.5
Total	236	1.0	18357	79.2	4596	19.8	290	1.2	14812	60.2	9498	38.6

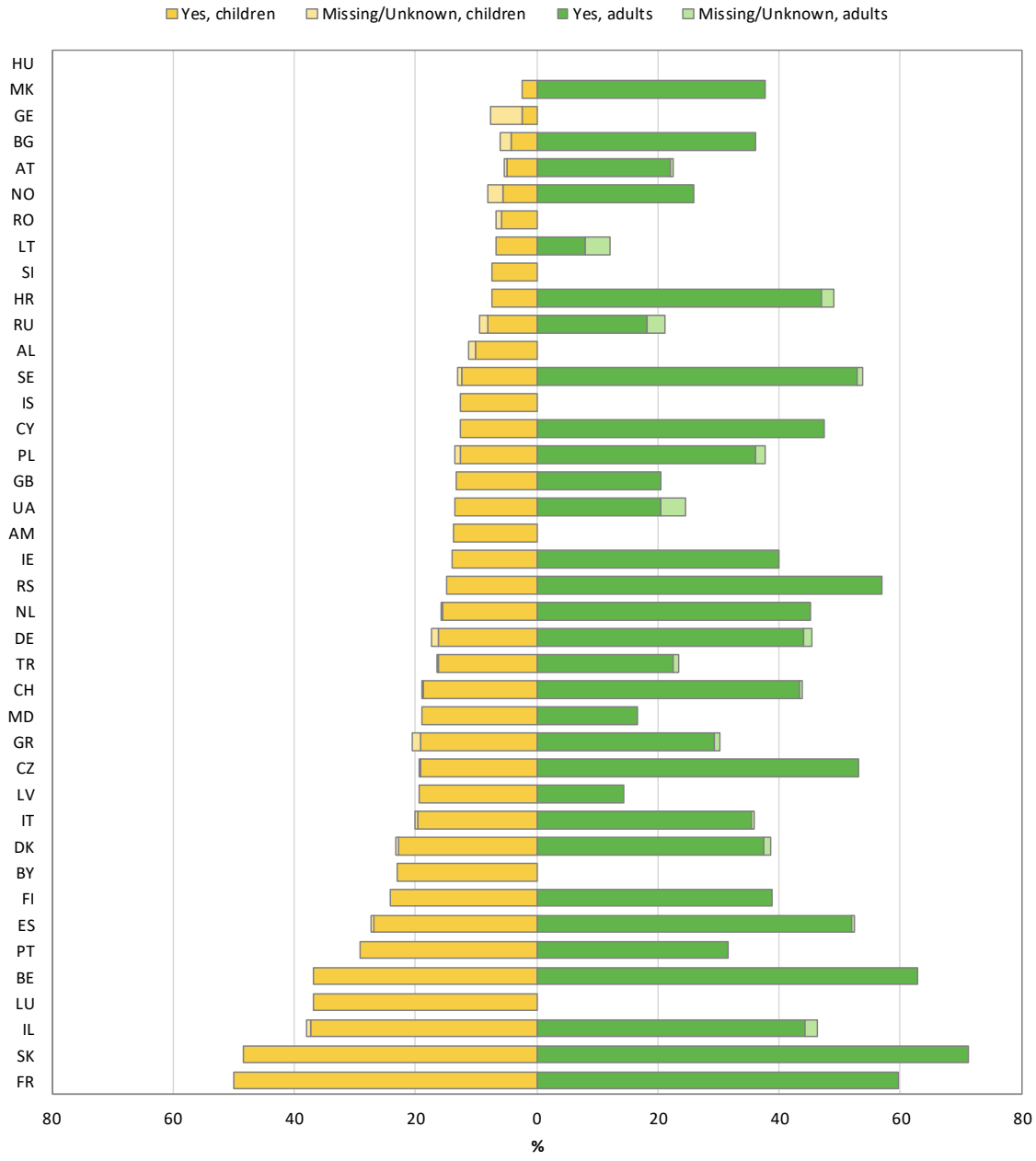
Note: Albania, Armenia, Belarus, and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but they are included in the total number.

Note: Inhaled steroids are reimbursed in most countries except in Lithuania and Serbia. In the Republic of Moldova they are reimbursed for children. In Bulgaria they are reimbursed if the people are also diagnosed with asthma or chronic obstructive pulmonary disease (COPD).

7. Respiratory complications and therapies

Figure 7.8 Pulmonary inflammation and exacerbation are often treated with inhaled or oral corticosteroids.

Use of inhaled steroids in children and adults seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information on use of inhaled steroids is missing for more than 10% of the people. Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: Inhaled steroids are reimbursed in most countries except in Georgia, Lithuania and Serbia. In the Republic of Moldova, they are reimbursed for children. In Bulgaria they are reimbursed if people are also diagnosed with asthma or chronic obstructive pulmonary disease (COPD).
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the use of inhaled steroids for at least 3 months during the survey year. The dark area of the bar indicates the percentage of people taking inhaled steroids, the lighter area shows the percentage of people for whom this information is missing.

7. Respiratory complications and therapies

Table 7.16 Use of oral steroids ≥3 months in all people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No		Yes		Missing/ Unknown		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	1	1.2	78	97.5	1	1.2						
Armenia	1	4.5	21	95.4	0	0.0						
Austria	3	0.8	374	97.9	5	1.3	3	0.8	371	96.1	12	3.1
Belarus	0	0.0	139	96.5	5	3.5						
Belgium	0	0.0	461	99.1	4	0.9	2	0.3	683	96.2	25	3.5
Bulgaria	2	1.7	116	98.3	0	0.0	0	0.0	80	96.4	3	3.6
Croatia	0	0.0	80	98.8	1	1.2	0	0.0	48	98.0	1	2.0
Cyprus	0	0.0	8	100	0	0.0	0	0.0	19	100	0	0.0
Czech Republic	1	0.3	323	98.2	5	1.5	0	0.0	276	97.2	8	2.8
Denmark	1	0.5	215	98.2	3	1.4	3	1.1	265	94.0	14	5.0
Finland	0	0.0	32	97.0	1	3.0	0	0.0	48	98.0	1	2.0
France	0	0.0	2632	98.5	39	1.5	0	0.0	3363	95.6	153	4.3
Georgia	4	5.0	76	95.0	0	0.0	0	0.0	8	100	0	0.0
Germany	43	1.6	2640	96.7	48	1.8	119	3.2	3335	91.0	210	5.7
Greece	3	1.4	203	97.1	3	1.4	3	0.9	330	97.1	7	2.1
Hungary	135	100	0	0.0	0	0.0	166	100	0	0.0	0	0.0
Iceland	0	0.0	8	100	0	0.0	0	0.0	6	100	0	0.0
Ireland	0	0.0	510	99.0	5	1.0	0	0.0	648	96.0	27	4.0
Israel	3	1.9	158	98.1	0	0.0	9	2.6	329	94.5	10	2.9
Italy	11	0.5	1954	88.2	250	11.3	16	0.5	2565	74.6	856	24.9
Latvia	0	0.0	31	100	0	0.0	0	0.0	14	100	0	0.0
Lithuania	0	0.0	15	100	0	0.0	1	4.0	24	96.0	0	0.0
Luxembourg	0	0.0	19	100	0	0.0						
Rep of Moldova	0	0.0	36	97.3	1	2.7	0	0.0	12	100	0	0.0
The Netherlands	1	0.2	492	91.3	46	8.5	0	0.0	829	89.7	95	10.3
North Macedonia	0	0.0	83	100	0	0.0	0	0.0	44	97.8	1	2.2
Norway	0	0.0	124	99.2	1	0.8	0	0.0	175	98.9	2	1.1
Poland	9	1.0	845	98.4	5	0.6	6	1.4	402	95.0	15	3.5
Portugal	4	2.4	161	95.8	3	1.8	0	0.0	157	97.5	4	2.5
Romania	1	0.4	234	98.3	3	1.3	0	0.0	10	100	0	0.0
Russian Fed.	28	1.4	1975	97.1	31	1.5	13	2.7	447	92.9	21	4.4
Serbia	0	0.0	127	100	0	0.0	0	0.0	64	98.5	1	1.5
Slovak Republic	1	0.8	113	94.2	6	5.0	1	0.7	121	87.0	17	12.2
Slovenia	0	0.0	54	100	0	0.0	0	0.0	40	95.2	2	4.8
Spain	5	0.5	1054	98.2	14	1.3	11	1.0	1053	94.5	50	4.5
Sweden	1	0.4	264	98.9	2	0.7	5	1.3	351	94.1	17	4.6
Switzerland	2	0.5	415	98.6	4	0.9	2	0.4	507	94.9	25	4.7
Turkey	1	0.0	1990	99.3	13	0.6	3	0.9	341	97.7	5	1.4
Ukraine	0	0.0	163	99.4	1	0.6	1	2.0	48	98.0	0	0.0
United Kingdom	0	0.0	4128	98.2	77	1.8	0	0.0	5153	91.6	475	8.4
Total	261	1.1	22351	96.4	577	2.5	364	1.5	22178	90.1	2058	8.4

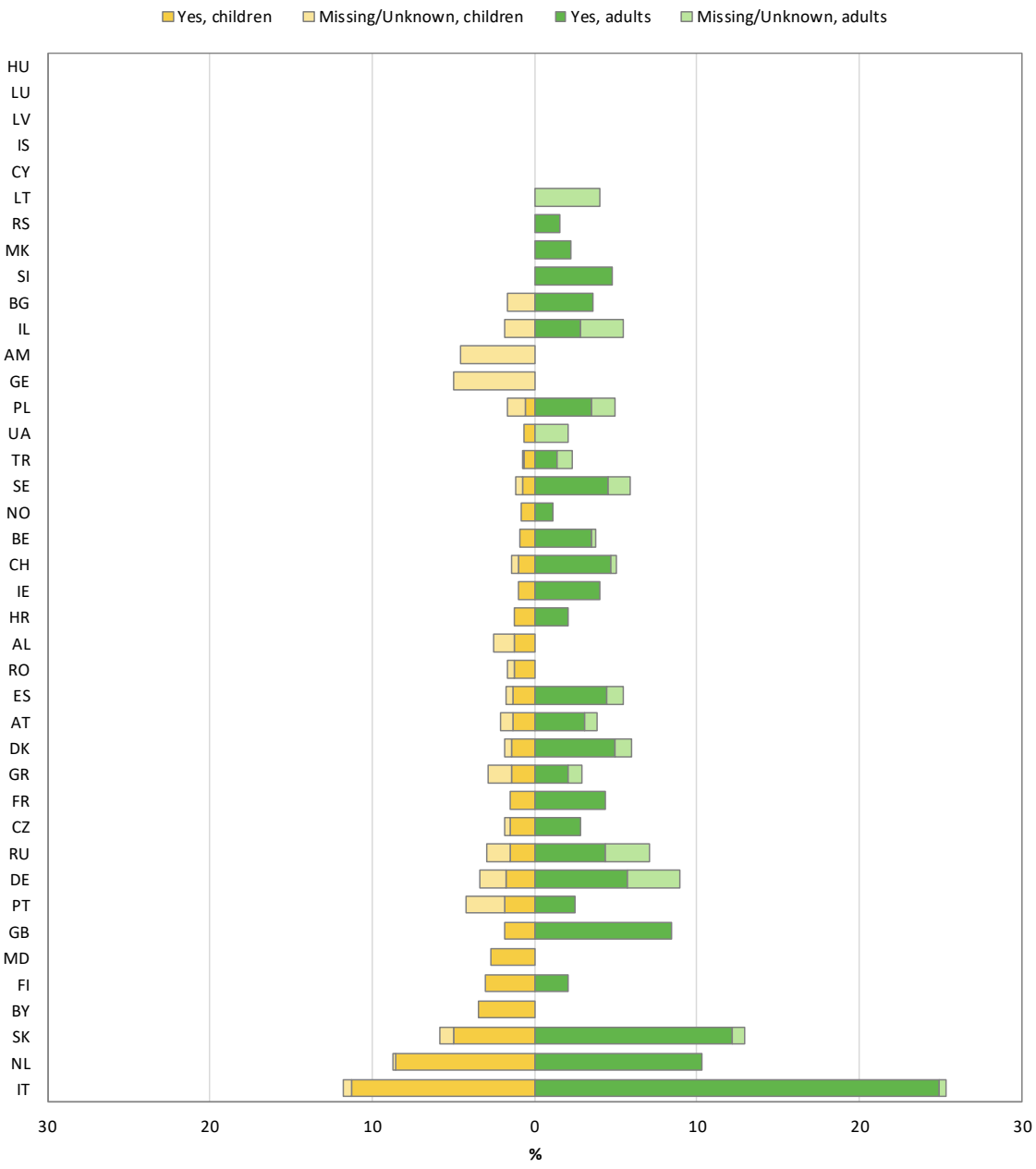
Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but they are included in the total number.

Note: Oral steroids are reimbursed in most countries except in Bulgaria, Lithuania, the Republic of Moldova and Poland. In Georgia they are reimbursed only when the individual is hospitalised.

7. Respiratory complications and therapies

Figure 7.9 *Pulmonary inflammation and exacerbation are often treated with oral or inhaled corticosteroids.*

Use of oral steroids in children and adults seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information on use of oral steroids is missing for more than 10% of the people. Albania, Armenia, Belarus, and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: Oral steroids are reimbursed in most countries except in Bulgaria, Lithuania, Republic of Moldova, Poland and Ukraine. In Latvia they are reimbursed for children.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the use of oral steroids for at least three months during the survey year. The dark part of the bar indicates the percentage of people taking oral steroids, the light area shows the percentage of people for whom this information is missing.

8. Gastro-intestinal complications and therapies

In this chapter we present data on common gastro-intestinal complications such as CF-related diabetes (CFRD), distal intestinal obstruction syndrome (DIOS) and salt loss syndrome (Pseudo Bartter Syndrome). Data on liver disease are also included, despite the observation that the definitions for the types of liver disease may be interpreted differently from country to country and even from centre to centre within a country.

The therapeutic options for the treatment of gastro-intestinal complications are limited. Here we show the data on the use of ursodeoxycholic acid and proton pump inhibitors (PPI). We collected information using the generic name of the drug, not the brand name.

Data on newly diagnosed malignancy is also reported in this section but it should be noted that the totals presented include information on the following types of malignancy, not only on GI-related cancers: lymphoid leukaemia, colorectal cancer, small bowel cancer, breast cancer, testicular cancer, other/type unknown.

8. Gastro-intestinal complications and therapies

Table 8.1 Prevalence of CF-related diabetes (CFRD) in 2021 in adults with CF seen in 2021 who have never had a transplant, by country and overall.

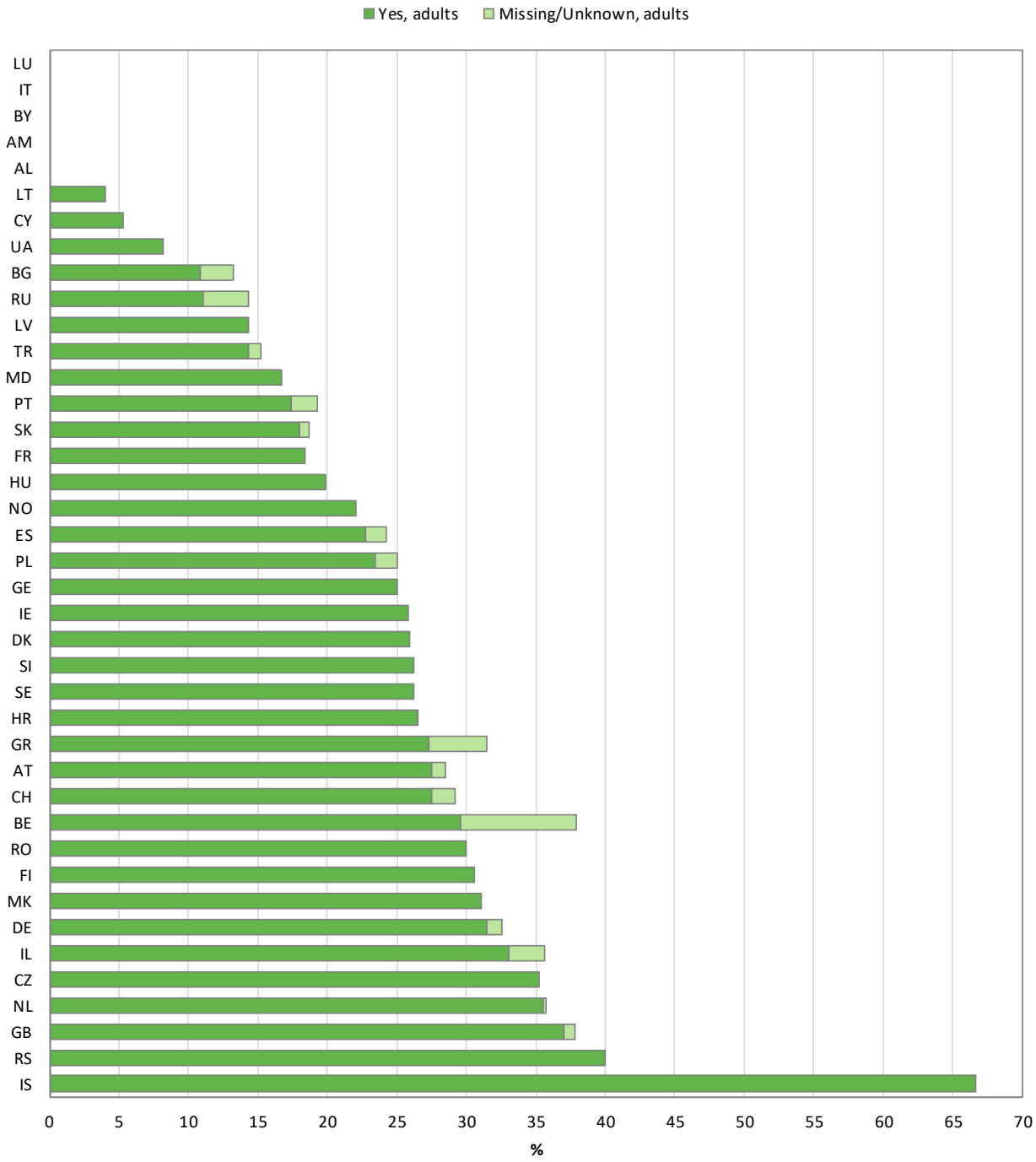
Country	CFRD this year											
	Missing/ Unknown		No		Yes, treated with daily insulin		Yes, treated with oral hypo-glycaemic agents		Yes, dietary advice only		Yes, therapy unknown	
	N	%	N	%	N	%	N	%	N	%	N	%
Austria	4	1.0	276	71.5	79	20.5	2	0.5	25	6.5	0	0.0
Belarus												
Belgium	59	8.3	441	62.1	144	20.3	15	2.1	51	7.2	0	0.0
Bulgaria	2	2.4	72	86.7	9	10.8	0	0.0	0	0.0	0	0.0
Croatia	0	0.0	36	73.5	12	24.5	0	0.0	1	2.0	0	0.0
Cyprus	0	0.0	18	94.7	0	0.0	0	0.0	1	5.3	0	0.0
Czech Republic	0	0.0	184	64.8	84	29.6	0	0.0	11	3.9	5	1.8
Denmark	0	0.0	209	74.1	73	25.9	0	0.0	0	0.0	0	0.0
Finland	0	0.0	34	69.4	13	26.5	2	4.1	0	0.0	0	0.0
France	0	0.0	2871	81.7	645	18.3	0	0.0	0	0.0	0	0.0
Georgia	0	0.0	6	75.0	2	25.0	0	0.0	0	0.0	0	0.0
Germany	41	1.1	2470	67.4	801	21.9	58	1.6	49	1.3	245	6.7
Greece	14	4.1	233	68.5	73	21.5	1	0.3	16	4.7	3	0.9
Hungary	0	0.0	133	80.1	33	19.9	0	0.0	0	0.0	0	0.0
Iceland	0	0.0	2	33.3	4	66.7	0	0.0	0	0.0	0	0.0
Ireland	0	0.0	501	74.2	135	20.0	0	0.0	39	5.8	0	0.0
Israel	9	2.6	224	64.4	90	25.9	4	1.1	17	4.9	4	1.1
Italy	414	12.0	2321	67.5	690	20.1	5	0.1	7	0.2	0	0.0
Latvia	0	0.0	12	85.7	2	14.3	0	0.0	0	0.0	0	0.0
Lithuania	0	0.0	24	96.0	1	4.0	0	0.0	0	0.0	0	0.0
Rep of Moldova	0	0.0	10	83.3	2	16.7	0	0.0	0	0.0	0	0.0
The Netherlands	2	0.2	594	64.3	285	30.8	5	0.5	38	4.1	0	0.0
North Macedonia	0	0.0	31	68.9	14	31.1	0	0.0	0	0.0	0	0.0
Norway	0	0.0	138	78.0	30	16.9	3	1.7	4	2.3	2	1.1
Poland	7	1.6	317	74.9	69	16.3	2	0.5	26	6.1	2	0.5
Portugal	3	1.9	130	80.7	20	12.4	0	0.0	8	5.0	0	0.0
Romania	0	0.0	7	70.0	3	30.0	0	0.0	0	0.0	0	0.0
Russian Fed.	16	3.3	412	85.6	40	8.3	3	0.6	10	2.1	0	0.0
Serbia	0	0.0	39	60.0	26	40.0	0	0.0	0	0.0	0	0.0
Slovak Republic	1	0.7	113	81.3	18	12.9	0	0.0	7	5.0	0	0.0
Slovenia	0	0.0	31	73.8	9	21.4	0	0.0	2	4.8	0	0.0
Spain	16	1.4	844	75.8	198	17.8	17	1.5	39	3.5	0	0.0
Sweden	0	0.0	275	73.7	71	19.0	8	2.1	0	0.0	19	5.1
Switzerland	9	1.7	378	70.8	133	24.9	3	0.6	10	1.9	1	0.2
Turkey	3	0.9	296	84.8	41	11.7	1	0.3	4	1.1	4	1.1
Ukraine	0	0.0	45	91.8	4	8.2	0	0.0	0	0.0	0	0.0
United Kingdom	45	0.8	3497	62.1	1549	27.5	158	2.8	164	2.9	215	3.8
Total	645	2.6	17235	70.1	5403	22.0	287	1.2	530	2.1	500	2.0

Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.

8. Gastro-intestinal complications and therapies

Figure 8.1 *Important differences in the prevalence of CF-related diabetes throughout Europe might reflect genetic backgrounds , but also may be linked to life expectancy.*

Prevalence of CFRD, by country. All adults with CF seen in 2021 aged 18 years or older who have never had a transplant.



Note: We excluded from the graph the countries for which the information on CFRD is missing for more than 10% of the adults. Albania, Armenia, Belarus, and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the prevalence of CF-related diabetes (CFRD), by country. The dark area of the bar shows the percentage of adults with CF who have CFRD, the lighter area shows the percentage of adults for whom this information is missing. Only people aged 18 years or older were included in this graph.

8. Gastro-intestinal complications and therapies

Table 8.2 Prevalence of liver disease in children and adolescents with CF (<18 years) seen in 2021 who have never had a transplant, by country and overall.

Country	Liver disease this year													
	Missing/ Unknown		No		Yes, cirrhosis with portal hypertension/ hypersplenism		Yes, cirrhosis no portal hypertension/ hypersplenism		Yes, cirrhosis, portal hypertension unknown		Yes, liver disease without cirrhosis		Yes, variceal bleeding	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Albania	4	5.0	37	46.2	1	1.2	0	0.0	0	0.0	38	47.5	0	0.0
Armenia	0	0.0	13	59.1	0	0.0	0	0.0	0	0.0	9	40.9	0	0.0
Austria	2	0.5	197	51.6	7	1.8	11	2.9	0	0.0	165	43.2	0	0.0
Belarus	0	0.0	96	66.7	3	2.1	2	1.4	0	0.0	43	29.9	0	0.0
Belgium	1	0.2	449	96.6	15	3.2	0	0.0	0	0.0	0	0.0	0	0.0
Bulgaria	2	1.7	69	58.5	4	3.4	1	0.8	0	0.0	42	35.6	0	0.0
Croatia	0	0.0	73	90.1	3	3.7	0	0.0	0	0.0	5	6.2	0	0.0
Cyprus	0	0.0	8	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Czech Republic	2	0.6	270	82.1	4	1.2	2	0.6	1	0.3	50	15.2	0	0.0
Denmark	49	22.4	135	61.6	7	3.2	0	0.0	0	0.0	28	12.8	0	0.0
Finland	0	0.0	26	78.8	0	0.0	1	3.0	0	0.0	6	18.2	0	0.0
France	0	0.0	2295	85.9	36	1.3	29	1.1	0	0.0	311	11.6	0	0.0
Georgia	4	5.0	63	78.7	0	0.0	1	1.2	0	0.0	12	15.0	0	0.0
Germany	23	0.8	2069	75.8	32	1.2	40	1.5	17	0.6	550	20.1	0	0.0
Greece	7	3.3	175	83.7	1	0.5	2	1.0	0	0.0	24	11.5	0	0.0
Hungary	2	1.5	101	74.8	2	1.5	0	0.0	0	0.0	30	22.2	0	0.0
Iceland	0	0.0	8	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Ireland	43	8.3	442	85.8	4	0.8	3	0.6	3	0.6	20	3.9	0	0.0
Israel	3	1.9	126	78.3	2	1.2	6	3.7	1	0.6	23	14.3	0	0.0
Italy	24	1.1	1681	75.9	15	0.7	11	0.5	1	0.0	483	21.8	0	0.0
Latvia	1	3.2	21	67.7	1	3.2	0	0.0	0	0.0	8	25.8	0	0.0
Lithuania	0	0.0	15	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Luxembourg	0	0.0	15	78.9	0	0.0	1	5.3	0	0.0	3	15.8	0	0.0
Rep of Moldova	0	0.0	35	94.6	0	0.0	0	0.0	0	0.0	2	5.4	0	0.0
The Netherlands	6	1.1	406	75.3	18	3.3	12	2.2	4	0.7	93	17.2	0	0.0
North Macedonia	0	0.0	58	69.9	2	2.4	5	6.0	0	0.0	18	21.7	0	0.0
Norway	0	0.0	111	88.8	1	0.8	0	0.0	0	0.0	13	10.4	0	0.0
Poland	9	1.0	585	68.1	19	2.2	10	1.2	1	0.1	234	27.2	1	0.1
Portugal	1	0.6	117	69.6	5	3.0	6	3.6	0	0.0	39	23.2	0	0.0
Romania	6	2.5	165	69.3	12	5.0	3	1.3	2	0.8	50	21.0	0	0.0
Russian Fed.	28	1.4	1491	73.3	63	3.1	80	3.9	1	0.0	371	18.2	0	0.0
Serbia	0	0.0	99	77.9	4	3.1	1	0.8	0	0.0	23	18.1	0	0.0
Slovak Republic	0	0.0	58	48.3	0	0.0	8	6.7	0	0.0	54	45.0	0	0.0
Slovenia	0	0.0	31	57.4	3	5.6	2	3.7	0	0.0	18	33.3	0	0.0
Spain	15	1.4	805	75.0	8	0.7	7	0.6	1	0.1	237	22.1	0	0.0
Sweden	7	2.6	226	84.6	3	1.1	6	2.2	0	0.0	25	9.4	0	0.0
Switzerland	10	2.4	343	81.5	5	1.2	0	0.0	5	1.2	58	13.8	0	0.0
Turkey	7	0.3	1750	87.3	15	0.7	20	1.0	16	0.8	196	9.8	0	0.0
Ukraine	1	0.6	132	80.5	6	3.7	6	3.7	0	0.0	18	11.0	1	0.6
United Kingdom	0	0.0	3784	90.0	37	0.9	24	0.6	0	0.0	360	8.6	0	0.0
Total	257	1.1	18580	80.1	338	1.5	300	1.3	53	0.2	3659	15.8	2	0.0

Note: Belgium: collects only cirrhosis with portal hypertension "yes" or "no", therefore no liver disease means no cirrhosis with portal hypertension.
Germany: variceal bleeding information is not reported.
Serbia: cirrhosis without portal hypertension/hypersplenism means the presence of CF-related liver disease with normal liver function.
Ukraine: Liver disease without cirrhosis also includes ultrasound signs of changes in the liver.

8. Gastro-intestinal complications and therapies

Table 8.3 Prevalence of liver disease in adults with CF (≥18 years) seen in 2021 who have never had a transplant, by country and overall.

