2010

ECFS Patient Registry
Annual Data Report

European Cystic Fibrosis Society
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Denmark

ECFS Patient Registry

Annual Data Report

2010 data

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Preface

We are delighted to share with you the 2010 annual report from the European Cystic Fibrosis Society Patient Registry (ECFSPR). This report contains epidemiological data from national Cystic Fibrosis (CF) registries and individual CF centres throughout Europe and neighbouring countries. It is the sixth official report, and includes demographic and clinical data on 32,248 CF patients from 22 countries throughout Europe. This is the most comprehensive collection of CF clinical data from countries in Europe to date.

All data included in this report was entered into ECFRecord, a software program developed in 2009 by the ECFSPR specifically for CF data collection. There were two methods of data entry into ECFRecord: *direct entry*, in which a country/centre inputs patient data directly into ECFRecord and *annual upload* where countries, with an already existing national registry, uploaded all their national data as an XML-file into the software. In 2010, 10 countries entered clinical data directly into the ECFSPR software and 12 countries uploaded already collated national registry data. The list of 2010 contributing countries and individual centres can be found on page 6. This year, we are delighted to welcome Slovak Republic and new centres from Austria, Slovenia, Spain and Switzerland who have all submitted their data to the ECFSPR for the first time.

The primary goal of the ECFSPR is to allow comparison of CF clinical outcomes across Europe. This analysis has been carried out by the ECFSPR statisticians using all the raw data entered by participating countries/centres. Analysing the raw data allows comparison of different countries data that is not possible using individual countries annual reports. As a result, some countries data presented in the ECSFPR report may differ from the data published in their annual registry report. Reasons for this include difference in patient inclusion criteria, different definitions used for disease complications and different choices of reference values. Further details or how this occurs and is dealt with can be found within the report and in Appendix 1.

It is anticipated that the number of countries submitting their data to the ECFSPR will continue to grow. As a result, the ECFSPR has developed a new data collection software program, called ECFSTracker. ECFSTracker has replaced ECFRecord and is currently being rolled out in countries throughout Europe. In addition to allowing direct entry of patient data and annual uploading of national registry data, ECFSTracker also permits the entry of encounter based data in real time which may be of value to CF clinicians as well as ensuring a faster and more efficient collection of CF data. For more information on the software please visit the webpage https://www.ecfs.eu/ecfspr-software. It is also anticipated that with the introduction of this new software, the time period between data entry and production of the ECFSPR annual report will shorten considerably.

In addition to being the basis for this annual report, the ECFSPR data are used for research and other purposes for the benefit of CF patients. These include epidemiological research, identification of patients eligible for clinical trials, and data needed for pharmaceutical companies in order to apply for approval of new treatments. All research requests for data require approval by both the ECFSPR Scientific Committee and the ECFSPR Steering Group. If the requests come from industry, the ECFS Clinical Trial Network also reviews them. All applications must meet European and individual country data protection regulations concerning patient anonymity. There have been over 27 applications for use of the ECFSPR data during the past three years (2011: 7, 2012: 9, 2013: 11) and these continue to increase in number. We are confident that the ECFSPR is evolving into an important tool for CF epidemiology research that will lead to improvements in CF patient care and outcomes.

The running of the ECFSPR and development of this report takes a considerable amount of work. I would like to take this opportunity to thank the national registries' and the individual centre representatives for their participation in the ECFSPR, especially dealing with the tight deadlines necessary to get this report completed. I would like to thank the ECFSPR staff that has worked so hard on the production of this report and the running of the registry. In particular, Jacqui van Rens, the ECFSPR Executive Coordinator, who ensures that everything, from data collection and meeting arrangements to handling of research requests, runs like clockwork. I would like to thank the Service Desk, Alice Fox and Patrizia Iansa, for dealing with the many challenges associated with providing support for the software in 22 countries, many with different languages and even more different hospital IT systems. Also, many thanks to our statisticians, Anna Zolin and Laura Viviani, for their careful and professional approach to the data analysis, an essential component of the registry. In addition, considerable thanks to Dr. Hanne Vebert Olesen who has provided great leadership and vision to the ECFSPR over the past 5 years. Hanne Vebert Olesen has stepped down this year and will be greatly missed by the ECFSPR team. I would like to personally thank her for her assistance and guidance during my transition into the position of new ECFSPR Director.

Finally, I would like to thank all the CF patients throughout Europe for their willingness to participate in this registry. Without the CF patients, the registry would not exist and we hope that the registry will provide useful information for CF patients, their families and caregivers that will lead to improved CF care throughout Europe.

Sincerely,

Edward F. McKone, MD, FRCPI
ECFSPR Director

To the patients

This report is about you and how cystic fibrosis (CF) affects you and other patients all over Europe. It is based on information collected by individual CF centres and the national CF registries that participate in the European Cystic Fibrosis Society Patient Registry. We have tried to make the presentation of these data as clear as possible and hope that you will find this report interesting and easy to understand. You are always welcome to contact us if there is something that is unclear, or if you have ideas on how to do it better next year. You can contact us by email: ecfs-pr@uzleuven.be.

For discussions about the results in your country we encourage you to contact your own CF centre.

You can find more information about the ECFSPR on the patient-dedicated page of our website, at this link: www.ecfs.eu/projects/ecfs-patient-registry/information-about-ecfspr-cf-patients.

List of centres and national registries that provided the data

Country	Centre/National registry name	Contact person
Austria	9 individual centres: Medizinische Universität Innsbruck, Abt. für Kinder und Jugendheilkunde, CF Zentrum, Innsbruck Landes- Frauen-und Kinderklinik, Abt. für Kinder- und Jugendheilkunde, Linz CF Zentrum Steyr, LKH, Steyr Universitätsklinik für Kinder- und Jugendheilkunde, Vienna Allgemeines Krankenhaus der Stadt Wien (AKH) – Medizinischer Universitätscampus, Klinische Abt. für Thoraxchirurgie, Vienna Klinikum Wels Grieskirchen GmbH, Abt. für Kinder- und ugendheilkunde, Wels *LKH Universität Klinikum Graz, Abt. für Pädiatrische Pulmonologie und Allergologie, Graz* *Klinikum Klagenfurt am Wörthersee, Abt. für Kinder- und Jugendheilkunde, Klagenfurt* *Kardinal Schwarzenberg'sches Krankenhaus Betriebsges mbH, Abt. für Kinder- und Jugendheilkunde, Schwarzach*	Thomas Frischer Helmut Ellemunter Maria Bauer Josef Emhofer Thomas Frischer, Sabine Renner Peter Jaksch, Stefanie Veith Elisabeth Steiner Gabriela Thalhammer, Maria Wagenhofer Franz Wadlegger Christoph Seelbach
Belgium	Belgisch Mucoviscidose Register – Registre Belge de la Mucoviscidose	Muriel Thomas Simeon Wanyama
Czech Republic	Cystic Fibrosis Registry of the Czech Republic	Pavel Drevinek Milan Macek Alena Bilkova Marek Turnovec
Denmark	Cystic Fibrosis Registry of Denmark	Hanne Vebert Olesen Tania Pressler
France	Registre Français de la Mucoviscidose	Sophie Ravilly Lydie Lemonnier Virginie Colomb
Germany	Qualitätssicherung Mukoviszidose with 80 CF centers	Martin Stern Marguerite Honer Birgitt Wiese Paul Wenzlaff
Greece	1 individual centre: Cystic Fibrosis Centre, Aristotelian University of Thessaloniki, Hippokration Hospital, Thessaloniki	Elpis Hatziagorou John Tsanakas, Elpis Hatizagorou, Maria Fotoulaki, John Kioumis
Hungary	Cystic Fibrosis Registry of Hungary	Rita Ujhelyi Géza Marsal, Attila Hornyák
Israel	National registry with 6 individual centres (one centre did not submit 2010 data) Cystic Fibrosis Clinic, Soroka Medical Centre, Ben Gurion University, Beer Sheva Meyer Children's Hospital of Haifa, Rambam Medical Centre, Pediatric Pulmonary Unit, Haifa Cystic Fibrosis Centre, Carmel Medical Centre, Haifa Hadassah Medical Centre, Mount Scopus Paediatrics, Cystic Fibrosis Centre, Jerusalem Schneider Children's Medical Centre of Israel, Petach Tikvah	Meir Mei-Zahav Micha Aviram Galit Livnat Michal Gur Eitan Kerem, Thea Pugatsch Meir Mei-Zahav
Italy	Cystic Fibrosis Registry of Italy	Carla Colombo Natalia Cirilli, Gianluca Ferrari, Patrizia Iansa

Country	Centre/National registry name	Contact person
Latvia	1 individual centre: Rīga Stradinš University, Riga	Karina Mahlina Karina Mahlina
Netherlands	Dutch Cystic Fibrosis Registry	Vincent Gulmans
Portugal	2 individual centres: Cystic Fibrosis Centre, Centro Hospitalar Lisboa Norte, Lisbon Cystic Fibrosis Centre, Centro Hospitalar de Lisboa Ocidental, Hospital Dona Estefânia, Lisbon	Celeste Barreto Celeste Barreto, Luísa Pereira José Cavaco
Republic of Moldova	Cystic Fibrosis Registry of Moldova	Svetlana Sciucca
Russian Federation	2 individual centres: *Adult CF center, Research Institute of Pulmonology, Moscow* *Children's CF center, Research Centre for Medical Genetics, Moscow*	Nataliya Kashirskaya, Alexandr Chernyak, Stanislav Krasovskiy Elena Amelina Nikolay Kapranov
Serbia	1 individual centre: National Centre for Cystic Fibrosis, Mother and Child Health Institute of Serbia "Dr Vukan Cupic", Belgrade	Natasa Stojnic Predrag Minic, Natasa Stojnic
Slovak Republic	*Cystic Fibrosis Registry of Slovakia*	Hana Kayserova, Mariá Drugdova
Slovenia	2 individual centres: University Children`s Hospital, Pulmonary Department, Ljubljana *University Clinic of Pulmonary and Allergic Diseases, Golnik*	Uroš Krivec Jasna Rodnam Uroš Krivec Ana Kotnik Pirs, Barbara Salobir Karmen Meško Meglič
Spain	11 individual centres: Hospital de Sabadell, Corporació Sanitaria,Parc Taulí, Clinica Pediàtrica, Unitat Clinica de Fibrosis Quìstica, Barcelona Hospital La Paz Pediatric CF centre, Madrid Hospital Ramón y Cajal, Unidad de Fibrosis Quistica, Madrid CEIC Hospital Universitario La Princesa, Neumologia Adultos, Madrid Hospital Niño Jesus, Unidad de Neumologia Pediàtrica, Madrid Hospital Materno-Infantil Carlos Haya, Unidad Fibrosis Quìstica Pediàtrica, Malaga Hospital Universitario La Fe, Unidad de Trasplante Pulmonar y Fibrosis Quìstica, Valencia Hospital Universitario de Cruces, Barakaldo, Vizkaya *Hospital Vall d'Hebron, Unidad Fibrosis Quìstica e Neumologia Pediàtrica, Barcelona* *Hospital Materno-Infantil Carlos Haya, Unidad Fibrosis Quìstica Adultos, Malaga* Hospital Clinico Universitario de Valencia, Unidad di Neumologia Infantil y Fibrosis Quìstica, Valencia	Carlos Vazquez-Cordero Miguel Garcia González Oscar Asensio de la Cruz Maria del Carmen Antelo Landeira, María Isabel Barrio Gomez de Agüero Adelaida Lamas Ferreiro, Marta Ruiz de Valbuena, Lucrecia Suárez Cortina Rosa Maria Giron Jose R. Villa Asensi Francisco Javier Perez Frias, Estela Perez Ruiz Amparo Solé Jove , Monica Cebrián Carlos Vazquez-Cordero Silvia Gartner Casilda Olveira Fuster, Nuria Porras Pèrez Amparo Escribano Montaner
Sweden	Cystic Fibrosis Registry of Sweden	Isabelle de Monestrol Anders Lindblad

Country	Centre/National registry name	Contact person
Switzerland	8 individual centres: CF Erwachsenenzentrum, Spital Tiefenau, Spital Netz Bern Universitätsklinik für Kinderheilkunde, Zentrum für Cystische Fibrose und Pulmonologie, Inselspital, Bern Centre Hospitalier Universitaire Vaudois (CHUV), Départment Médico-Chirurgical de Pédiatrie, Pneumologie Pédiatrie et Mucoviscidose, Lausanne Ostschweizer Kinderspital, Pneumologie Pädiatrische, St. Gallen Kinderspital Zürich, Abt. für Pneumologie, Zürich *Centre Hospitalier Universitaire Vaudois (CHUV), Policlinique Mèdicale Universitaire, Départment de Médicine, Consultation de Mucoviscidose, Lausanne* *Luzerner Kantonsspital, Zentralschweiz für Kinder und Erwachsene, Pneumologie und Schlafmedizin, Pädiatrische Gastroenterologie, Pädiatrische Pneumologie, Luzern* *Hôpital de Morges, Consultation de Mucoviscidose Adulte, Morge*	Andreas Jung Reta Fischer, Carlo Mordasini Martin Schöni Gaudenz Hafen Jürg Barben Andreas Jung Laurent Nicod Marie Hofer, Bernhard Schwizer Johannes Spalinger Peter Eng Alain Sauty Marie Hofer,
United Kingdom	UK Cystic Fibrosis Registry	Elaine Gunn Diana Bilton Stephanie McNeill

List of individual centres and national registries who contributed to the ECFSPR. New participants since the last report of 2008-2009 data are in italics. Where the name is in large print, the person is the country representative in the ECFSPR Steering Group; where the name is underlined, he/she is the database manager for the national registry.

Authors

For this report, the tables and graphs were written, commented and/or revised by:

Anna Zolin, Italy, Statistician, Dipartimento di Scienze Cliniche e di Comunità, Università degli Studi di Milano;
Jacqui van Rens, Belgium, ECFSPR Executive Coordinator;
Alice Fox and **Patrizia Iansa**, Italy, ECFSPR Service Desk;
Angeliki Preftitsi, Greece and **Ulrike Pypops**, Belgium: CF Europe representatives in the ECFSPR;
Vincent Gulmans, The Netherlands, **Andreas Jung**, Switzerland, **Anil Mehta**, United Kingdom, **Laura Viviani**, Italy: members of the ECFSPR Executive Committee;
Contributing country managers and national representatives (the names are listed on page 6);
Hanne Vebert Olesen, Denmark, previous ECFSPR Director.
Edward McKone, Ireland, ECFSPR Director.

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Introduction

The European Cystic Fibrosis Society Patient Registry (ECFSPR)

The ECFSPR collects demographic and clinical data on consenting cystic fibrosis (CF) patients from Europe and neighbouring countries. Data are collected using a common set of variables and definitions, and are sent to the ECFSPR in one of two ways:

- National CF registries (or individual centres with local databases) extract patient data from their own database and import the data into the ECFSPR software;
- Individual centres input patient 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. The data stored in the central database are anonymous, and only year/month of birth and random centre numbers are used as identifiers. The data are available for scientific purposes on application. All requests are reviewed by the ECFSPR Scientific Committee and, based on their recommendation, the country representatives in the Steering Group will take a final decision on the approval of the requests.

For more information, please visit our website http://www.ecfs.eu/projects/ecfs-patient-registry/intro.

General considerations

For the national registries, some of the definitions and data coding do not fully correspond to the ECFSPR ones, either because some pieces of information are not collected by the national registries or they are collected in a different way. When the national registries upload their data, they are also asked to state in a document whether their variables definitions meet those of the ECFSPR. If major discrepancies between the definitions are present, those variables have been omitted from the annual report, or in the case of minor discrepancies, a footnote is added to the graphs and tables explaining the difference. For example, the ECFSPR collects information on presence of chronic *Pseudomonas aeruginosa* (Ps. A.) infection according to the modified Leeds criteria and/or the presence of elevated Pseudomonas antibodies (see Appendix 2). If a national registry collects such information as “at least one positive Ps. A. culture this year”, this information would be too different from the definition of chronic Ps. A. of the ECFSPR, and we would set this variable to “missing” for that country. If instead a country defines chronic Ps. A. as “the presence of more than four positive cultures in 6 months”, this variable would be included in the annual report since the definition is much closer to the ECFSPR definition, however a footnote will be added to the relevant tables and graphs.

If a country does not collect a certain variable (or if it is completely different from ECFSPR definitions as described above), we have omitted that country from the relevant graphs in the report. The same happens for countries where the information is missing for more than 10% of the patients. All data, however, will be presented in the tables. The number of missing values is important for the interpretation of the results, since it is impossible to know if a patient with a

missing value for e.g. a complication has this complication or not, making the given frequencies less accurate. For example, in a country where 7% of the patients have liver disease, but where 20% of patients have unknown/missing information on liver disease, the true frequency of liver disease can be anything between 7 and 27%.

You will find some differences in the findings between the national registries' own reports and the ECFSPR report. This is because some variables are recoded or computed in different ways. For example, some national registries compute the age at the annual visit and consider 16 years as the cut-off for adult age, for the ECFSPR, we compute the age at FEV1/height/weight measurement and the age at follow-up (the end of the year) and we consider 18 years as cut-off for adult age. Since clinical outcomes do not change very much over a 12 month period, we do not consider this to be a serious obstacle to interpretation. Another example, for lung function values, like FEV1, the raw data, reported in litres, are not informative unless they are expressed in relation to the age, sex and height of the patient. We therefore needed to transform the raw values into new variables in order to compare lung function between patients and countries. We used common reference populations (one for children and one for adults) for all data when calculating the values as percentage of predicted from the raw data. Slightly different values can be found 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.