Country	Liver disease this year													
	Missing/ Unknown		No		Yes, cirrhosis with portal hypertension/ hypersplenism		Yes, cirrhosis no portal hypertension/ hypersplenism		Yes, cirrhosis, portal hypertension unknown		Yes, liver disease without cirrhosis		Yes, variceal bleeding	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Austria	0	0.0	186	48.2	11	2.8	13	3.4	0	0.0	176	45.6	0	0.0
Belgium	3	0.4	671	94.5	36	5.1	0	0.0	0	0.0	0	0.0	0	0.0
Bulgaria	2	2.4	57	68.7	2	2.4	3	3.6	0	0.0	19	22.9	0	0.0
Croatia	0	0.0	39	79.6	3	6.1	0	0.0	0	0.0	7	14.3	0	0.0
Cyprus	0	0.0	18	94.7	0	0.0	0	0.0	0	0.0	1	5.3	0	0.0
Czech Republic	2	0.7	213	75.0	6	2.1	3	1.1	3	1.1	57	20.1	0	0.0
Denmark	61	21.6	172	61.0	10	3.5	2	0.7	0	0.0	37	13.1	0	0.0
Finland	0	0.0	39	79.6	1	2.0	0	0.0	0	0.0	9	18.4	0	0.0
France	0	0.0	2848	81.0	86	2.4	109	3.1	0	0.0	473	13.4	0	0.0
Georgia	0	0.0	5	62.5	0	0.0	0	0.0	0	0.0	3	37.5	0	0.0
Germany	75	2.0	2212	60.4	106	2.9	68	1.9	63	1.7	1140	31.1	0	0.0
Greece	22	6.5	225	66.2	7	2.1	12	3.5	1	0.3	73	21.5	0	0.0
Hungary	0	0.0	150	90.4	3	1.8	4	2.4	0	0.0	9	5.4	0	0.0
Iceland	0	0.0	5	83.3	1	16.7	0	0.0	0	0.0	0	0.0	0	0.0
Ireland	8	1.2	544	80.6	31	4.6	6	0.9	13	1.9	73	10.8	0	0.0
Israel	10	2.9	272	78.2	7	2.0	1	0.3	0	0.0	58	16.7	0	0.0
Italy	45	1.3	1975	57.5	52	1.5	26	0.8	1	0.0	1338	38.9	0	0.0
Latvia	0	0.0	8	57.1	0	0.0	0	0.0	0	0.0	6	42.9	0	0.0
Lithuania	1	4.0	24	96.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Rep of Moldova	0	0.0	8	66.7	0	0.0	0	0.0	0	0.0	4	33.3	0	0.0
The Netherlands	11	1.2	630	68.2	76	8.2	21	2.3	9	1.0	177	19.2	0	0.0
North Macedonia	0	0.0	14	31.1	5	11.1	5	11.1	0	0.0	21	46.7	0	0.0
Norway	3	1.7	157	88.7	4	2.3	0	0.0	3	1.7	10	5.6	0	0.0
Poland	9	2.1	208	49.2	15	3.5	4	0.9	4	0.9	182	43.0	1	0.2
Portugal	6	3.7	125	77.6	2	1.2	0	0.0	0	0.0	28	17.4	0	0.0
Romania	0	0.0	3	30.0	2	20.0	0	0.0	0	0.0	5	50.0	0	0.0
Russian Fed.	25	5.2	340	70.7	31	6.4	14	2.9	0	0.0	71	14.8	0	0.0
Serbia	0	0.0	29	44.6	1	1.5	3	4.6	0	0.0	32	49.2	0	0.0
Slovak Republic	0	0.0	52	37.4	10	7.2	1	0.7	0	0.0	76	54.7	0	0.0
Slovenia	0	0.0	28	66.7	5	11.9	1	2.4	0	0.0	8	19.0	0	0.0
Spain	19	1.7	879	78.9	15	1.3	4	0.4	3	0.3	194	17.4	0	0.0
Sweden	16	4.3	276	74.0	9	2.4	5	1.3	0	0.0	67	18.0	0	0.0
Switzerland	6	1.1	374	70.0	22	4.1	6	1.1	4	0.7	122	22.8	0	0.0
Turkey	5	1.4	297	85.1	6	1.7	3	0.9	4	1.1	34	9.7	0	0.0
Ukraine	0	0.0	21	42.9	5	10.2	1	2.0	0	0.0	22	44.9	0	0.0
United Kingdom	0	0.0	4571	81.2	96	1.7	66	1.2	0	0.0	895	15.9	0	0.0
Total	329	1.3	17681	71.9	666	2.7	382	1.5	108	0.4	5433	22.1	1	0.0

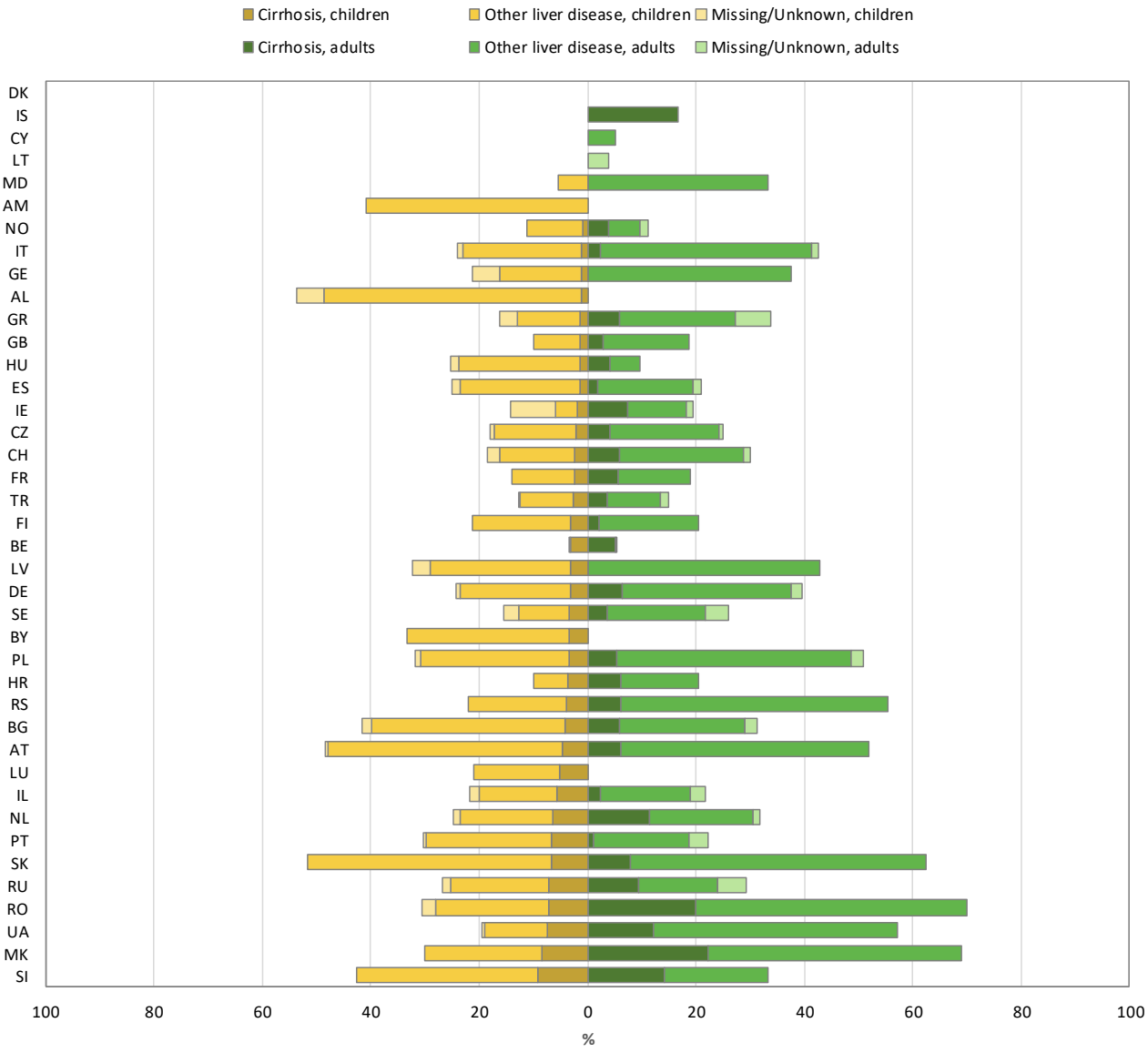
Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.

Note: Belgium: collects only cirrhosis with portal hypertension "yes" or "no", therefore no liver disease means no cirrhosis with portal hypertension.
Serbia: cirrhosis without portal hypertension/hypersplenism means the presence of CF-related liver disease with normal liver function.
Ukraine: Liver disease without cirrhosis also includes ultrasound signs of changes in the liver.

8. Gastro-intestinal complications and therapies

Figure 8.2 The prevalence of liver disease with or without cirrhosis is heterogenous across the countries in Europe.

Prevalence and severity of liver disease in children and adults seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information on liver disease is missing for more than 10% of the people with CF. Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: Belgium: collects only cirrhosis with portal hypertension "yes" or "no", therefore no liver disease means no cirrhosis with portal hypertension.
Germany: variceal bleeding information not reported.
Serbia: cirrhosis without portal hypertension/hypersplenism means the presence of CF-related disease with normal liver function.
Ukraine: Liver disease without cirrhosis also includes ultrasound signs of changes in the liver.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

Figure 8.2 shows the frequency of liver disease by country. Liver disease is defined according to severity of portal hypertension (increased blood pressure in the liver veins, often resulting in blood shunting past the cirrhotic liver) divided into five categories, including no liver disease (see Appendix 3, page 171). This graph emphasises better than the table the vast differences in frequency and severity, which may be due to different interpretations of diagnostic results and differences in definitions.

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Table 8.4 Prevalence of the use of ursodeoxycholic acid for ≥ 3 months in all people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No		Yes		Missing/ Unknown		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	4	5.0	37	46.2	39	48.7						
Armenia	0	0.0	16	72.7	6	27.3						
Austria	1	0.3	202	52.9	179	46.9	0	0.0	194	50.3	192	49.7
Belarus	0	0.0	35	24.3	109	75.7						
Belgium	0	0.0	376	80.9	89	19.1	0	0.0	575	81.0	135	19.0
Bulgaria	2	1.7	67	56.8	49	41.5	0	0.0	56	67.5	27	32.5
Croatia	0	0.0	52	64.2	29	35.8	2	4.1	26	53.1	21	42.9
Cyprus	0	0.0	8	100	0	0.0	0	0.0	17	89.5	2	10.5
Czech Republic	1	0.3	226	68.7	102	31.0	0	0.0	189	66.5	95	33.4
Denmark	0	0.0	162	74.0	57	26.0	3	1.1	183	64.9	96	34.0
Finland	0	0.0	24	72.7	9	27.3	0	0.0	36	73.5	13	26.5
France	0	0.0	2201	82.4	470	17.6	0	0.0	2690	76.5	826	23.5
Georgia	1	1.2	59	73.7	20	25.0	1	12.5	5	62.5	2	25.0
Germany	15	0.5	1636	59.9	1080	39.5	33	0.9	1698	46.3	1933	52.8
Greece	3	1.4	150	71.8	56	26.8	3	0.9	238	70.0	99	29.1
Hungary	0	0.0	87	64.4	48	35.6	2	1.2	76	45.8	88	53.0
Iceland	0	0.0	8	100	0	0.0	0	0.0	5	83.3	1	16.7
Ireland	0	0.0	501	97.3	14	2.7	0	0.0	600	88.9	75	11.1
Israel	3	1.9	135	83.8	23	14.3	8	2.3	282	81.0	58	16.7
Italy	8	0.4	1695	76.5	512	23.1	15	0.4	2288	66.6	1134	33.0
Latvia	1	3.2	22	71.0	8	25.8	0	0.0	8	57.1	6	42.9
Lithuania	0	0.0	11	73.3	4	26.7	0	0.0	24	96.0	1	4.0
Luxembourg	0	0.0	17	89.5	2	10.5						
Rep of Moldova	0	0.0	25	67.6	12	32.4	0	0.0	5	41.7	7	58.3
The Netherlands	1	0.2	425	78.8	113	21.0	1	0.1	682	73.8	241	26.1
North Macedonia	0	0.0	59	71.1	24	28.9	0	0.0	14	31.1	31	68.9
Norway	0	0.0	114	91.2	11	8.8	0	0.0	166	93.8	11	6.2
Poland	6	0.7	452	52.6	401	46.7	7	1.6	136	32.1	280	66.2
Portugal	1	0.6	113	67.3	54	32.1	0	0.0	114	70.8	47	29.2
Romania	3	1.3	169	71.0	66	27.7	2	20.0	4	40.0	4	40.0
Russian Fed.	30	1.5	137	6.7	1867	91.8	15	3.1	125	26.0	341	70.9
Serbia	0	0.0	98	77.2	29	22.8	0	0.0	35	53.8	30	46.1
Slovak Republic	0	0.0	67	55.8	53	44.2	2	1.4	57	41.0	80	57.5
Slovenia	0	0.0	28	51.8	26	48.1	0	0.0	17	40.5	25	59.5
Spain	14	1.3	822	76.6	237	22.1	52	4.7	814	73.1	248	22.3
Sweden	2	0.7	226	84.6	39	14.6	3	0.8	301	80.7	69	18.5
Switzerland	1	0.2	334	79.3	86	20.4	3	0.6	385	72.1	146	27.3
Turkey	1	0.0	1665	83.1	338	16.9	4	1.1	295	84.5	50	14.3
Ukraine	1	0.6	3	1.8	160	97.6	1	2.0	0	0.0	48	98.0
United Kingdom	0	0.0	3424	81.4	781	18.6	0	0.0	4267	75.8	1361	24.2
Total	99	0.4	15888	68.5	7202	31.1	157	0.6	16612	67.5	7831	31.8

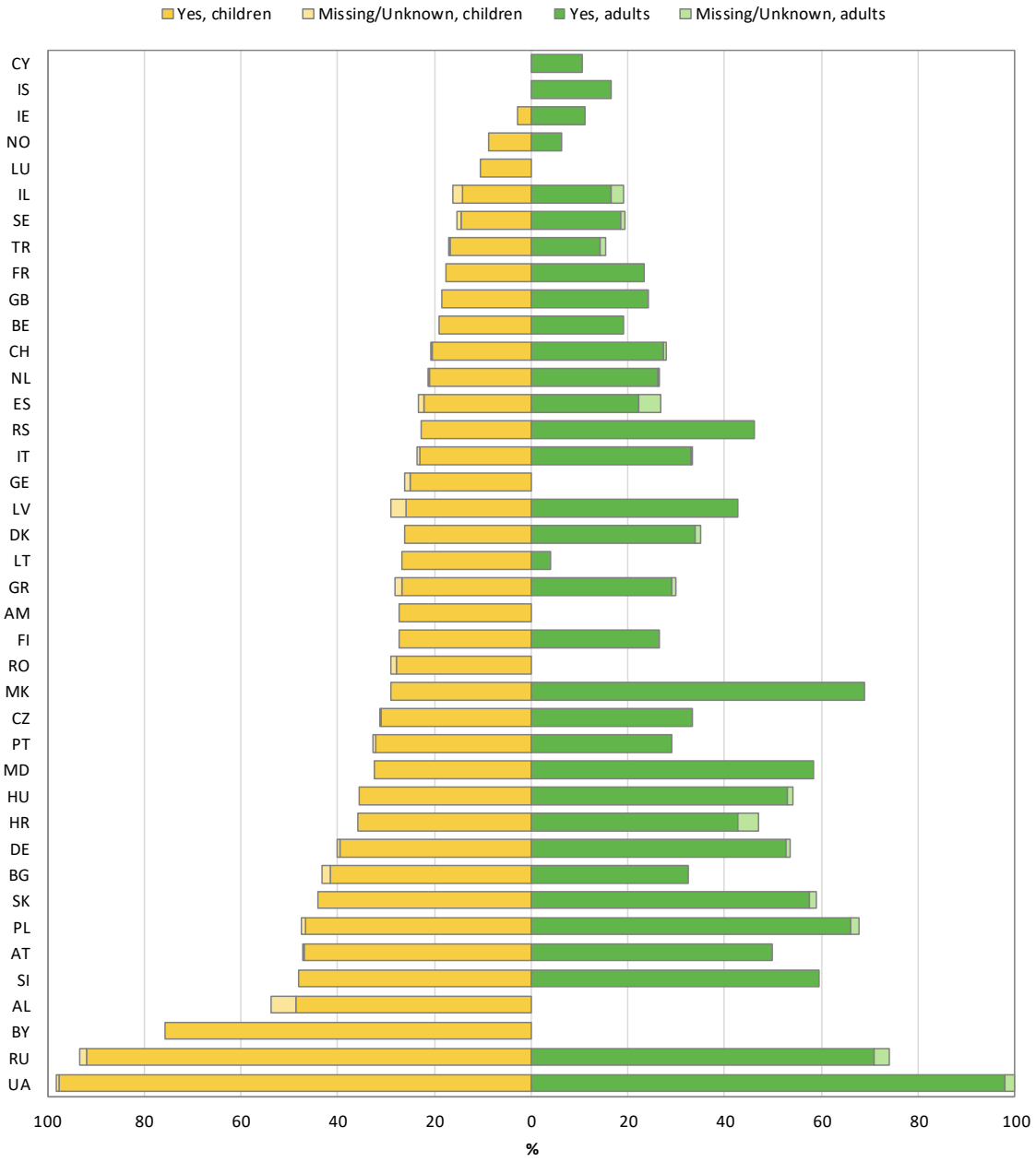
Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.

Note: Oral ursodesoxycholic acid is reimbursed in most countries in Europe, except in Armenia, Bulgaria, Lithuania, Serbia and Ukraine. In the Republic of Moldova, it is reimbursed for children and 70% for adults.

8. Gastro-intestinal complications and therapies

Figure 8.3 *Ursodeoxycholic acid is often prescribed for people with CF to treat cholestasis or liver disease.*

Use of ursodeoxycholic acid in children and adults seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information on oral ursodeoxycholic acid use is missing for more than 10% of the people with CF.
Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: Oral ursodeoxycholic acid is reimbursed in most countries in Europe, except in Armenia, Bulgaria, Lithuania, Serbia and Ukraine. In the Republic of Moldova, it is reimbursed for children and for 70% for adults.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows how many people with CF used ursodeoxycholic acid for at least three consecutive months during 2021. Ursodeoxycholic acid is used as a treatment for CF liver disease. The dark area of the bar indicates the percentage of people taking the medication, the lighter area shows the percentage of people for whom this information is missing.

8. Gastro-intestinal complications and therapies

Table 8.5 Prevalence of the use of proton pump inhibitors (PPI) for ≥ 3 months in all people with CF seen in 2021 who have never had a transplant, by country and overall.

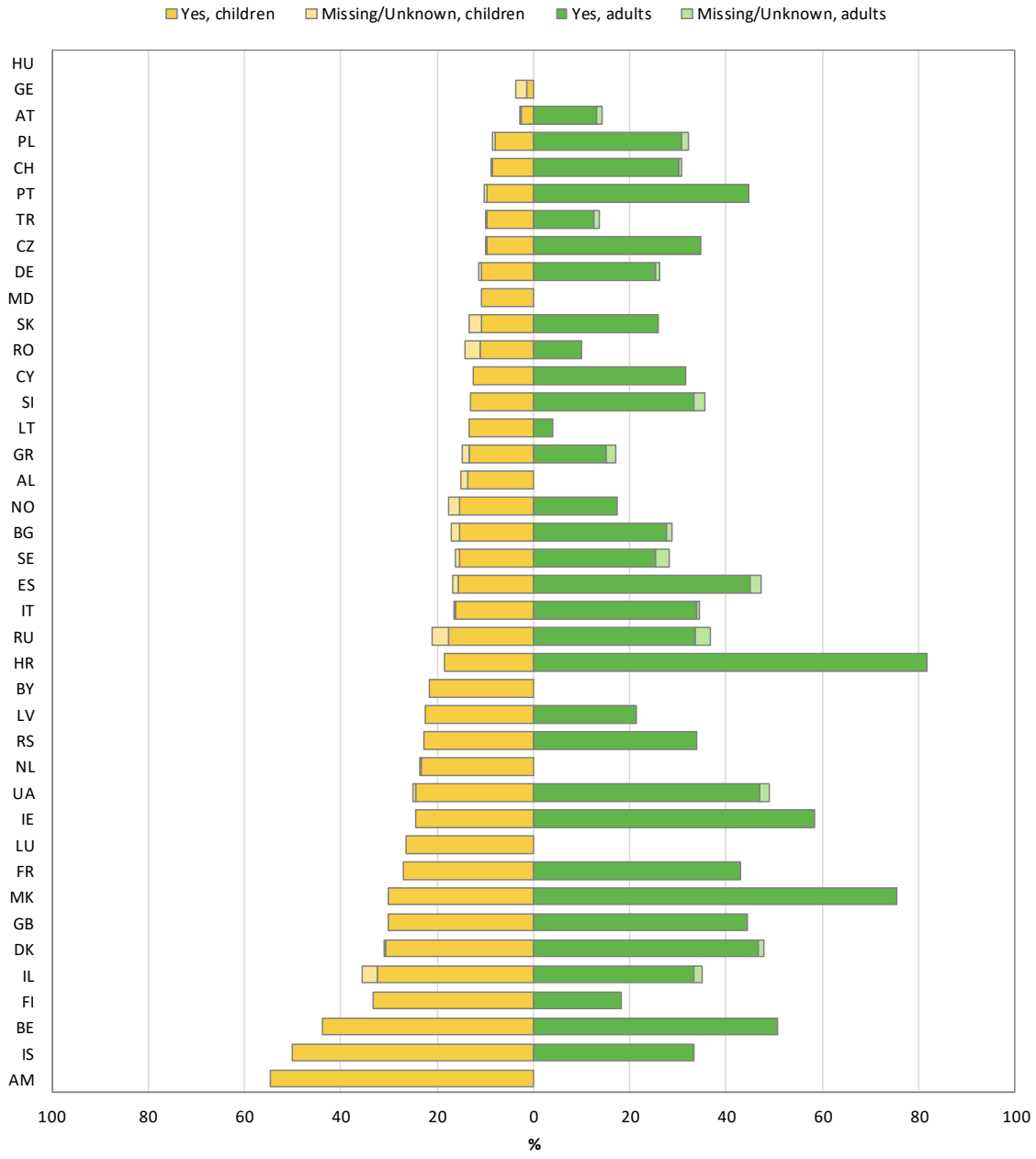
Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No		Yes		Missing/ Unknown		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	1	1.2	68	85.0	11	13.7						
Armenia	0	0.0	10	45.4	12	54.5						
Austria	1	0.3	371	97.1	10	2.6	4	1.0	331	85.7	51	13.2
Belarus	0	0.0	113	78.5	31	21.5						
Belgium	0	0.0	261	56.1	204	43.9	0	0.0	351	49.4	359	50.6
Bulgaria	2	1.7	98	83.0	18	15.2	1	1.2	59	71.1	23	27.7
Croatia	0	0.0	66	81.5	15	18.5	0	0.0	9	18.4	40	81.6
Cyprus	0	0.0	7	87.5	1	12.5	0	0.0	13	68.4	6	31.6
Czech Republic	1	0.3	296	90.0	32	9.7	0	0.0	185	65.1	99	34.9
Denmark	1	0.5	151	68.9	67	30.6	3	1.1	147	52.1	132	46.8
Finland	0	0.0	22	66.7	11	33.3	0	0.0	40	81.6	9	18.4
France	0	0.0	1950	73.0	721	27.0	0	0.0	2003	57.0	1513	43.0
Georgia	2	2.5	77	96.2	1	1.2	1	12.5	7	87.5	0	0.0
Germany	12	0.4	2425	88.8	294	10.8	35	1.0	2703	73.8	926	25.3
Greece	3	1.4	178	85.2	28	13.4	7	2.1	282	82.9	51	15.0
Hungary	135	100	0	0.0	0	0.0	166	100	0	0.0	0	0.0
Iceland	0	0.0	4	50.0	4	50.0	0	0.0	4	66.7	2	33.3
Ireland	0	0.0	389	75.5	126	24.5	0	0.0	280	41.5	395	58.5
Israel	5	3.1	104	64.6	52	32.3	6	1.7	226	64.9	116	33.3
Italy	7	0.3	1848	83.4	360	16.2	16	0.5	2251	65.5	1170	34.0
Latvia	0	0.0	24	77.4	7	22.6	0	0.0	11	78.6	3	21.4
Lithuania	0	0.0	13	86.7	2	13.3	0	0.0	24	96.0	1	4.0
Luxembourg	0	0.0	14	73.7	5	26.3						
Rep of Moldova	0	0.0	33	89.2	4	10.8	0	0.0	12	100	0	0.0
The Netherlands	1	0.2	412	76.4	126	23.4	272	29.4	331	35.8	321	34.7
North Macedonia	0	0.0	58	69.9	25	30.1	0	0.0	11	24.4	34	75.6
Norway	3	2.4	103	82.4	19	15.2	0	0.0	146	82.5	31	17.5
Poland	7	0.8	785	91.4	67	7.8	6	1.4	287	67.8	130	30.7
Portugal	1	0.6	151	89.9	16	9.5	0	0.0	89	55.3	72	44.7
Romania	8	3.4	204	85.7	26	10.9	0	0.0	9	90.0	1	10.0
Russian Fed.	69	3.4	1607	79.0	358	17.6	15	3.1	304	63.2	162	33.7
Serbia	0	0.0	98	77.2	29	22.8	0	0.0	43	66.1	22	33.8
Slovak Republic	3	2.5	104	86.7	13	10.8	0	0.0	103	74.1	36	25.9
Slovenia	0	0.0	47	87.0	7	13.0	1	2.4	27	64.3	14	33.3
Spain	10	0.9	894	83.3	169	15.7	28	2.5	586	52.6	500	44.9
Sweden	2	0.7	224	83.9	41	15.4	10	2.7	268	71.8	95	25.5
Switzerland	1	0.2	384	91.2	36	8.5	3	0.6	369	69.1	162	30.3
Turkey	1	0.0	1809	90.3	194	9.7	4	1.1	301	86.2	44	12.6
Ukraine	1	0.6	123	75.0	40	24.4	1	2.0	25	51.0	23	46.9
United Kingdom	0	0.0	2937	69.8	1268	30.1	0	0.0	3130	55.6	2498	44.4
Total	277	1.2	18462	79.6	4450	19.2	579	2.3	14973	60.9	9048	36.8

Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.
Note: Oral proton pump inhibitors are reimbursed in most countries except in Bulgaria, Lithuania, the Republic of Moldova, Poland, and Serbia.

8. Gastro-intestinal complications and therapies

Figure 8.4 *Proton Pump Inhibitors are used to treat gastroesophageal reflux or gastritis, common complications in CF.*

Use of proton pump inhibitors (PPI) in children and adults seen in 2021 who have never had a transplant, by country.



Note: We excluded from the graph the countries for which the information on the use of PPI is missing for more than 10% of the people with CF. Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the graph for adults.
Note: Oral proton pump inhibitors are reimbursed in most countries except in Bulgaria, Lithuania, the Republic of Moldova, Serbia and Ukraine.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the use of proton pump inhibitors (PPI) for more at least three consecutive months during the survey year. The dark area of the bar indicates the percentage of people with CF using PPI, the lighter part shows the percentage of people for whom this information is missing.

8. Gastro-intestinal complications and therapies

Table 8.6 Malignancy newly diagnosed this year in all people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No		Yes		Missing/ Unknown		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	6	7.5	74	92.5	0	0.0						
Armenia	0	0.0	22	100	0	0.0						
Austria	4	1.0	378	98.9	0	0.0	3	0.8	382	99.0	1	0.3
Belarus	0	0.0	143	99.3	1	0.7						
Belgium	0	0.0	464	99.8	1	0.2	1	0.1	704	99.1	5	0.7
Bulgaria	2	1.7	116	98.3	0	0.0	2	2.4	80	96.4	1	1.2
Croatia	0	0.0	81	100	0	0.0	1	2.0	47	95.9	1	2.0
Cyprus	0	0.0	8	100	0	0.0	0	0.0	19	100	0	0.0
Czech Republic	2	0.6	327	99.4	0	0.0	3	1.1	278	97.9	3	1.0
Denmark	0	0.0	219	100	0	0.0	0	0.0	282	100	0	0.0
Finland	0	0.0	33	100	0	0.0	0	0.0	49	100	0	0.0
France	0	0.0	2670	99.96	1	0.0	7	0.2	3490	99.3	19	0.5
Georgia	7	8.7	73	91.2	0	0.0	0	0.0	8	100	0	0.0
Germany	9	0.3	2722	99.7	0	0.0	40	1.1	3577	97.6	47	1.3
Greece	5	2.4	204	97.6	0	0.0	5	1.5	332	97.6	3	0.9
Hungary	2	1.5	133	98.5	0	0.0	2	1.2	164	98.8	0	0.0
Iceland	0	0.0	8	100	0	0.0	1	16.7	5	83.3	0	0.0
Ireland	42	8.2	473	91.8	0	0.0	9	1.3	664	98.4	2	0.3
Israel	3	1.9	158	98.1	0	0.0	8	2.3	338	97.1	2	0.6
Italy	21	0.9	2184	98.6	10	0.4	38	1.1	3373	98.1	26	0.8
Latvia	0	0.0	31	100	0	0.0	0	0.0	14	100	0	0.0
Lithuania	1	6.7	14	93.3	0	0.0	0	0.0	25	100	0	0.0
Luxembourg	0	0.0	19	100	0	0.0						
Rep of Moldova	0	0.0	37	100	0	0.0	0	0.0	12	100	0	0.0
The Netherlands	4	0.7	535	99.3	0	0.0	0	0.0	921	99.7	3	0.3
North Macedonia	0	0.0	83	100	0	0.0	0	0.0	45	100	0	0.0
Norway	0	0.0	125	100	0	0.0	1	0.6	175	98.9	1	0.6
Poland	9	1.0	850	98.9	0	0.0	9	2.1	411	97.2	3	0.7
Portugal	1	0.6	167	99.4	0	0.0	4	2.5	156	96.9	1	0.6
Romania	9	3.8	229	96.2	0	0.0	0	0.0	10	100	0	0.0
Russian Fed.	0	0.0	2034	100	0	0.0	0	0.0	481	100	0	0.0
Serbia	0	0.0	127	100	0	0.0	0	0.0	65	100	0	0.0
Slovak Republic	1	0.8	119	99.2	0	0.0	1	0.7	137	98.6	1	0.7
Slovenia	0	0.0	54	100	0	0.0	0	0.0	42	100	0	0.0
Spain	15	1.4	1057	98.5	1	0.1	16	1.4	1092	98.0	6	0.5
Sweden	8	3.0	259	97.0	0	0.0	17	4.6	354	94.9	2	0.5
Switzerland	1	0.2	419	99.5	1	0.2	4	0.7	528	98.9	2	0.4
Turkey	6	0.3	1998	99.7	0	0.0	6	1.7	343	98.3	0	0.0
Ukraine	0	0.0	164	100	0	0.0	1	2.0	46	93.9	2	4.1
United Kingdom	5	0.1	4197	99.8	3	0.1	5	0.1	5604	99.6	19	0.3
Total	163	0.7	23008	99.2	18	0.1	184	0.7	24266	98.6	150	0.6

Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.

Note: Belgium reports prevalence of malignancy, not new occurrence of cancer in the year of follow-up, so some malignancies may have been diagnosed earlier.

8. Gastro-intestinal complications and therapies

Table 8.7 Prevalence of distal intestinal obstruction syndrome (DIOS) in all people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No		Yes		Missing/ Unknown		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	4	5.0	76	95.0	0	0.0						
Armenia	0	0.0	18	81.8	4	18.2						
Austria	1	0.3	368	96.3	13	3.4	0	0.0	375	97.1	11	2.8
Belarus	0	0.0	143	99.3	1	0.7						
Belgium	0	0.0	445	95.7	20	4.3	2	0.3	678	95.5	30	4.2
Bulgaria	2	1.7	116	98.3	0	0.0	2	2.4	81	97.6	0	0.0
Croatia	0	0.0	80	98.8	1	1.2	0	0.0	46	93.9	3	6.1
Cyprus	0	0.0	8	100	0	0.0	0	0.0	18	94.7	1	5.3
Czech Republic	1	0.3	326	99.1	2	0.6	2	0.7	281	98.9	1	0.3
Denmark	0	0.0	215	98.2	4	1.8	0	0.0	275	97.5	7	2.5
Finland	0	0.0	32	97.0	1	3.0	0	0.0	48	98.0	1	2.0
France	0	0.0	2611	97.7	60	2.2	0	0.0	3404	96.8	112	3.2
Georgia	5	6.2	75	93.7	0	0.0	0	0.0	8	100	0	0.0
Germany	19	0.7	2637	96.6	75	2.7	56	1.5	3491	95.3	117	3.2
Greece	5	2.4	200	95.7	4	1.9	5	1.5	326	95.9	9	2.6
Hungary	0	0.0	135	100	0	0.0	2	1.2	162	97.6	2	1.2
Iceland	0	0.0	7	87.5	1	12.5	0	0.0	6	100	0	0.0
Ireland	0	0.0	512	99.4	3	0.6	0	0.0	671	99.4	4	0.6
Israel	3	1.9	156	96.9	2	1.2	8	2.3	336	96.5	4	1.1
Italy	18	0.8	2164	97.7	33	1.5	42	1.2	3341	97.2	54	1.6
Latvia	0	0.0	30	96.8	1	3.2	0	0.0	13	92.9	1	7.1
Lithuania	0	0.0	15	100	0	0.0	0	0.0	25	100	0	0.0
Luxembourg	0	0.0	19	100	0	0.0						
Rep of Moldova	0	0.0	35	94.6	2	5.4	0	0.0	12	100	0	0.0
The Netherlands	6	1.1	527	97.8	6	1.1	12	1.3	885	95.8	27	2.9
North Macedonia	0	0.0	82	98.8	1	1.2	0	0.0	45	100	0	0.0
Norway	1	0.8	121	96.8	3	2.4	3	1.7	167	94.3	7	3.9
Poland	10	1.2	837	97.4	12	1.4	5	1.2	416	98.3	2	0.5
Portugal	1	0.6	164	97.6	3	1.8	3	1.9	155	96.3	3	1.9
Romania	4	1.7	231	97.1	3	1.3	0	0.0	10	100	0	0.0
Russian Fed.	19	0.9	1957	96.2	58	2.8	16	3.3	455	94.6	10	2.1
Serbia	0	0.0	127	100	0	0.0	0	0.0	65	100	0	0.0
Slovak Republic	1	0.8	118	98.3	1	0.8	1	0.7	138	99.3	0	0.0
Slovenia	0	0.0	51	94.4	3	5.6	0	0.0	42	100	0	0.0
Spain	14	1.3	1052	98.0	7	0.6	13	1.2	1092	98.0	9	0.8
Sweden	8	3.0	251	94.0	8	3.0	17	4.6	342	91.7	14	3.7
Switzerland	1	0.2	403	95.7	17	4.0	4	0.7	515	96.4	15	2.8
Turkey	8	0.4	1983	98.9	13	0.6	7	2.0	339	97.1	3	0.9
Ukraine	0	0.0	164	100	0	0.0	0	0.0	48	98.0	1	2.0
United Kingdom	0	0.0	4091	97.3	114	2.7	0	0.0	5292	94.0	336	6.0
Total	131	0.6	22582	97.4	476	2.0	200	0.8	23616	96.0	784	3.2

Note: Albania, Armenia, Belarus, and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.
Note: Denmark only reported DIOS requiring hospitalisation.

8. Gastro-intestinal complications and therapies

Table 8.8 Prevalence of salt loss syndrome in all people with CF seen in 2021 who have never had a transplant, by country and overall.

Country	Children (<18 years)						Adults (≥18 years)					
	Missing/ Unknown		No		Yes		Missing/ Unknown		No		Yes	
	N	%	N	%	N	%	N	%	N	%	N	%
Albania	4	5.0	74	92.5	2	2.5						
Armenia	0	0.0	19	86.4	3	13.6						
Austria	1	0.3	376	98.4	5	1.3	1	0.3	385	99.7	0	0.0
Belarus	0	0.0	141	97.9	3	2.1						
Belgium	0	0.0	460	98.9	5	1.1	0	0.0	709	99.9	1	0.1
Bulgaria	2	1.7	115	97.5	1	0.8	2	2.4	80	96.4	1	1.2
Croatia	0	0.0	81	100	0	0.0	0	0.0	49	100	0	0.0
Cyprus	0	0.0	8	100	0	0.0	0	0.0	19	100	0	0.0
Czech Republic	1	0.3	326	99.1	2	0.6	0	0.0	282	99.3	2	0.7
Denmark	219	100	0	0.0	0	0.0	282	100	0	0.0	0	0.0
Finland	0	0.0	33	100	0	0.0	0	0.0	49	100	0	0.0
France	2671	100	0	0.0	0	0.0	3516	100	0	0.0	0	0.0
Georgia	4	5.0	75	93.7	1	1.2	0	0.0	8	100	0	0.0
Germany	12	0.4	2701	98.9	18	0.7	66	1.8	3595	98.1	3	0.1
Greece	5	2.4	203	97.1	1	0.5	27	7.9	312	91.8	1	0.3
Hungary	135	100	0	0.0	0	0.0	166	100	0	0.0	0	0.0
Iceland	0	0.0	8	100	0	0.0	0	0.0	6	100	0	0.0
Ireland	515	100	0	0.0	0	0.0	675	100	0	0.0	0	0.0
Israel	3	1.9	157	97.5	1	0.6	8	2.3	339	97.4	1	0.3
Italy	18	0.8	2141	96.7	56	2.5	38	1.1	3302	96.1	97	2.8
Latvia	0	0.0	30	96.8	1	3.2	0	0.0	14	100	0	0.0
Lithuania	0	0.0	15	100	0	0.0	0	0.0	25	100	0	0.0
Luxembourg	0	0.0	17	89.5	2	10.5						
Rep of Moldova	0	0.0	36	97.3	1	2.7	0	0.0	12	100	0	0.0
The Netherlands	539	100	0	0.0	0	0.0	924	100	0	0.0	0	0.0
North Macedonia	0	0.0	83	100	0	0.0	0	0.0	45	100	0	0.0
Norway	0	0.0	125	100	0	0.0	0	0.0	177	100	0	0.0
Poland	10	1.2	845	98.4	4	0.5	9	2.1	413	97.6	1	0.2
Portugal	1	0.6	165	98.2	2	1.2	3	1.9	158	98.1	0	0.0
Romania	6	2.5	227	95.4	5	2.1	0	0.0	9	90.0	1	10.0
Russian Fed.	27	1.3	1911	93.9	96	4.7	20	4.2	455	94.6	6	1.2
Serbia	0	0.0	120	94.5	7	5.5	0	0.0	65	100	0	0.0
Slovak Republic	2	1.7	114	95.0	4	3.3	1	0.7	138	99.3	0	0.0
Slovenia	0	0.0	52	96.3	2	3.7	0	0.0	42	100	0	0.0
Spain	13	1.2	1045	97.4	15	1.4	14	1.3	1095	98.3	5	0.4
Sweden	267	100	0	0.0	0	0.0	373	100	0	0.0	0	0.0
Switzerland	1	0.2	418	99.3	2	0.5	3	0.6	531	99.4	0	0.0
Turkey	8	0.4	1878	93.7	118	5.9	7	2.0	339	97.1	3	0.9
Ukraine	0	0.0	163	99.4	1	0.6	0	0.0	49	100	0	0.0
United Kingdom	4205	100	0	0.0	0	0.0	5628	100	0	0.0	0	0.0
Total	8669	37.4	14162	61.1	358	1.5	11763	47.8	12714	51.7	123	0.5

Note: Albania, Armenia, Belarus and Luxembourg have <5 adults seen in 2021 and are excluded from the table for adults, but the people are included in the total number.

9. CFTR modulator therapies

The introduction of CFTR modulator therapies has had a significant impact on the health status and quality of life of people with CF as well as on CF care. These therapies target defects in the structure and function of the cystic fibrosis transmembrane conductance regulator protein. However, CFTR modulators are only effective in people with specific variant classes since different variants cause different defects in the protein.

In this chapter we present information about the use of the different CFTR modulators for people with CF. Maps showing the availability of these therapies (as reimbursed or not by national health services) in the countries in the ECFSPR are provided as an aid to the interpretation of the results and to help illustrate the country-specific variations in the therapy utilisation.

We adopted the eligibility criteria of the European Medicines Agency (EMA) for the countries in and outside Europe for 2021. For Israel, the Russian Federation and Switzerland different, specific eligibility criteria, laid down by the national regulatory authorities, have been applied.

The eligibility criteria for the CFTR modulators in 2021 in Europe are:

Ivacaftor:

The individual must be at least 4 months old (6 months in Switzerland; 2 years in Israel) with at least one of the following variants: G551D, G1244E, G1349D, G178R, G551S, S1251N, S1255P, S549N, or S549R, R117H (for R117H: in Switzerland people must be at least 18 years old, in Israel there is no approval required).

Lumacaftor/Ivacaftor:

The individual must be at least 2 years old (6 years in Israel and the Russian Federation) (up to 18 years in the Russian Federation) and F508del homozygous.

Tezacaftor/Ivacaftor:

The individual must be at least 6 years old (12 years in Switzerland), and is F508del homozygous, or F508del heterozygous with one of the following variants: P67L, R117C, L206W, R352Q, A455E, D579G, 711+3A→G, S945L, S977F, R1070W, D1152H, 2789+5G→A, 3272-26A→G, or 3849+10kbC→T (also R347H in Israel).

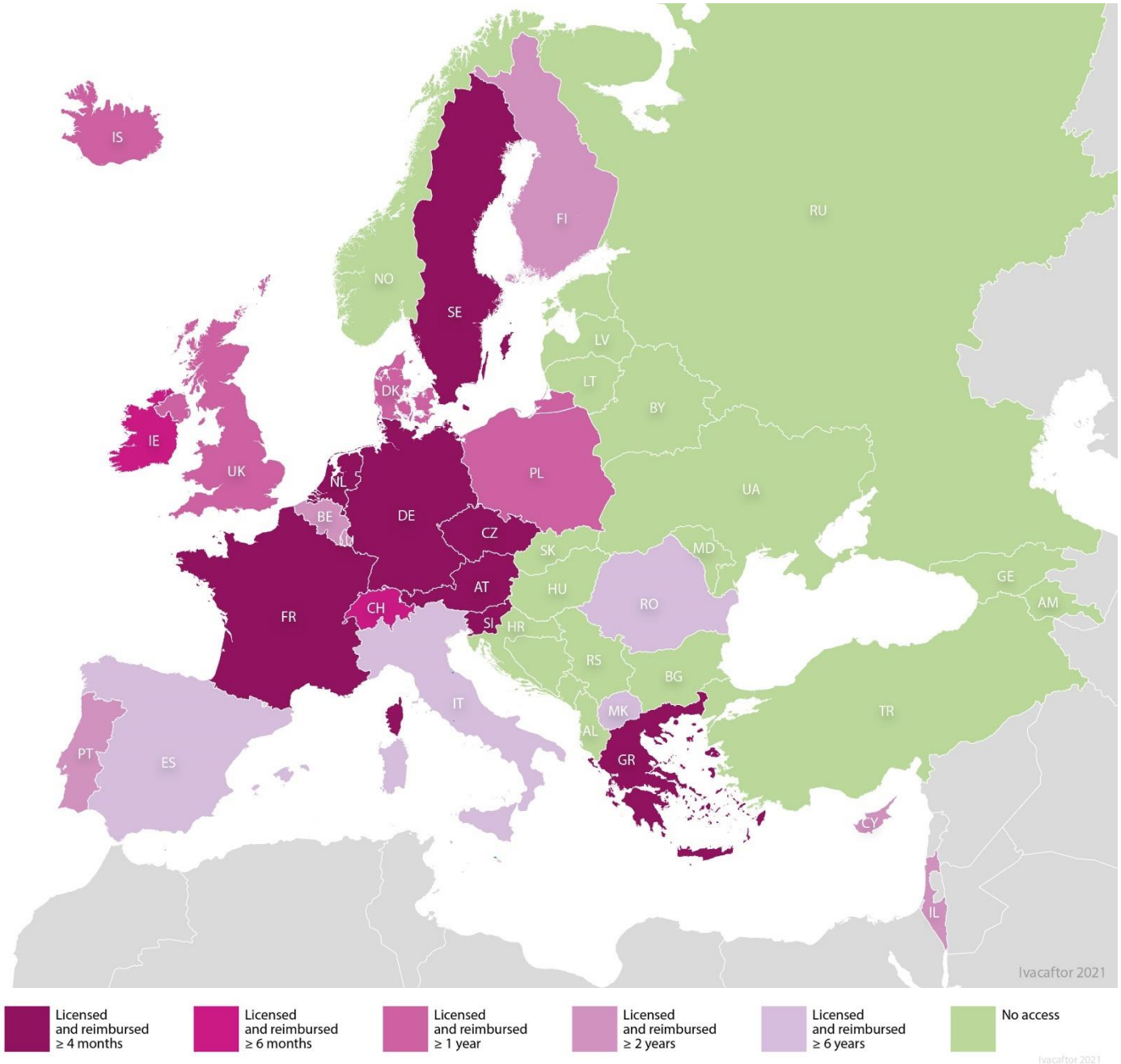
Elexacaftor/Tezacaftor/Ivacaftor:

The individual must be 12 years or older (no age limitation in Israel; up to 18 years in the Russian Federation) and is F508del homozygous or F508del heterozygous.

In countries where the therapy is licensed but not reimbursed, or not licensed nor reimbursed, eligible people may sometimes have access to the therapy because of a clinical trial or a compassionate use programme.

9. CFTR modulator therapies

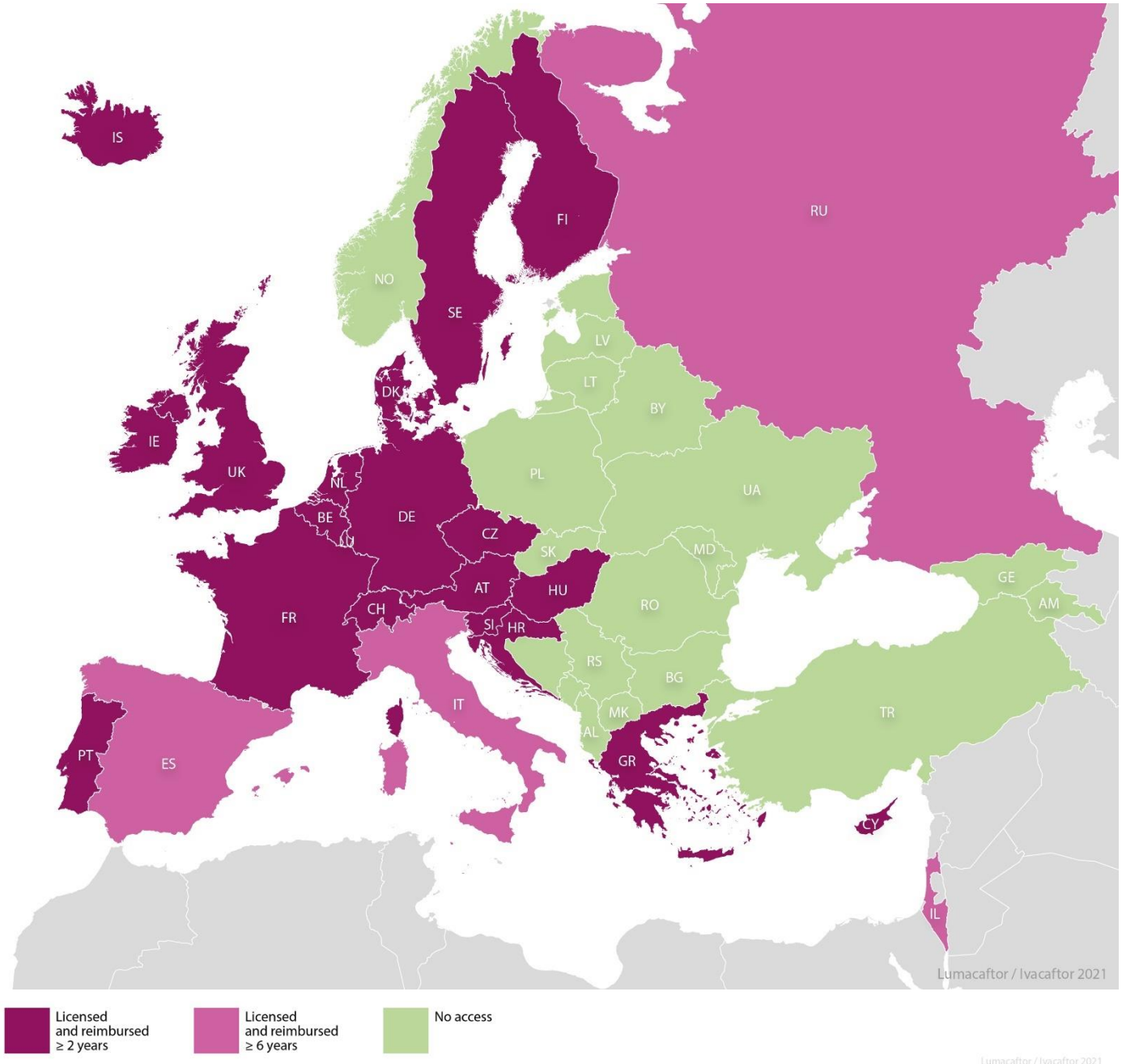
Figure 9.1 Countries where ivacaftor was licensed and reimbursed in 2021.



Note: Belgium: reimbursement only for people with two CF-causing variants or sweat chloride > 60mmol/L and with pulmonary or GI symptoms and/or growth deviation; excluded are people with R117H variant and people with a lung transplantation.
Israel: For people with the variant R117H there is no approval is required.
Sweden: no official reimbursement; the therapy is available through the healthcare system for people with the eligible CFTR variants (excluding R117H).
Switzerland and the United Kingdom: For people with the variant R117H it is reimbursed to people with CF if ≥ 18 years old.

9. CFTR modulator therapies

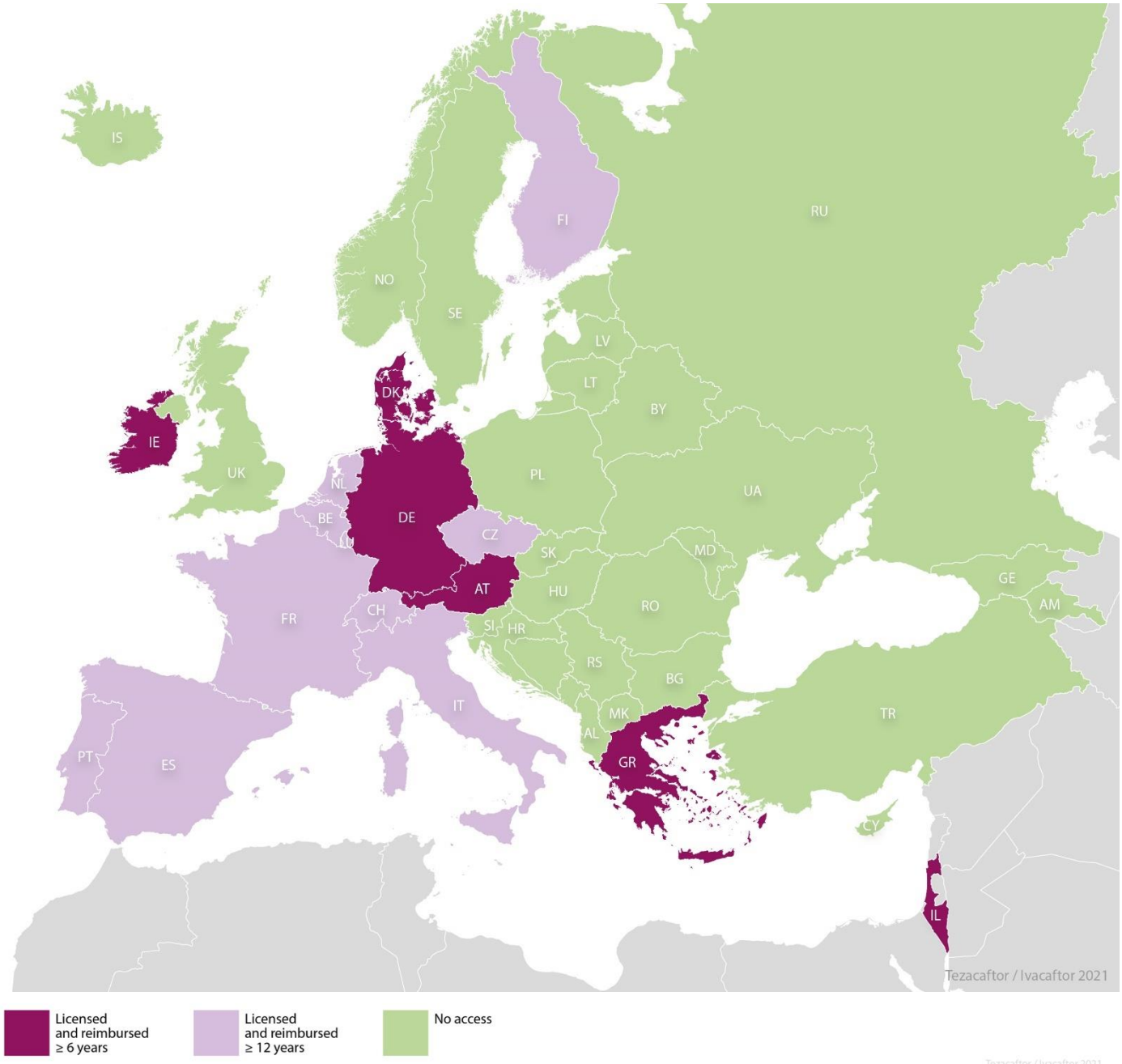
Figure 9.2 Countries where lumacaftor/ivacaftor was reimbursed in year 2021.



Note: Israel: reimbursement is for people with CF who are ≥6 years old.
The Russian Federation: reimbursement is for people with CF who are between 6 and 18 years old.

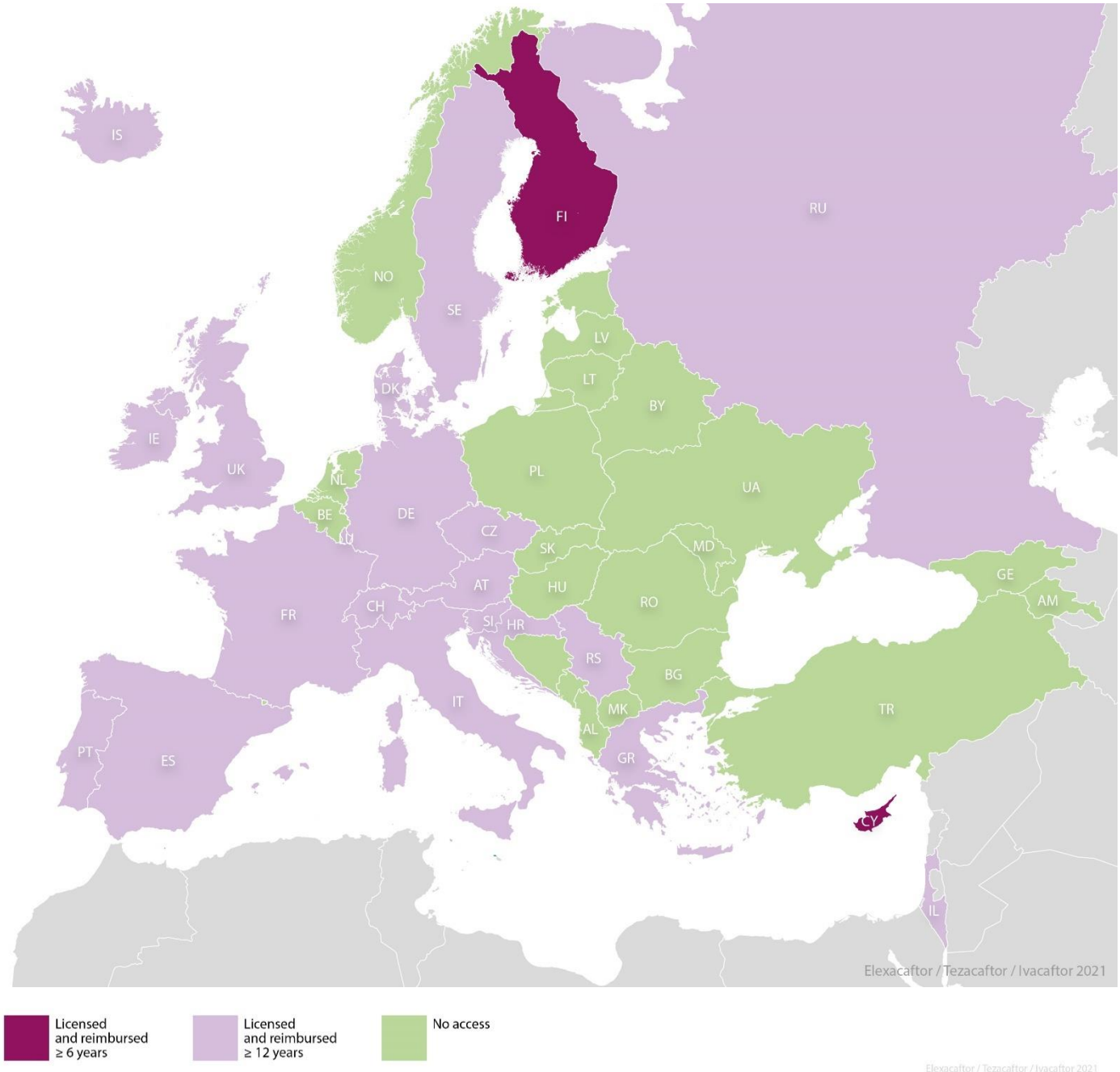
9. CFTR modulator therapies

Figure 9.3 Countries where tezacaftor/ivacaftor was reimbursed in year 2021.



9. CFTR modulator therapies

Figure 9.4 Countries where elexacaftor/tezacaftor/ivacaftor is licensed and reimbursed in year 2021.



Note: The Russian Federation: reimbursement is for people with CF who are between 6 and 18 years old.
Sweden: the therapy is available in compassionate use only.

9. CFTR modulator therapies

Table 9.1: People with CF by country and eligibility for at least one modulator, age and genotype. People with CF seen in 2021 who have never had a transplant.