Abbreviations and terms

Country codes:

AT:	Austria
BE:	Belgium
CH:	Switzerland
CZ:	Czech Republic
DK:	Denmark
DE:	Germany
ES:	Spain
FR:	France
GR:	Greece
HU:	Hungary
IL:	Israel
IT:	Italy
LV:	Latvia
MD:	Republic of Moldova
NL:	The Netherlands
PT:	Portugal
RS:	Serbia
RU:	Russian Federation
SE:	Sweden
SI:	Slovenia
SK:	Slovak Republic
UK:	United Kingdom

Medical abbreviations and terms:

FEV1: forced expiratory volume in one second (lung function parameter).
FEV1%: the FEV1 as a percentage of the average value for healthy people of the same age, height and sex.
BMI: body mass index (weight (kg)/(height (m))^2).
CFRD: CF related diabetes.
NaCl: sodium chloride. Here: inhaled hypertonic saline.
rhDNase: ribosomal human DNase – marketed as Pulmozyme®.
Bronchodilator: medication that relaxes the muscles of the airways, used also for asthma.
ABPA: allergic broncho-pulmonary aspergillosis, an allergic reaction to the mould *Aspergillus.*
Meconium ileus: congenital obstruction of the gut with thick, sticky faeces.
Pneumothorax: collapsed lung, in CF usually because of severe lung damage.
Haemoptysis: coughing up blood. This happens frequently in small amounts in CF, so the complication we asked for here is major bleeding (more than 250 ml).
Pancreatic insufficiency: the absence of pancreatic enzymes in the gut leading to malnutrition if not treated (pancreatic sufficiency is therefore defined as the use of pancreatic enzyme supplementation).

Statistical abbreviations and terms:

N: the number of patients in a group for whom the information is not missing.
N miss: number of missing values. It is the number of patients for whom the information was missing.
Min: minimum. It is the lowest value.
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 patients 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 patients are diagnosed before 5 months of age, and the other half of the patients are diagnosed after 5 months of age.
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 patients are diagnosed before 1 month of age, and the other three quarters are diagnosed after 1 month of age.
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 patients are diagnosed before 3 years, the other quarter are diagnosed after 3 years.
Quartiles: The 25th Percentile, the median and the 75th percentile are collectively called quartiles, because they divide the set of measurements into quarters.
Z-score: it indicates how far (in other terms, how many standard deviations) a value is from the mean value of a reference population (see Appendix 1 for details). 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. 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.

Summary of data report

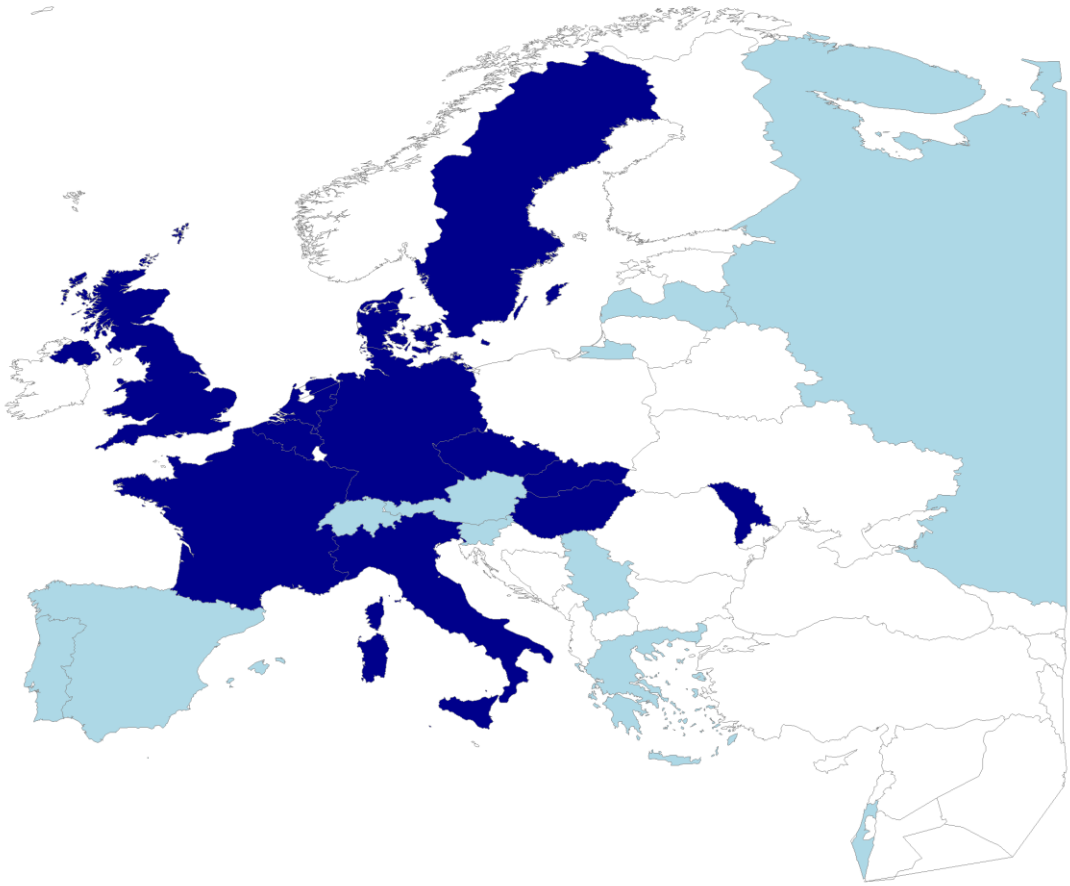
Outcome		Females	Males	Total
Patients registered in the ECFSPR in year 2010	n	15389	16859	32248
	(%)	(47.7)	(52.3)	
Age at follow-up (years, patients alive on 31/12/2010)	mean	19.1	19.8	19.5
	median	17.2	18.3	17.8
Patients ≥ 18 years (patients alive on 31/12/2010)	%	47.6	50.8	49.3
Age at diagnosis*	mean (years)	4.1	3.7	3.9
	median (months)	5.0	5.0	5.0
Patients with at least one F508del allele*	%	82.6	82.8	82.7
Patients deceased in 2010	n	158	157	315
	(%)	(1.0)	(0.9)	(0.9)
Age at death (years)	mean	28.7	30.2	29.4
	median	28.0	28.0	28.0
Patients living with lung transplant*	n	662	644	1306
	(%)	(4.8)	(4.2)	(4.5)
Patients living with liver transplant*	n	59	103	162
	(%)	(0.4)	(0.7)	(0.6)

* United Kingdom: only patients with complete data required for all of these clinical outcomes were included.

Data report

1. Demographics

Figure 1.1 Map of countries that contributed to the ECFSPR in year 2010.



Countries that sent their data to the ECFSPR as national registries are in dark blue, countries with individual centres that sent their data are in light blue.

Table 1.1 Number of patients seen in year 2010, by country.

Country	2010	Estimated coverage 2010
Austria	511	57%[1]
Belgium*	1138	>90%
Czech Republic*	523	100%
Denmark*	450	100%
France*	5759	90%
Germany*	5003	95%[2]
Greece	96	20%[1,3]
Hungary*	557	90%
Israel**	429	72%[1]
Italy*	4119	70%
Latvia	30	>90%[1]
Rep of Moldova*	42	100%
The Netherlands*	1306	97%
Portugal	138	48%[1]
Russian Federation	359	15-20%
Serbia	121	>90%
Slovak Republic*	333	>90%
Slovenia	80	75%[4]
Spain	918	30%[1]
Sweden*	509	80-85%[5]
Switzerland	443	55%[6]
United Kingdom*	9384	100%[7]
Total	32248	

*Countries with an established national CF registry.

**Although Israel does not have an official national registry, we consider it as such since all the CF centres in the country contribute to the ECFSPR.

[1] Estimate, since the total number of patients is not known.

[2] National registry has 95% coverage.

[3] Coverage is higher for paediatric patients than for adult patients: only a minority of adult patients participated in the ECFSPR.

[4] Coverage is 100% for children and 50% for adults.

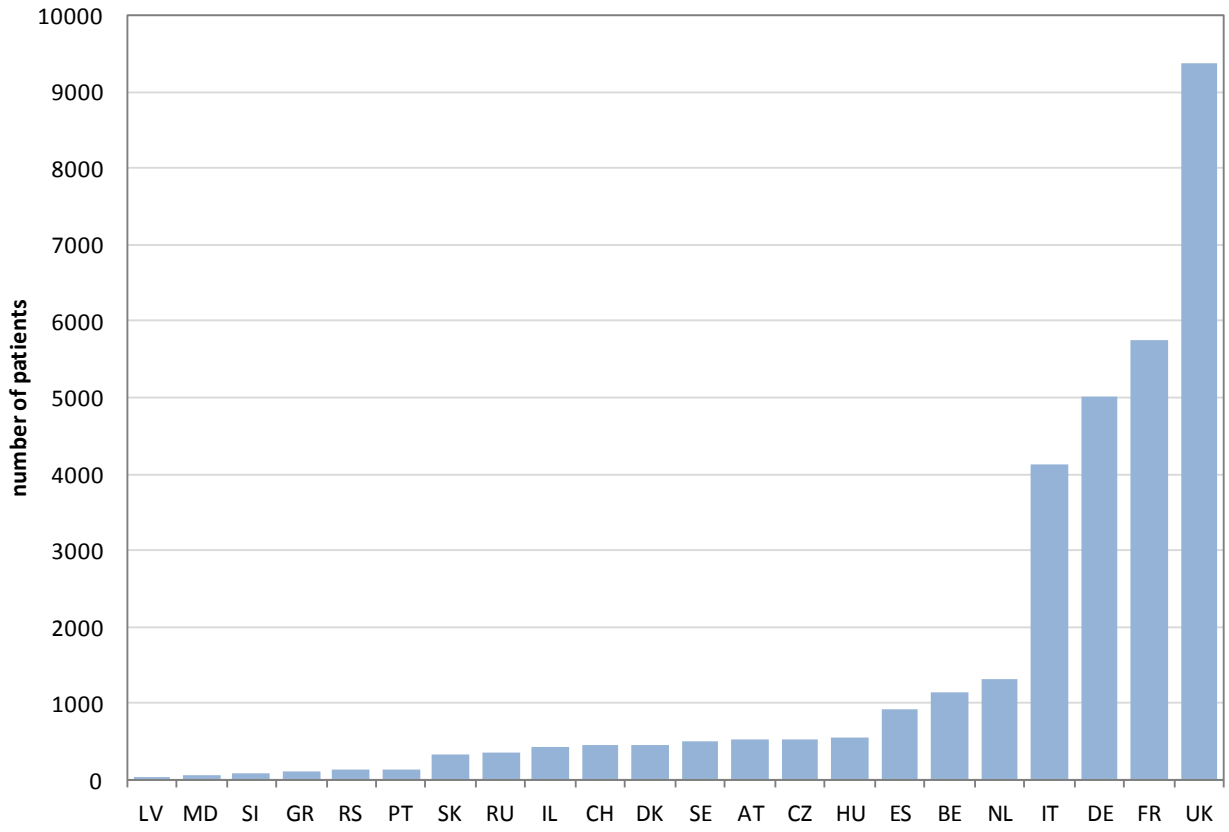
[5] Due to software issues, only 80-85% of patients present in the registry were reported to the ECFSPR. Total number of patients for Sweden is less than 2010 due to the removal of CF diagnosis of some patients.

[6] Coverage is higher for paediatric patients than for adults patients: only a minority of adult centres participated in the ECFSPR.

[7] National registry coverage. Total number for UK is one patient less than 2010 UK annual report due to the removal of CF diagnosis. For the clinical outcomes reported in Section 2: Diagnosis to Section 8: Transplantation, only UK patients with complete data collection were included (N=7936, 85% of the UK total).

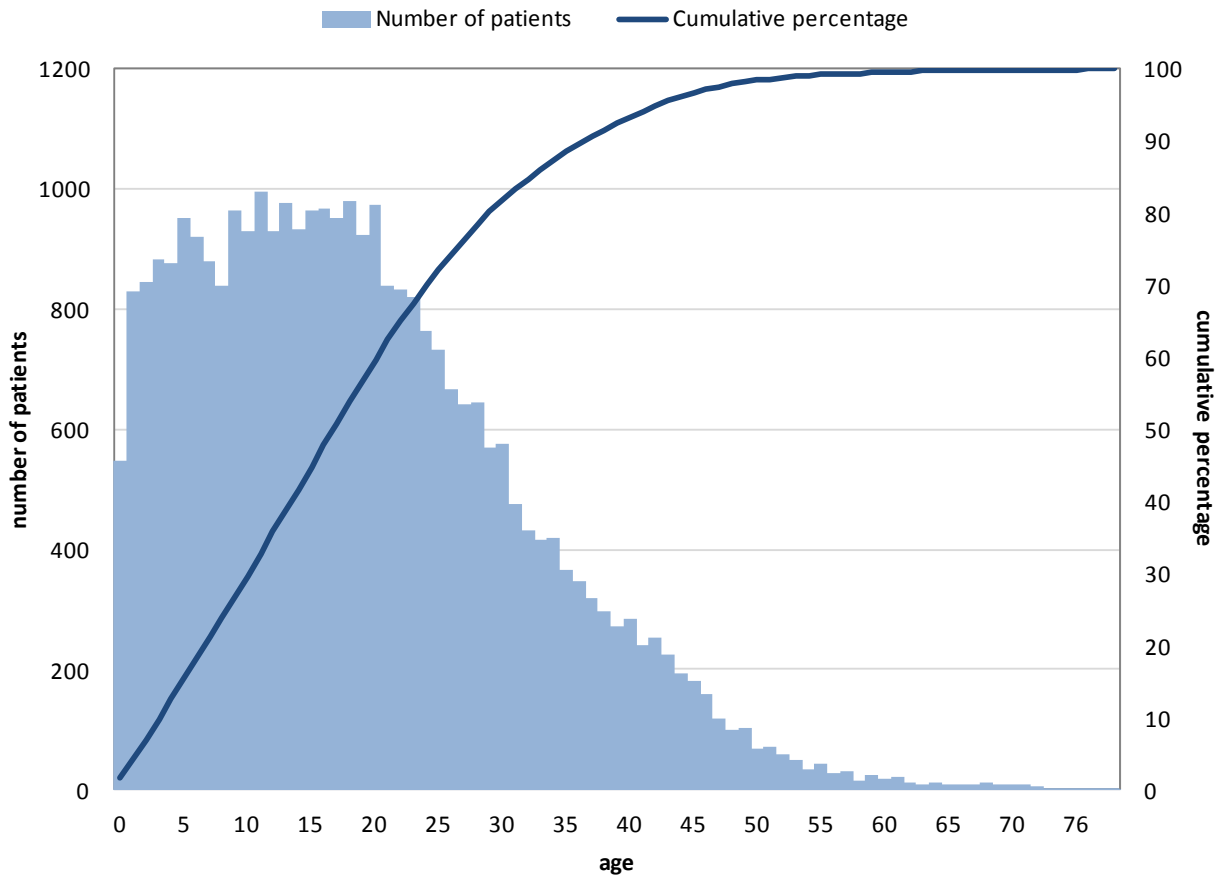
The column labelled “estimated coverage 2010” shows the estimated percentage of CF patients living in that country who are included in the national registries/national data collections. Note that one individual centre might include almost all patients for some countries (e.g. Latvia and Serbia).

Figure 1.2 Number of patients in the ECFSPR in year 2010, by country.



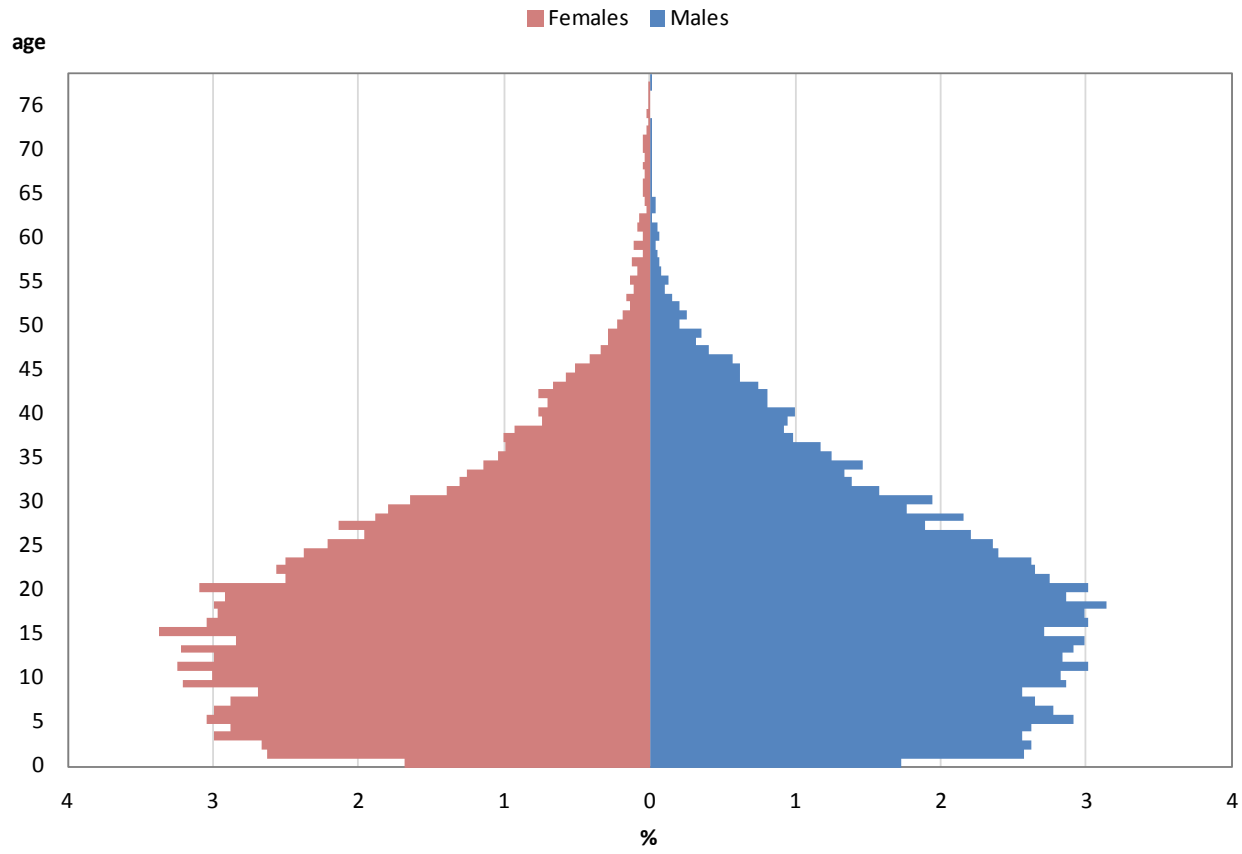
Each vertical bar shows the number of patients living in that country and included in the ECFSPR in 2010. Please refer to table 1.1 for the coverage in each country.