		Not eligible								Eligible					
		F508del homozygote		F508del heterozygote		Not F508del		Genotyping not done		F508del homozygote		F508del heterozygote		Not F508del	
Country		N	%	N	%	N	%	N	%	N	%	N	%	N	%
Albania	0-1	3	60.0	0	0.0	0	0.0	2	40.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	3	27.3	1	9.1	2	18.2	5	45.5	0	0.0	0	0.0
	6-11	0	0.0	8	20.0	1	2.5	3	7.5	27	67.5	1	2.5	0	0.0
	12-17	0	0.0	0	0.0	3	12.5	0	0.0	17	70.8	3	12.5	1	4.2
	18+	0	0.0	0	0.0	0	0.0	0	0.0	2	50.0	2	50.0	0	0.0
Armenia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	1	25.0	3	75.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	10	90.9	0	0.0	1	9.1	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	7	100	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0
Austria	0-1	15	50.0	8	26.7	6	20.0	0	0.0	0	0.0	1	3.3	0	0.0
	2-5	0	0.0	22	27.5	11	13.8	0	0.0	36	45.0	6	7.5	5	6.3
	6-11	0	0.0	44	37.0	13	10.9	0	0.0	59	49.6	2	1.7	1	0.8
	12-17	0	0.0	0	0.0	27	17.7	0	0.0	71	46.4	55	36.0	0	0.0
	18+	0	0.0	0	0.0	45	11.7	0	0.0	197	51.0	140	36.3	4	1.0
Belarus	0-1	1	16.7	4	66.7	1	16.7	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	15	62.5	5	20.8	0	0.0	4	16.7	0	0.0	0	0.0
	6-11	0	0.0	31	49.2	11	17.5	0	0.0	21	33.3	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	15	29.4	0	0.0	16	31.4	20	39.2	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	1	33.3	2	66.7	0	0.0
Belgium	0-1	16	32.0	20	40.0	9	18.0	0	0.0	0	0.0	2	4.0	3	6.0
	2-5	0	0.0	28	31.8	14	15.9	0	0.0	42	47.7	3	3.4	1	1.1
	6-11	0	0.0	42	25.5	26	15.8	0	0.0	77	46.7	15	9.1	5	3.0
	12-17	0	0.0	0	0.0	27	16.7	0	0.0	69	42.6	66	40.7	0	0.0
	18+	0	0.0	0	0.0	94	13.2	0	0.0	293	41.3	315	44.4	8	1.1
Bulgaria	0-1	1	20.0	4	80.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	12	35.3	5	14.7	0	0.0	16	47.1	1	2.9	0	0.0
	6-11	0	0.0	18	42.9	1	2.4	0	0.0	20	47.6	2	4.8	1	2.4
	12-17	0	0.0	0	0.0	6	16.2	0	0.0	13	35.1	18	48.7	0	0.0
	18+	0	0.0	0	0.0	20	24.1	0	0.0	23	27.7	39	47.0	1	1.2
Croatia	0-1	2	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	6	25.0	2	8.3	0	0.0	16	66.7	0	0.0	0	0.0
	6-11	0	0.0	5	23.8	0	0.0	0	0.0	14	66.7	2	9.5	0	0.0
	12-17	0	0.0	0	0.0	1	2.9	0	0.0	16	47.1	17	50.0	0	0.0
	18+	0	0.0	0	0.0	1	2.0	0	0.0	36	73.5	12	24.5	0	0.0
Cyprus	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	1	50.0	0	0.0	1	50.0	0	0.0	0	0.0
	6-11	0	0.0	2	40.0	2	40.0	0	0.0	1	20.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	100	0	0.0
	18+	0	0.0	0	0.0	8	42.1	0	0.0	2	10.5	8	42.1	1	5.3
Czech Rep.	0-1	16	48.5	13	39.4	4	12.1	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	32	37.7	7	8.2	0	0.0	44	51.8	1	1.2	1	1.2
	6-11	0	0.0	41	41.0	12	12.0	0	0.0	42	42.0	3	3.0	2	2.0
	12-17	0	0.0	0	0.0	14	12.6	0	0.0	47	42.3	48	43.2	2	1.8
	18+	0	0.0	0	0.0	32	11.3	1	0.4	122	43.0	120	42.3	9	3.2
Denmark	0-1	22	68.8	10	31.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	12	21.4	3	5.4	0	0.0	38	67.9	3	5.4	0	0.0
	6-11	0	0.0	13	20.6	1	1.6	0	0.0	47	74.6	2	3.2	0	0.0
	12-17	0	0.0	0	0.0	2	2.9	0	0.0	46	67.7	20	29.4	0	0.0
	18+	0	0.0	0	0.0	8	2.8	0	0.0	194	68.8	79	28.0	1	0.4
Finland	0-1	0	0.0	1	50.0	1	50.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	1	20.0	0	0.0	4	80.0	0	0.0	0	0.0
	6-11	0	0.0	5	38.5	6	46.2	0	0.0	2	15.4	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	5	38.5	0	0.0	5	38.5	3	23.1	0	0.0
	18+	0	0.0	0	0.0	13	26.5	2	4.1	11	22.5	23	46.9	0	0.0
France	0-1	95	47.0	65	32.2	39	19.3	0	0.0	0	0.0	3	1.5	0	0.0
	2-5	0	0.0	192	37.0	78	15.0	0	0.0	239	46.1	6	1.2	4	0.8
	6-11	0	0.0	290	33.1	139	15.9	0	0.0	360	41.1	79	9.0	7	0.8

Country		Not eligible								Eligible					
		F508del homozygote		F508del heterozygote		Not F508del		Genotyping not done		F508del homozygote		F508del heterozygote		Not F508del	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
	12-17	0	0.0	0	0.0	141	13.1	0	0.0	474	44.1	442	41.1	18	1.7
	18+	0	0.0	0	0.0	544	15.5	0	0.0	1394	39.7	1514	43.1	64	1.8
Georgia	0-1	0	0.0	1	14.3	5	71.4	1	14.3	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	1	4.6	14	63.6	6	27.3	1	4.6	0	0.0	0	0.0
	6-11	0	0.0	2	5.9	31	91.2	1	2.9	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	13	76.5	2	11.8	0	0.0	2	11.8	0	0.0
	18+	0	0.0	0	0.0	6	75.0	1	12.5	0	0.0	1	12.5	0	0.0
Germany	0-1	105	45.5	83	35.9	32	13.9	8	3.5	0	0.0	1	0.4	2	0.9
	2-5	0	0.0	243	38.2	77	12.1	7	1.1	293	46.0	13	2.0	4	0.6
	6-11	0	0.0	328	34.9	116	12.4	1	0.1	439	46.8	42	4.5	13	1.4
	12-17	0	0.0	0	0.0	101	10.9	0	0.0	426	46.1	385	41.7	12	1.3
	18+	0	0.0	0	0.0	422	11.5	3	0.1	1724	47.1	1454	39.7	61	1.7
Greece	0-1	2	20.0	5	50.0	3	30.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	14	43.8	8	25.0	0	0.0	9	28.1	1	3.1	0	0.0
	6-11	0	0.0	22	30.1	14	19.2	0	0.0	32	43.8	5	6.9	0	0.0
	12-17	0	0.0	0	0.0	19	20.2	0	0.0	36	38.3	39	41.5	0	0.0
	18+	0	0.0	0	0.0	72	21.2	4	1.2	101	29.7	162	47.7	1	0.3
Hungary	0-1	3	33.3	4	44.4	2	22.2	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	10	27.8	6	16.7	0	0.0	20	55.6	0	0.0	0	0.0
	6-11	0	0.0	17	39.5	3	7.0	0	0.0	21	48.8	2	4.7	0	0.0
	12-17	0	0.0	0	0.0	12	25.5	0	0.0	16	34.0	19	40.4	0	0.0
	18+	0	0.0	0	0.0	26	15.7	0	0.0	55	33.1	85	51.2	0	0.0
Iceland	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	2	66.7	0	0.0	1	33.3	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	1	33.3	1	33.3	1	33.3
	18+	0	0.0	0	0.0	2	33.3	0	0.0	2	33.3	2	33.3	0	0.0
Ireland	0-1	5	26.3	5	26.3	1	5.3	0	0.0	0	0.0	6	31.6	2	10.5
	2-5	0	0.0	19	18.3	7	6.7	0	0.0	58	55.8	12	11.5	8	7.7
	6-11	0	0.0	39	20.1	7	3.6	0	0.0	112	57.7	26	13.4	10	5.2
	12-17	0	0.0	0	0.0	6	3.0	0	0.0	118	59.6	69	34.9	5	2.5
	18+	0	0.0	0	0.0	16	2.4	0	0.0	356	52.7	268	39.7	35	5.2
Israel	0-1	1	16.7	0	0.0	4	66.7	1	16.7	0	0.0	0	0.0	0	0.0
	2-5	1	7.7	3	23.1	8	61.5	1	7.7	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	8	13.8	35	60.3	0	0.0	5	8.6	10	17.2	0	0.0
	12-17	0	0.0	0	0.0	52	61.9	0	0.0	9	10.7	23	27.4	0	0.0
	18+	0	0.0	0	0.0	192	55.2	1	0.3	35	10.1	112	32.2	8	2.3
Italy	0-1	31	25.0	47	37.9	41	33.1	0	0.0	0	0.0	1	0.8	4	3.2
	2-5	0	0.0	222	47.4	137	29.3	0	0.0	89	19.0	7	1.5	13	2.8
	6-11	0	0.0	309	36.9	261	31.2	0	0.0	186	22.2	62	7.4	19	2.3
	12-17	0	0.0	0	0.0	242	30.8	1	0.1	165	21.0	361	45.9	17	2.2
	18+	0	0.0	0	0.0	1043	30.4	0	0.0	666	19.4	1656	48.2	72	2.1
Latvia	0-1	1	50.0	0	0.0	1	50.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	2	20.0	2	20.0	0	0.0	6	60.0	0	0.0	0	0.0
	6-11	0	0.0	1	10.0	2	20.0	0	0.0	6	60.0	1	10.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	6	66.7	3	33.3	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	9	64.3	5	35.7	0	0.0
Lithuania	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	5	71.4	0	0.0	0	0.0	2	28.6	0	0.0	0	0.0
	6-11	0	0.0	1	50.0	0	0.0	0	0.0	1	50.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	3	50.0	0	0.0	1	16.7	2	33.3	0	0.0
	18+	0	0.0	0	0.0	4	16.0	0	0.0	9	36.0	12	48.0	0	0.0
Luxemburg	0-1	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	4	50.0	1	12.5	0	0.0	3	37.5	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	2	28.6	0	0.0	5	71.4	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	1	50.0	0	0.0	0	0.0	1	50.0	0	0.0
	18+	0	0.0	0	0.0	2	50.0	0	0.0	2	50.0	0	0.0	0	0.0
Moldova	0-1	1	33.3	0	0.0	2	66.7	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	2	28.6	0	0.0	5	71.4	0	0.0	0	0.0
	6-11	0	0.0	7	46.7	2	13.3	0	0.0	6	40.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	3	25.0	0	0.0	4	33.3	4	33.3	1	8.3
	18+	0	0.0	0	0.0	6	50.0	0	0.0	2	16.7	4	33.3	0	0.0
Netherlands	0-1	18	56.3	10	31.3	3	9.4	0	0.0	0	0.0	1	3.1	0	0.0

Country		Not eligible								Eligible					
		F508del homozygote		F508del heterozygote		Not F508del		Genotyping not done		F508del homozygote		F508del heterozygote		Not F508del	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
	2-5	0	0.0	30	24.8	12	9.9	0	0.0	76	62.8	2	1.7	1	0.8
	6-11	0	0.0	43	23.6	18	9.9	0	0.0	98	53.9	19	10.4	4	2.2
	12-17	0	0.0	0	0.0	14	6.9	0	0.0	133	65.2	55	27.0	2	1.0
	18+	0	0.0	0	0.0	76	8.2	1	0.1	487	52.7	353	38.2	7	0.8
N.Macedonia	0-1	4	50.0	4	50.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	9	32.1	3	10.7	0	0.0	15	53.6	1	3.6	0	0.0
	6-11	0	0.0	5	29.4	0	0.0	0	0.0	10	58.8	2	11.8	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	20	66.7	10	33.3	0	0.0
	18+	0	0.0	0	0.0	7	15.6	1	2.2	18	40.0	19	42.2	0	0.0
Norway	0-1	1	8.3	10	83.3	1	8.3	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	13	41.9	6	19.4	0	0.0	12	38.7	0	0.0	0	0.0
	6-11	0	0.0	12	30.0	10	25.0	0	0.0	12	30.0	6	15.0	0	0.0
	12-17	0	0.0	0	0.0	6	14.3	0	0.0	18	42.9	17	40.5	1	2.4
	18+	0	0.0	0	0.0	22	12.4	0	0.0	54	30.5	93	52.5	8	4.5
Poland	0-1	25	38.5	33	50.8	5	7.7	0	0.0	0	0.0	1	1.5	1	1.5
	2-5	0	0.0	82	41.2	32	16.1	0	0.0	82	41.2	3	1.5	0	0.0
	6-11	0	0.0	116	37.4	42	13.6	0	0.0	117	37.7	32	10.3	3	1.0
	12-17	0	0.0	0	0.0	38	13.3	0	0.0	121	42.5	126	44.2	0	0.0
	18+	0	0.0	0	0.0	65	15.4	1	0.2	185	43.7	171	40.4	1	0.2
Portugal	0-1	1	7.7	9	69.2	3	23.1	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	15	46.9	5	15.6	0	0.0	12	37.5	0	0.0	0	0.0
	6-11	0	0.0	14	22.2	8	12.7	0	0.0	41	65.1	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	11	18.3	0	0.0	35	58.3	14	23.3	0	0.0
	18+	0	0.0	0	0.0	31	19.3	0	0.0	63	39.1	65	40.4	2	1.2
Romania	0-1	7	58.3	5	41.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	27	45.0	5	8.3	1	1.7	27	45.0	0	0.0	0	0.0
	6-11	0	0.0	32	38.6	12	14.5	0	0.0	37	44.6	1	1.2	1	1.2
	12-17	0	0.0	0	0.0	11	13.3	0	0.0	38	45.8	34	41.0	0	0.0
	18+	0	0.0	0	0.0	2	20.0	0	0.0	3	30.0	5	50.0	0	0.0
Russian Fed.	0-1	45	24.9	66	36.5	46	25.4	24	13.3	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	164	37.6	108	24.8	25	5.7	139	31.9	0	0.0	0	0.0
	6-11	0	0.0	358	44.9	174	21.8	25	3.1	240	30.1	0	0.0	0	0.0
	12-17	0	0.0	0	0	121	19.5	13	2.1	207	33.4	279	45.0	0	0.0
	18+	0	0.0	0	0	120	25.0	32	6.7	105	21.8	224	46.6	0	0.0
Serbia	0-1	7	46.7	8	53.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	15	41.7	2	5.6	0	0.0	19	52.8	0	0.0	0	0.0
	6-11	0	0.0	11	31.4	3	8.6	0	0.0	20	57.1	1	2.9	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	1	2.4	24	58.5	16	39.0	0	0.0
	18+	0	0.0	0	0.0	8	12.3	2	3.1	37	56.9	18	27.7	0	0.0
Slovak Rep.	0-1	4	50.0	4	50.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	4	18.2	5	22.7	0	0.0	12	54.6	1	4.6	0	0.0
	6-11	0	0.0	14	27.5	10	19.6	0	0.0	21	41.2	6	11.8	0	0.0
	12-17	0	0.0	0	0.0	8	20.5	0	0.0	15	38.5	14	35.9	2	5.1
	18+	0	0.0	0	0.0	26	18.7	0	0.0	48	34.5	60	43.2	5	3.6
Slovenia	0-1	1	50.0	1	50.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	2	22.2	0	0.0	0	0.0	7	77.8	0	0.0	0	0.0
	6-11	0	0.0	7	24.1	1	3.5	0	0.0	21	72.4	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	3	21.4	0	0.0	8	57.1	3	21.4	0	0.0
	18+	0	0.0	0	0.0	7	16.7	1	2.4	20	47.6	14	33.3	0	0.0
Spain	0-1	18	22.8	36	45.6	23	29.1	0	0.0	0	0.0	1	1.3	1	1.3
	2-5	0	0.0	95	46.3	53	25.9	0	0.0	52	25.4	2	1.0	3	1.5
	6-11	0	0.0	174	43.5	97	24.3	0	0.0	99	24.8	29	7.3	1	0.3
	12-17	0	0.0	0	0.0	76	19.5	0	0.0	131	33.7	179	46.0	3	0.8
	18+	0	0.0	0	0.0	291	26.1	0	0.0	267	24.0	538	48.3	18	1.6
Sweden	0-1	6	46.2	2	15.4	5	38.5	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	11	18.6	11	18.6	0	0.0	37	62.7	0	0.0	0	0.0
	6-11	0	0.0	29	34.1	7	8.2	0	0.0	44	51.8	4	4.7	1	1.2
	12-17	0	0.0	0	0.0	15	13.6	0	0.0	51	46.4	41	37.3	3	2.7
	18+	0	0.0	0	0.0	45	12.1	0	0.0	161	43.2	159	42.6	8	2.1
Switzerland	0-1	9	28.1	19	59.4	3	9.4	0	0.0	0	0.0	1	3.1	0	0.0
	2-5	0	0.0	32	35.6	17	18.9	0	0.0	41	45.6	0	0.0	0	0.0
	6-11	0	0.0	68	41.0	27	16.3	0	0.0	69	41.6	2	1.2	0	0.0
	12-17	0	0.0	0	0.0	12	9.0	0	0.0	57	42.9	63	47.4	1	0.8

Country		Not eligible								Eligible					
		F508del homozygote		F508del heterozygote		Not F508del		Genotyping not done		F508del homozygote		F508del heterozygote		Not F508del	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
	18+	0	0.0	0	0.0	79	14.8	0	0.0	248	46.4	203	38.0	4	0.8
Turkey	0-1	19	8.4	32	14.2	150	66.4	22	9.7	0	0.0	0	0.0	3	1.3
	2-5	0	0.0	84	15.0	375	66.8	22	3.9	70	12.5	4	0.7	6	1.1
	6-11	0	0.0	99	13.9	482	67.7	19	2.7	94	13.2	9	1.3	9	1.3
	12-17	0	0.0	0	0.0	342	67.7	17	3.4	61	12.1	82	16.2	3	0.6
	18+	0	0.0	0	0.0	223	63.9	9	2.6	40	11.5	72	20.6	5	1.4
Ukraine	0-1	5	45.5	5	45.5	1	9.1	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	12	30.8	3	7.7	0	0.0	24	61.5	0	0.0	0	0.0
	6-11	0	0.0	35	56.5	9	14.5	0	0.0	17	27.4	1	1.6	0	0.0
	12-17	0	0.0	0	0.0	4	7.7	0	0.0	20	38.5	28	53.9	0	0.0
	18+	0	0.0	0	0.0	8	16.3	0	0.0	12	24.5	29	59.2	0	0.0
United Kingdom	0-1	84	42.4	58	29.3	18	9.1	6	3.0	0	0.0	26	13.1	6	3.0
	2-5	0	0.0	294	32.1	58	6.3	10	1.1	438	47.8	97	10.6	20	2.2
	6-11	0	0.0	433	26.4	99	6.0	6	0.4	809	49.3	257	15.7	36	2.2
	12-17	0	0.0	0	0.0	127	8.8	1	0.1	740	51.0	538	37.1	44	3.0
	18+	0	0.0	0	0.0	436	7.8	7	0.1	2621	46.6	2387	42.4	177	3.1

9. CFTR modulator therapies

Table 9.2: F508del homozygote people with CF eligible for at least one modulator by country, by age and last CFTR modulator prescribed. People with CF seen in 2021 who have never had a transplant.

Country		Missing/Unknown		No		Ivacaftor		Lumacaftor/Ivacaftor		Tezacaftor/Ivacaftor		Elexacaftor/Tezacaftor/Ivacaftor		Other CFTR modulator	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
Albania	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	5	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	27	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	17	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Armenia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Austria	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	17	47.2	0	0.0	19	52.8	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	27	45.8	0	0.0	27	45.8	5	8.5	0	0.0	0	0.0
	12-17	0	0.0	17	23.9	0	0.0	9	12.7	6	8.5	39	54.9	0	0.0
	18+	0	0.0	57	28.9	0	0.0	19	9.6	17	8.6	104	52.8	0	0.0
Belarus	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	4	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	21	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	16	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Belgium	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	8	19.1	0	0.0	34	81.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	10	13.0	0	0.0	65	84.4	2	2.6	0	0.0	0	0.0
	12-17	0	0.0	7	10.1	0	0.0	2	2.9	58	84.1	2	2.9	0	0.0
	18+	0	0.0	12	4.1	0	0.0	5	1.7	185	63.1	91	31.1	0	0.0
Bulgaria	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	12	75.0	0	0.0	4	25.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	13	65.0	0	0.0	7	35.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	8	61.5	0	0.0	5	38.5	0	0.0	0	0.0	0	0.0
	18+	0	0.0	22	95.7	0	0.0	0	0.0	0	0.0	1	4.4	0	0.0
Croatia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	16	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	13	92.9	0	0.0	1	7.1	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	13	81.3	0	0.0	0	0.0	0	0.0	3	18.8	0	0.0
	18+	0	0.0	29	80.6	0	0.0	0	0.0	0	0.0	6	16.7	1	2.8
Cyprus	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	100	0	0.0
Czech Rep.	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	4	9.1	0	0.0	40	90.9	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	4	9.5	0	0.0	37	88.1	1	2.4	0	0.0	0	0.0
	12-17	0	0.0	2	4.3	0	0.0	5	10.6	2	4.3	38	80.9	0	0.0
	18+	0	0.0	28	23.0	0	0.0	5	4.1	1	0.8	88	72.1	0	0.0
Denmark	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	38	100	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	1	2.1	0	0.0	40	85.1	0	0.0	6	12.8	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	1	2.2	0	0.0	45	97.8	0	0.0
	18+	0	0.0	6	3.1	0	0.0	0	0.0	1	0.5	187	96.4	0	0.0
Finland	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	4	100	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	2	100	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	5	100	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	11	100	0	0.0

Country		Missing/Unknown		No		Ivacaftor		Lumacaftor/Ivacaftor		Tezacaftor/Ivacaftor		Elexacaftor/Tezacaftor/Ivacaftor		Other CFTR modulator	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
France	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	30	12.6	0	0.0	0	0.0	209	87.5	0	0.0	0	0.0	0	0.0
	6-11	27	7.5	0	0.0	0	0.0	329	91.4	1	0.3	3	0.8	0	0.0
	12-17	25	5.3	0	0.0	0	0.0	79	16.7	0	0.0	370	78.1	0	0.0
	18+	190	13.6	0	0.0	0	0.0	69	5.0	1	0.1	1134	81.4	0	0.0
Georgia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Germany	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	120	41.0	0	0.0	173	59.0	0	0.0	0	0.0	0	0.0
	6-11	1	0.2	135	30.8	1	0.2	267	60.8	26	5.9	9	2.1	0	0.0
	12-17	1	0.2	78	18.3	0	0.0	27	6.3	9	2.1	309	72.5	2	0.5
	18+	4	0.2	191	11.1	2	0.1	38	2.2	53	3.1	1435	83.2	1	0.1
Greece	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	2	22.2	0	0.0	7	77.8	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	6	18.8	0	0.0	25	78.1	1	3.1	0	0.0	0	0.0
	12-17	0	0.0	3	8.3	0	0.0	29	80.6	0	0.0	4	11.1	0	0.0
	18+	2	2.0	9	8.9	0	0.0	28	27.7	8	7.9	54	53.5	0	0.0
Hungary	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	13	65.0	0	0.0	7	35.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	17	81.0	0	0.0	4	19.1	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	10	62.5	0	0.0	6	37.5	0	0.0	0	0.0	0	0.0
	18+	0	0.0	37	67.3	0	0.0	18	32.7	0	0.0	0	0.0	0	0.0
Iceland	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	100	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	100	0	0.0
Ireland	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	6	10.3	0	0.0	52	89.7	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	3	2.7	1	0.9	102	91.1	4	3.6	2	1.8	0	0.0
	12-17	0	0.0	3	2.5	0	0.0	6	5.1	0	0.0	109	92.4	0	0.0
	18+	0	0.0	12	3.4	0	0.0	10	2.8	14	3.9	320	89.9	0	0.0
Israel	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	2	40.0	0	0.0	3	60.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	9	100	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	35	100	0	0.0
Italy	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	70	78.7	0	0.0	18	20.2	0	0.0	1	1.1	0	0.0
	6-11	0	0.0	89	47.9	1	0.5	92	49.5	1	0.5	3	1.6	0	0.0
	12-17	0	0.0	32	19.4	0	0.0	65	39.4	1	0.6	67	40.6	0	0.0
	18+	0	0.0	62	9.3	1	0.2	182	27.3	14	2.1	407	61.1	0	0.0
Latvia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	6	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	6	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	6	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	9	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Lithuania	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	9	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Luxemburg	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	3	100	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	5	100	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	1	50.0	0	0.0	0	0.0	0	0.0	1	50.0	0	0.0

Country		Missing/Unknown		No		Ivacaftor		Lumacaftor/Ivacaftor		Tezacaftor/Ivacaftor		Elexacaftor/Tezacaftor/Ivacaftor		Other CFTR modulator	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
Moldova	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	5	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	6	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	4	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Netherlands	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	5	6.6	0	0.0	71	93.4	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	4	4.1	0	0.0	94	95.9	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	9	6.8	0	0.0	36	27.1	83	62.4	5	3.8	0	0.0
	18+	1	0.2	84	17.3	0	0.0	118	24.2	226	46.4	58	11.9	0	0.0
N.Macedonia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	15	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	10	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	20	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	18	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Norway	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	12	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	11	91.7	0	0.0	1	8.3	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	13	72.2	0	0.0	5	27.8	0	0.0	0	0.0	0	0.0
	18+	0	0.0	28	51.9	0	0.0	25	46.3	0	0.0	1	1.9	0	0.0
Poland	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	79	96.3	0	0.0	3	3.7	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	110	94.0	0	0.0	7	6.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	112	92.6	0	0.0	3	2.5	1	0.8	5	4.1	0	0.0
	18+	2	1.1	160	86.5	0	0.0	4	2.2	0	0.0	19	10.3	0	0.0
Portugal	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	10	83.3	0	0.0	2	16.7	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	31	75.6	0	0.0	10	24.4	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	5	14.3	0	0.0	13	37.1	0	0.0	17	48.6	0	0.0
	18+	0	0.0	8	12.7	0	0.0	16	25.4	2	3.2	37	58.7	0	0.0
Romania	0-1														
	2-5	0	0.0	27	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	37	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	38	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	3	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Russian Fed.	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	1	0.7	137	98.6	1	0.7	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	208	86.7	1	0.4	30	12.5	1	0.4	0	0.0	0	0.0
	12-17	3	1.5	147	71.0	1	0.5	50	24.2	1	0.5	5	2.4	0	0.0
	18+	1	1.0	94	89.5	0	0.0	3	2.9	1	1.0	6	5.7	0	0.0
Serbia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	19	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	20	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	24	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	37	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Slovak Rep.	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	12	100	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	1	4.8	0	0.0	20	95.2	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	1	6.7	0	0.0	10	66.7	0	0.0	4	26.7	0	0.0
	18+	0	0.0	10	20.8	0	0.0	25	52.1	0	0.0	11	22.9	2	4.2
Slovenia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	6	85.7	0	0.0	1	14.3	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	17	81.0	0	0.0	0	0.0	0	0.0	4	19.1	0	0.0
	12-17	0	0.0	1	12.5	0	0.0	0	0.0	0	0.0	7	87.5	0	0.0
	18+	0	0.0	2	10.0	0	0.0	0	0.0	0	0.0	18	90.0	0	0.0

Country		Missing/Unknown		No		Ivacaftor		Lumacaftor/Ivacaftor		Tezacaftor/Ivacaftor		Elexacaftor/Tezacaftor/Ivacaftor		Other CFTR modulator	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
Spain	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	52	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	4	4.0	0	0.0	95	96.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	4	3.1	0	0.0	7	5.3	101	77.1	19	14.5	0	0.0
	18+	0	0.0	18	6.7	0	0.0	0	0.0	197	73.8	51	19.1	1	0.4
Sweden	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	4	10.8	0	0.0	33	89.2	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	5	11.4	0	0.0	39	88.6	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	1	2.0	0	0.0	48	94.1	0	0.0	2	3.9	0	0.0
	18+	0	0.0	26	16.2	0	0.0	108	67.1	10	6.2	17	10.6	0	0.0
Switzerland	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	31	75.6	0	0.0	10	24.4	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	34	49.3	0	0.0	29	42.0	4	5.8	2	2.9	0	0.0
	12-17	0	0.0	10	17.5	0	0.0	0	0.0	0	0.0	47	82.5	0	0.0
	18+	0	0.0	17	6.9	0	0.0	4	1.6	5	2.0	222	89.5	0	0.0
Turkey	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	68	97.1	0	0.0	2	2.9	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	91	96.8	0	0.0	0	0.0	3	3.2	0	0.0	0	0.0
	12-17	0	0.0	55	90.2	0	0.0	0	0.0	0	0.0	6	9.8	0	0.0
	18+	0	0.0	29	72.5	0	0.0	1	2.5	0	0.0	10	25.0	0	0.0
Ukraine	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	24	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	17	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	20	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	12	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
United Kingdom	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	72	16.4	0	0.0	366	83.6	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	42	5.2	0	0.0	534	66.0	227	28.1	6	0.7	0	0.0
	12-17	0	0.0	27	3.7	1	0.1	34	4.6	33	4.5	645	87.2	0	0.0
	18+	0	0.0	104	4.0	6	0.2	6	0.2	70	2.7	2435	92.9	0	0.0

9. CFTR modulator therapies

Table 9.3: F508del heterozygote people with CF eligible for at least one modulator by country, by age and last CFTR modulators prescribed. People with CF seen in 2021 who had never had a transplant.

		Missing/Unknown		No		Ivacaftor		Lumacaftor/Ivacaftor		Tezacaftor/Ivacaftor		Elexacaftor/Tezacaftor/Ivacaftor		Other CFTR modulator	
Country		N	%	N	%	N	%	N	%	N	%	N	%	N	%
Albania	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0	1	100	0	0	0	0	0	0	0	0	0	0
	12-17	0	0	3	100	0	0	0	0	0	0	0	0	0	0
	18+	0	0	2	100	0	0	0	0	0	0	0	0	0	0
Armenia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Austria	0-1	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	2	33.3	4	66.7	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	31	56.4	2	3.6	0	0.0	2	3.6	20	36.4	0	0.0
	18+	0	0.0	51	36.4	10	7.1	0	0.0	5	3.6	73	52.1	1	0.7
Belarus	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	20	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Belgium	0-1	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	3	100	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	11	73.3	4	26.7	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	44	66.7	6	9.1	0	0.0	9	13.6	7	10.6	0	0.0
	18+	0	0.0	169	53.7	26	8.3	0	0.0	55	17.5	65	20.6	0	0.0
Bulgaria	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	1	50.0	1	50.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	12	66.7	2	11.1	0	0.0	0	0.0	4	22.2	0	0.0
	18+	0	0.0	37	94.9	0	0.0	0	0.0	0	0.0	2	5.1	0	0.0
Croatia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	13	76.5	0	0.0	0	0.0	0	0.0	4	23.5	0	0.0
	18+	0	0.0	12	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cyprus	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	4	50.0	0	0.0	0	0.0	0	0.0	4	50.0	0	0.0
Czech Rep.	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	3	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	10	20.8	2	4.2	0	0.0	3	6.3	33	68.8	0	0.0
	18+	0	0.0	40	33.3	4	3.3	0	0.0	11	9.2	65	54.2	0	0.0
Denmark	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	3	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	1	50.0	0	0.0	0	0.0	1	50.0	0	0.0	0	0.0
	12-17	0	0.0	2	10.0	0	0.0	0	0.0	0	0.0	18	90.0	0	0.0
	18+	0	0.0	16	20.3	0	0.0	0	0.0	0	0.0	63	79.8	0	0.0
Finland	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	100	0	0.0
	18+	0	0.0	5	21.7	0	0.0	0	0.0	5	21.7	13	56.5	0	0.0
France	0-1	1	33.3	0	0.0	2	66.7	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	1	16.7	0	0.0	5	83.3	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	63	79.8	0	0.0	15	19.0	0	0.0	1	1.3	0	0.0	0	0.0

Country		Missing/Unknown		No		Ivacaftor		Lumacaftor/Ivacaftor		Tezacaftor/Ivacaftor		Elexacaftor/Tezacaftor/Ivacaftor		Other CFTR modulator	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
	12-17	160	36.2	0	0.0	23	5.2	0	0.0	17	3.9	242	54.8	0	0.0
	18+	525	34.7	0	0.0	47	3.1	0	0.0	153	10.1	789	52.1	0	0.0
Georgia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Germany	0-1	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	2	15.4	11	84.6	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	15	35.7	21	50.0	0	0.0	5	11.9	1	2.4	0	0.0
	12-17	2	0.5	82	21.3	20	5.2	0	0.0	10	2.6	270	70.1	1	0.3
	18+	9	0.6	257	17.7	56	3.9	0	0.0	45	3.1	1084	74.6	3	0.2
Greece	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	3	60.0	2	40.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	19	48.7	0	0.0	0	0.0	2	5.1	18	46.2	0	0.0
	18+	0	0.0	53	32.7	1	0.6	0	0.0	14	8.6	94	58.0	0	0.0
Hungary	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	16	84.2	0	0.0	3	15.8	0	0.0	0	0.0	0	0.0
	18+	0	0.0	66	77.7	0	0.0	19	22.4	0	0.0	0	0.0	0	0.0
Iceland	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	100	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	100	0	0.0
Ireland	0-1	0	0.0	4	66.7	2	33.3	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	4	33.3	8	66.7	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	3	11.5	21	80.8	0	0.0	2	7.7	0	0.0	0	0.0
	12-17	0	0.0	6	8.7	18	26.1	0	0.0	2	2.9	43	62.3	0	0.0
	18+	0	0.0	54	20.2	74	27.6	0	0.0	7	2.6	133	49.6	0	0.0
Israel	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	3	30.0	0	0.0	0	0.0	1	10.0	6	60.0	0	0.0
	12-17	0	0.0	4	17.4	0	0.0	0	0.0	1	4.4	18	78.3	0	0.0
	18+	1	0.9	11	9.8	0	0.0	0	0.0	3	2.7	97	86.6	0	0.0
Italy	0-1	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	2	28.6	5	71.4	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	47	75.8	15	24.2	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	1	0.3	200	55.4	14	3.9	0	0.0	7	1.9	139	38.5	0	0.0
	18+	1	0.1	822	49.6	64	3.9	0	0.0	93	5.6	676	40.8	0	0.0
Latvia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	3	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	5	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Lithuania	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	12	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Luxemburg	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	100	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Moldova	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	4	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	4	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Netherlands	0-1	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

Country		Missing/Unknown		No		Ivacaftor		Lumacaftor/Ivacaftor		Tezacaftor/Ivacaftor		Elexacaftor/Tezacaftor/Ivacaftor		Other CFTR modulator	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
	2-5	0	0.0	1	50.0	1	50.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	16	84.2	2	10.5	0	0.0	1	5.3	0	0.0	0	0.0
	12-17	0	0.0	35	63.6	4	7.3	1	1.8	6	10.9	9	16.4	0	0.0
	18+	0	0.0	179	50.7	32	9.1	6	1.7	79	22.4	57	16.2	0	0.0
N.Macedonia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	9	90.0	1	10.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	17	89.5	2	10.5	0	0.0	0	0.0	0	0.0	0	0.0
Norway	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	5	83.3	1	16.7	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	14	82.4	2	11.8	0	0.0	0	0.0	1	5.9	0	0.0
	18+	1	1.1	86	92.5	6	6.5	0	0.0	0	0.0	0	0.0	0	0.0
Poland	0-1	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	3	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	32	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	1	0.8	121	96.0	0	0.0	0	0.0	0	0.0	4	3.2	0	0.0
	18+	2	1.2	144	84.2	2	1.2	0	0.0	1	0.6	22	12.9	0	0.0
Portugal	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	6	42.9	0	0.0	0	0.0	0	0.0	8	57.1	0	0.0
	18+	0	0.0	45	69.2	0	0.0	0	0.0	0	0.0	20	30.8	0	0.0
Romania	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	32	94.1	1	2.9	0	0.0	0	0.0	1	2.9	0	0.0
	18+	0	0.0	5	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Russian Fed.	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	3	1.1	216	77.4	0	0.0	0	0.0	1	0.4	59	21.2	0	0.0
	18+	0	0.0	210	93.8	4	1.8	2	0.9	1	0.5	7	3.1	0	0.0
Serbia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	16	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	18	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Slovak Republic	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	5	83.3	0	0.0	0	0.0	0	0.0	1	16.7	0	0.0
	12-17	0	0.0	8	57.1	0	0.0	0	0.0	0	0.0	6	42.9	0	0.0
	18+	0	0.0	49	81.7	0	0.0	0	0.0	1	1.7	10	16.7	0	0.0
Slovenia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	2	66.7	0	0.0	0	0.0	0	0.0	1	33.3	0	0.0
	18+	0	0.0	1	7.1	0	0.0	0	0.0	0	0.0	13	92.9	0	0.0
Spain	0-1	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	1	50.0	1	50.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	27	93.1	1	3.5	0	0.0	1	3.5	0	0.0	0	0.0
	12-17	0	0.0	124	69.3	1	0.6	1	0.6	13	7.3	40	22.4	0	0.0
	18+	0	0.0	320	59.5	5	0.9	0	0.0	62	11.5	151	28.1	0	0.0
Sweden	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	3	75.0	1	25.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	39	95.1	1	2.4	0	0.0	0	0.0	1	2.4	0	0.0
	18+	0	0.0	131	82.4	1	0.6	0	0.0	0	0.0	27	17.0	0	0.0
Switzerland	0-1	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	6	9.5	4	6.4	0	0.0	2	3.2	51	81.0	0	0.0

Country		Missing/Unknown		No		Ivacaftor		Lumacaftor/Ivacaftor		Tezacaftor/Ivacaftor		Elexacaftor/Tezacaftor/Ivacaftor		Other CFTR modulator	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
	18+	0	0.0	52	25.6	9	4.4	0	0.0	1	0.5	141	69.5	0	0.0
Turkey	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	4	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	9	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	78	95.1	0	0.0	0	0.0	0	0.0	4	4.9	0	0.0
	18+	0	0.0	58	80.6	0	0.0	0	0.0	0	0.0	14	19.4	0	0.0
Ukraine	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	28	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	28	96.6	0	0.0	0	0.0	1	3.5	0	0.0	0	0.0
United Kingdom	0-1	0	0.0	12	46.2	14	53.9	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	44	45.4	50	51.6	2	2.1	0	0.0	1	1.0	0	0.0
	6-11	0	0.0	125	48.6	100	38.9	1	0.4	31	12.1	0	0.0	0	0.0
	12-17	0	0.0	117	21.8	59	11.0	1	0.2	23	4.3	338	62.8	0	0.0
	18+	0	0.0	371	15.5	210	8.8	1	0.0	128	5.4	1677	70.3	0	0.0

9. CFTR modulator therapies

Table 9.4: People with CF without F508del, eligible for at least one modulator by country, by age and last CFTR modulators prescribed. People with CF seen in 2021 who had never had a transplant.

Country		Missing/Unknown		No		Ivacaftor		Lumacaftor/Ivacaftor		Tezacaftor/Ivacaftor		Elexacaftor/Tezacaftor/Ivacaftor	
		N	%	N	%	N	%	N	%	N	%	N	%
Albania	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Armenia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Austria	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	2	40.0	3	60.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	1	25.0	3	75.0	0	0.0	0	0.0	0	0.0
Belarus	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Belgium	0-1	0	0.0	3	100	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	2	40.0	3	60.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	4	50.0	4	50.0	0	0.0	0	0.0	0	0.0
Bulgaria	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0
Croatia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cyprus	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0
Czech Rep.	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	2	100	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	2	100	0	0.0	0	0.0	0	0.0
	18+	0	0.0	1	11.1	8	88.9	0	0.0	0	0.0	0	0.0
Denmark	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0
Finland	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

Country		Missing/Unknown		No		Ivacaftor		Lumacaftor/Ivacaftor		Tezacaftor/Ivacaftor		Elexacaftor/Tezacaftor/Ivacaftor	
		N	%	N	%	N	%	N	%	N	%	N	%
France	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	4	100	0	0.0	0	0.0	0	0.0
	6-11	2	28.6	0	0.0	5	71.4	0	0.0	0	0.0	0	0.0
	12-17	9	50.0	0	0.0	9	50.0	0	0.0	0	0.0	0	0.0
	18+	23	35.9	0	0.0	40	62.5	0	0.0	0	0.0	1	1.6
Georgia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Germany	0-1	0	0.0	1	50.0	1	50.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	3	75.0	1	25.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	4	30.8	9	69.2	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	4	33.3	8	66.7	0	0.0	0	0.0	0	0.0
	18+	0	0.0	17	27.9	43	70.5	0	0.0	1	1.6	0	0.0
Greece	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0
Hungary	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Iceland	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Ireland	0-1	0	0.0	1	50.0	1	50.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	2	25.0	6	75.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	10	100	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	5	100	0	0.0	0	0.0	0	0.0
	18+	0	0.0	4	11.4	31	88.6	0	0.0	0	0.0	0	0.0
Israel	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	7	87.5	0	0.0	0	0.0	1	12.5
Italy	0-1	0	0.0	4	100	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	9	69.2	4	30.8	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	11	57.9	8	42.1	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	3	17.7	14	82.4	0	0.0	0	0.0	0	0.0
	18+	0	0.0	29	40.3	42	58.3	0	0.0	0	0.0	1	1.4
Latvia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Lithuania	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Luxemburg	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

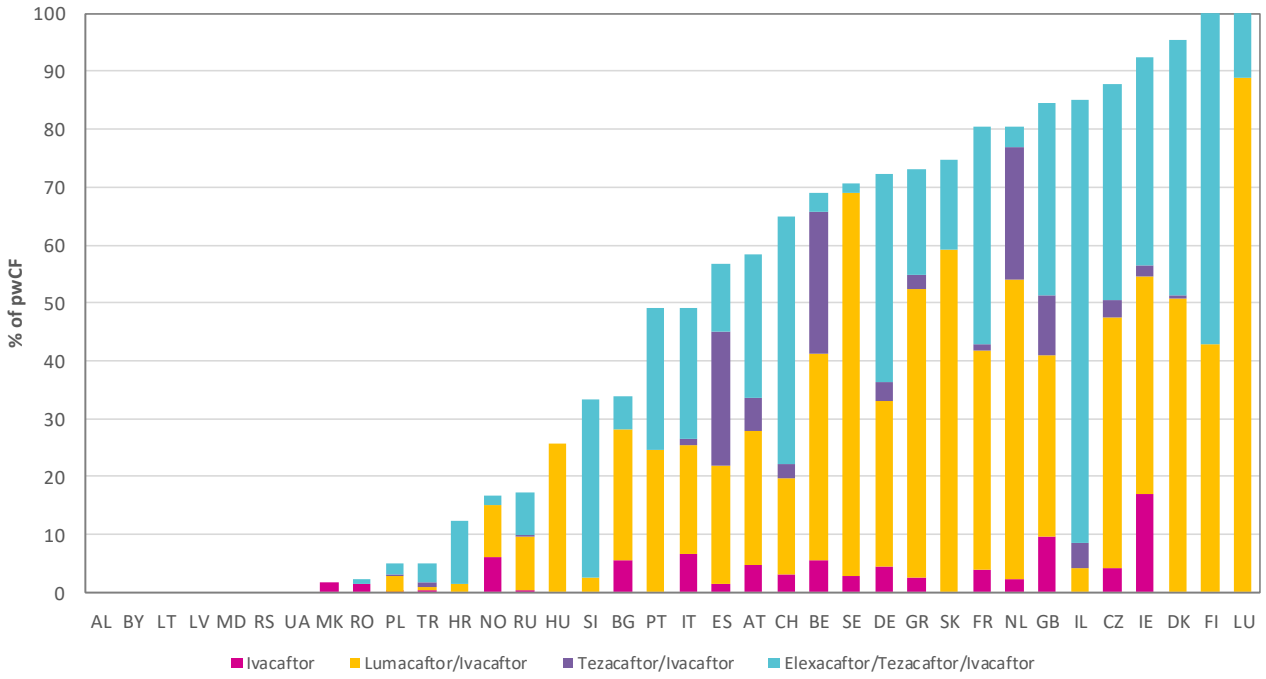
Country		Missing/Unknown		No		Ivacaftor		Lumacaftor/Ivacaftor		Tezacaftor/Ivacaftor		Elexacaftor/Tezacaftor/Ivacaftor	
		N	%	N	%	N	%	N	%	N	%	N	%
Moldova	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Netherlands	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	3	75.0	1	25.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0
	18+	1	14.3	3	42.9	3	42.9	0	0.0	0	0.0	0	0.0
N. Macedonia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Norway	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0
	18+	0	0.0	5	62.5	3	37.5	0	0.0	0	0.0	0	0.0
Poland	0-1	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	2	66.7	1	33.3	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0
Portugal	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	1	50.0	0	0.0	0	0.0	1	50.0
Romania	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Russian Fed.	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Serbia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Slovak Rep.	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	5	100	0	0.0	0	0.0	0	0.0	0	0.0
Slovenia	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

Country		Missing/Unknown		No		Ivacaftor		Lumacaftor/Ivacaftor		Tezacaftor/Ivacaftor		Elexacaftor/Tezacaftor/Ivacaftor	
		N	%	N	%	N	%	N	%	N	%	N	%
Spain	0-1	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	1	33.3	2	66.7	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	1	100	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	1	33.3	2	66.7	0	0.0	0	0.0	0	0.0
	18+	0	0.0	8	44.4	10	55.6	0	0.0	0	0.0	0	0.0
Sweden	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	1	33.3	2	66.7	0	0.0	0	0.0	0	0.0
	18+	0	0.0	5	62.5	3	37.5	0	0.0	0	0.0	0	0.0
Switzerland	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	1	100	0	0.0	0	0.0	0	0.0
	18+	0	0.0	2	50.0	2	50.0	0	0.0	0	0.0	0	0.0
Turkey	0-1	0	0.0	3	100	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	5	83.3	1	16.7	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	9	100	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	2	66.7	0	0.0	0	0.0	0	0.0	1	33.3
	18+	0	0.0	5	100	0	0.0	0	0.0	0	0.0	0	0.0
Ukraine	0-1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	6-11	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	18+	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
United Kingdom	0-1	0	0.0	4	66.7	2	33.3	0	0.0	0	0.0	0	0.0
	2-5	0	0.0	10	50.0	9	45.0	1	5.0	0	0.0	0	0.0
	6-11	0	0.0	6	16.7	30	83.3	0	0.0	0	0.0	0	0.0
	12-17	0	0.0	9	20.5	28	63.6	1	2.3	0	0.0	6	13.6
	18+	0	0.0	48	27.1	91	51.4	1	0.6	1	0.6	36	20.3

9. CFTR modulator therapies

Figure 9.5 *Lumacaftor/Ivacaftor is the predominant CFTR modulator in children, followed by the triple combination therapy.*

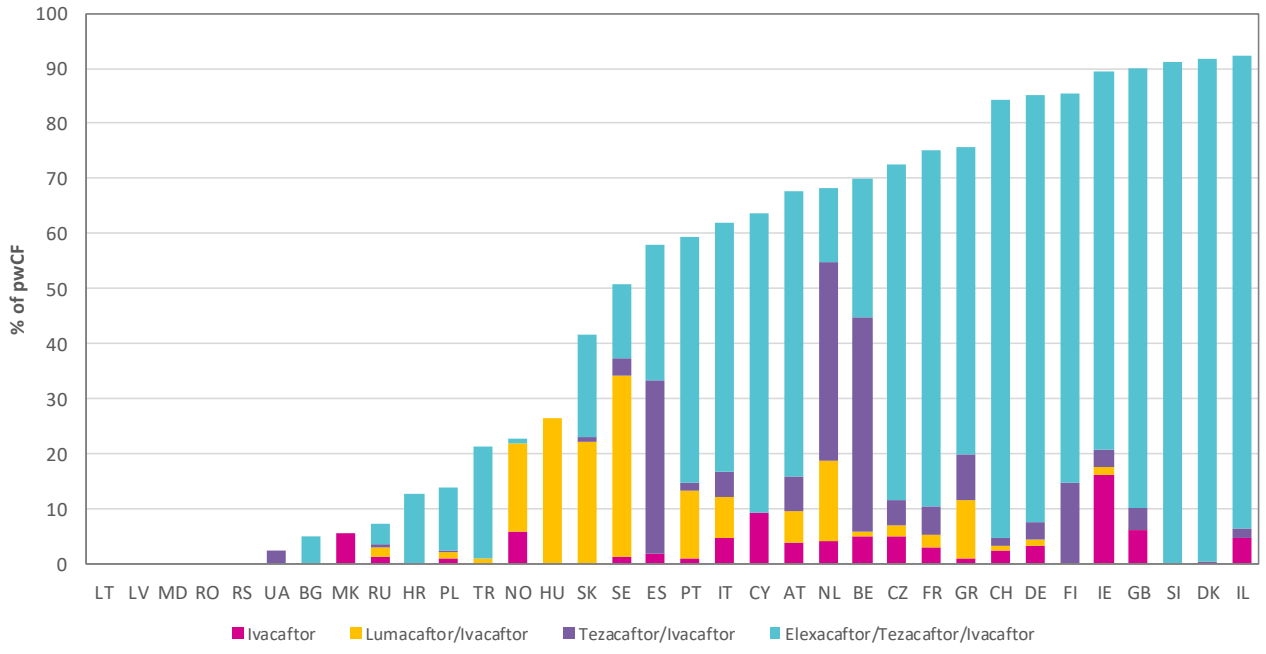
People with CF eligible for at least one modulator, by country and last CFTR modulator, children seen in 2021 who had never had a transplant.



Note: Albania, Armenia, Belarus, Georgia, Iceland and Luxembourg have <5 eligible adults seen in 2021 and are excluded from the graph.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

Figure 9.6 *In the majority of countries in Europe, more than 50% of all adults with CF are now eligible to receive a CFTR modulator treatment.*

People with CF eligible for at least one modulator, by country and last CFTR modulator, adults seen in 2021 who had never had a transplant.



Note: Albania, Armenia, Belarus, Georgia, Iceland and Luxembourg have <5 eligible adults seen in 2021 and are excluded from the graph.
Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

10. Transplantation

Despite the advent of highly effective CFTR modulators, lung transplant is still a realistic scenario for some people with CF. Availability of lung transplantation differs amongst the countries participating in the Registry and eligibility criteria also vary. The numbers presented in the tables and figures that follow should be considered an indication of accessibility to a regional or national lung transplantation programme rather than a reflection of the standards of patient care and health status of the people with CF in a specific country.

The same applies to liver transplant, the second most common organ that is transplanted in CF. In this chapter, we also give information on kidney transplant and other (unspecified) organ transplant.

We asked if people have had a transplant or not and, if they are, the year of their (latest) transplant. In some countries people who've had a transplant are no longer registered in the CF centres or the national CF registry because they have transferred to a transplant centre. For this reason, the figures may report a lower number than the reality, but it was not possible to acquire more accurate data.

10. Transplantation

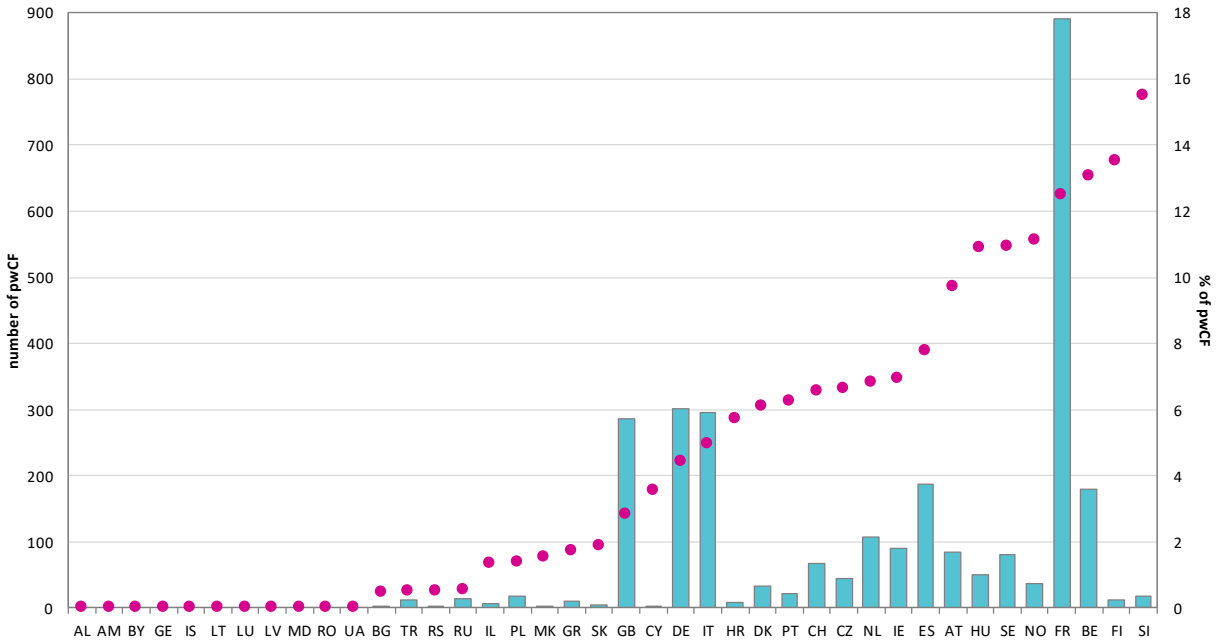
Table 10.1 Number of people with CF alive in 2021 with transplanted lung(s), by age and sex.

Age	Males	Females	Total	Transplants carried out in 2021
0-5	0	0	0	0
6-11	1	5	6	1
12-17	17	17	34	4
18-29	242	354	596	44
30-39	534	518	1052	20
40-49	400	407	807	10
50-59	180	133	313	4
60+	32	29	61	1
Total	1406	1463	2869	84

This table shows the number of people with CF alive in 2021 who have had one or more lung transplant(s) at some time in their life, by age group, as well as the number of people transplanted during 2021.

Figure 10.1 The number and proportion of people with CF living with a lung transplant is extremely heterogenous across Europe.

Number of people with CF living in 2021 with transplanted lungs, by country.



Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the number of people with CF alive at 31/12/2021 who have had a lung transplant (light turquoise bars) at some point in their life. The pink dots (right axis) show the percentage of people that are living with transplanted lung in 2021 out of all people with CF that were seen in 2021.

10. Transplantation

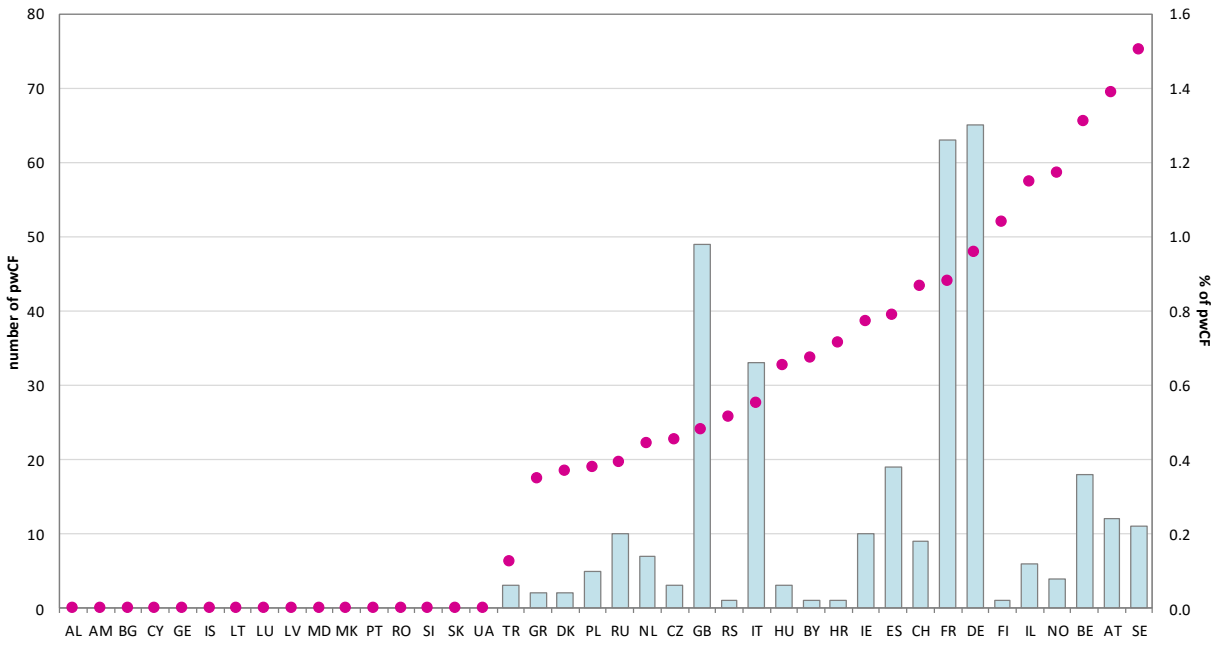
Table 10.2 Number of people with CF living in 2021 with transplanted liver, by age and sex.

Age	Males	Females	Total	Transplants carried out in 2021
0-5	3	0	3	1
6-11	5	0	5	0
12-17	26	15	41	6
18-29	92	44	136	4
30-39	64	31	95	0
40-49	32	14	46	1
50-59	8	4	12	0
60+	0	0	0	0
Total	230	108	338	12

This table shows the number of people with CF alive in 2021 who have had a liver transplant at some time in their life, by age group, as well as the number of people transplanted during 2021.

Figure 10.2 The number and proportion of people with CF living with a liver transplant is extremely heterogenous throughout Europe.

Number of people with CF living in 2020 with transplanted liver, by country.



Note: United Kingdom: In the graphs of this report, we use GB as abbreviation for the United Kingdom of United Kingdom and Northern Ireland.

This graph shows the number of people with CF alive at 31/12/2021 who have had a liver transplant (light turquoise bars) at some point in their life. The pink dots (right axis) show the percentage of people that are living with transplanted liver in 2021 out of all people with CF that were seen in 2021. Note that on the left vertical axis the number of people who had a liver transplant is much lower than the number of lung transplanted people. The main reason for this is that liver disease is only found in a subset of people with CF, whereas lung disease affects almost all people with CF.

10. Transplantation

Table 10.3 Number of people with CF living in 2021 with transplanted kidney, by age and sex.

Age	Males	Females	Total	Transplants carried out in 2021
0-5	0	0	0	0
6-11	0	0	0	0
12-17	1	0	1	0
18-29	9	4	13	2
30-39	24	39	63	7
40-49	36	39	75	9
50-59	17	16	33	3
60+	5	2	7	1
Total	92	100	192	22

Note: Hungary does not collect information on kidney transplant.

This table shows the number of people with CF alive in 2021 who have had a kidney transplant at some time in their life, by age group, as well as the number of people transplanted during 2021.

Table 10.4 Number of people with CF living in 2021 with other transplanted organs (not lung, liver, kidney), by age and sex.

Age	Males	Females	Total	Transplants carried out in 2021
0-5	0	1	1	0
6-11	0	0	0	0
12-17	2	2	2	2
18-29	10	8	10	1
30-39	8	10	8	0
40-49	9	10	9	0
50-59	5	4	5	0
60+	1	0	1	0
Total	35	35	35	3

This table shows the number of people with CF alive in 2021 who have had an organ transplant that is not lung, liver or kidney at some time in their life, by age group, as well as the number of people transplanted during 2021.

11. Mortality

Information on mortality and survival in the era of highly effective CFTR modulators is currently a major area of focus in CF. Although we can speculate that these drugs willincrease life expectancy in people with CF, the effects can only be monitored in the long-term. In this chapter we present the number of deaths per age group, divided by females and males. Respiratory disease remains the predominant cause of death.

We do not present data on survival prediction in this report since mortality data are heterogenous and may be incomplete in the participating countries. However, information on survival is collected and reported on by selected National Registries and we refer you to their country-specific annual reports for further reading.

11. Mortality

Table 11.1 Number of deaths in 2021, by age and sex.