Figure 1.3 Age at follow-up distribution. Patients alive on 31/12/2010.



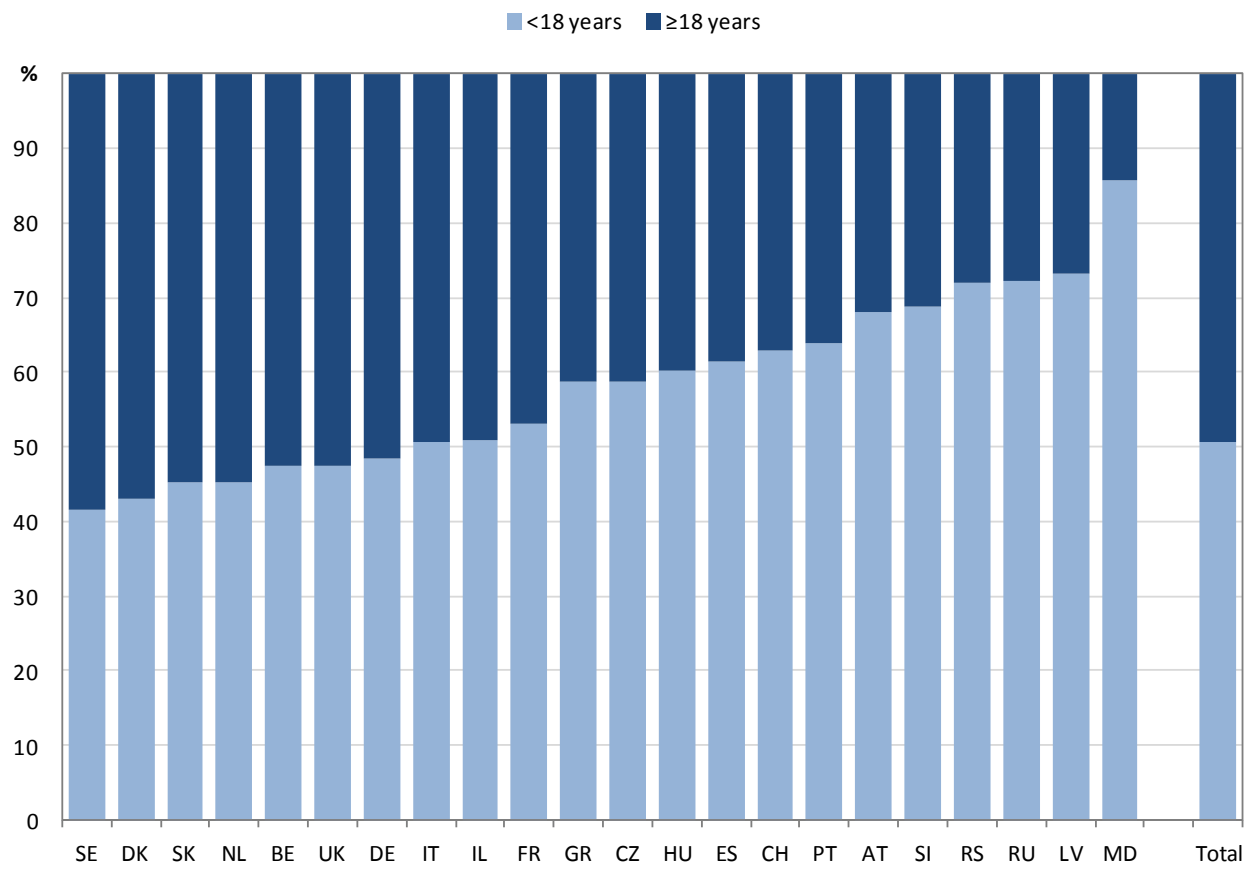
Each blue vertical bar represents the number of patients of that age alive in 2010. The cumulative percentage (blue line, right vertical axis) describes how many patients (as a percentage) are below a certain age (e.g. 50% of the patients are less than 18 years of age).

Figure 1.4 Age at follow-up distribution by sex. Patients alive on 31/12/2010.



The pyramid shows the percentage of patients of different ages as horizontal bars. The right hand side of the pyramid (blue) shows, for males, how many patients (as a percentage) have a certain age, the left hand side (red) shows the same for females. The lower number of patients at the bottom of the pyramid is due to the fact that some patients have not yet been diagnosed (mean age at diagnosis is 3.9 years, see table 2.1).

Figure 1.5 Proportion of adults (≥18 years) and children (<18 years). Patients alive on 31/12/2010.



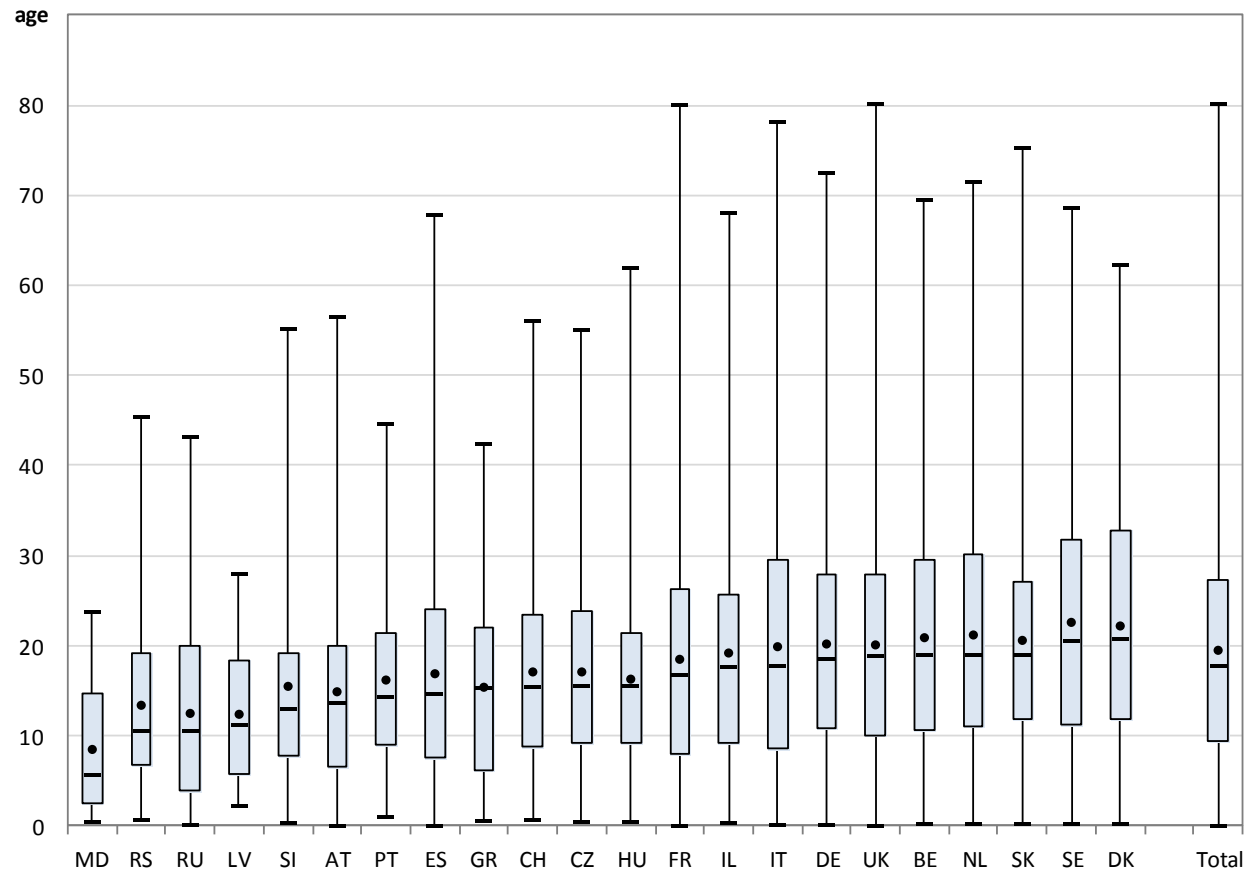
This graph shows the percentage of patients in each country who are adults (dark blue) or children (light blue). The percentage of adult patients varies considerably between the different countries, but this is partly an effect of the way the patients are included: for some countries only a few individual centres sent the data to the ECFSPR, and the proportion of children and adults may reflect the proportion of paediatric and adult centres in that country included in the ECFSPR. Please refer to table 1.1 for coverage.

Table 1.2 Age at follow-up: descriptive statistics, by country and overall. Patients alive on 31/12/2010.

Country	N	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)
Austria	509	14.9	0.0	6.5	13.6	19.9	56.5
Belgium	1131	20.9	0.2	10.7	19.0	29.5	69.5
Czech Republic	508	17.1	0.5	9.2	15.5	23.9	55.0
Denmark	447	22.2	0.2	11.8	20.8	32.8	62.3
France	5699	18.5	0.0	8.1	16.8	26.2	80.0
Germany	4959	20.2	0.1	10.8	18.5	28.0	72.5
Greece	92	15.4	0.6	6.2	15.3	22.0	42.4
Hungary	557	16.3	0.5	9.2	15.5	21.4	61.9
Israel	429	19.2	0.3	9.2	17.7	25.6	68.0
Italy	4087	19.9	0.1	8.7	17.8	29.5	78.1
Latvia	30	12.4	2.2	5.7	11.2	18.4	28.0
Rep of Moldova	42	8.5	0.4	2.5	5.7	14.7	23.7
The Netherlands	1289	21.2	0.2	11.0	19.0	30.1	71.5
Portugal	136	16.2	1.0	9.0	14.3	21.4	44.6
Russian Federation	351	12.5	0.1	4.0	10.5	20.0	43.2
Serbia	118	13.4	0.7	6.7	10.5	19.2	45.4
Slovak Republic	332	20.6	0.2	11.8	19.0	27.1	75.2
Slovenia	80	15.5	0.3	7.8	13.0	19.1	55.1
Spain	909	16.9	0.0	7.6	14.7	24.0	67.8
Sweden	507	22.6	0.2	11.3	20.5	31.7	68.6
Switzerland	439	17.1	0.7	8.9	15.4	23.4	56.0
United Kingdom	9281	20.1	0.0	10.0	18.9	28.0	80.1
Total	31932	19.5	0.0	9.5	17.8	27.3	80.1

This table shows the descriptive statistics for age at follow-up of the patients by country and overall. Only patients who were alive on December 31st 2010 are included.

Figure 1.6 Age at follow-up: box-plot, by country and overall. Patients alive on 31/12/2010.



This box-plot is a graphic representation of the age detailed in table 1.2. For each country the dash (black line crossing the blue 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. The following figure explains how to read the box.

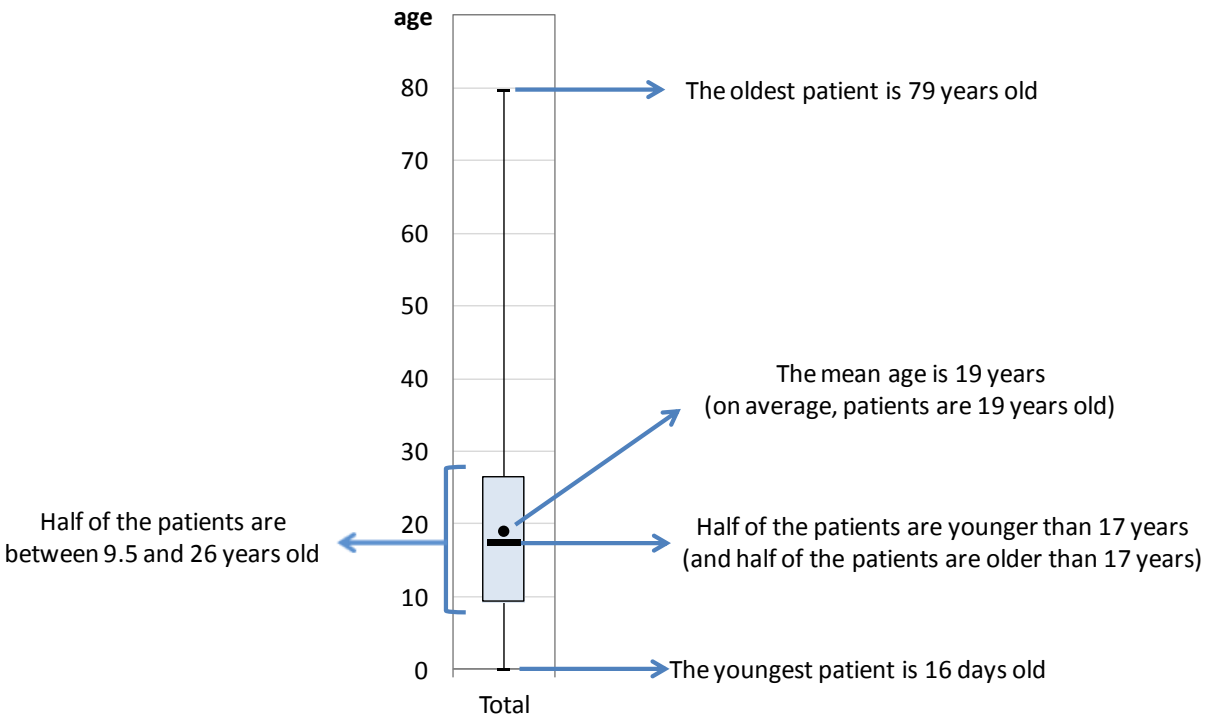
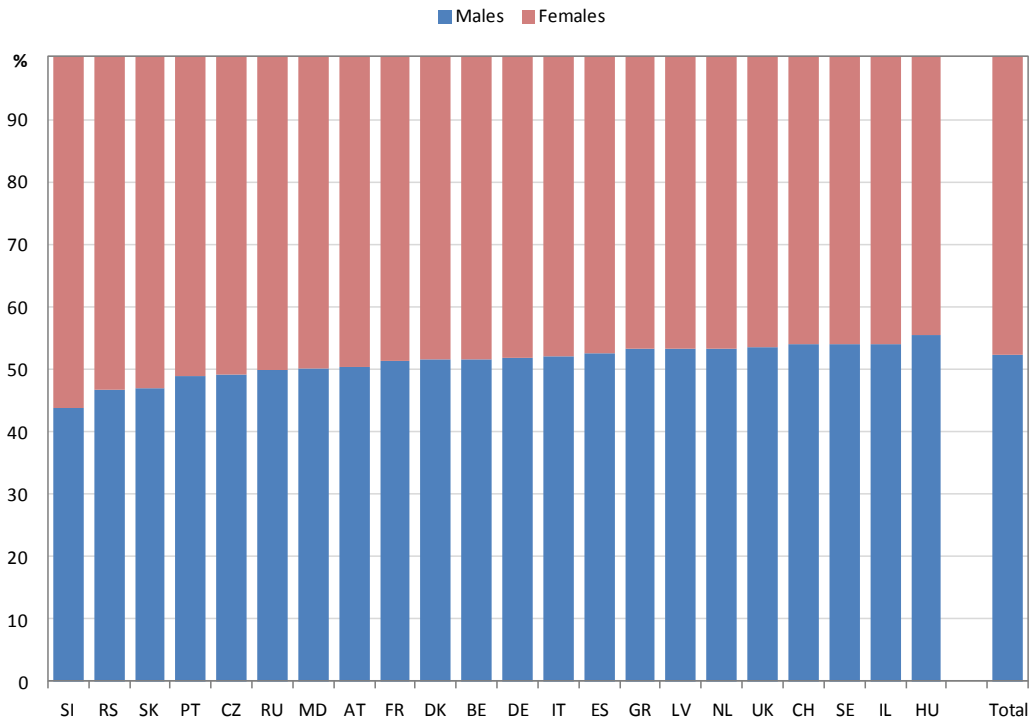
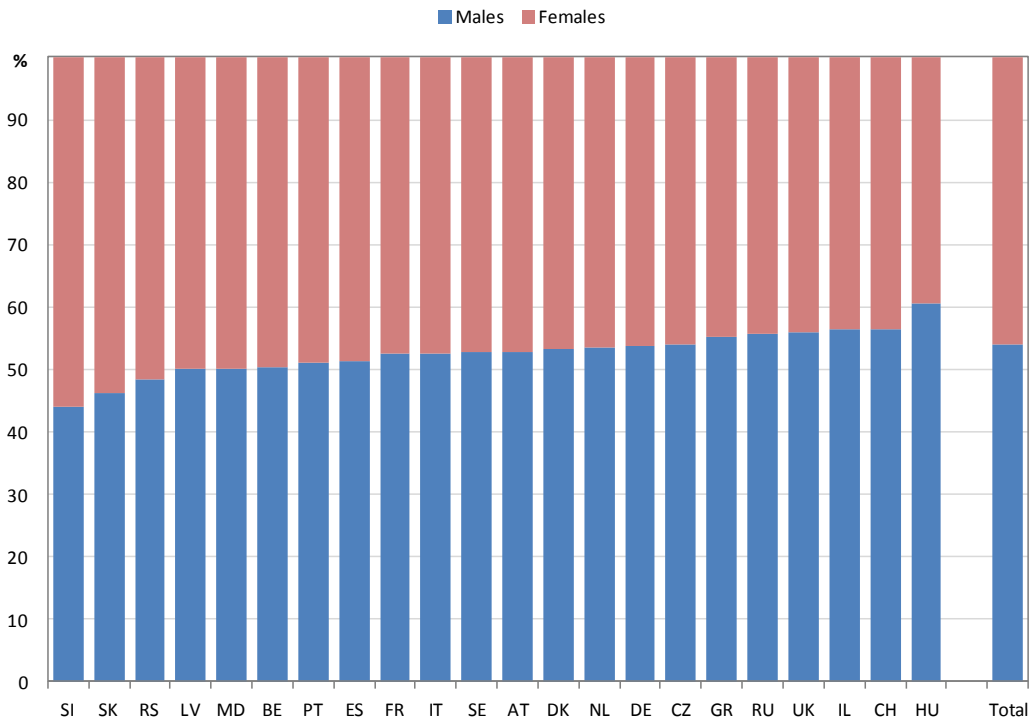


Figure 1.7 Sex distribution, by country and overall. Patients alive on 31/12/2010.



Sex distribution of all patients. Overall (see "Total"), in the ECFSPR there are more male than female patients, which could reflect a higher mortality in the female CF patients. The proportion is not uniform across the different countries.

Figure 1.8 Sex distribution, by country and overall. Patients alive on 31/12/2010 and aged 18 years or more.



Sex distribution for adult patients. The total proportion of females in the adult group is similar to the proportion of females in the whole population.

2. Diagnosis

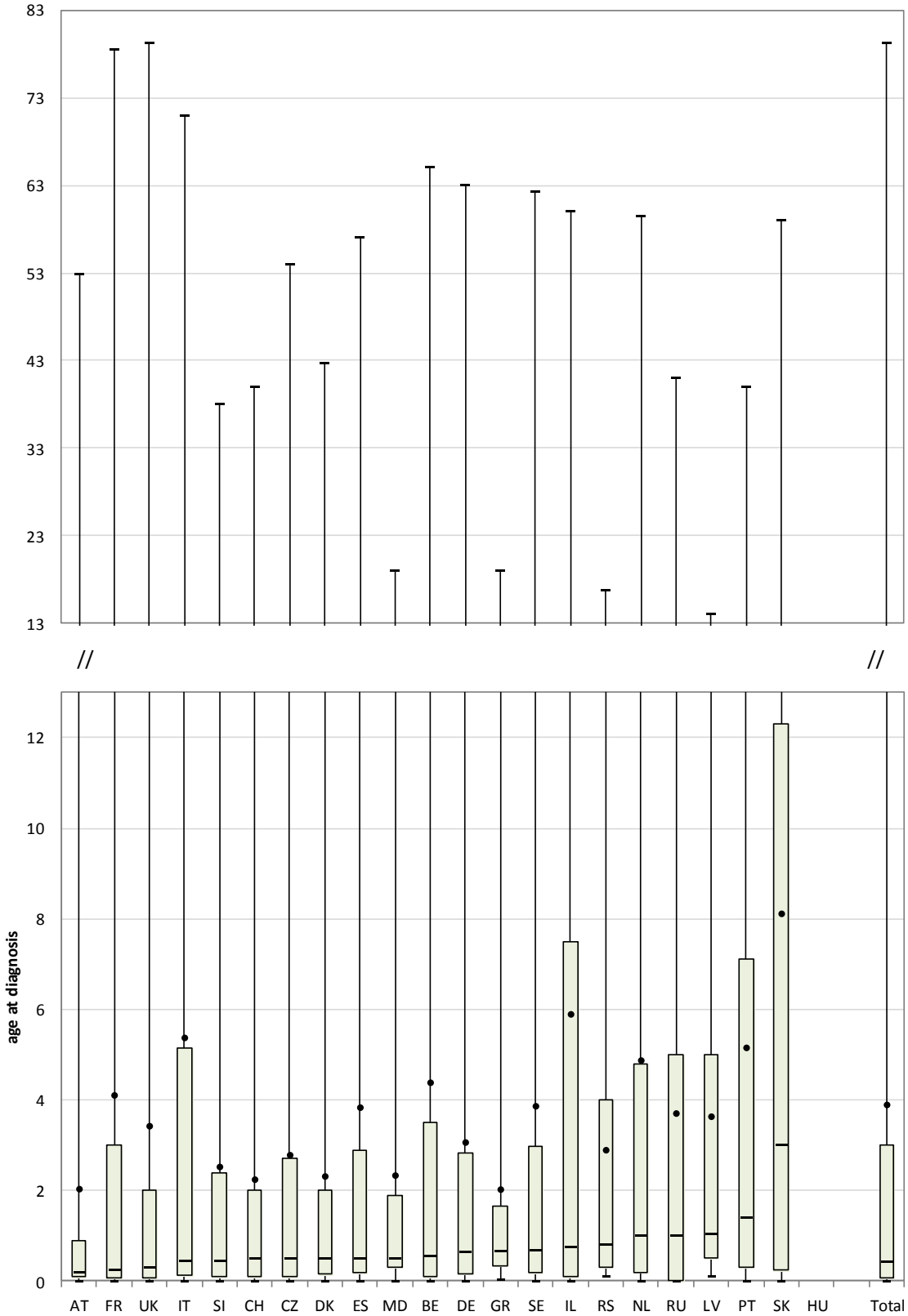
Hereafter, only for United Kingdom, only patients with complete data collection for clinical outcomes will be presented (N=7936, 85% of UK total).

Table 2.1 Age at diagnosis (in years): descriptive statistics, by country and overall. All patients seen in 2010.

Country	N	N miss	Mean (average age at diagnosis)	Min (lowest age at diagnosis)	25th pctl (25 % of the patients were diagnosed before this age)	Median (half the patients were diagnosed before this age)	75th pctl (75% of the patients were diagnosed before this age)	Max (highest age at diagnosis)
Austria	487	24	2.03	0.00	0.10	0.20	0.90	52.81
Belgium	1128	10	4.38	0.00	0.11	0.55	3.50	65.01
Czech Republic	523	0	2.78	0.00	0.10	0.50	2.70	53.90
Denmark	450	0	2.31	0.00	0.17	0.50	2.00	42.67
France	5487	272	4.10	0.00	0.08	0.25	3.00	78.50
Germany	4359	644	3.06	0.00	0.17	0.64	2.83	62.95
Greece	88	8	2.02	0.04	0.33	0.67	1.67	19.00
Hungary	0	557	-	-	-	-	-	-
Israel	427	2	5.89	0.00	0.11	0.75	7.50	60.00
Italy	4055	64	5.37	0.00	0.13	0.44	5.16	70.86
Latvia	30	0	3.63	0.10	0.50	1.04	5.00	14.00
Rep of Moldova	42	0	2.33	0.00	0.30	0.50	1.90	19.00
The Netherlands	893	413	4.87	0.00	0.20	1.00	4.80	59.42
Portugal	138	0	5.15	0.00	0.30	1.40	7.10	40.00
Russian Federation	333	26	3.70	0.00	0.00	1.00	5.00	41.00
Serbia	115	6	2.89	0.10	0.30	0.80	4.00	16.70
Slovak Republic	304	29	8.11	0.00	0.25	3.00	12.30	59.00
Slovenia	79	1	2.52	0.00	0.10	0.45	2.40	38.00
Spain	898	20	3.83	0.00	0.20	0.50	2.90	57.00
Sweden	458	51	3.86	0.00	0.20	0.68	2.97	62.28
Switzerland	435	8	2.24	0.00	0.10	0.50	2.00	40.00
United Kingdom	7859	77	3.42	0.00	0.08	0.30	2.00	79.18
Total	28588	2212	3.89	0.00	0.08	0.42	3.00	79.18

This table shows the descriptive statistics for age at diagnosis by country and overall. For prenatal diagnoses (children diagnosed before birth), the age at diagnosis has been set to 0.

Figure 2.1 Age at diagnosis (in years): box-plot, by country and overall. All patients seen in 2010.



This box-plot is a graphic representation of age at diagnosis as detailed in table 2.1. For each country the dash (black line crossing the blue 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. Please note that the vertical axis is interrupted to emphasise the change of scale in the upper part of the graph. The figure on the next page explains how to read the box.

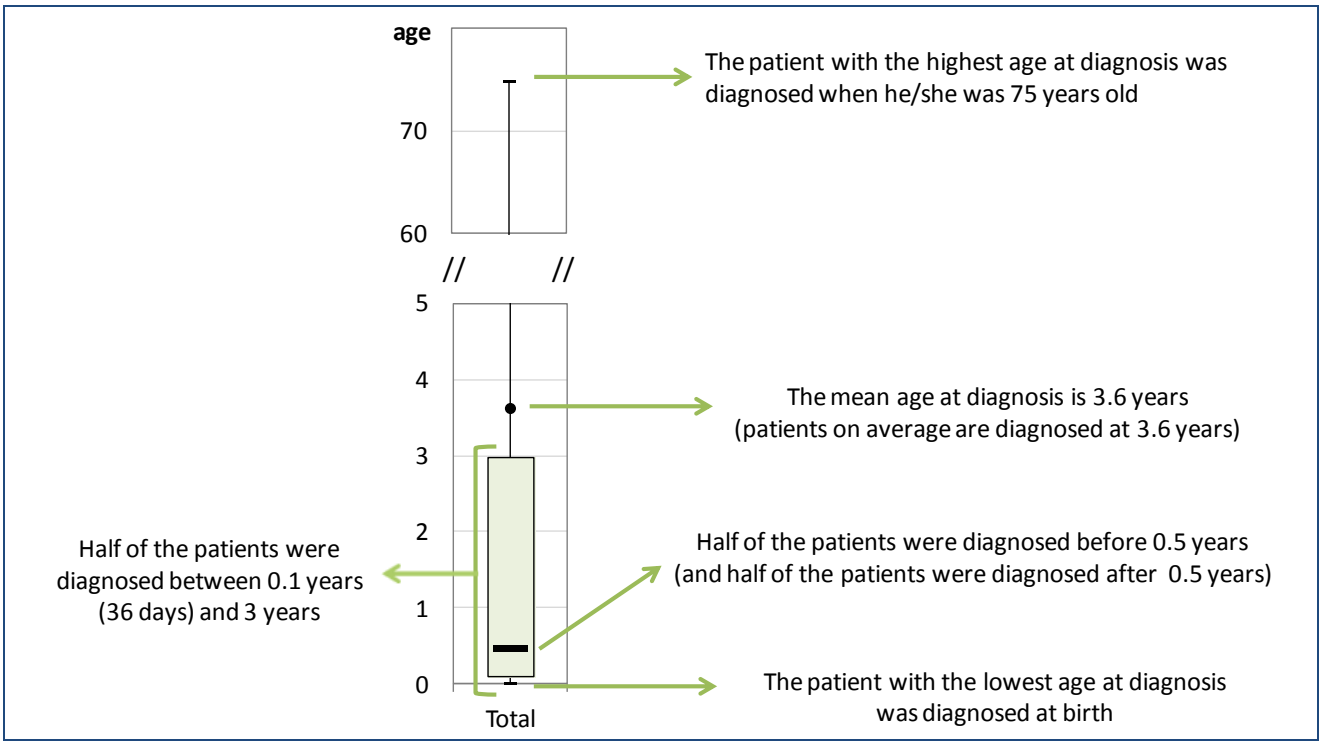
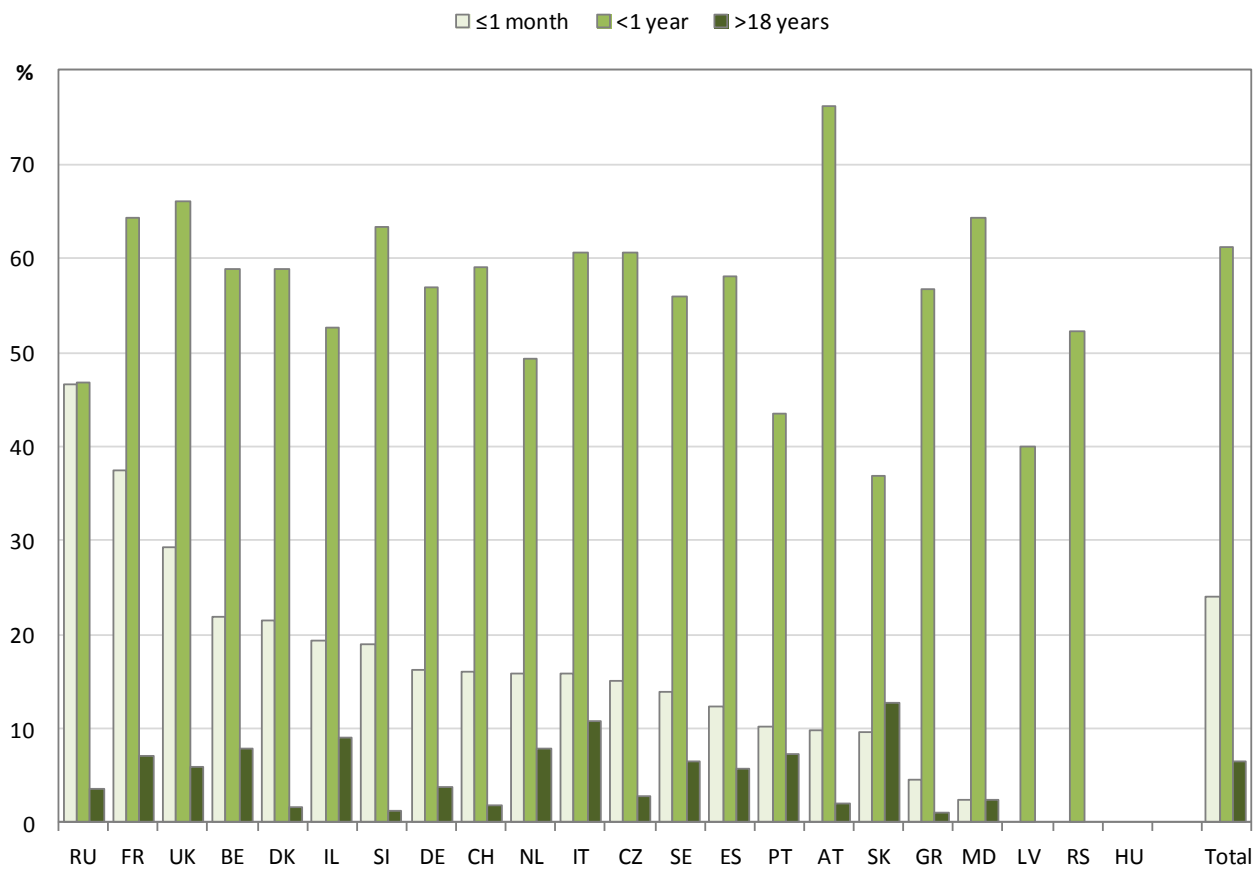

age
70
60
5
4
3
2
1
0
Total
The patient with the highest age at diagnosis was diagnosed when he/she was 75 years old
The mean age at diagnosis is 3.6 years (patients on average are diagnosed at 3.6 years)
Half of the patients were diagnosed before 0.5 years (and half of the patients were diagnosed after 0.5 years)
Half of the patients were diagnosed between 0.1 years (36 days) and 3 years
The patient with the lowest age at diagnosis was diagnosed at birth

Figure 2.2 Proportion of patients diagnosed at age 1 month or younger, younger than 1 year and older than 18 years, by country and overall. All patients seen in 2010.



This graphs shows age at diagnosis in subgroups. The vertical bars represent how many patients (as a percentage) were diagnosed within the first month of life (grey), within the first year of life (light green), and after 18 years of age (dark green). Note that the diagnoses performed within 1 month are also part of the diagnoses performed in the first year, and that the diagnoses performed between 1 year and 18 years are not shown in the graph, therefore the bars do not sum to 100%.

Figure 2.3 Proportion of patients who underwent neonatal screening, by country and overall. Patients 5 years old or younger seen in 2010.

Note: Belgium: no national neonatal screening programme. Positive answers ("neonatal screening performed") are reported when neonatal screening is one of the factors that led to CF diagnosis.
Czech Republic: positive answers ("neonatal screening performed") are reported when neonatal screening is one of the factors that led to CF diagnosis.
France: neonatal screening is recorded only if it is part of the diagnosis.
United Kingdom: diagnosis suggested by neonatal screening.

This graph shows the percentage of patients 5 years old or younger in 2010 who had newborn screening performed (see country specific notes above). Dark green horizontal bars represent newborn screening "performed", light green ones "not performed". This graph shows that in some countries there is no newborn screening and that in others almost all the CF patients underwent newborn screening during the five years previous to 2010. In total, almost 55% of all children 5 years old or younger registered in the ECFSPR in 2010, underwent newborn screening, but this estimate reflects the fact that not all the countries perform newborn screening.

Figure 2.4 Patients with meconium ileus, by country and overall. Patients aged 10 years or younger.

Figure 2.5 Patients with meconium ileus, by country and overall. Patients aged 11 years or older.

These two graphs show the prevalence of meconium ileus (operated or not) at birth in two age groups: 0 to 10 years (fig 2.4) and 11 years or older (fig 2.5). Overall, the proportion of child patients (≤10 years) with meconium ileus is higher compared to the older age group (>10 years). This difference is not due to an increase in the prevalence of meconium ileus in the younger generations but could be due to the fact that some older patients with meconium ileus have died, and are therefore not present in the current data collection (which refers to only patients seen in 2010). The graphs also show that the frequency of reported meconium ileus varies between countries.

3. Genetics

We supplied the countries with a list of the 1600 most common mutations based on the Cystic Fibrosis Mutation database (CFTR1). If the patient had a mutation that was not present in the database, the country had the possibility to enter the name of the mutation as free text. During the data cleaning process, the genotypes not on our list were checked for obvious misspellings or alternative names and, if identical to a known mutation, renamed. We use the original mutation name (legacy name) in this report, since more than 90% of the mutations in the database use this nomenclature.

If DNA analysis to look for CFTR mutations was never carried out, we asked the countries to report “Not done” in the genotype field. If DNA analysis was done, but only one or no mutations were found, we asked the countries to write “Unknown” for the un-identified mutations. Please note that there are differences from country to country in how DNA testing is carried out; some countries use standard kits that test only a limited number of common mutations (e.g. 28), and other countries perform DNA analyses of the whole gene until the mutation is identified.