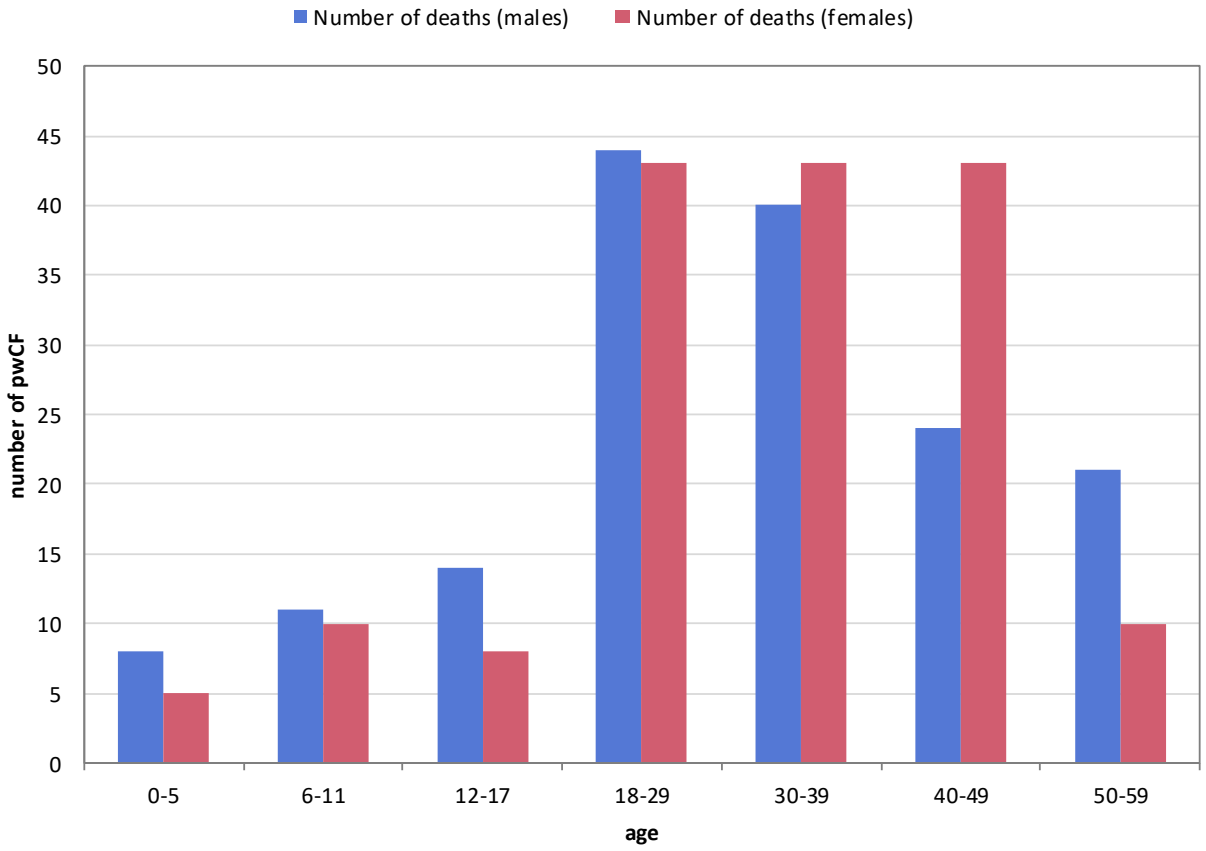
Age at death	Number of male pwCF	% of deaths in this age group (of all male deaths)	Number of female pwCF	% of deaths in this age group (of all female deaths)	Total	% Total
0-5	8	4.7	5	2.9	13	3.8
6-11	11	6.4	10	5.7	21	6.1
12-17	14	8.2	8	4.6	22	6.4
18-29	44	25.7	43	24.6	87	25.1
30-39	40	23.4	43	24.6	83	24.0
40-49	24	14.0	43	24.6	67	19.4
50-59	21	12.3	10	5.7	31	9.0
60+	9	5.3	13	7.4	22	6.4
Total	171	0.6	175	0.7	346	0.7

Note: For the United Kingdom, all people with a confirmed diagnosis of CF were included (N=10,907). The total number of the CF population presented is 51,901.

This table shows the number of deaths in 2021 by age group and sex. Death in small children is very rare, and the most frequent range of age at death for both sexes is 21-30 years. It is possible that the numbers are under reported because some of the people who died may not have been seen at the centre during the year, and therefore the information may not have been recorded.

Figure 11.1 Most of the deaths occur between the third and the fifth decade of life in people with CF in Europe.

Age at death distribution of people with CF deceased in 2021, by sex.



This graph shows the distribution of age at death of people with CF who died in 2021, separated by males (blue) and females (red).

11. Mortality

Table 11.2 Cause of death distribution of deaths in 2021.

Cause of death in 2021	Number of deaths	Percentage of all deaths
Respiratory	162	46.8
Non-CF related	50	14.4
Transplantation	48	13.9
Unknown	27	7.8
Other CF related	24	6.9
Cancer	17	4.9
Liver-GI	12	3.5
Suicide	5	1.4
Trauma	1	0.3
Total	346	

Note: For the United Kingdom, all individuals with a confirmed diagnosis of CF were included (N=10,907). The total number of people presented is 51,901.
Note: Germany and the United Kingdom record Cause of death as "cardio/respiratory".
The Netherlands does not record "Cancer" and "Other-CF related" as cause of death.

The table shows cause of death for the people with CF who died in 2021. The most frequent cause of death was respiratory disease.

12. Longitudinal data

Longitudinal data analysis is the key to gaining insight into clinical trends over the years and, for the first time, we included in this report longitudinal data on disease outcomes and drug utilisation that are of major clinical interest. We present graphs with data over time on demographics, newborn screening, lung function, BMI, *Pseudomonas aeruginosa* infection, medications used in the treatment of lung disease, as well as the CFTR modulators.

Each of the graphs contains cross sectional data per year between 2008 and 2021 of people with a confirmed CF diagnosis. All people with CF alive, deceased, or not seen during the year of follow-up were included. Exclusion criteria were people who were lost to follow-up, and transplanted individuals (lung and/or liver). Also, people with missing values are excluded when computing the yearly prevalence for each variable.

For the information on the proportion of children diagnosed with CF by newborn screening, only children are selected that were aged 5 years or younger at the beginning of the year of follow-up.

We analysed the years 2011, 2016 and 2021 for both the lung function and the BMI graphs. For the lung function graph, we selected only children with CF aged 6 years or older at the time of the lung function measurement. For the BMI graph, only children with CF aged 2 years and older at the time of the height and weight measurements were selected.

For drug utilisation, we selected people with CF who are eligible for CFTR modulators from 2018 onwards for the analyse.

12. Longitudinal data

Figure 12.1 *The number of countries and people with CF participating in the ECFSPR has risen continuously over the years.*

Number of people with CF and number of countries from 2008 to 2021.

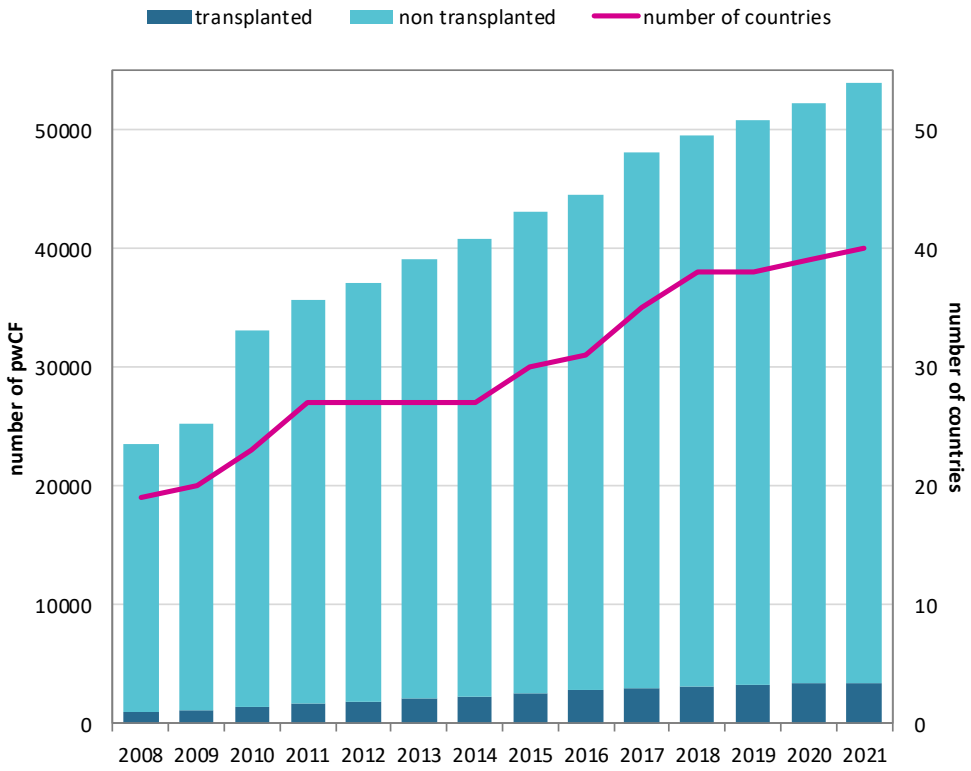
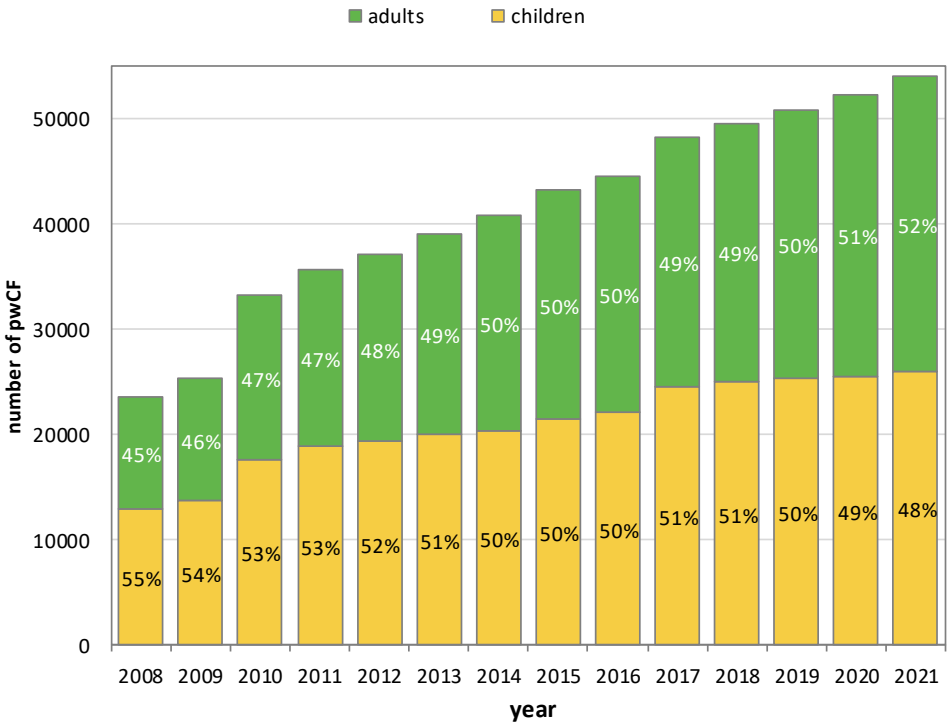


Figure 12.2 *In recent years the proportion of adults with CF in Europe has risen significantly and as of 2021 adults were more than >50% of the total.*

Number of people with CF and percentage of adults and children from 2008 to 2021.



12. Longitudinal data

Figure 12.3 *In the last decade the proportion of children diagnosed with CF by newborn screening has increased to almost 90% throughout Europe.*

Neonatal screening done in people with CF 5 years old or younger in the year of follow-up from 2011 to 2021.

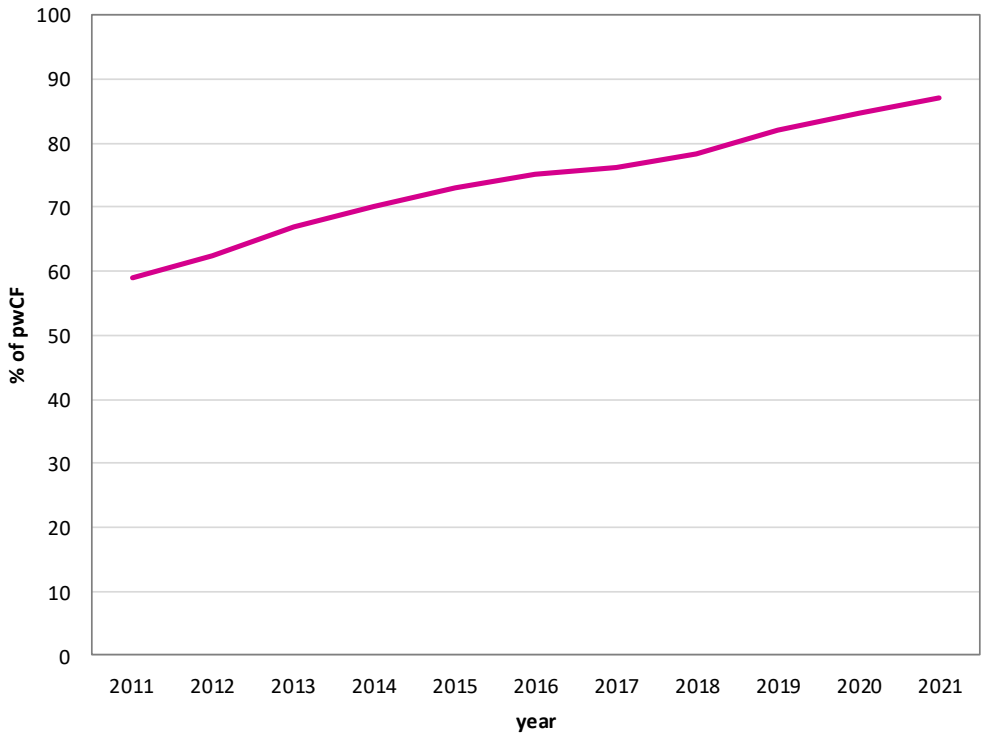
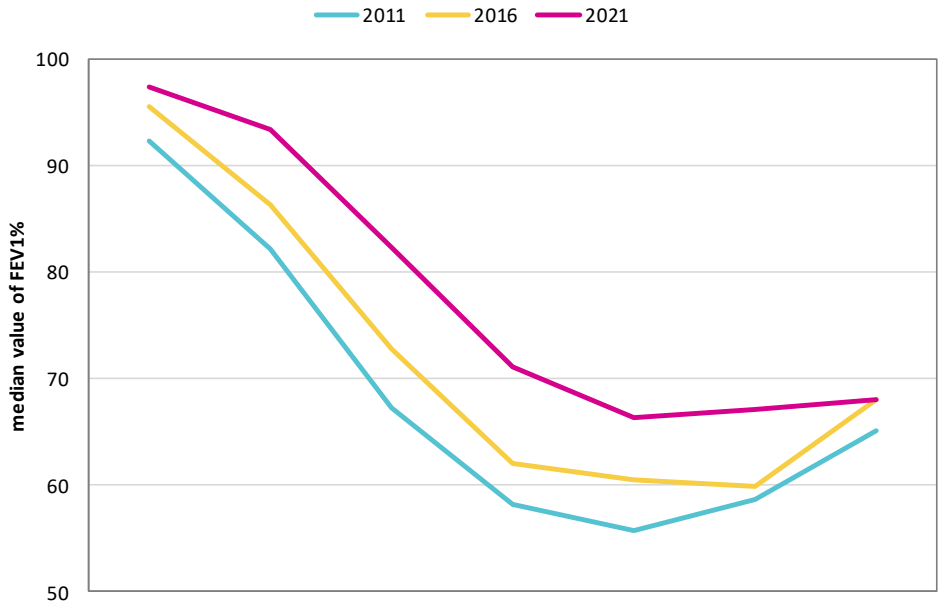


Figure 12.4 *Pulmonary function, as expressed by FEV_1, has been increasing over the years in all age groups, with a sharper rise since the introduction of CFTR modulators.*

Median FEV_1% by age group in 2011, 2016 and 2021.



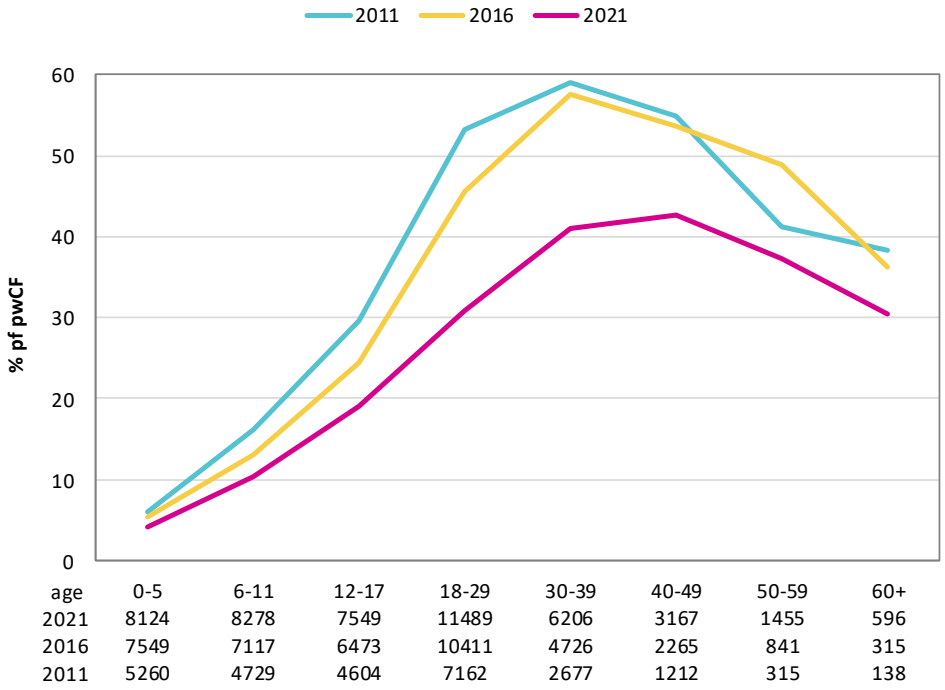
age	6-11	12-17	18-29	30-39	40-49	50-59	60+
2021	7161	7399	11162	6105	3160	1457	613
2016	6558	6211	9933	4655	2254	852	316
2011	5019	5227	8200	3169	1467	380	150

Note: People with CF aged 6 years or more at lung function measurement, who have never had a lung or liver transplant.

12. Longitudinal data

Figure 12.5 *The prevalence of Pseudomonas aeruginosa infection decreased across the whole CF population in Europe since increased availability of highly effective CFTR modulators.*

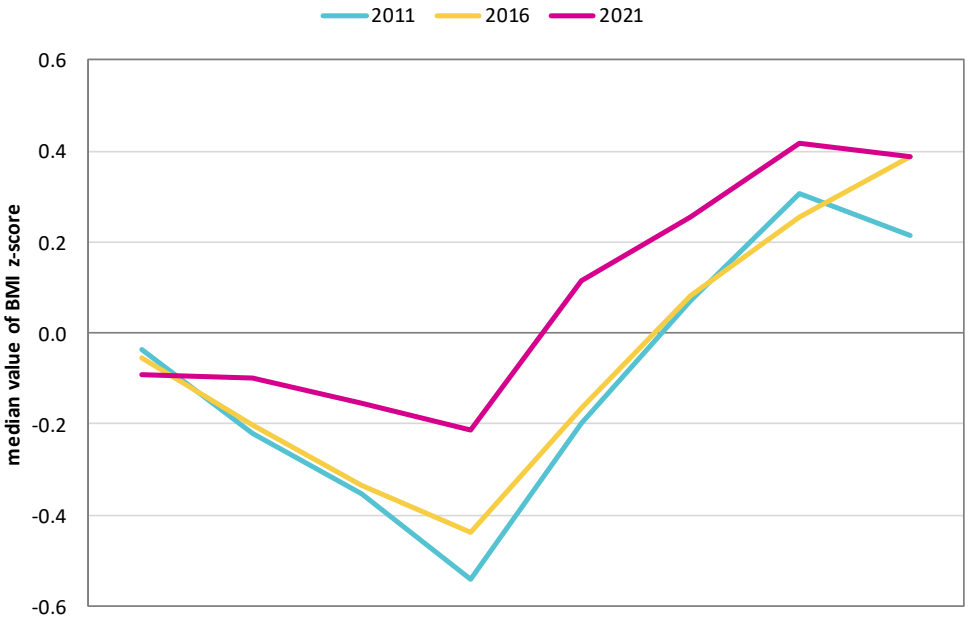
Prevalence of people with CF infected by Pseudomonas aeruginosa by age group in 2011, 2016 and 2021.



age	0-5	6-11	12-17	18-29	30-39	40-49	50-59	60+
2021	8124	8278	7549	11489	6206	3167	1455	596
2016	7549	7117	6473	10411	4726	2265	841	315
2011	5260	4729	4604	7162	2677	1212	315	138

Figure 12.6 *A significant improvement in BMI in 2021 from the age of 6 years is a reflection of the efficacy of CFTR modulator therapy in Europe.*

Median z-score for BMI by age group in 2011, 2016 and 2021.



age	2-5	6-11	12-17	18-29	30-39	40-49	50-59	60+
2021	5161	8168	7873	11466	6198	3188	1459	621
2016	4658	7221	6607	10449	4832	2329	891	334
2011	3365	5415	5463	8389	3230	1474	389	152

Only people with CF aged 2 years or more at measurements, who have never had a lung or liver transplant.

12. Longitudinal data

Figure 12.7 *Increased use of CFTR modulators in children and adults with CF in Europe goes hand in hand with a decrease in the prescription of azithromycin and inhaled antibiotics, while the prevalence of inhaled mucolytics remains mostly unchanged.*

Use of therapies among children from 2011 to 2021

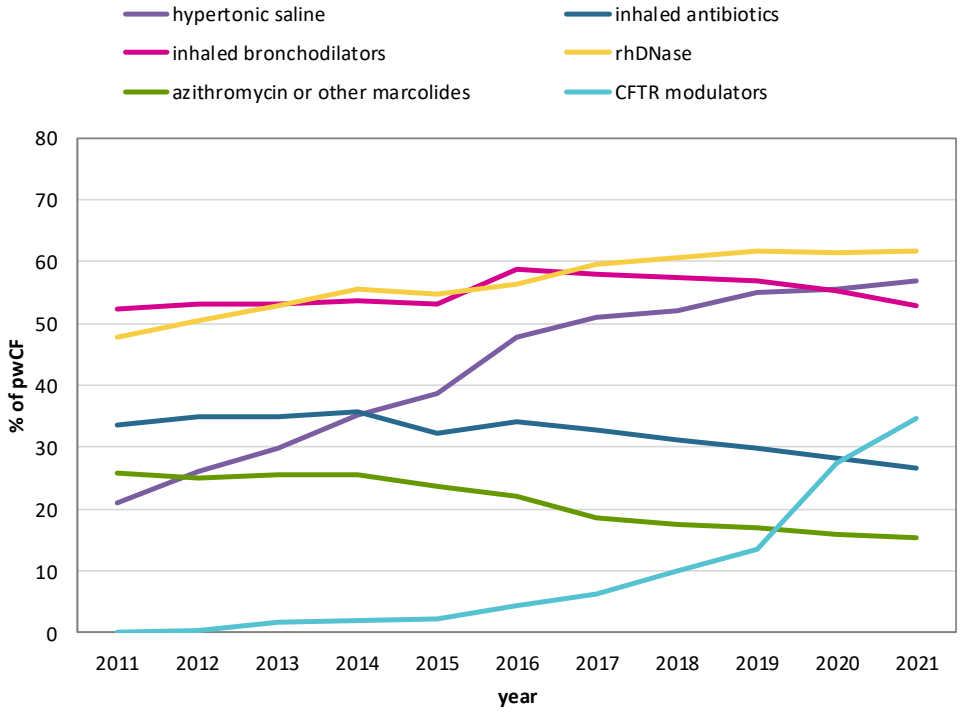
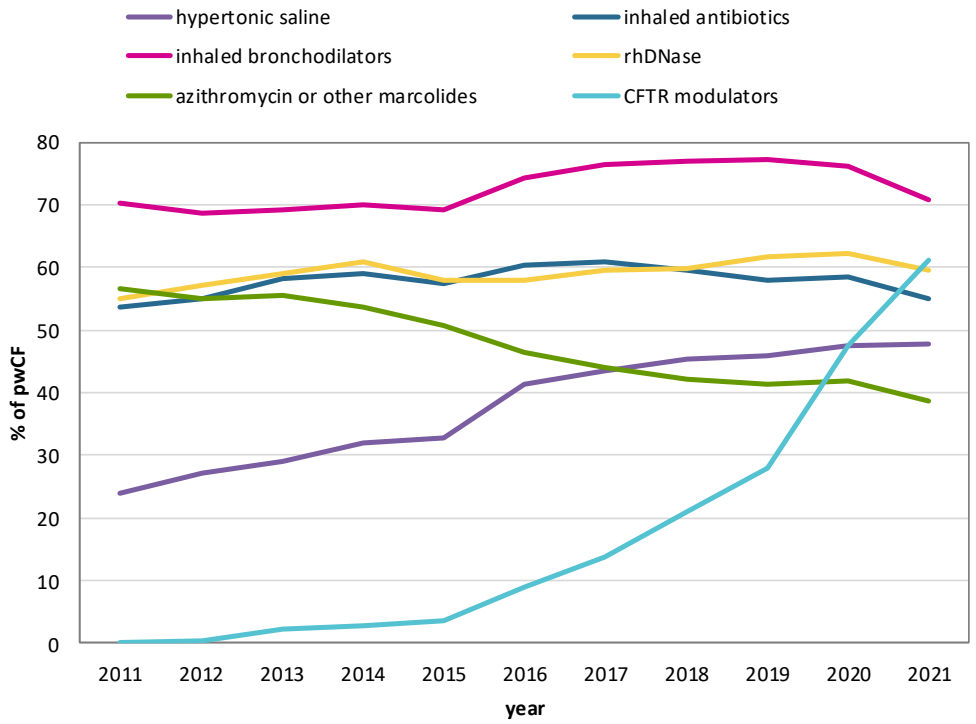


Figure 12.8 *Increased use of CFTR modulators in children and adults with CF in Europe goes hand in hand with a decrease in the prescription of azithromycin and inhaled antibiotics, while the prevalence of inhaled mucolytics remains mostly unchanged.*

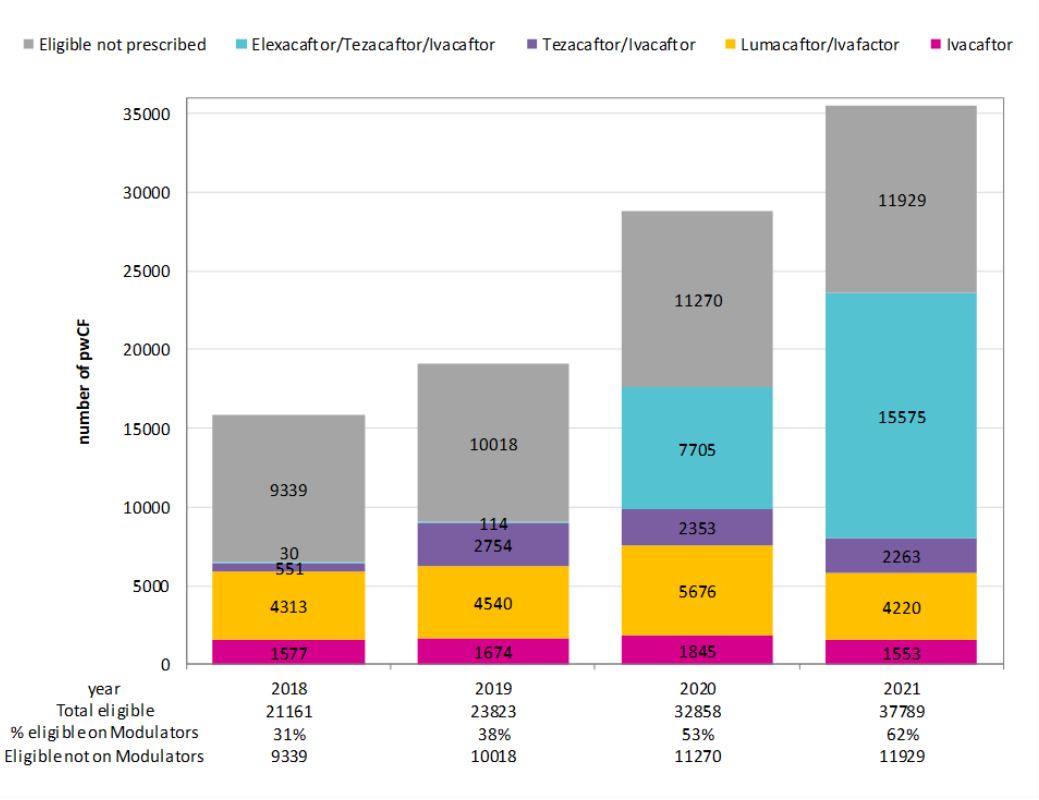
Use of therapies among adults from 2011 to 2021.



12. Longitudinal data

Figure 12.9 *Availability of elexacaftor/tezacaftor/ivacaftor in Europe has meant a considerable increase in CFTR modulator utilisation in 2020 and 2021.*

Use of modulator by people with CF eligible for at least one modulator from 2018 to 2021.



year	2018	2019	2020	2021
Total eligible	21161	23823	32858	37789
% eligible on Modulators	31%	38%	53%	62%
Eligible not on Modulators	9339	10018	11270	11929

Data quality

Data that are to be employed in vital research and pharmacovigilance studies, inform public health planning, and as an instrument to monitor and review a range of patient outcomes need to be of demonstrably high quality.