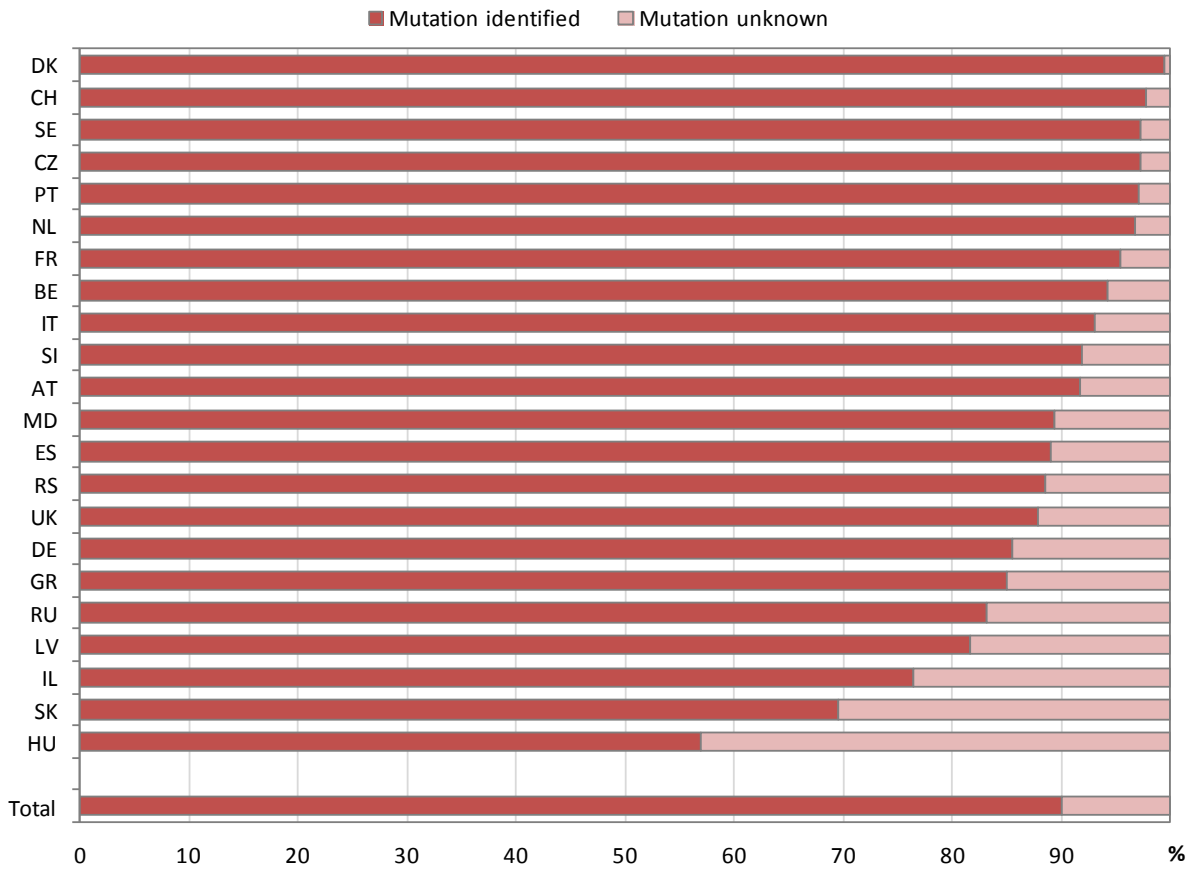
Table 3.1 Proportion of patients with DNA analysis and the result of this, by country and overall. All patients seen in 2010.

Country	N	Genotyping			Among genotyping done	
		missing information	not done	done	two mutations identified	at least one mutation unknown
Austria	511	11 (2.1%)	1 (0.20%)	499 (97.7%)	435 (87.2%)	64 (12.8%)
Belgium	1138	0 (0.0%)	14 (1.2%)	1124 (98.8%)	1026 (91.3%)	98 (8.7%)
Czech Republic	523	0 (0.0%)	0 (0.0%)	523 (100%)	501 (95.8%)	22 (4.2%)
Denmark	450	1 (0.2%)	0 (0.0%)	449 (99.8%)	445 (99.1%)	4 (0.9%)
France	5759	0 (0.0%)	0 (0.0%)	5759 (100%)	5400 (93.8%)	359 (6.2%)
Germany	5003	0 (0.0%)	386 (7.7%)	4617 (92.3%)	3632 (78.7%)	985 (21.3%)
Greece	96	3 (3.1%)	0 (0.0%)	93 (96.9%)	69 (74.2%)	24 (25.8%)
Hungary	557	1 (0.2%)	0 (0.0%)	556 (99.8%)	259 (46.6%)	297 (53.4%)
Israel	429	0 (0.0%)	1 (0.2%)	428 (99.8%)	302 (70.6%)	126 (29.4%)
Italy	4119	0 (0.0%)	51 (1.2%)	4068 (98.8%)	3581 (88.0%)	487 (12.0%)
Latvia	30	0 (0.0%)	0 (0.0%)	30 (100%)	19 (63.3%)	11 (36.7%)
Rep of Moldova	42	0 (0.0%)	0 (0.0%)	42 (100%)	35 (83.3%)	7 (16.7%)
The Netherlands	1306	0 (0.0%)	84 (6.4%)	1222 (93.6%)	1155 (94.5%)	67 (5.5%)
Portugal	138	0 (0.0%)	2 (1.5%)	136 (98.5%)	129 (94.8%)	7 (5.2%)
Russian Federation	359	0 (0.0%)	23 (6.4%)	336 (93.6%)	239 (71.1%)	97 (28.9%)
Serbia	121	0 (0.0%)	12 (9.9%)	109 (90.1%)	87 (79.8%)	22 (20.2%)
Slovak Republic	333	0 (0.0%)	1 (0.3%)	332 (99.7%)	185 (55.7%)	147 (44.3%)
Slovenia	80	0 (0.0%)	0 (0.0%)	80 (100%)	70 (87.5%)	10 (12.5%)
Spain	918	19 (2.1%)	0 (0.0%)	899 (97.9%)	719 (80.0%)	180 (20.0%)
Sweden	509	0 (0.0%)	0 (0.0%)	509 (100%)	487 (95.7%)	22 (4.3%)
Switzerland	443	2 (0.5%)	5 (1.1%)	436 (98.4%)	421 (96.6%)	15 (3.4%)
United Kingdom	7936	0 (0.0%)	382 (4.8%)	7554 (95.2%)	5915 (78.3%)	1639 (21.7%)
Total	30800	37 (0.1%)	962 (3.1%)	29801 (97.8%)	25111 (84.3%)	4690 (15.7%)

This table shows how many patients underwent DNA analysis to identify the CFTR mutations (column "genotyping done") and, for those patients, how many patients had both mutations identified (column

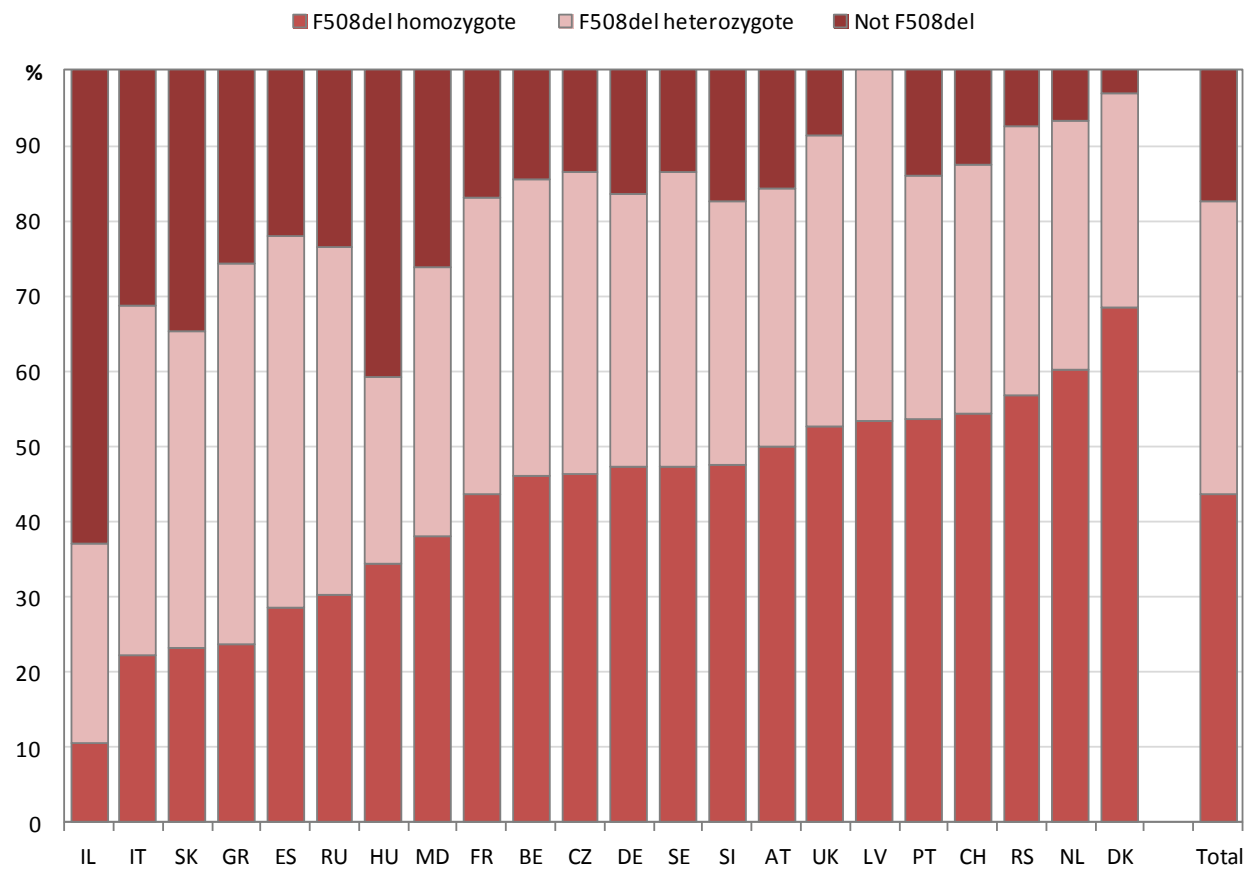
"two mutations identified") and for how many one or both mutations remained unidentified (column "at least one mutation unknown").

Figure 3.1 Proportion of identified mutations, by country and overall. Only patients with DNA analysis.



This graph shows the percentage of mutations that are not identified (unknown in light pink) after DNA analysis, by country and overall. One "allele" means one of the two CFTR genes. The number of non-identified alleles varies greatly from country to country; this is partly due to the availability of DNA testing. Overall, 10% of mutations remain unidentified after DNA analysis, leaving 15.7% of the patients have at least one mutation unidentified.

Figure 3.2 Prevalence of F508del homozygous and heterozygous patients, by country and overall. All patients seen in 2010.



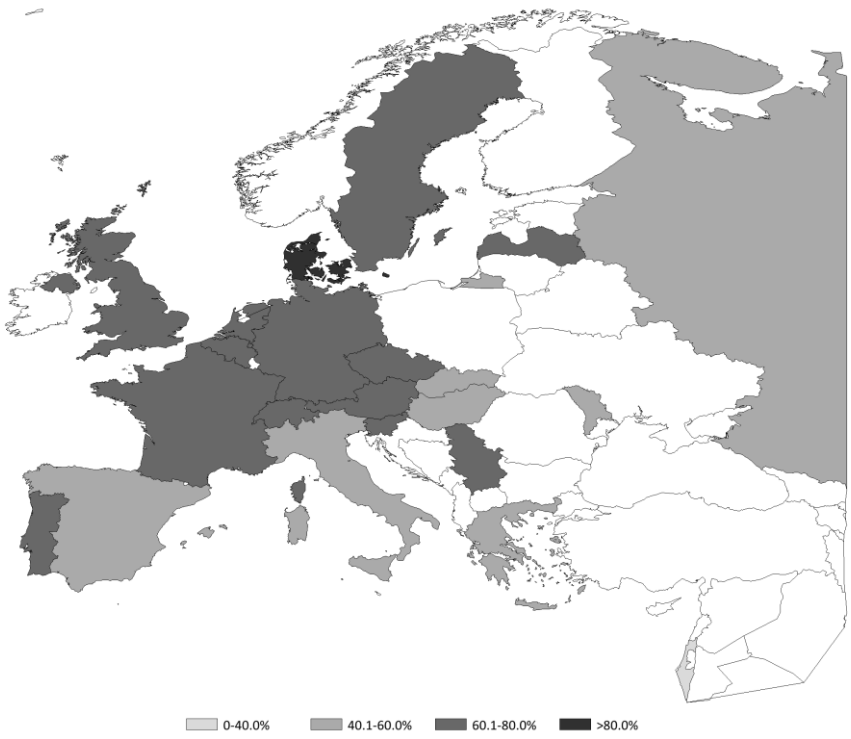
F508del is the most commonly occurring CFTR mutation in the world, it accounts for about 70% of all mutations in Caucasians. Patients who carry two F508del mutations are often described as having “classic CF”, but other combinations of mutations may cause the same degree of disease. We have grouped the patients in F508del homozygous (have two F508del mutations), F508del heterozygous (have one F508del mutation and another mutation, different from F508del), and patients without F508del mutations. Only patients who have been genotyped, have been included in this graph. “Unknown” mutations 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.

Table 3.2 Allelic frequencies of the 13 most common mutations in the ECFSPR database.

Mutation name	Number of alleles	Percentage among tested	Country with highest frequency
F508del	37655	63.18	Denmark (82.63%)
G542X	1593	2.67	Greece (8.06%)
N1303K	1225	2.06	Italy (5.31%)
G551D	734	1.23	United Kingdom (2.97%)
W1282X	613	1.03	Israel (22.20%)
R553X	581	0.97	Switzerland (2.87%)
1717-1G->A	562	0.94	Switzerland (2.29%)
R117H	547	0.92	United Kingdom (1.91%)
2789+5G->A	522	0.88	Rep of Moldova (4.76%)
3849+10KbC->T	444	0.74	Slovak Republic (3.16%)
2183AA->G	326	0.55	Italy (2.04%)
621+1G->T	326	0.55	Greece (9.68%)
R1162X	320	0.54	Slovenia (5.63%)

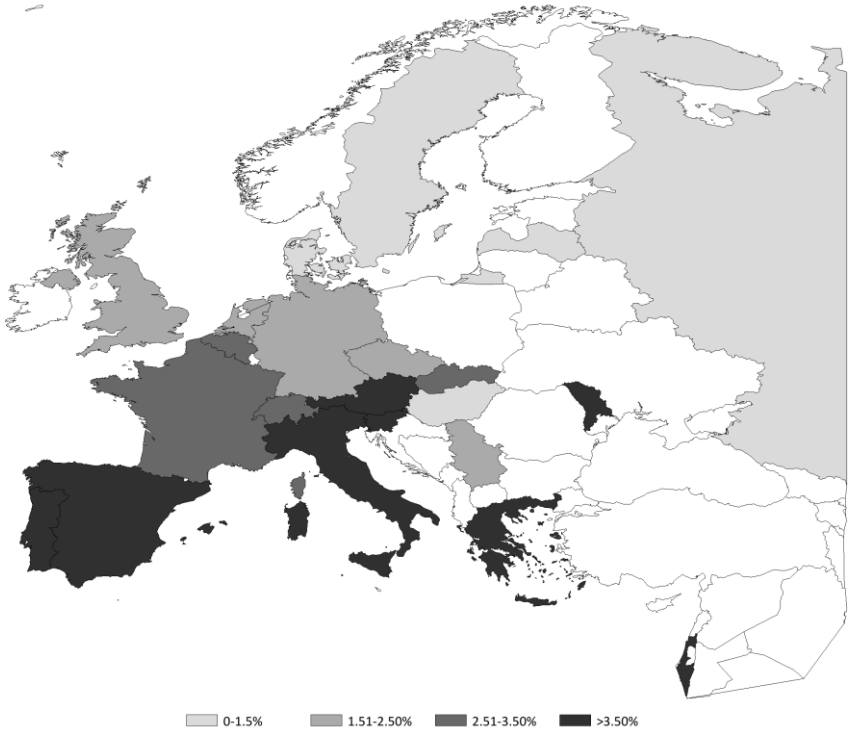
This table lists the allele frequency of the 13 most commonly occurring mutations found in the ECFSPR database. The last column reports in which country this particular mutation is most frequent. F508del is by far the most frequent mutation. Additionally, since F508del is included in all genetic screening tests, this is also the mutation with the highest detection rate.

Figure 3.3 Geographical distribution of mutation F508del.



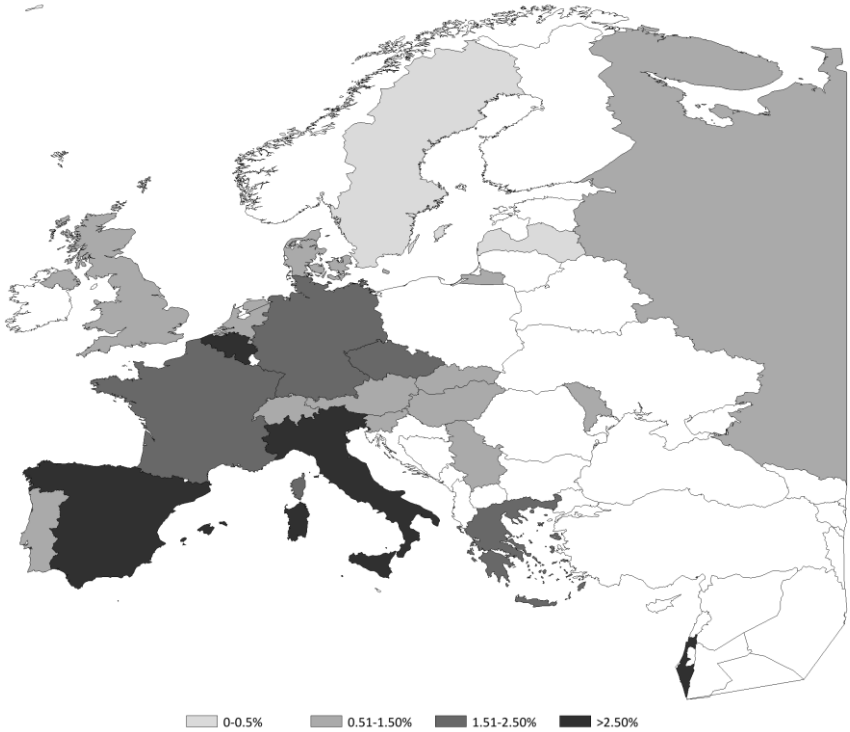
Although this mutation is the most common in all countries, the frequency still varies from 23.83% in Israel to 82.63% in Denmark.

Figure 3.4 Geographical distribution of mutation G542X.



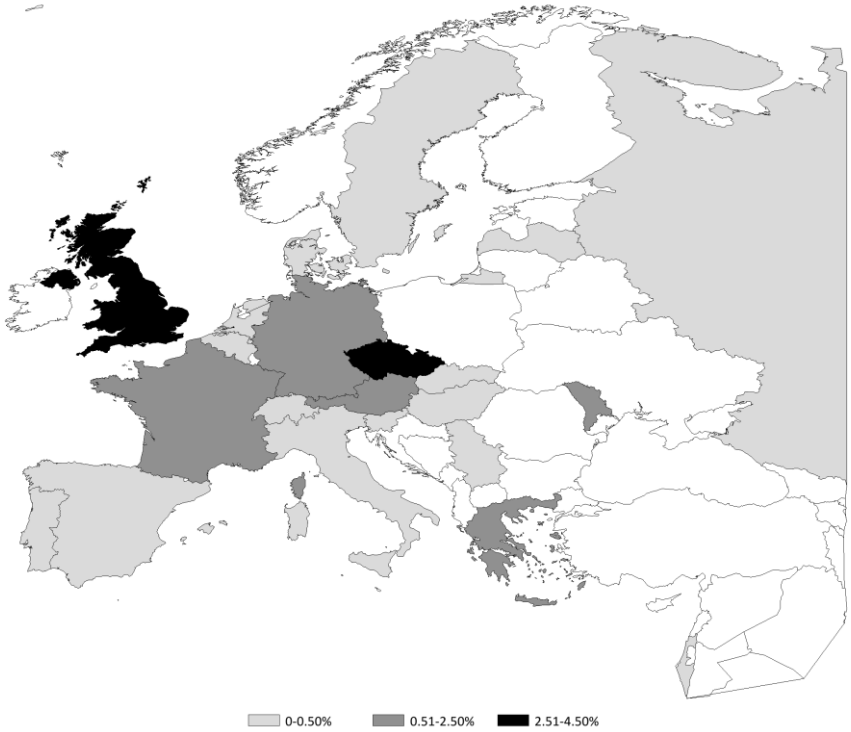
This mutation is most frequent in southern Europe, with the highest frequency in Greece (8.06%), whereas it is very rarely found in Scandinavia (0.7% in Denmark and Sweden, 0.0% in Latvia).

Figure 3.5 Geographical distribution of mutation N1303K.



This mutation is most frequent in Italy (5.31%) and other countries in Southern Europe, but rare in Northern Europe.

Figure 3.6 Geographical distribution of mutation G551D.



Note: Israel: the G551D was not in the mutation panel for 2010, therefore the prevalence is unknown.

This mutation is most frequent in the United Kingdom (2.97%), whereas it is very rare in Scandinavia and in Southern Europe (less than 0.5%).

Figure 3.5 Geographical distribution of mutation W1282X.

This mutation, being of Middle-Eastern origin, is by far most frequent in Israel (22.2%) with a very high frequency in Ashkenazi Jews. The distribution across Europe is fairly uniform.

4. Lung function

FEV1 is measured in litres but it is normally expressed as a percentage of the expected value (FEV1%). The expected value is computed from healthy individuals of the same sex, height and age, this is termed the reference population. For this report we used the reference populations and the equations described by Wang et al. for children and Hankinson et al. for adults (see Appendix 1 for full reference). An FEV1% of 100 means that the lung function measure is equal to the mean lung function measure of people of the same age, sex and height of the reference population.

Spirometry requires a certain amount of coordination, and can generally not be performed until about six years of age. We have therefore computed FEV1% values only for patients aged 6 years or older.

We asked the countries to report to the ECFSPR the best FEV1 recorded throughout the year (according to the FEV1% computed at the CF centres). A few national registries do not record the best value, but other FEV1 values, so we have added a footnote to the tables and graphs describing which FEV1 was reported from those countries. Research has shown that when comparing groups of patients, the difference between the best FEV1% and a random value from the same year can be up to 4.3% points[1]. This finding should be taken into consideration when comparing the results. Likewise, as lung function in CF deteriorates with age, differences in FEV1 may reflect that the CF population of a country is older.

We excluded patients who have had one or more lung transplants from the analyses on FEV1, since their lung function does not reflect the severity of their CF lung disease.

[1] Wanyama et al, JCF 2010; 9,S1:428

Table 4.1 FEV1% of predicted: descriptive statistics, by country. Patients aged 6-17 years who have never had a lung transplant.

Country	N	N Miss	Mean (average FEV1%)	Min	25th pctl (25% of patients have FEV1% below this value)	Median (50% of patients have FEV1% below this value)	75th pctl (75% of patients have FEV1% below this value)	Max
Austria	226	6	92.1	28.2	82.1	94.8	106.0	136.1
Belgium	392	8	94.7	30.2	84.4	97.2	106.2	140.6
Czech Republic	199	11	90.8	26.3	79.3	95.0	102.8	131.1
Denmark	136	4	99.5	30.3	90.5	101.9	111.7	142.3
France[1]	1755	163	85.6	17.0	72.9	88.1	100.5	147.0
Germany[2]	1692	57	84.8	15.7	72.5	87.4	99.9	134.5
Greece	30	1	103.1	24.3	92.1	106.6	126.1	147.5
Hungary	0	118	-	-	-	-	-	-
Israel	156	3	91.2	39.0	82.4	94.2	104.1	135.1
Italy	938	92	94.5	21.1	83.1	97.6	107.7	145.9
Latvia	10	2	94.8	50.6	64.5	97.3	112.6	136.4
Rep of Moldova	10	1	76.2	17.4	55.1	74.7	96.3	127.6
The Netherlands	437	6	90.9	15.2	81.0	92.9	103.2	133.3
Portugal	54	13	79.2	18.4	59.3	82.6	98.2	123.5
Russian Federation	23	72	80.0	27.0	61.4	85.0	99.3	130.3
Serbia	56	3	82.4	16.4	70.1	83.3	104.9	128.7
Slovak Republic	16	45	93.2	43.8	91.3	97.3	106.0	111.4
Slovenia	38	1	87.4	35.7	77.6	92.3	101.0	111.3
Spain	370	4	90.4	30.7	78.9	93.1	104.9	136.1
Sweden[3]	157	3	89.4	30.9	79.4	91.7	102.5	132.9
Switzerland	195	1	91.2	39.6	80.2	91.3	105.3	133.0
United Kingdom[4]	2252	224	83.0	14.7	72.0	85.1	97.2	139.6

[1] France: reports the last FEV1 of the year.
[2] Germany: reports the FEV1 value closest to the patient's birthday (without exacerbation).
[3] Sweden: reports FEV1 collected at the time of the annual review.
[4] United Kingdom: reports FEV1 collected at the time of the annual review. All analyses of FEV1 in the UK 2010 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

This table shows some descriptive statistics for FEV1 in children, expressed as % of predicted. Note that transplanted patients and children below 6 years of age have been excluded from the analyses.

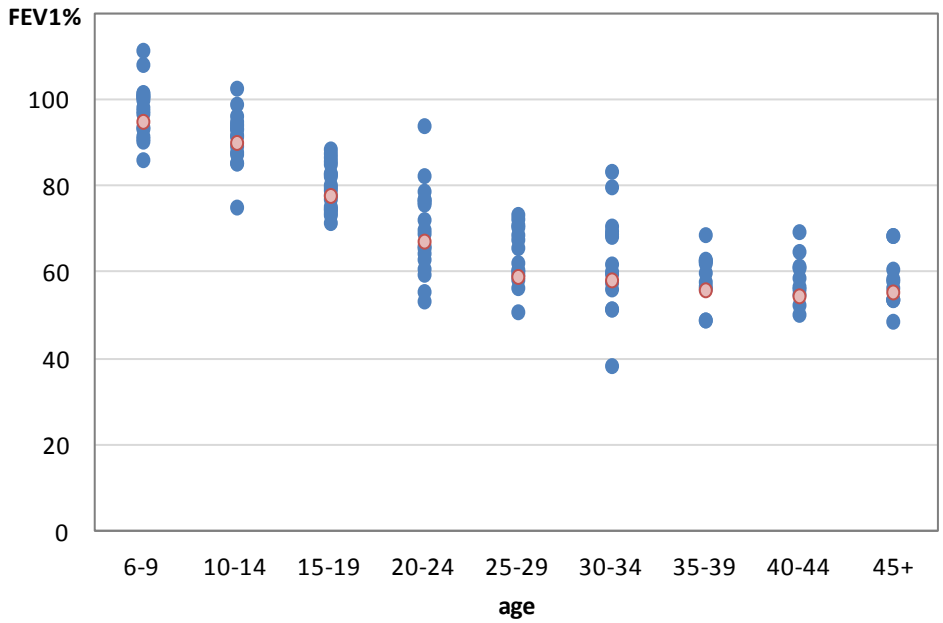
Table 4.2 FEV1% of predicted: descriptive statistics, by country. Patients aged 18 years or older who have never had a lung transplant.

Country	N	N Miss	Mean (average FEV1%)	Min	25th pctl (25% of patients have FEV1% below this value)	Median (50% of patients have FEV1% below this value)	75th pctl (75% of patients have FEV1% below this value	Max
Austria	133	2	74.8	17.8	54.9	78.7	93.8	123.8
Belgium	453	7	70.6	21.8	53.5	71.6	85.7	141.9
Czech Republic	84	90	67.4	16.3	45.2	64.8	93.5	112.3
Denmark	196	3	74.4	16.8	56.0	75.8	93.9	124.8
France[1]	2089	136	58.3	12.7	38.0	56.3	77.5	125.1
Germany[2]	2116	89	59.8	8.9	38.8	58.4	78.6	132.2
Greece	29	0	56.4	22.8	36.9	54.3	75.1	101.4
Hungary	0	106	-	-	-	-	-	-
Israel	183	5	69.9	21.3	54.7	73.6	85.2	119.4
Italy	1336	161	68.9	15.1	50.1	69.0	87.8	136.0
Latvia	7	0	40.7	25.5	27.6	41.4	45.2	73.4
Rep of Moldova	4	2	60.8	43.3	47.3	54.5	74.3	90.9
The Netherlands	612	18	63.1	14.7	45.3	62.7	80.3	119.3
Portugal	38	2	56.4	21.1	43.6	53.9	70.4	93.9
Russian Federation	100	0	54.8	15.8	35.2	47.6	71.0	123.4
Serbia	33	1	54.5	17.3	36.6	56.9	70.1	99.3
Slovak Republic	19	91	75.2	47.6	72.5	75.9	81.9	90.7
Slovenia	14	0	56.1	33.9	40.3	51.8	79.9	83.3
Spain	257	1	65.2	13.6	48.0	64.5	81.5	110.5
Sweden[3]	228	14	73.5	19.6	56.7	73.2	90.8	128.4
Switzerland	140	6	63.6	20.9	48.5	61.8	78.3	115.8
United Kingdom[4]	3441	162	61.0	9.2	42.8	61.0	79.0	130.2

[1] France: reports the last FEV1 of the year.
[2] Germany: reports the FEV1 value closest to the patient's birthday (without exacerbation).
[3] Sweden: reports FEV1 collected at the time of the annual review.
[4] United Kingdom: reports FEV1 collected at the time of the annual review. All analyses of FEV1 in the UK 2010 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

This table shows some descriptive statistics for FEV1 in adults, expressed as % of predicted. Note that transplanted patients have been excluded from the analyses.

Figure 4.1 Median FEV1% of predicted by age group and by country. Patients aged 6 years or older who have never had a lung transplant.



Note: we excluded from the analyses those age groups wherein the number of patients was <10.
Note: not all the countries reported the best FEV1 value of the year (see tables 4.1 and 4.2).

This graph shows the median FEV1% (the value that separates the highest and lowest half of the patients) by age group. Each country is represented by a dot (in blue) and the overall estimate is in red. The general pattern shows that the FEV% slowly decreases until the age of 25-29, and then levels out. The patients in the oldest age groups are patients that survived, and may therefore represent the patients with less disease severity. There is considerable variability between countries.

Table 4.3 FEV1% of predicted: descriptive statistics by age group (patients aged 6 years or older) who have never had a lung transplant.

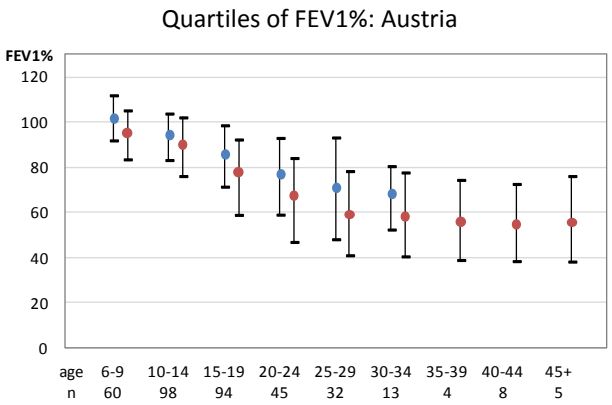
Age at FEV1 measurement	N	N Miss	Mean	Min	25th pctl	Median	75th pctl	Max
6-9	2772	340	93.4	17.7	83.5	95.1	105.3	147.5
10-14	4004	313	88.0	16.9	76.3	90.2	102.1	145.9
15-19	3860	309	75.4	13.1	59.2	77.9	92.6	139.5
20-24	3302	274	66.1	8.9	46.9	67.3	84.2	136.0
25-29	2389	188	60.5	9.4	41.0	59.1	78.5	141.9
30-34	1624	116	59.6	12.6	40.6	58.3	77.8	125.6
35-39	1074	91	57.9	13.6	38.9	56.0	74.6	125.3
40-44	818	50	57.4	14.8	38.4	54.6	72.6	132.2
45+	811	53	58.3	9.5	38.3	55.5	76.4	130.2

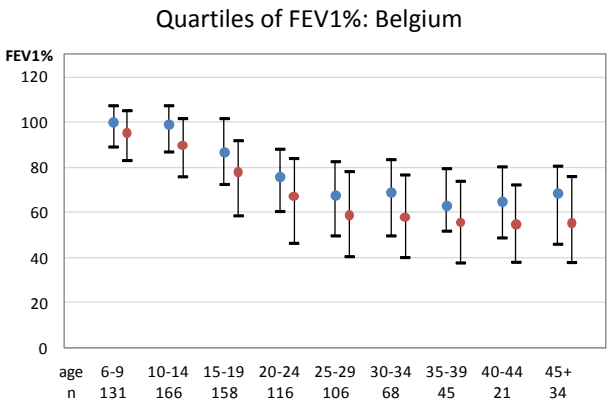
Note: not every country reported the best FEV1 value of the year (see tables 4.1 and 4.2).

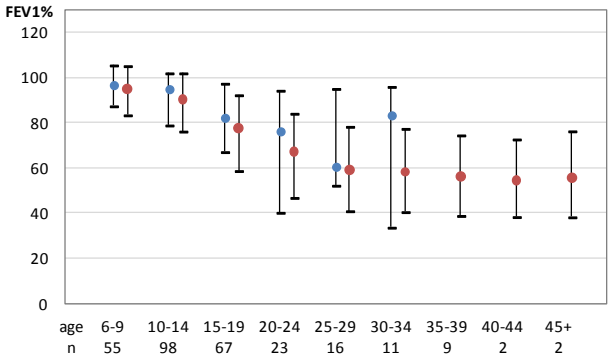
This table shows FEV1% by age group for the total data set. The median values reported in this table are shown as red dots in fig 4.1.

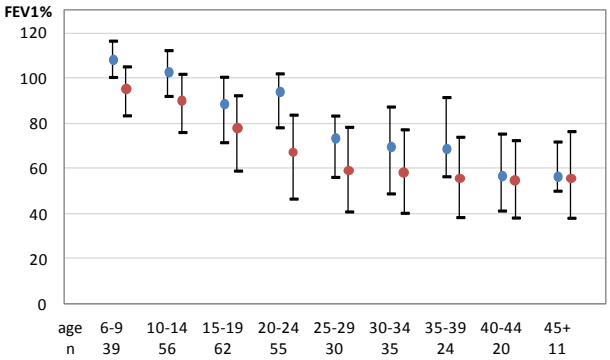
Figure 4.2 Quartiles of FEV1% of predicted by age group and by country. Patients aged 6 years or older and who have never had a lung transplant.

The figures below show the FEV1% 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"). In blue are the quartiles for the country, in red are the pooled quartiles computed on all other countries (i.e. excluding that country). We did not compute quartiles where the number of patients is <10 in an age group so there are no blue dots for those age groups (the number of patients in each age group is shown underneath the horizontal axis). We therefore excluded Latvia and the Republic of Moldova from the graphs because none of the age groups had more than 10 patients.