Data quality measures deployed by the ECFSPR

Several measures are in place in the ECFSPR that demonstrate our ongoing commitment to quality and our support, to this end, for the contributing centres and national registries, namely:

Clear guidance documentation including variable descriptions, parameters, options and references; training (live, recorded webinars, ad-hoc sessions when required) and expert help provided by the ECFSPR Service Desk; a secure, custom-built data collection platform that highlights errors and inconsistencies during data input / upload, additional rigorous checks applied by the statisticians, and final data approval by the Registry Director and the country representatives.

To enhance and complement these efforts we launched a new initiative in 2018, whereby members of the ECFSPR staff visit participant centres to verify and validate data at source.

The aims of the on-site validation visits

During the on-site validation visit our objectives are to quantify data completeness, consistency and the accuracy of data-input at source level, and to verify, in accordance with current local and European legislation, that the centre obtained the informed consent of individuals with CF to include his/her data in the Registry. Additionally, the visits offer an invaluable opportunity for the Registry and its participants to collaborate further on improving quality, relevance, and reliability in the ECFSPR data.

“Consistency” means adherence by the centre to the variable definitions, options, and parameters used by the Registry. “Accuracy” of data-input is defined as the proportion of values recorded in the ECFSPR software that match the medical records.

In a selected country, the aim is to visit at least 10% of the centres, and visits are limited to centres with ≥50 individuals with CF. In each centre, a subset of variables is checked for 15-20% of the total number of people with CF in a given follow-up year (this is always the most recent data approved by the ECFSPR).

What data is checked?

The variables checked are the same for each centre and they were chosen because they are more challenging to collect and/or more open to misinterpretation or misrepresentation (based on ECFSPR experience and participant feedback), and they are significant because they are used in reported Registry outcomes. They cover demographics, diagnosis, transplantation, anthropometric and lung function measurements, bacterial infections, selected medications, and defined complications.

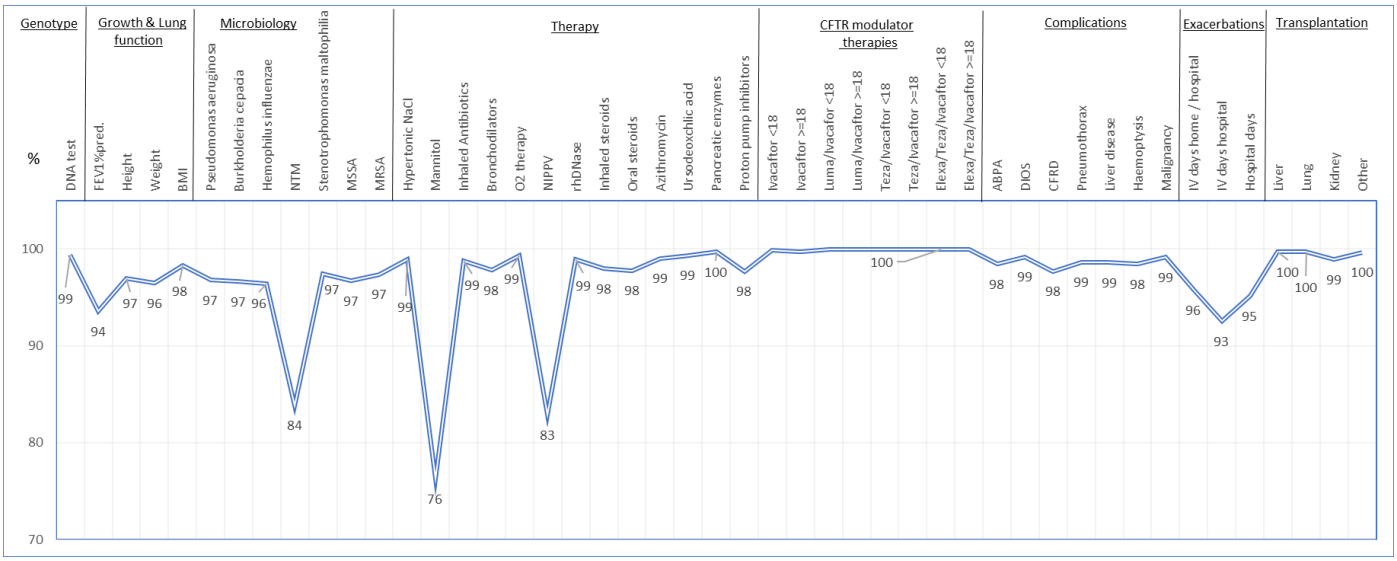
Results of the validation visits

Below we present a synopsis of the overall quality of the ECFPSR data based on the above-mentioned factors, completeness and accuracy. In this report, the overall results are shown in order to highlight areas where improvement has been demonstrated.

Completeness

We represent the completeness of the data in 2021, for all non-transplanted people with CF seen in all participating countries, as overall percentages by variable.

Table 12.1 Data completeness in follow-up year 2021, overall results by variable.



Note: Completeness for FEV1 is evaluated only on people of at least 6 years old.
Note: Completeness for BMI is evaluated for people of at least 2 years old.

Figure 13.1 is a graphical representation of the overall completeness by variable, for the year 2021, from the participating countries in the ECFSPR.

The overall completeness of data, 97%, for all variables from the countries participating in the Registry in 2021 is high. For the variables NTM (non-tuberculous mycobacteria), Mannitol and NIPPV (non-invasive positive pressure ventilation) however, the completion rates are below 90%. This result is a reflection of the fact that the ECFSPR NTM variable and definitions do not adequately capture information on NTM diagnosis; for future years the variable and definition have been adapted. Regarding completeness for Mannitol and NIPPV, these are not preferred therapies for CF in some countries or are not reimbursed / are unavailable in others.

Accuracy

In 12 countries, clinical data from 812 individuals from a total of 13,251 people with CF were validated for the follow-up year 2020 or 2021. The ECFSPR visited 11 countries in 2022: Austria, Croatia, Czech Republic, Denmark, Ireland, Luxembourg, Netherlands, Norway, Slovakia, Slovenia, and Sweden. We audited the clinical data of 525 individuals from a total of 6,506 people with CF (amounting to 8%) in these countries. The results for accuracy, which include the outcomes from the German national registry who visited its own centres to validate the data, can be seen in figure 12.2.

For each on-site visit the ECFSPR statisticians generated a random list of people with CF in 3 age categories to be checked on-site. 50% of the selected population were aged 18 or older, 40% were aged 6-17 years and 10% were younger than 6. As mentioned previously, source data was checked only for a selection of variables. The exactness of the values and thereby data consistency was determined by comparing the ECFSPR data and the data in the patient medical record at source.

The accuracy results of the validated data from onsite visits for the follow-up years 2020 and 2021 are presented in figure 12.2 as percentages.

Table 12.2 Data accuracy for the follow-up years 2020 and 2021 from countries visited, overall results by variable.

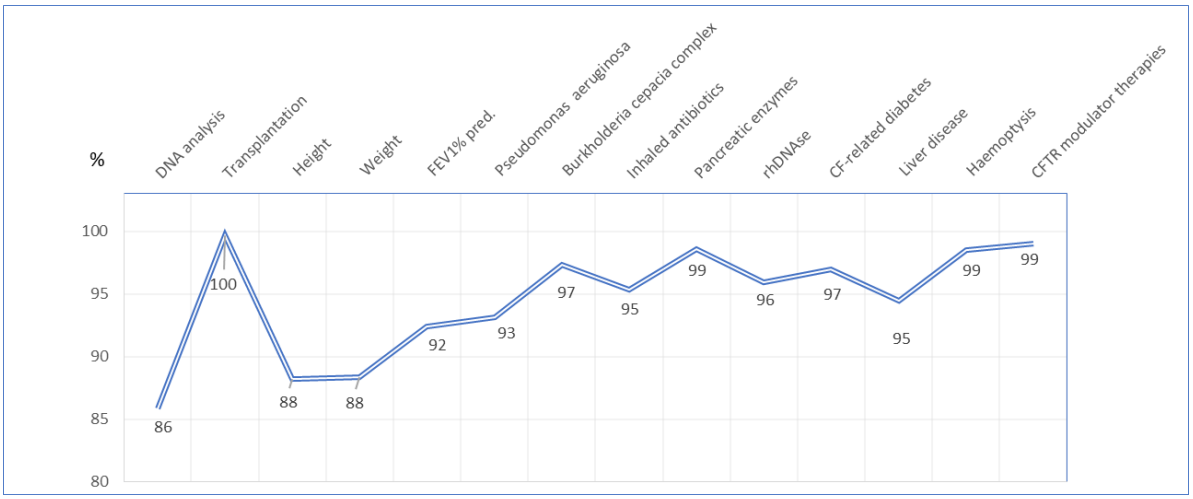


Table 12.3 Quartiles of validated data accuracies for people with CF, from the follow-up years 2020 and 2021 for the countries visited.

Variable	DNA analysis	Transplantation	Height	Weight	FEV1% pred.	Pseudomonas aeruginosa	Burkholderia cepacia complex	Inhaled antibiotics	Pancreatic enzymes	rhDNAse	CF-related diabetes	Liver disease	Haemoptysis	CFTR modulator therapies
25th percentile	81	100	89	84	89	90	94	94	99	92	95	92	98	99
50th percentile	89	100	93	90	94	95	99	96	100	98	97	95	100	100
75th percentile	95	100	95	92	97	99	100	98	100	99	100	97	100	100

Data accuracy is directly influenced by the availability of the original patient medical records at the centres and by local interpretation and understanding of the ECFSPR variable definitions. Overall, for most variables, the accuracy of validated data in 2021 shows a 2% increase compared to the previous years, amounting to an average of 95%. Variables such as genotype, height and weight are more challenging for data providers, but the overall anomalies were minimal (less than 5%). The accuracy of the genetic data could not be verified without the original genetic report, and the percentages of DNA-testing data validated as accurate varied across centres; this can be due to transplantation and follow-up in another centre, transfer to another centre or to adult care, shared care, and other cases where genotyping reports are not forwarded when an individual moves. Many centres had, however, repeated genotyping since the introduction of CFTR modulators and did have new genetic reports which meant that anomalies were reduced (2%). To overcome incoherencies in height/ weight the reporting centres will streamline and improve procedures to ensure they document the data as per the ECFSPR definitions.

Conclusion

The overall results present a positive picture of the completeness and accuracy of the data submitted to the ECFSPR. The areas for improvement that have been identified are already helping us to focus efforts on where they have the highest impact.

National registries have been encouraged to continue to apply data quality measures in their own countries and, consequently, several of them have launched national data quality activities, including validation visits that mirror the ECFSPR system.

We are confident that the measures deployed in partnership with the participating countries certify our collective efforts to further optimise the quality of data in the Registry.

Publications

The ECFSPR database is a useful source for research and the data is actively used. Applications for data are conscientiously handled in accordance with the ECFSPR guidelines. You will find more information on the data application process on the website www.ecfs.eu/projects/ecfs-patient-registry/data-request-application.

In the period from January 2011 to March 2023 we received 114 applications to use Registry data. The majority of these requests, 82%, originated from researchers from the European Cystic Fibrosis Society and other institutes, and 18% of the applications came from Industry.

Several of these research projects have resulted in publications and other publications are in the pipeline. A complete overview of publications using ECFSPR data is available on www.ecfs.eu/projects/ecfs-patient-registry/articles.

Sponsors

The ECFSPR is grateful to the following organisations for the support of our work, by means of an unrestricted grant:

National Patient Organisations

muco.be

LIFC
Lega Italiana
Fibrosi Cistica

association luxembourgeoise
de lutte contre la mucoviscidose

Cystische Fibrose Schweiz
Mucoviscidose Suisse
Fibrosi Cistica Svizzera
Cystic Fibrosis Switzerland

Appendix 1 List of contributing centres and national registries

List of individual centres and national registries that contributed to the ECFSPR. In turquoise: the name of the country representative in the ECFSPR Steering Group; underlined: the name of the database manager for the national registry; in Italics: new participants with 2021 data.

Country	Centre/National Registry name	Contact
Albania	1 individual centre:	Irena Kasmi
	”Mother Thereza” Hospital Centre, Department of Paediatrics, Tirana	Irena Kasmi Evda Vevecka
Armenia	1 individual centre:	Satenik Harutyunyan
	Yerevan State Medical University, Muratsan University Hospital, Cystic Fibrosis Centre, Yerevan	Satenik Harutyunyan
Austria	14 individual centres:	Andreas Pfleger
	Medizinische Universität Graz, Universitätsklinik für Kinder- und Jugendheilkunde, Klinische Abteilung für Pädiatrische Pulmonologie und Allergologie und CF Zentrum für Kinder, Jugendliche und Erwachsene, Graz	Ernst Eber Andreas Pfleger Maria Gaber Manfred Modl Doris Malle-Scheid
	Medizinische Universität Innsbruck, Zertifiziertes CF Zentrum für Kinder, Jugendliche und Erwachsene, Innsbruck	Helmut Ellemunter Johannes Eder Dorothea Appelt
	Klinikum Klagenfurt am Wörthersee, Abteilung für Kinder- und Jugendheilkunde, Pädiatrische Pulmologie/ Allergologie, Klagenfurt	Franz Hubert Wadlegger
	Kepler Universitätsklinikum, Universitätsklinik für Kinder- und Jugendheilkunde, Linz	Adrienne Molnar
	Kepler Universitätsklinikum, Klinik für Lungenheilkunde/ Pneumologie, Linz	Viktoria Reinelt Katrin Scheich
	Kardinal Schwarzenberg Klinikum, Abteilung für Kinder- und Jugendmedizin, Schwarzach im Pongau	Josef Riedler Christoph Seelbach
	Salzburger Landeskliniken, Universitätsklinik für Pneumologie, Salzburg	Michael Studnicka Natalie Firlei-Fleischmann
	PEK Klinikum Steyr, Abteilung für Kinder- und Jugendheilkunde und Abteilung für Lungenheilkunde, Steyr	Alexander Ebner Margit Kallinger Monika Pell
	Medizinische Universität Wien, Allgemeines Krankenhaus Wien für Thoraxchirurgie, Vienna	Peter Jaksch Dagmar Liebhart
	Medizinische Universität, Allgemeines Krankenhaus Wien, Universitätsklinik für Kinder-und Jugendheilkunde, Klinische Abteilung für Pädiatrische Pneumologie, Allergologie und Endokrinologie, Zentrum für Cystische Fibrose, Vienna	Sabine Renner Saskia Gruber Brigitte Mersi
	Klinik Ottakring, Abteilung für Kinder- und Jugendheilkunde mit Ambulanz, Vienna	Thomas Frischer Katharina Kainz Angela Zacharasiewicz
	Klinik Hietzing, Abteilung für Atmungs- und Lungenkrankheiten, Vienna	Andrea Lakatos–Krepcik

Country	Centre/National Registry name	Contact
	Klinikum Wels-Grieskirchen, Abteilung für Kinder- und Jugendheilkunde, Wels	Beatrix Wintersteiger Vera Karin Bauer
	Klinikum Wels-Grieskirchen, Abteilung für Lungenkrankheiten, Wels	Alexander Leitner Matthäus Ploder Thomas Tempelmayer
Belarus	1 individual centre: Belarusian Republic Children's Centre of Pulmonology and Cystic Fibrosis, Pulmonary Department, 3rd City Children's Clinical Hospital, Minsk	Sviatlana Keegan Vladimir Bobrovnichiy Sviatlana Keegan
Belgium	Belgian Cystic Fibrosis Registry	Géraldine Daneau Simeon Wanyama
Bulgaria	2 individual centres: Alexandrovska University Hospital, Pediatric Clinic, Sofia University Hospital St. Marina, 2nd Paediatric Clinic, Varna	Guergana Petrova Guergana Petrova Miglena Georgieva Nataliya Dobrudzhanska Margarita Nikolova Ruzha Pancheva
Croatia	1 individual centre: University Hospital Centre Zagreb, Cystic Fibrosis Centre – Paediatrics and Adults, Zagreb On behalf of the Croatian people with CF Database	Duska Tjesic-Drinkovic Andrea Vukić Dugac Duska Tješić-Drinković Andrea Vukić Dugac Ivan Bambir Ivona Markelić
Cyprus	1 individual centre: Medical School, University of Cyprus, children and adults, Cyprus	Panayiotis Yiallouros Panayiotis Yiallouros Andreas Matthaiou Panayiotis Kouis Pinelopi Anagnostopoulou
Czech Republic	Cystic Fibrosis Registry of the Czech Republic	Pavel Drevinek Alena Bilkova Milan Macek Marek Turnovec
Denmark	Cystic Fibrosis Registry Denmark	Hanne Vebert Olesen Tania Pressler
Finland	Cystic Fibrosis Registry of Finland, Department of Paediatrics, Turku University Hospital, Turku	Varpu Elenius Katriina Pihlajamaa Aleksi Kemppainen
France	Registre Français de la Mucoviscidose	Lydie Lemonnier Clémence Dehillotte
Germany	German Cystic Fibrosis Registry	Lutz Naehrlich Julia Wosniok
Greece	Cystic Fibrosis Registry of Greece	Elpis Hatziagorou John Tsanakas Panagiota Mitrou Kostas Mathioudakis Anastasios Tsolakidis
Georgia	1 individual centre: I. Tsitsishvili Children's Clinic, CF Centre, Tblisi	Ia Khurtsilava Ia Khurtsilava Doduna Agladze

Country	Centre/National Registry name	Contact
Hungary	Cystic Fibrosis Registry of Hungary	Andrea Párniczky Géza Marsal
Iceland	1 individual centre:	Helga Elidottir
	Children´s Medical Center Landspitali – The National University Hospital of Iceland, Reykjavik, Iceland	Helga Elidottir
Ireland	Cystic Fibrosis Registry of Ireland	Godfrey Fletcher Laura Kirwan
Israel	6 individual centres:	Meir Mei-Zahav
	Soroka Medical Centre, Ben Gurion University, Beer Sheva	Micha Aviram
	Carmel Medical Centre, Haifa	Galit Livnat
	Ruth Rappaport Children's Hospital, Rambam Medical Centre, Haifa	Michal Gur
	Hadassah Medical Centre, Mount Scopus, Jerusalem	Malena Cohen-Cymberknoh
	Schneider Children's Medical Centre of Israel, Petach Tikvah	Meir Mei-Zahav
	Safra Children's Hospital, Sheba Medical Centre, Ramat Gan	Ori Efrati
Italy	Italian Cystic Fibrosis Registry	Rita Padoan Marco Salvatore Annalisa Amato Gianluca Ferrari
Latvia	1 individual centre:	Elina Aleksejeva
	Rīga Stradiņš University, Children's Clinical University Hospital, Department of Pneumology, Riga	Elina Aleksejeva Dita Gaidule-Logina
Lithuania	2 individual centres:	Kęstutis Malakauskas
	Hospital of Lithuanian University of Health Sciences Kauno Klinikos, Adult Cystic Fibrosis Centre, Kaunas	Kęstutis Malakauskas Virginija Kalinauskaitė -Žukauskė
	Hospital of Lithuanian University of Health Sciences Kauno Klinikos, Centre of Pediatric Chronic Respiratory Diseases, Kaunas	Valdone Misevičiene
Luxembourg	1 individual centre:	Anna-Maria Charatsi
	Centre Hospitalier de Luxembourg	Anna-Maria Charatsi Michael Sieren Flore Nzuangue
Rep. of North Macedonia	2 individual centres:	Stojka Fustik Tatjana Jakovska-Maretti
	Institute for respiratory diseases in children Kozle, Centre for cystic fibrosis, Children and adults, Kozle	Tatjana Jakovska-Maretti Ivana Arnaudova Danevska
	University Children's Hospital, Centre for Cystic Fibrosis, Skopje	Stojka Fustik Ana Stamatova Andriana Andeevska
Rep. of Moldova	Outpatient Centre for Cystic Fibrosis and Other Rare Diseases	Oxana Turcu
Netherlands	Dutch Cystic Fibrosis Registry	Vincent Gulmans Domenique Zomer
Norway	Norwegian Cystic Fibrosis Patient Registry	Egil Bakkeheim Anita Senstad Wathne

Country	Centre/National Registry name	Contact
Poland	13 individual centres:	Łukasz Woźniacki
	Voivodeship Children's Hospital, Dept. of Paediatric Pneumology and Allergology, Bydgoszcz	Radoslawa Staszak – Kowalska Mikolaj Kowalski
	Cystic Fibrosis Centre, Polanki Paediatric Hospital, Gdansk	Maria Trawinska-Bartnicka Ewa Sapiejka Anna Steinert-Dymecki
	Centrum Medyczne Karpacz, Children/Adults' Hospital, Karpacz	Grzegorz Gaszczyk Monika Rams
	John Paul II Upper Silesian Child Health Centre, The independent Public Clinical Hospital no 6 of the Medical University of Silesian in Katowice, Katowice	Urszula Grzybowska-Chlebowczyk Bozena Kordys-Darmolinska
	St. Louis Regional Specialised Children's Hospital, Krakow	Stanislaw Stepniewski Daria Dziecichowicz-Latala
	Wojewódzkie Wielospecjalistyczne centrum Onkologii i Traumatologii im. M. Kopernika w Lodzi, Ośrodek Pediatryczny im. J. Korczak, Lodz	Agnieszka Brzozowska Agnieszka Koniarek-Maniecka
	University Hospital of Lords Transfiguration, Dept. of Pulmonology, Allergology and Pulmonary Oncology, Poznan	Szczepan Cofta Agata Nowicka
	Karol Jonscher University Hospital of Poznan University of Medical Sciences, Poznan	Irena Wojsyk-Banaszak
	Institute of Tuberculosis and Lung Diseases, Rabka-Zdrój Branch, Dept. of Pneumology and Cystic Fibrosis, Rabka Zdroj	Henryk Mazurek Lidia Pawlik
	Provincial Clinical Hospital no. 2, St. Queen Jadwiga, Dept of Allergology and Cystic Fibrosis, St Jadwigi Krolowej in Rzeszów, Rzeszów	Marta Rachel
	Szczecin Hospital "Zdroje" Dep. Of Pediatrics, Allergology and Pulmonology	Pawel Gonerko Pawel Fabisiak
	Dziekanow Paediatric Hospital, Cystic Fibrosis Centre, Institute of Mother and Child, Warsaw	Dorota Sands Łukasz Woźniacki
	Institute of Tuberculosis and Lung Diseases, Adult CF Centre, Warsaw	Wojciech Skorupa Sylwia Ziernik
Portugal	Cystic Fibrosis Registry of Portugal	Luísa Pereira
Romania	6 individual centres:	Liviu Pop
	Regional Cystic Fibrosis Centre, Clinical Emergency Children's Hospital of Brasov, Brasov	Laura Larisa Dracea
	Clinical Children's Hospital "Grigore Alexandrescu", Bucharest	Simona Mosescu
	Mother & Child Health Institute, Bucharest	Iustina Stan
	Regional Cystic Fibrosis Centre Cluj, Clinical Emergency Hospital for Children of Cluj-Napoca, Cluj-Napoca	Radu Sorin Șerban Szabo Csilla-Enikő
	Regional Cystic Fibrosis Centre, "Sf. Maria" Children Emergency Hospital Iasi, Iasi	Dana-Teodora Anton-Paduraru
	National Cystic Fibrosis Centre, Timişoara	Liviu Pop Ioana Ciuca

Country	Centre/National Registry name	Contact
Russian Federation	Cystic Fibrosis Registry of the Russian Federation	Elena Kondratyeva Elena Amelina Marina Starinova Stanislav Krasovskiy Anna Voronkova Nataliya Kashirskaya
Serbia	1 individual centre:	Milan Rodic
	National Centre for Cystic Fibrosis, Mother and Child Health Institute of Serbia "Dr Vukan Čupić", Belgrade	Predrag Minić Milan Rodić Aleksandar Sovtić
Slovakia	6 individual centres:	Hana Kayserova
	Childrens CF Centre, DFN Banská Bystrica, Banská Bystrica	Branko Takáč
	Centrum cystickej fibrozy pre dospelych FNSP FDR, Banská Bystrica	Eva Bérešova
	Centrum cystickej fibrozy pre dospelych, Klinika pneumologie l.SZU a Univerzitna nemocnica, Bratislava	Marta Hajkova
	Klinika detskej pneumologie SZU UN Bratislava, pracovisko Podunajské Biskupice, Bratislava	Hana Kayserova Nina Bližňáková
	CF Adult centre, University Hospital L Pasteura, Košice	Lenka Kopčová
	Centrum cystickej fibrozy detí, Detská fakultná nemocnica Košice, Košice	Anna Fetekeova Zuzana Hribíková
Slovenia	3 individual centres:	Uroš Krivec
	University Clinic of Pulmonary and Allergic Diseases, Golnik	Matjaž Fležar Julij Šelb Urška Hribar Maja Pogačar
	University Medical Centre Ljubljana, Department of Pulmonology and Allergy, Ljubljana	Izidor Kos Barbara Salobir
	University Medical Centre Ljubljana, University Children`s Hospital, Unit for pulmonary diseases, Ljubljana	Uroš Krivec Jasna Rodman Berlot Majda Oštir
Spain	25 individual centres:	Mª Dolores Pastor Vivero
	Parc Taulí Hospital Universitario, Hospital de Sabadell, Unitat de Pneumologia Pediátrica i Unitat de Fibrosi Quística, Sabadell, Barcelona	Oscar Asensio de la Cruz Miguel Garcia Gonzàlez Xavier Pomares Amigó Concepción Montón Soler
	Hospital Sant Joan de Déu, Unitat de Pneumologia Pediàtrica i Fibrosi Quística, Barcelona	Maria Cols i Roig Jordi Costa i Colomer
	Hospital Universitari Vall d'Hebron, Unidad de Fibrosis Quística del Adulto, Barcelona	Antonio Alvarez Fernández
	Hospital Universitari Vall d'Hebron, Unidad Fibrosis Quística y Neumología Pediátrica, Barcelona	Silvia Gartner
	Hospital Universitario Cruces, Unidad de Fibrosis Quística, Bizkaia	Mª Dolores Pastor Vivero Ainhoa Gómez Bonilla Beatriz Gómez Crespo Estibaliz Catediano Sainz

Country	Centre/National Registry name	Contact
	Hospital Universitario Reina Sofia, Unidad de Alergia y Neumología Pediátricas y UGC Neumología, Facultad de Medicina e Instituto Maimónides de Investigación Biomédica de Córdoba (IMIBIC), Cordoba	Javier Torres Borrego José Manuel Vaquero Barrios
	Complejo Hospitalario Universitario Insular Materno Infantil, Las Palmas de Gran Canaria	Antonio José Aguilar Fernández
	Hospital Universitario La Paz, Unidad de Fibrosis Quìstica Adultos, Servicio de Neumología, Madrid	Concha Prados
	Hospital Universitario La Paz, Sección de Neumología Pediátrica, Unidad de Fibrosis Quística Pediátrica, Madrid	Marta Ruiz de Valbuena Maiz Cristina de Manuel Gómez
	Hospital Universitario La Princesa, Neumología Adultos, Madrid	Rosa María Girón
	Hospital Niño Jesús, Sección de Neumología Pediátrica, Unidad de Fibrosis Quística, Madrid	José R. Villa Asensi Patricia Fernandez Garcia Alejandro López Neyra Verónica Sanz Santiago Rosa Ana Muñoz Codoceo
	Hospital Universitario Ramón y Cajal, Unidad de Fibrosis Quística, Madrid	Luis Maiz Carro Rosa Maria Nieto Royo Ana Morales Tirado Saioa Vicente Santamaria Enrique Blitz Castro
	Hospital Universitario 12 de Octubre, Unidad de Fibrosis Quística Pediátrica, Unidad de Fibrosis Quística Adultos, Madrid	Carmen Luna Paredes Enrique Salcedo Lobato Layla Diab Cáceres Cristina Garfia Castillo
	Hospital Regional Universitario de Málaga, Unidad Fibrosis Quística Adultos de Andalucía Oriental, Málaga	Casilda Olveira Fuster Gabriel María Olveira Fuster Nuria Porras Pèrez
	Hospital Regional Universitario de Málaga, Unidad de Fibrosis Quística Pediátrica, Málaga	Estela Pèrez-Ruiz Pilar Caro-Aguilera Juan Carlos Ramos Díaz
	Hospital Clínico Universitario Virgen de la Arrixaca, Unidad de Fibrosis Quística, Murcia	Pedro Mondéjar-López
	Hospital Universitario Central de Asturias, Unidad de Fibrosis Quística, Oviedo	José Ramón Gutiérrez Martínez David González Jimenez Marta Garcia Clemente
	Hospital Universitario Son Espases, Servicio de Neumología y Servicio de Pediatría, Unidad de Neumología y Alergia Pediátrica, Palma de Mallorca	Alexandre Palou-Rotger Catalina Bover-Bauza Joan Figuerola Mulet Leticia Rubia de Azevedo
	Hospital Universitario Virgen del Rocío, Unidad de Fibrosis Quística, Sevilla	Isabel Delgado Pecellín Esther Quintana Gallego Laura Carrasco Hernández
	Hospital Universitario Nuestra Señora de Candelaria, Santa Cruz de Tenerife, Tenerife	Alicia Callejón Orlando Mesa Medina
	Hospital Clínico Universitario de Valencia, Unidad de Fibrosis Quística Pediátrica, Valencia	Silvia Castillo Corullón
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Country	Centre/National Registry name	Contact
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	Hospital Universitario Miguel Servet, Unidad de Neumología Pediátrica y Fibrosis Quística, Zaragoza	Carlos Martín de Vicente
Sweden	Cystic Fibrosis Registry of Sweden	Christina Krantz Anders Lindblad
Switzerland	20 individual centres:	Andreas Jung
	Kinderspital Aarau, Kantonsspital Aarau AG, Abteilung pädiatrische Pneumologie, Allergologie und Immunologie, Aarau	Dominik Müller-Suter Peter Eng Rachel Kusche
	Kantonsspital Aarau AG, Klinik für Pneumologie und Schlafmedizin, Aarau	G. Mauro Tini Lydia Eisenmann
	Universitätsspital Basel, Klinik für Pneumologie, Adulte Cystische Fibrose, Basel	Michael Tamm Kathleen Jahn
	UKBB Universitäts-Kinderspital beider Basel, Abteilung Intensivmedizin & Pneumologie, Basel	Jürg Hammer Daniel Trachsel Anja Jochmann Diana Reppucci Jakob Usemann
	Inselspital Bern, Universitätsklinik für Pneumologie, Adulte Cystische Fibrose, Bern	Thomas Geiser Dagmar Lin Michaela Semmler
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	Universitätsklinik für Kinderheilkunde, Zentrum für Cystische Fibrose und Pulmonologie, Inselspital, Bern	Philipp Latzin Carmen Casaulta Romy Rodriguez
	Hôpital Cantonal Fribourg, Pädiatrie, Fribourg	Maxime Hensen Johannes Wildhaber
	Hôpitaux Universitaires de Genève, Département de la Femme, de l'Enfant et de l'Adolescent, Unité de Pneumologie Pédiatrique, Genève	Anne Mornand Nadège Gabent
	Hôpitaux Universitaires de Genève, Département de Médecine, Service de Pneumologie, Consultation de Mucoviscidose Adulte, Genève	Jérôme Plojoux Valerie Durand
	Centre Hospitalier Universitaire Vaudois (CHUV), Département femme-mère-enfant, Service de pédiatrie, Unité de pneumologie et mucoviscidose pédiatrique, Lausanne	Isabelle Rochat Laurence Mioranza
	Consultation de Mucoviscidose Adulte et de CFTR-related Disorders, Service de Pneumologie, Département de Médecine, Centre Hospitalier Universitaire Vaudois (CHUV), Lausanne	Angela Koutsokera Zisis Balmpouzis Georgia Mitropoulou Isabelle Huart Bellavere Caroline Dutoit

Country	Centre/National Registry name	Contact
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	Luzerner Kantonsspital, Abteilung für Pneumologie, Zentrum für Cystische Fibrose für Erwachsene, Luzern	Christian Murer Gabriele Riedener Luzia Rytz
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	Children's Hospital of Eastern Switzerland, Division of Paediatric Pulmonology & CF Centre, St Gallen	Jürg Barben Katharina Hartog Christine Baumgartner
	Kantonsspital St. Gallen, Lungenzentrum, Zentrum für Cystische Fibrose für Erwachsene, St. Gallen	Martin Brutsche Otto Schoch Anna-Lena Walter Rebekka Kleiner
	Kantonsspital Winterthur, Klinik für Pneumologie und Klinik für Innere Medizin, Adulte Cystische Fibrose, Winterthur	Markus Hofer Sieghart Filippi
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	Medipol University Faculty of Medicine, Division of Pediatric Pulmonology, Istanbul	Sedat Öktem Füsun Ünal
	Medeniyet University, Faculty of Medicine, Division of Pediatric Pulmonology, Istanbul	Saniye Girit Zeynep Reyhan Onay
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	Dnipro Children's Clinical Hospital	*Anastasiia Fialkovska*
	Ivano-Frankivsk Regional Children's Clinical Hospital of Ivano-Frankivsk Regional Council, Department of Pulmonology, Ivano-Frankivsk	Sirun Makian Olha Fedynska
	Cystic Fibrosis Centre of Western Ukrainian Specialized Children's Medical Centre, Lviv	Lyudmyla Bober Halyna Makukh
	Volyn Regional Childrens Hospital	*Myroslava Melnyk*
United Kingdom	UK Cystic Fibrosis Registry	Sarah Clarke Susan Charman Elaine Gunn Siobhán Carr

Appendix 2 Inclusion criteria and technical notes

Patient inclusion criteria

The ECFSPR registers people diagnosed with CF in accordance with agreed definitions:

Two sweat tests value > 59 mmol/L chloride: CF diagnosis accepted.