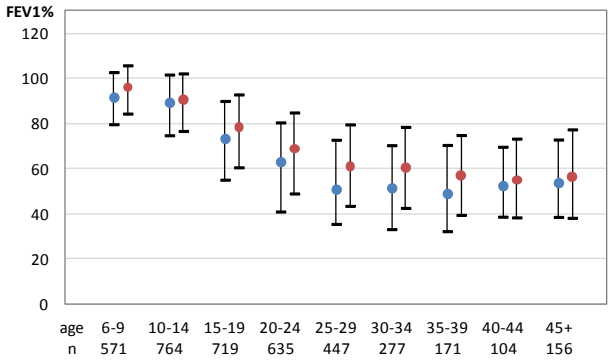




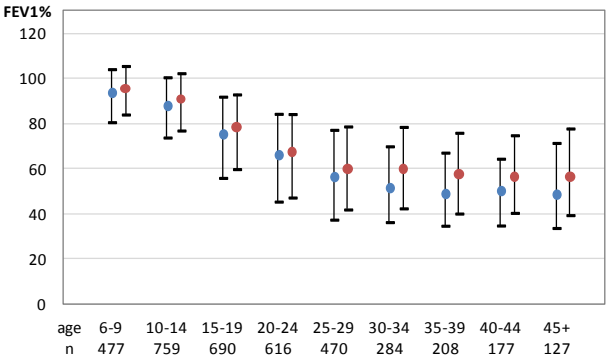


[figure 4.2 continued]

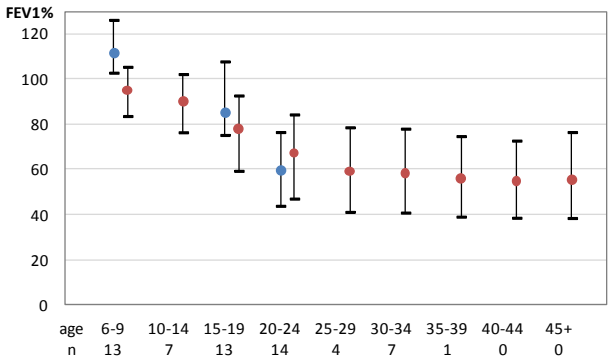
Quartiles of FEV1%: France[1]



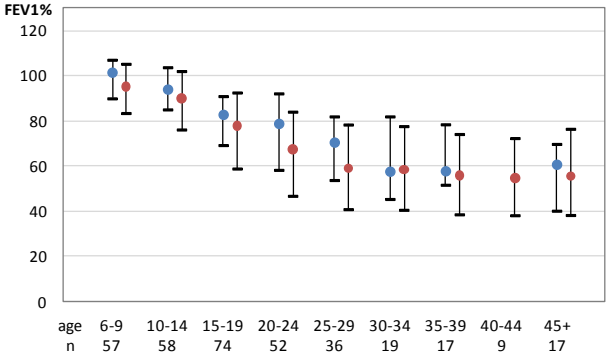
Quartiles of FEV1%: Germany[2]



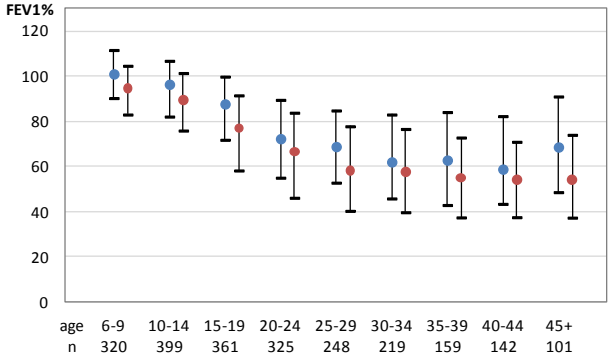
Quartiles of FEV1%: Greece



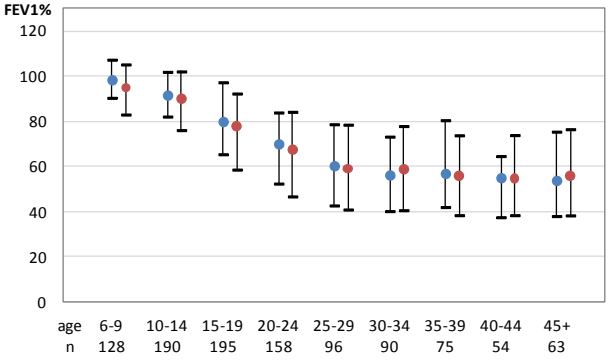
Quartiles of FEV1%: Israel



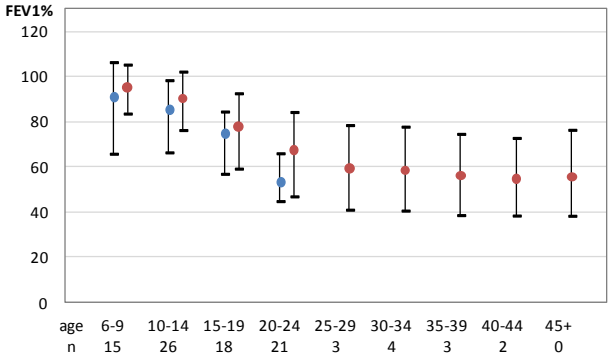
Quartiles of FEV1%: Italy



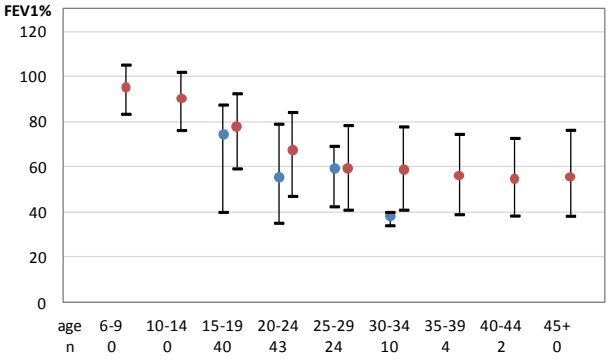
Quartiles of FEV1%: The Netherlands



Quartiles of FEV1%: Portugal



Quartiles of FEV1%: Russian Federation

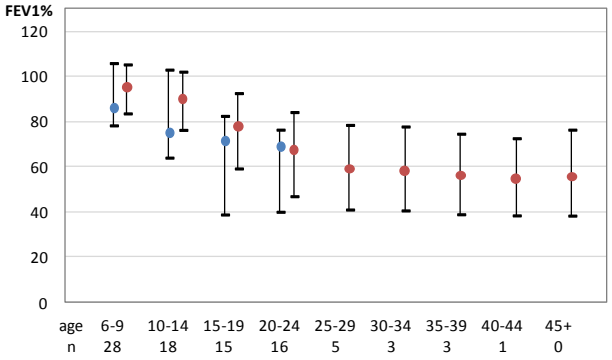


[1] France: reports the last FEV1 of the year.

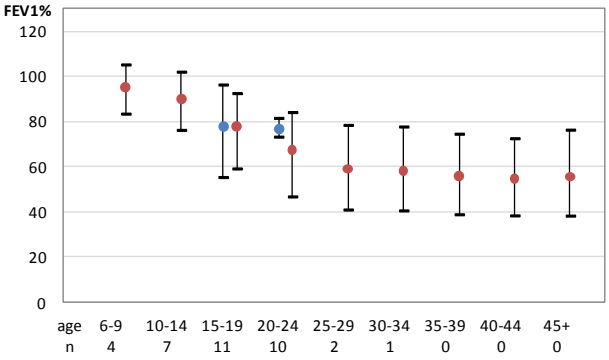
[2] Germany: reports the FEV1 value closest to the patient's birthday (without exacerbation).

[figure 4.2 continued]

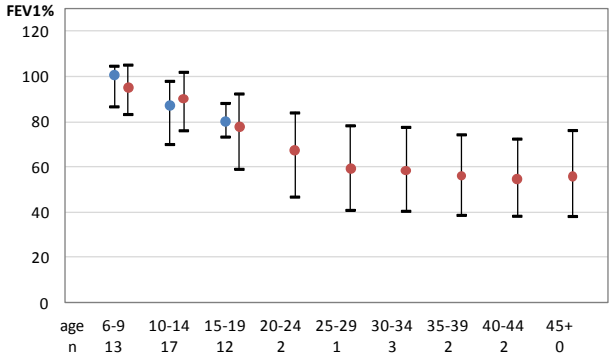
Quartiles of FEV1%: Serbia



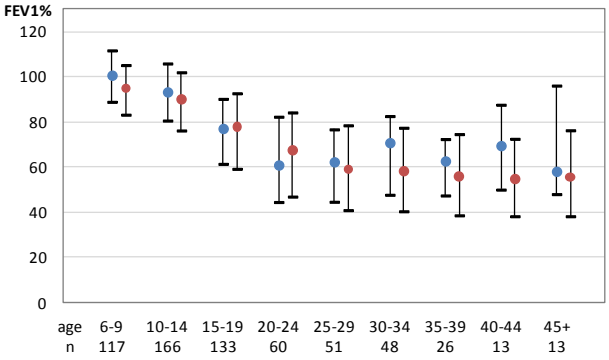
Quartiles of FEV1%: Slovak Republic



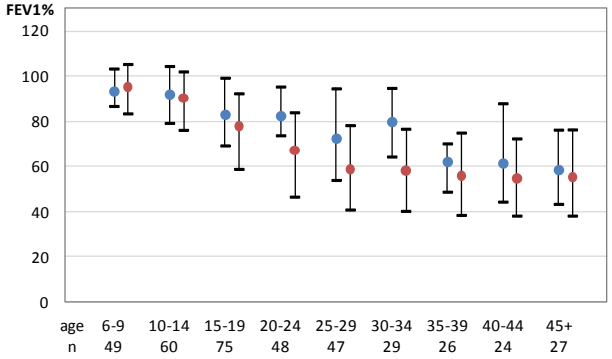
Quartiles of FEV1%: Slovenia



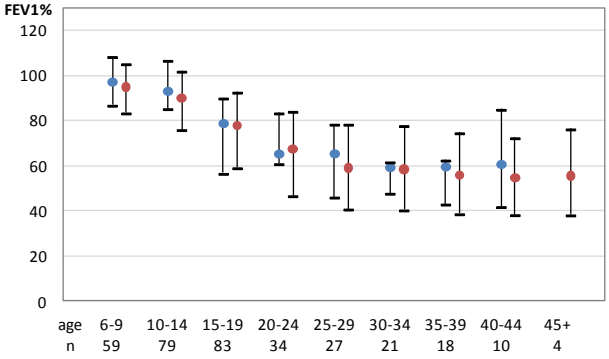
Quartiles of FEV1%: Spain



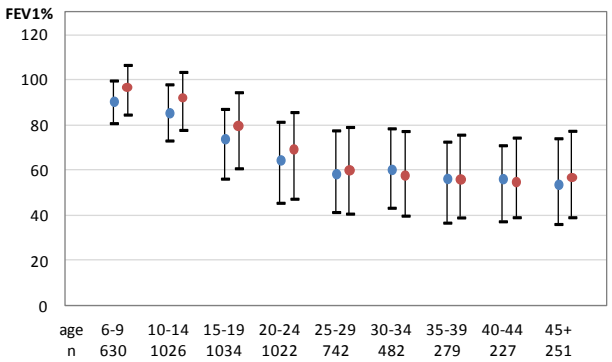
Quartiles of FEV1%: Sweden[3]



Quartiles of FEV1%: Switzerland



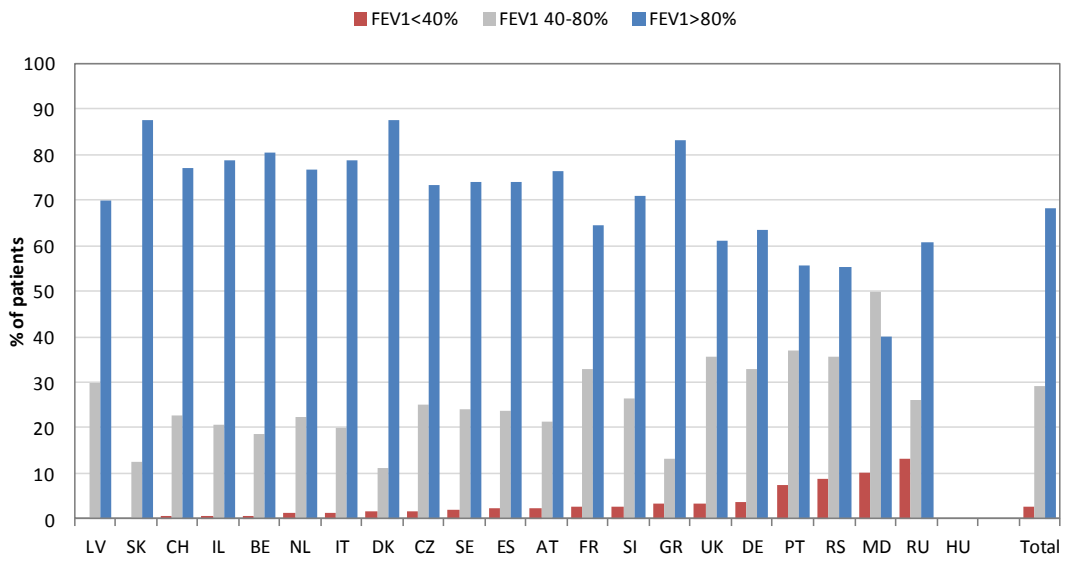
Quartiles of FEV1%: United Kingdom[4]



[3] Sweden: reports FEV1 collected at the time of the annual review.

[4] United Kingdom: reports FEV1 collected at the time of the annual review. All analyses of FEV1 in the UK 2010 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

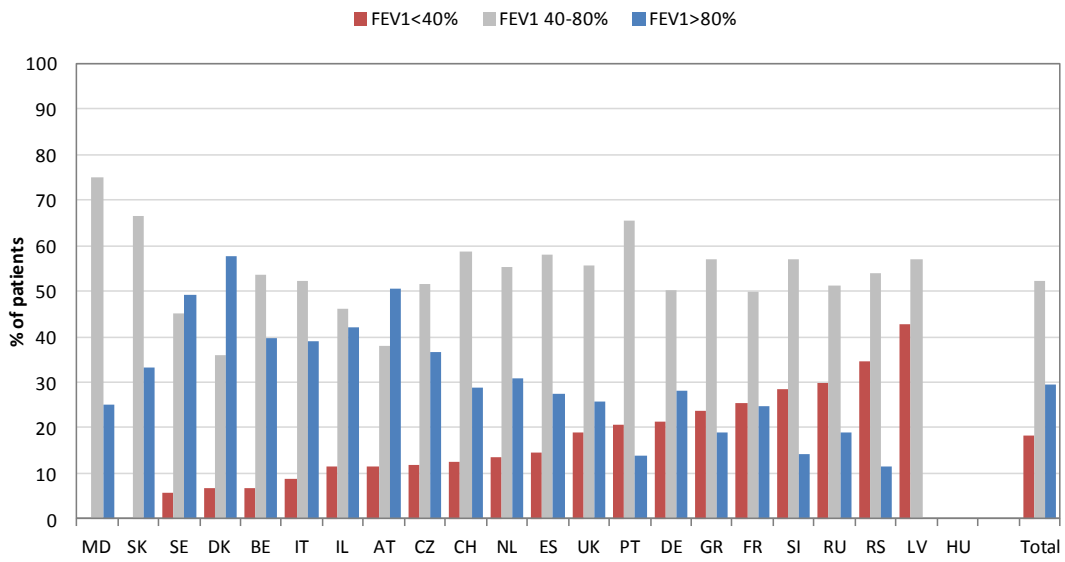
Figure 4.3 FEV1% of predicted according to severity group and age group, by country and overall. Patients aged 6-17 years who have never had a lung transplant.



Note: not every country reported the best FEV1 value of the year:
France reported the last FEV1 of the year,
Germany reported the FEV1 value closest to the patient's birthday (without exacerbation),
Sweden reported FEV1 collected at the time of the annual review,
United Kingdom: reports FEV1 collected at the time of the annual review. All analyses of FEV1 in the UK 2010 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

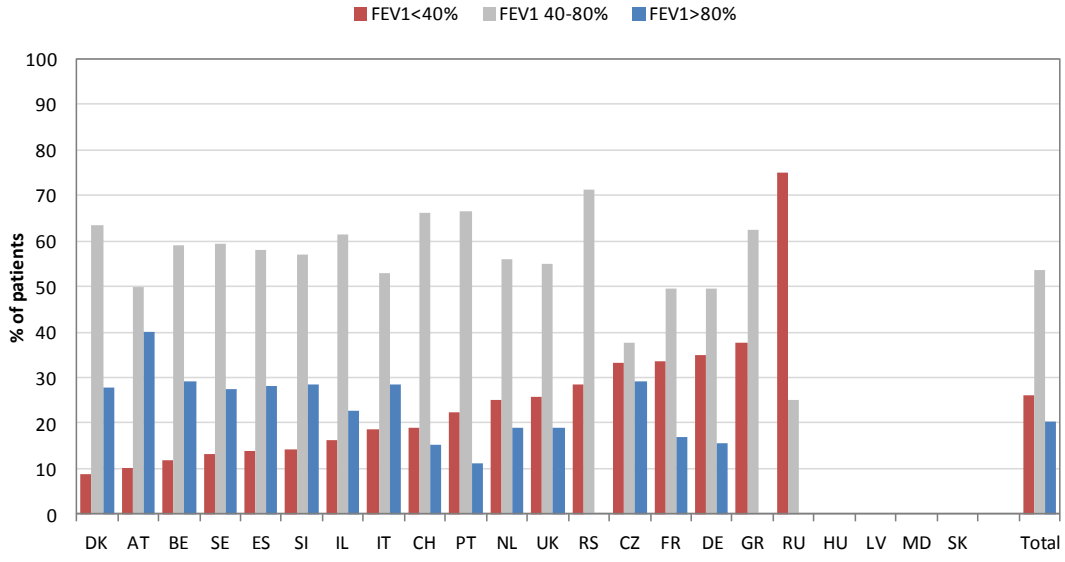
Figures 4.3, 4.4 and 4.5 show the FEV1% by severity group, by country and overall. Patients with an FEV1% higher than 80% are generally considered to have mild lung disease, patients with FEV1% between 80 and 40% moderate lung disease and patients with FEV1 <40% severe lung disease. However, since a 10 year old child with a lung function of 50% has considerably worse lung disease than a 50 year old patient with the same FEV1%, and the age distribution is not the same in all countries, we have chosen to show children (fig 4.3) and adults (fig 4.4 and 4.5) separately.

Figure 4.4 FEV1% of predicted according to severity group and age group, by country and overall. Patients aged 18-29 years who have never had a lung transplant.



Note: not every country reported the best FEV1 value of the year:
France reported the last FEV1 of the year,
Germany reported the FEV1 value closest to the patient's birthday (without exacerbation),
Sweden reported FEV1 collected at the time of the annual review,
United Kingdom: reports FEV1 collected at the time of the annual review. All analyses of FEV1 in the UK 2010 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

Figure 4.5 FEV1% of predicted according to severity group and age group, by country and overall. Patients aged 30 years or older who have never had a lung transplant.