One sweat test value > 59 mmol/L chloride and DNA Analysis/Genotyping – two identified disease-causing CF variants: CF diagnosis accepted.

Sweat value ≤ 59 mmol/L chloride:

If the sweat value is less than or equal to 59 mmol/L chloride or not reported, then at least 2 of these must be fulfilled:

DNA Analysis/Genotyping: two identified disease-causing CF variants;

Transepithelial (Nasal) Potential Difference or Intestinal Current Measurement: result consistent with a diagnosis of CF;

Clinical Presentation: typical features of CF.

Diagnosis reversal:

If the patient's CF diagnosis was reversed during the year, one of the options must be true:

DNA Analysis: unable to identify two disease causing CF variants;

Transepithelial (Nasal) Potential Difference and/or Intestinal Current Measurement: result not consistent with a diagnosis of CF;

Repeated normal values from sweat tests and confirmed by the clinical team.

Data of people without a CF diagnosis according to the agreed definitions are accepted in the database but not included in the analyses.

References

1) ECFS best practice guidelines: the 2018 revision

2) European Cystic Fibrosis Society Standards of Care: Best Practice guidelines (2013)

Data manipulation

To ensure that data is anonymous, the ECFS collects only year and month of birth and the day of birth was set to the 15th of the month.

For prenatal diagnoses, we set age at diagnosis equal to 0.

We checked for outliers and, whenever possible, we corrected the values according to the instructions of the national registries / individual centres. If, after the data quality controls, aberrant values were still present in the database, we set them to missing.

Software used for data management and statistical analyses.

SAS software, Version 9.4. Copyright, SAS Institute Inc. SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc., Cary, NC, USA.

Explanation of statistical terms

Max: maximum. It is the highest value.

Mean: it is the average value of a set of measurements. For example, if the mean age at diagnosis is 3 years, it means that, on average, the people are diagnosed when they are 3 years old.

Median: the value that separates the set of measurements in two halves, so that 50% of measurements are below the median value and the other 50% of measurements are above the median value. For example, if median age at diagnosis is 5 months, it means that half of the people are diagnosed before 5 months of age, and the other half of the people are diagnosed after 5 months of age.

Min: minimum. It is the lowest value.

N: the number of people in a group for whom the information is not missing.

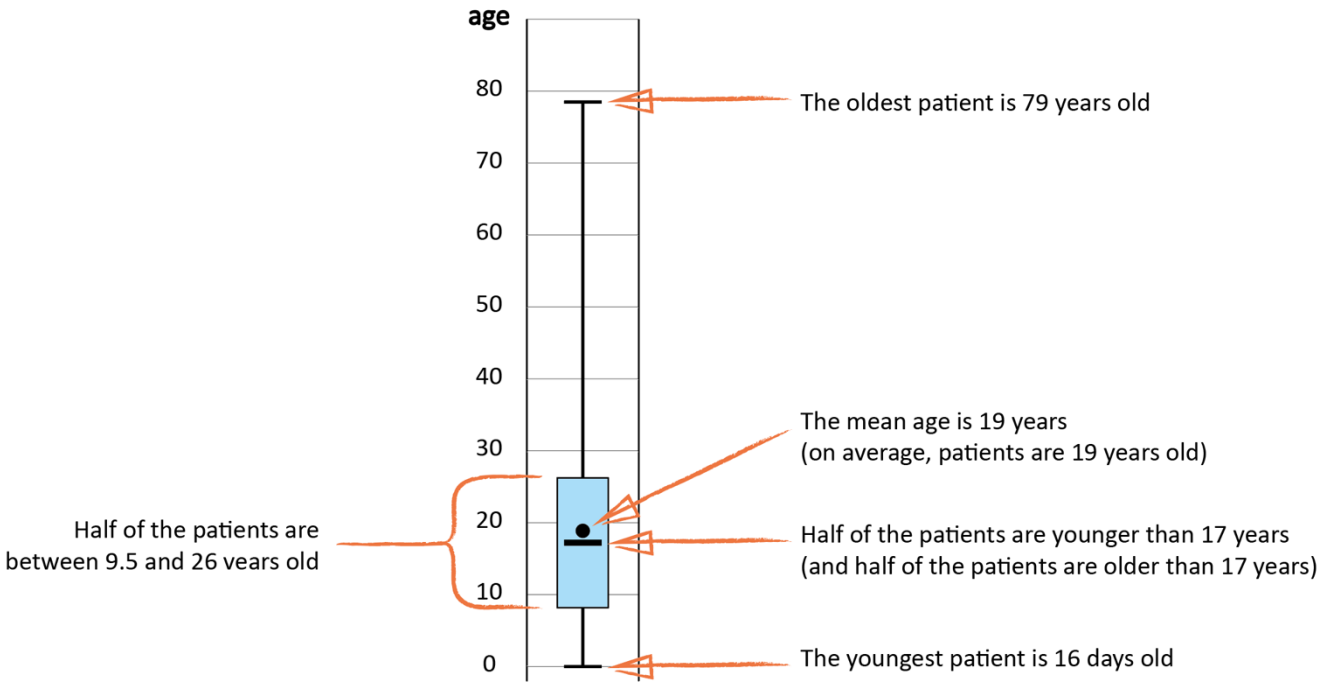
N miss: number of missing values. It is the number of people for whom the information is missing.

Quartiles: the 25th percentile, the median (the 50th percentile) and the 75th percentile are collectively called quartiles, because they divide the set of measurements into quarters.

25th Pctl: 25th percentile, also called first quartile. It is the value that separates the set of measurements in two parts, so that one quarter (25%) of the measurements is below it and the other three quarters are above it. For example, if the 25th percentile for age at diagnosis is 1 month, it means that a quarter of the people were diagnosed before they were a month old, and the other three quarters were diagnosed after they were a month old.

50th Pctl: 50th percentile, also called second quartile or median (please refer to definition of Median).

75th Pctl: 75th percentile, also called third quartile. It is the value that separates the set of measurements in two parts, so that three quarters (75%) are below it and the other quarter is above it. For example, if the 75th percentile for age at diagnosis is 3 years, it means that three quarters of the people are diagnosed before they were 3 years old, and the remaining quarter was diagnosed after they reached 3 years of age.



Note: This is an example of how to read a boxplot. The numbers used in this figure are not real.

Appendix 3 Variables and definitions used by the ECFSPR

Variables (vs 5.0)

Demographics

CF centre code
Patient code
Year of follow-up
Date of birth (year and month)
Gender
Status of patient
Cause of death
Date of death

Diagnosis

Diagnosis status
Age at diagnosis
Sweat test type
Electrolytes type
Chloride value
Meconium Ileus
Nasal Potential Difference (NPD)
CF-typical NPD
Date of NPD
Intestinal current measurement (ICM)
CF-typical ICM
Date of ICM
Neonatal screening

Genotype

First variant (possible to record complex variants in cis)
Second variant (possible to record complex variants in cis)

Maintenance Therapy

Inhaled continuous (≥ 3 months) hypertonic saline ≥3%
Inhaled continuous (≥ 3 months) Mannitol
Inhaled antibiotic this year - continuous (≥ 3 months) or on/off for a total of (≥ 3months)
Inhaled continuous (≥ 3 months) bronchodilators
Oxygen therapy ≥ 3 months during the year of follow-up (incl. 24h/day, nighttime, exercise). Does not need to be continuously but should be from a single prescription).
Use of continuous (≥ 3 months) non-invasive positive pressure ventilation (NIPPV)
Use of continuous (≥ 3 months) rhDNase this year
Use of continuous (≥ 3 months) Inhaled steroids
Use of continuous (≥ 3 months) Oral steroids
Use of continuous (≥ 3 months) azithromycin (or other macrolide) this year
Use of continuous (≥ 3 months) ursodeoxycholic acid this year
Use of continuous (≥ 3 months) pancreatic enzymes this year
Use of continuous (≥ 3 months) proton pump inhibitors (PPI) this year
Use of CFTR Modulator Therapy
Start and stop dates CFTR Modulator Therapy (start date & stop date x 2 per kind of modulator)
Sweat chloride values - before CFTR modulator & during CFTR modulator

Complications

Allergic broncho-pulmonary aspergillosis this year
Diabetes this year
Pneumothorax this year
Distal intestinal obstruction syndrome (DIOS)
Salt depletion this year
Liver disease this year
Haemoptysis major volume of expectorate > 250ml in a day.

Pancreatic status: faecal elastase

Pancreatic status: faecal fat
Occurrence of malignancy this year

Lung function and nutrition follow-up

Date of best FEV1* recorded this year

Value of best FEV1* recorded this year
Value of best FVC** recorded this year

Date of lowest LCI 2.5% this year
Value of lowest LCI 2.5% this year

Type of device used for LCI measurement
Height measured at date of best FEV1* (or in case of no FEV1, last height of the year)

Weight measured at date of best FEV1* (or in case of no FEV1, last height of the year)

*FEV1 of highest FEV1% predicted
**FVC at time of best FEV1

Microbiology (*positive - chronic* or *positive - not chronic* options for all pathogens)

Pseudomonas aeruginosa
Staphylococcus aureus
Burkholderia cepacia complex
Stenotrophomonas maltophilia
Nontuberculous mycobacteria
Achromobacter spp
Haemophilus influenza
MRSA
Total days on intravenous antibiotics at home and in hospital this year
Total days on intravenous antibiotics in hospital this year
Total days in hospital this year

Transplant

Liver transplant
Year of latest liver transplant (before or during this year)
Lung transplant
Year of latest lung transplant (before or during this year)
Kidney transplant
Year of latest lung transplant (before or during this year)
Other transplant
Year of latest other transplant (before or during this year)

Definitions and References

1 Sweat Test: Parameters, Values to be reported, References

i. Diagnostic standards: the quantity of sweat should indicate an adequate rate of sweat production;

ii. a. The sweat sample should be processed immediately after sweat collection;

b. Chloride concentration measurement is the preferred analysis for Diagnostic sweat tests. For sweat tests in relation to CFTR modulator therapy, Chloride is the only

c. accepted value;
Chloride value: report the Chloride value in millimols per litre (mmol/L). If duplicate tests

d. were completed on the same day, for diagnostic sweat tests, **report the highest positive**

e. **value;**
A sweat chloride value >59 mmol/L is consistent with a diagnosis of CF;
A sweat chloride value <30 mmol/L makes the diagnosis of CF unlikely (However, specific CF causing mutations can be associated with a sweat test below 30 mmol/L).
n.b. *The acceptable range for Chloride values is 1-160 mmol/L.* ***Anyone who has a Chloride value above 160 mmol/L should be re-tested;***

iii. As already mentioned above, the ECFSPR will consider only Titration/Chloride values in analyses.

References

1) ECFS best practice guidelines: the 2018 revision
2) European Cystic Fibrosis Society Standards of Care: Best Practice guidelines (2013)

2 Nutrition: Method, Values and Dates to be reported, References

i. The height and weight reported to the ECFSPR should be from the same day as the reported FEV1 (of highest FEV1% predicted of the year);

ii. If spirometry was not done, the last weight and height measurements of the year, and the date they were measured, should be recorded;

iii. Height and weight should be measured in accordance with EuroCareCF guidelines:
Weight: removal of outer clothing, shoes and socks;
Height: removal of shoes and socks, stadiometer - top of head in contact with headboard, slight pressure.

iv. Z-scores for height, weight & BMI are calculated with the CDC reference values [Kuczmarski et al (2002)].

References

1) Kromeyer-Hauschild K, Wabitsch M, Kunze D, Geller F, Geiss HC, Hesse V et al. Percentiles of body mass index in children and adolescents evaluated from different regional German studies. Monatsschr Kinderheilkd 2001; 149:807-818.
2) Lai H-C, Corey M, FitzSimmons S, Kosorok MR, Farrell M. Comparison of growth status of people with cystic fibrosis between the United States and Canada. Am J Clin Nutr 1999; 69:531-538.
3) Public Use File BGS98, German National Health Interview and Examination Survey 1998, Robert-Koch-Institut, Berlin, Germany, 2000.
4) Wiedemann B, Paul KD, Stern M, Wagner TO, Hirche TO, on behalf of the German CFQA Group. Evaluation of body mass index percentiles for assessment of malnutrition in children with cystic fibrosis. Eur J Clin Nutr 2007; 61, 759-768.
5) Kuczmarski RJ, Ogden CL, Guo SS et al. 2000 CDC Growth Charts for the United States: methods and development. Vital Health Stat 2002; 11(246): 1-190.

3 Spirometry: Criteria, Method, Values to be reported, References

The ECFS Patient Registry collects data on spirometry values to obtain standardised data for comparison with other centres/countries and for use in specific epidemiological studies. n.b. Some of the conditions for this (see below) may not be met at every clinical visit for all people and, for the ECFSPR, only spirometry tests fulfilling the criteria should be recorded by centres/submitted by the National Registries. **All spirometry tests should be carried out in accordance with the ATS/ERS guidelines.**

For the spirometry values reported to the ECFSPR the following criteria should be met:

i. **Pre-test preparation**

a. All recorded spirometry tests should be pre-bronchodilator* values:
   i. short-acting bronchodilators: at least 4 hours pre-test;
   ii. long-acting bronchodilators: at least 12 hours pre-test.

b. Date of birth, gender and height should be recorded for calculation of predicted values. In addition, the ECFS Patient Registry asks for the weight to be measured at the same time and recorded.

***In accordance with the official criteria of PortCF.*

ii. **Values to report:**

a. FEV1 in litres: must be the FEV1 in litres (to max 2 decimals) of the **highest FEV1% predicted of the year**, in accordance with local reference values;

b. FVC in litres ((to max 2 decimals): must be the FVC measured at the same time as the FEV1 of the highest FEV1% predicted of the year and it must be greater than or equal to the FEV1 measurement.

c. For the reported spirometry values, the date of the test and the patient's height and weight at that date should also be recorded in order to calculate the percent of predicted values and other values;

d. Only tests deemed valid according to ATS/ERS guidelines to be reported.

iii. **Calculation of percent of predicted values:**

a. A common set of reference values - the Global Lung Function Initiative equations (See (1) below) - is used for calculations;

References

1) Global Lung Function Initiative equations described by 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: 1324–1343).
2) Miller et al. Standardisation of spirometry. Eur Respir J 2005; 26: 319–338.
3) Miller et al. General considerations for lung function testing. Eur Respir J 2005; 26: 153–161.
4) Cystic Fibrosis Foundation Patient Registry User Guide, Version 4.0. 2006.
5) Rosenfeld et al. Task Force to Evaluate Choice of Spirometric Reference Equations for the National Patient Registry: Summary and Recommendations. Cystic Fibrosis Foundation Registry Committee; 2005.

4 Chronic infection in the lower airways: Definition, References

i. Chronic Pseudomonas aeruginosa infection: A patient should be considered chronically infected if the modified Leeds criteria are met - (a) below - and/or anti-pseudomonas antibodies are detected - (b) below.
A patient should be defined as chronically infected if he/she fulfils the criteria now, or has done so in recent years, and the physician has no reason to think that the status has changed.

a. Modified Leeds criteria - chronic infection: >50% of the samples (sputum/other) collected during the last 12 months should be positive; at least 4 samples collected.

b. Significantly raised levels of anti-pseudomonas antibodies according to local laboratories.

ii. Chronic infection with other gram-negative (and also gram-positive) bacteria should be defined using the same criteria as described above.

References

1) Lee TWR, Brownlee KG, Conway SP, Denton M, Littlewood JM. Evaluation of a new definition for chronic Pseudomonas aeruginosa in cystic fibrosis patients. J Cystic Fibrosis.
2) Proesmans M, Balinska-Miskiewiscz, Dupont L et al. Evaluating the "Leeds criteria" for Pseudomonas aeruginosa infection in a cystic fibrosis centre. Eur Resp J 2006;27:937-943.
3) Doring G, Conway SP, Heijerman HG, et al. Antibiotic therapy against Pseudomonas aeruginosa in cystic fibrosis: a European consensus. Eur Respir J 2000;16:749-767.

5 Allergic Bronchopulmonary Aspergillosis (ABPA): Diagnostic criteria and references

i. Acute or subacute clinical deterioration (cough, wheeze, exercise intolerance, exercise-induced asthma, change in pulmonary function, or increased sputum production) not attributable to another etiology;
ii. Total IgE > 500 IU/ml;
iii. Positive skin prick test for Aspergillus antigen (> 3 mm), or positive specific IgE for A. fumigatus.
iv. Either:
a) Precipitins to A. fumigatus, or in vitro demonstration of IgG antibody to A. fumigatus;
or
b) New or recent abnormalities on chest radiography (infiltrates or mucus plugging) or chest CT (characteristic changes) that have not cleared with antibiotics and standard physiotherapy.

References

1) Stevens DA, Moss RB, Kurup VP, Knutsen AP, Greenberger P, Judson MA, Denning DW, Crameri R, Brody AS, Light M, Skov M, Maish W, Mastella G; Participants in the Cystic Fibrosis Foundation Consensus Conference. Allergic bronchopulmonary aspergillosis in cystic fibrosis-state of the art: Cystic Fibrosis Foundation Consensus Conference. Clin Infect Dis. 2003 Oct 1;37 Suppl 3:S225-64

6 Liver Disease: Definitions

The ECFSPR has adopted the definitions for Liver Disease used by the Cystic Fibrosis Registry in the UNITED KINGDOM. These definitions discriminate people with severe liver disease (with portal hypertension) from milder cases (cirrhosis without portal hypertension).

- **Cirrhosis with Hypertension**: scarring of the liver related to underlying CF, typically in a biliary pattern. Severe liver disease may include portal hypertension and/or hypersplenism;
- **Cirrhosis without Hypertension**: scarring of the liver related to underlying CF;
- **Liver disease without cirrhosis**: this includes fatty liver or viral hepatitis but not biliary cirrhosis.

7 Pancreatic Status: Pancreatic Insufficiency, References

i. **Indicator of Pancreatic Insufficiency - Faecal Fat** (2 determinations are mandatory)
a. Young children: Stool fat (van de Kamer) > 4-5 g/d;
b. Children older than 10 years and adults: Stool fat (van de Kamer) >7g/d and/or faecal pancreatic elastase-1 < 200 ug/g.

Please note:
- Faecal fat excretion values of infants below 3 months are contradictory.
- Other than pancreatic causes of steatorrhoea must have been excluded.

ii. **For the ECFSPR, pancreatic status will be assessed as follows:**
- Pancreatic insufficiency: Faecal elastase <200 µg/g (twice), and faecal fat high* (twice);
- Pancreatic sufficiency: Faecal elastase ≥200 µg/g (twice) and faecal fat normal* (twice).

** Refer to 9.8.i.a and 9.8.i.b above*

References

1) Sinaasappel M, Stern M, Littlewood J, Wolfe S, Steinkamp G, Heijerman HGM, Robberecht E, Döring G. Nutrition in patients with cystic fibrosis. A European consensus. J Cystic Fibrosis 2002; 1:51-75.

2) Walkowiak J, Nousia-Arvanitakis S, Henker J, Stern M, Sinaasappel M, Dodge JA. Invited review: Indirect pancreatic function tests in children. J Pediatr Gastroenterol Nutr 2005; 40:107-114.

8 Salt Loss Syndrome: Definition and Reference

Primary metabolic alkalosis with blood pH > 7.45, serum sodium < 130 mmol/l and serum chloride < 90 mmol/l (all 3 of these to be manifest).

Reference

1) Fustik S, Pop-Jordanova N, Slaveska N, Koceva S, Efremov G. Metabolic alkalosis with hypoelectrolytemia in infants with cystic fibrosis. Pediatr int 2002; 44: 289-92.

9 Transplantation: Indications

i. For people with CF who had a transplant during the year of follow up:
   a. Use the best FEV1 before transplantation;
   b. Record therapy, complications, and microbiology from before transplantation.
ii. For patients who had a transplant before the current follow-up year:
   a. Record all available information.

Appendix 4 Explanation of terms

ABPA: allergic bronchopulmonary aspergillosis is an allergic lung disease characterised by an excessive response to the mould *Aspergillus fumigatus.*

BMI: body mass index, weight (kg) / [height (m)]^2.

Bronchodilator: medication that relaxes the muscles of the airways, used also for asthma.

CFRD: CF related diabetes.

CFTR: CF transmembrane conductance regulator is a protein at the cell surface that controls the salt and water balance across a cell. The gene that causes CF is the blueprint for the CFTR protein. Everyone has two copies of the gene for CFTR, but to be born with CF both CFTR genes must be affected by a CF-causing variant.

CFTR modulator therapy: a range of CFTR modulators have been approved for use. They are designed to correct the malfunctioning CFTR protein: different variants cause different defects in the structure of the protein and its functionality and the different CFTR modulators either correct or potentiate CFTR assembly or function; they can also be combined to become more efficient. Since the CFTR modulator therapies work specifically for certain variant classes, those currently available are effective only in people with those variants.

Compassionate use: is a treatment option that allows the use of an unauthorised medicine for people with CF who have no alternative treatment options and no access to clinical trials.

DIOS: distal intestinal obstruction syndrome is a condition, unique to people with CF. In DIOS, the intestines are blocked by thickened stool due to sticky mucus and other mechanisms, which leads to reduced stool flow through the intestines and abdominal pain and can result in an emergency.

FEV_1: the Forced Expiratory Volume of air in the first second of a forced exhaled breath.

FEV_1%: the FEV_1 as a percentage of the average value for healthy people of the same age, height, and sex.

Haemoptysis: coughing up blood. This happens frequently in small amounts in CF, so the complication we asked for is major bleeding (major meaning when the volume of expectorate is more than 250 ml over the course of the day).

Homozygous: CF is caused by variants of the CFTR gene, one on each allele. One is inherited from the mother and one from the father. If both variants are the same, the person is said to be homozygous for this variant.

Heterozygous: CF is caused by variants of the CFTR gene, one on each allele. One is inherited from the mother and one from the father. If these are two different variants, the person is considered to be heterozygous.

ICM: Intestinal current measurement is a method to diagnose or exclude CF in difficult situations (e.g. unclear relevance of CFTR variants). CF is caused by abnormalities in the mechanism that carries salt into and out of cells. With ICM, the rate of salt transport is measured in tissue samples taken from the person (rectal biopsy) and measured against reference values of a healthy population. ICM can be carried out at any age.

LCI: Lung clearance index, measured by multiple breath washout (MBW); this is a test that measures non-homogeneity of lung ventilation. A tracer gas is inhaled, and the time to exhale a defined proportion of the gas is determined. MBW is very sensitive and particularly useful to measure lung function in children and people with milder forms of CF.

Macrolides: a type of antibiotic with anti-inflammatory properties. Azithromycin is a macrolide often used in people with CF who have chronic Pseudomonas aeruginosa lung infection.

Meconium ileus: small-bowel obstruction caused by unusual thick, sticky faeces (i.e. meconium, which is the first stool of newborn babies).

NaCl: sodium chloride. Here: inhaled hypertonic saline.

NIPPV: Non-invasive positive pressure ventilation; this refers to mechanical ventilation that helps people with CF with breathing difficulties. It is done with the help of a face mask and does not require the insertion of an artificial airway (tube). It can be one of two types: BiPaP (Bi-level positive air pressure) or CpaP (continuous positive air pressure).

NPD: Nasal Potential Difference; this is a method to diagnose or exclude CF in unclear cases and involves placing an electrode on the surface of the inside of the nose to measure the electrical potential difference across the nasal epithelium. The NPD is a result of the transport of ions such as sodium and chloride in and out of the cells, a mechanism that is affected by defects in the CFTR protein.

Pancreatic insufficiency: the absence of pancreatic enzymes in the gut leading to malnutrition if not treated (in the ECFSPR pancreatic insufficiency is therefore defined as the use of pancreatic enzyme supplementation).

Pneumothorax: collapsed lung. In CF usually because of severe lung damage.

PPI: Proton Pump Inhibitors, is medication that reduces stomach acid levels.

rhDNase: recombinant human DNase (marketed as Pulmozyme®).

Steroids: are a group of medicines with a strong anti-inflammatory property. The types that are prescribed to people with CF are the group known as corticosteroids or glucocorticoids.

Variant:

Z-score (or standardised scores): a way to compare results with a "normal" population, the reference population. Negative z-scores mean that the value is below the mean of values in the reference population, whereas positive z-scores mean that the value is above the mean. Z-score equal to 0 means that the value is equal to the mean of values in the reference population. For example, a z-score for weight of-2 means that the weight is 2 standard deviations below the mean of subjects of the same age and sex of the reference population. For example, if the z-score for BMI of a 10-year-old boy is-2, it means that the BMI for that boy is 2 standard deviations below the mean BMI of 10-year-old boys of the reference population.

Appendix 5 Country Codes

AL	Albania
AM	Armenia
AT	Austria
BE	Belgium
BG	Bulgaria
BY	Belarus
CH	Switzerland
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
ES	Spain
FI	Finland
FR	France
GB	United Kingdom of Great Britain and Northern Ireland
GE	Georgia
GR	Greece
HR	Croatia
HU	Hungary
IE	Ireland
IL	Israel
IS	Iceland
IT	Italy
LT	Lithuania
LU	Luxembourg
LV	Latvia
MD	Republic of Moldova
MK	North Macedonia
NL	The Netherlands
NO	Norway
PL	Poland
PT	Portugal
RO	Romania
RS	Serbia
RU	Russian Federation
SE	Sweden
SI	Slovenia
SK	Slovak Republic
TR	Turkey
UA	Ukraine

Reference: www.iso.org/iso-3166-country-codes.html