Note: Slovak Republic was not reported because there is only one patients aged 30 or older.
Note: not every country reported the best FEV1 value of the year:
France reported the last FEV1 of the year,
Germany reported the FEV1 value closest to the patient's birthday (without exacerbation),
Sweden reported FEV1 collected at the time of the annual review,
United Kingdom: reports FEV1 collected at the time of the annual review. All analyses of FEV1 in the UK 2010 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

5. Microbiology

We collect data on three chronic infections – *Pseudomonas aeruginosa*, *Burkholderia cepacia complex species* and *Staphyloccocus aureus* – as well as the occurrence of non-tuberculous mycobacteria (NTM) and *Stenotrophomonas maltophilia*. In the microbiology category discrepancies exist between the ECFSPR definitions and those of the national registries. The ECFSPR definition of chronic infection (see Appendix 2) is:

> Patient 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 think the status has changed
>
> a. modified Leeds criteria, chronic infection: >50% of the sputum samples positive, collected during the last 12 months. At least 4 sputum samples during that period;
> b. and/or significantly raised bacteria-specific antibodies according to local laboratories.

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.

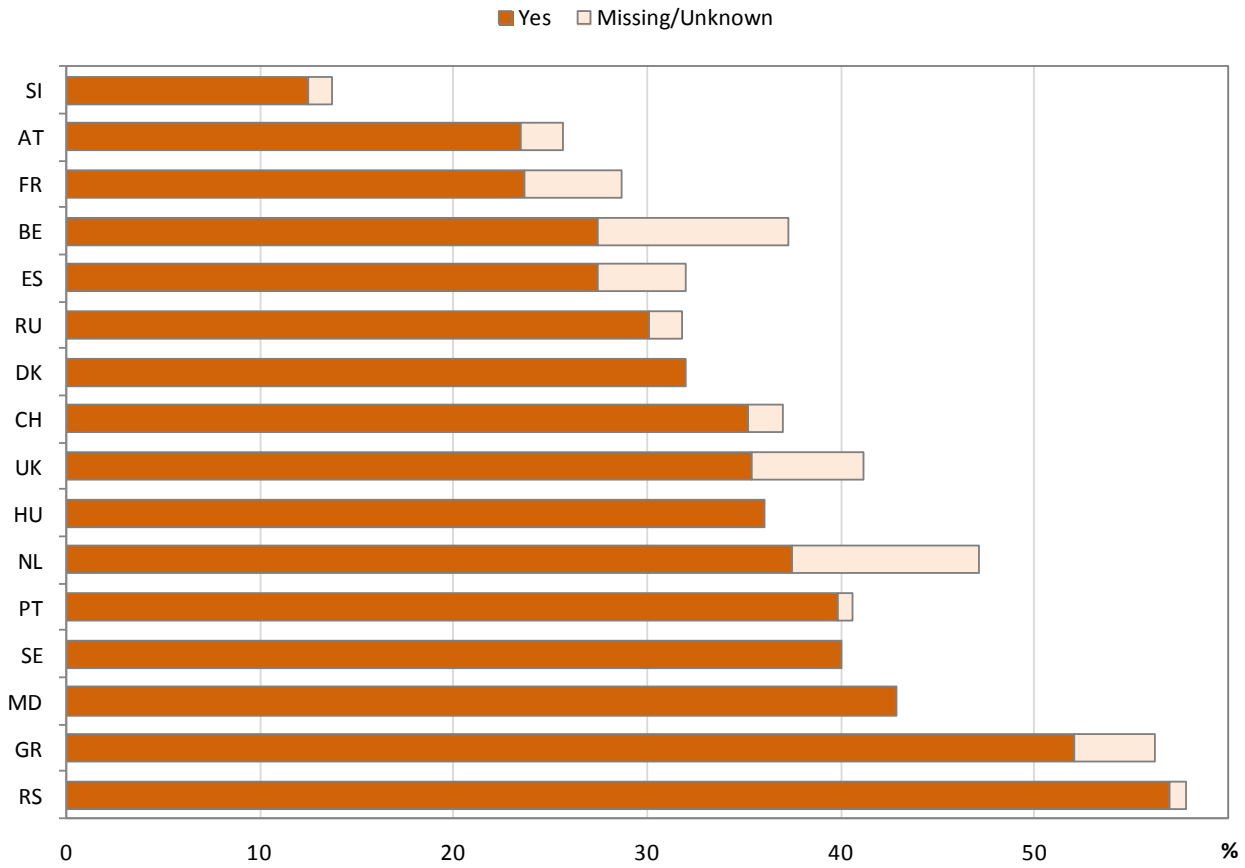
Table 5.1 Prevalence of chronic bacterial infection in all patients seen in 2010, by country.

Country	Chronic *Pseudomonas aeruginosa* number (%)			Chronic *Burkholderia cepacia complex species* number (%)			Chronic *Staphylococcus aureus* number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	11 (2.2)	380 (74.4)	120 (23.5)	11 (2.2)	486 (95.1)	14 (2.7)	11 (2.2)	215 (42.1)	285 (55.7)
Belgium	112 (9.8)	714 (62.7)	312 (27.5)	108 (9.5)	1011 (88.8)	19 (1.7)	1138 (100)	-	-
Czech Republic	315 (60.2)	178 (34.0)	30 (5.7)	315 (60.2)	195 (37.3)	13 (2.5)	315 (60.2)	103 (19.7)	105 (20.1)
Denmark	0 (0.0)	306 (68.0)	144 (32.0)	0 (0.0)	422 (93.8)	28 (6.2)	450 (100)	-	-
France	287 (5.0)	4108 (71.3)	1364 (23.7)	0 (0.0)	5680 (98.6)	79 (1.4)	5759 (100)	-	-
Germany	5003 (100)	-	-	5003 (100)	-	-	5003 (100)	-	-
Greece	4 (4.2)	42 (43.7)	50 (52.1)	4 (4.2)	91 (94.8)	1 (1.0)	4 (4.2)	70 (72.9)	22 (22.9)
Hungary	0 (0.0)	356 (63.9)	201 (36.1)	0 (0.0)	539 (96.8)	18 (3.2)	557 (100)	-	-
Israel	58 (13.5)	213 (49.7)	158 (36.8)	51 (11.9)	375 (87.4)	3 (0.7)	59 (13.8)	208 (48.5)	162 (37.7)
Italy	1004 (24.4)	2223 (54.0)	892 (21.6)	1004 (24.4)	3019 (73.3)	96 (2.3)	1004 (24.4)	2092 (50.8)	1023 (24.8)
Latvia	16 (53.3)	3 (10.0)	11 (36.7)	23 (76.7)	6 (20.0)	1 (3.3)	15 (50.0)	1 (3.3)	14 (46.7)
Rep of Moldova	0 (0.0)	24 (57.1)	18 (42.9)	42 (100)	-	-	0 (0.0)	19 (45.2)	23 (54.8)
The Netherlands	125 (9.6)	691 (52.9)	490 (37.5)	54 (4.1)	1230 (94.2)	22 (1.7)	59 (4.5)	713 (54.6)	534 (40.9)
Portugal	1 (0.7)	82 (59.4)	55 (39.9)	1 (0.7)	125 (90.6)	12 (8.7)	1 (0.7)	75 (54.3)	62 (45.0)
Russian Federation	6 (1.7)	245 (68.3)	108 (30.0)	5 (1.4)	324 (90.2)	30 (8.4)	7 (2.0)	111 (30.9)	241 (67.1)
Serbia	1 (0.8)	51 (42.2)	69 (57.0)	2 (1.6)	103 (85.1)	16 (13.2)	2 (1.6)	42 (34.7)	77 (63.7)
Slovak Republic	43 (12.9)	197 (59.2)	93 (27.9)	283 (85.0)	36 (10.8)	14 (4.2)	45 (13.5)	196 (58.9)	92 (27.6)
Slovenia	1 (1.3)	69 (86.3)	10 (12.5)	1 (1.3)	79 (98.7)	0 (0.0)	1 (1.3)	34 (42.5)	45 (56.2)
Spain	42 (4.6)	624 (68.0)	252 (27.4)	42 (4.6)	848 (92.4)	28 (3.0)	43 (4.7)	532 (57.9)	343 (37.4)
Sweden	0 (0.0)	305 (59.9)	204 (40.1)	0 (0.0)	498 (97.8)	11 (2.2)	509 (100)	-	-
Switzerland	8 (1.8)	279 (63.0)	156 (35.2)	8 (1.8)	423 (95.5)	12 (2.7)	10 (2.3)	221 (49.9)	212 (47.8)
United Kingdom[1]	461 (5.8)	4669 (58.8)	2806 (35.4)	363 (4.6)	7330 (92.4)	243 (3.0)	550 (6.9)	6236 (78.6)	1150 (14.5)

[1] United Kingdom: chronicity for *Pseudomonas aeruginosa* and *Staphylococcus aureus* is defined as: 3 or more positive isolates during the last 12 months. Information on *Burkholderia* is collected as follows: *Burkholderia* grown at annual review, not necessarily chronic.

This table shows, separately by country, the frequency of chronic *Pseudomonas aeruginosa*, chronic *Burkholderia cepacia complex species* and chronic *Staphylococcus aureus*. The number of missing values is also included. The identification rate of *Burkholderia cepacia complex species* in particular may also be influenced by differences in culture techniques employed.

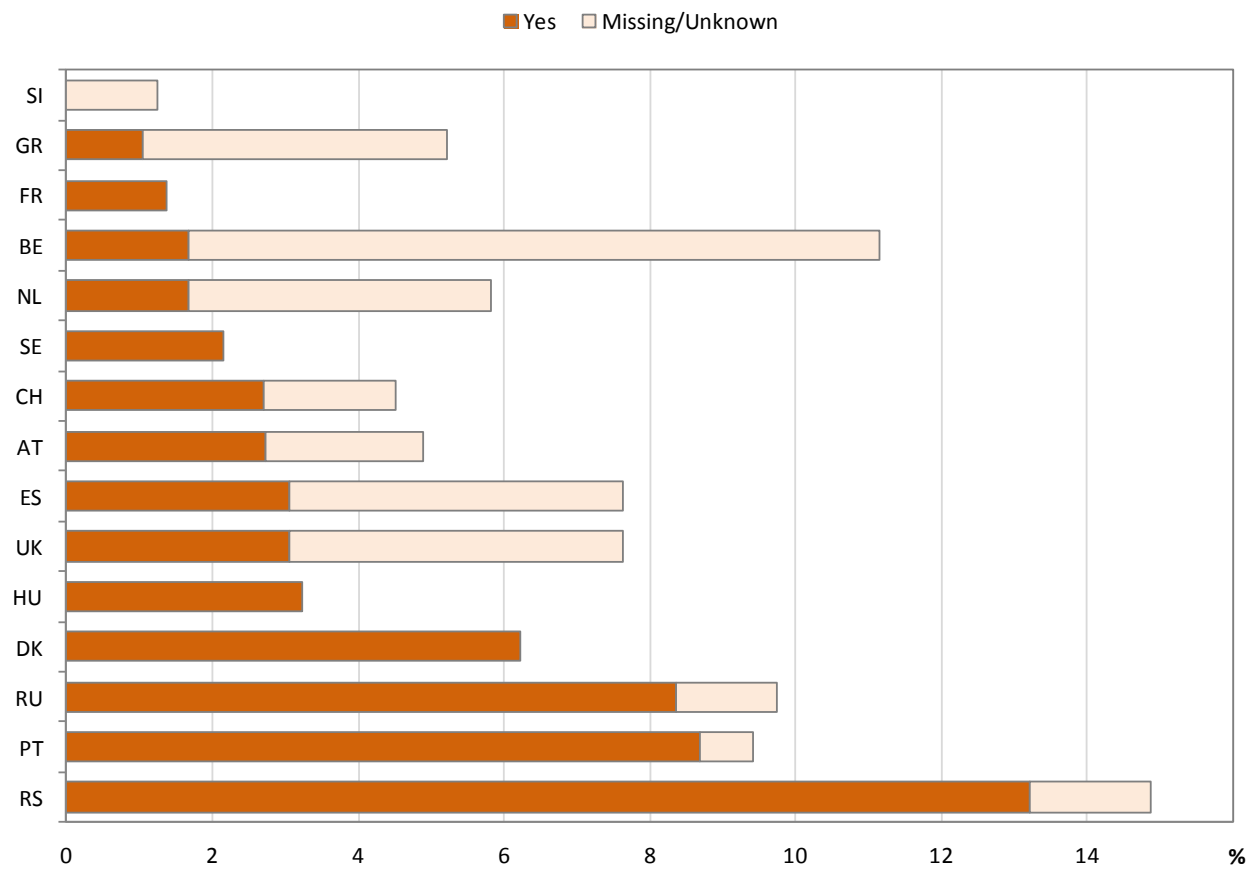
Figure 5.1 Prevalence of chronic Pseudomonas aeruginosa infection in all patients seen in 2010, by country.



Note: we excluded from the graph the countries for which the information on *Pseudomonas aeruginosa* was missing for more than 10% of the patients.
Note: United Kingdom: for chronic *Pseudomonas aeruginosa* the definition is: 3 or more positive isolates during the last 12 months.

The horizontal bars describe the percentage of patients with chronic *Pseudomonas aeruginosa* infection (in dark orange) and the percentage of patients where information on *Pseudomonas aeruginosa* infection was missing (in light orange). This is a frequent infection, but prevalence varies considerably between countries.

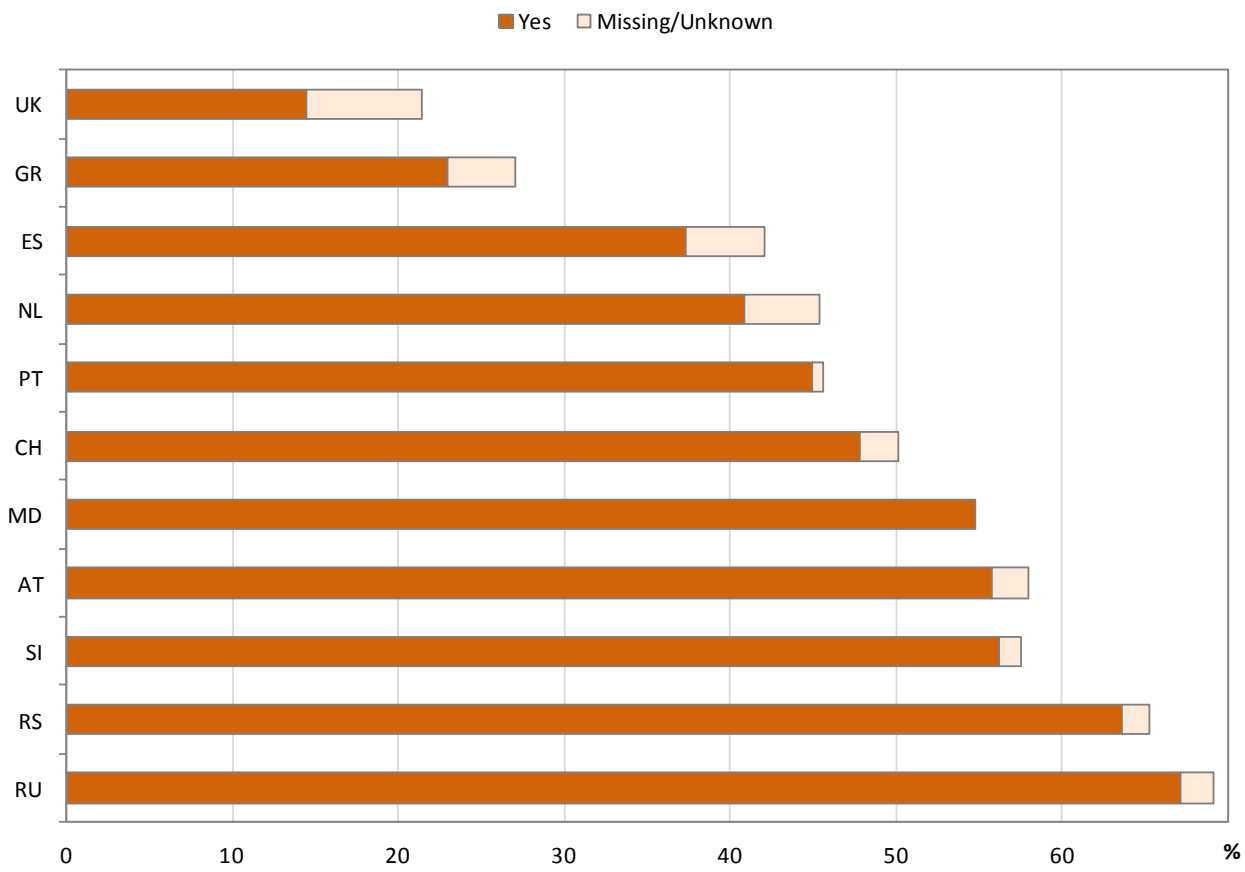
Figure 5.2 Prevalence of chronic Burkholderia cepacia complex species infection in all patients seen in 2010, by country.



Note: we excluded from the graph the countries for which the information on *Burkholderia cepacia complex species* was missing for more than 10% of the patients.
Note: United Kingdom: information on *Burkholderia* is collected as follows: *Burkholderia* grown at annual review, not necessarily chronic.

The horizontal bars describe the percentage of patients with chronic *Burkholderia* infection (in dark orange) and the percentage of patients where information on *Burkholderia* infection was missing (in light orange). This infection is much less frequent than *Pseudomonas aeruginosa* (note the different scale on the horizontal axis), and there is also some variation.

Figure 5.3 Prevalence of chronic Staphylococcus aureus infection in all patients seen in 2010, by country.



Note: we excluded from the graph the countries for which the information on *Staphylococcus aureus* was missing for more than 10% of the patients.
Note: United Kingdom: for chronic *Staphylococcus aureus* the definition is: 3 or more positive isolates during the last 12 months.

The horizontal bars describe the percentage of patients with chronic *Staphylococcus aureus* infection (in dark orange) and the percentage of patients where information on *Staphylococcus aureus* was missing (in light orange). This infection is as frequent as chronic *Pseudomonas aeruginosa* infection and a similar degree of variation between the countries can be observed.

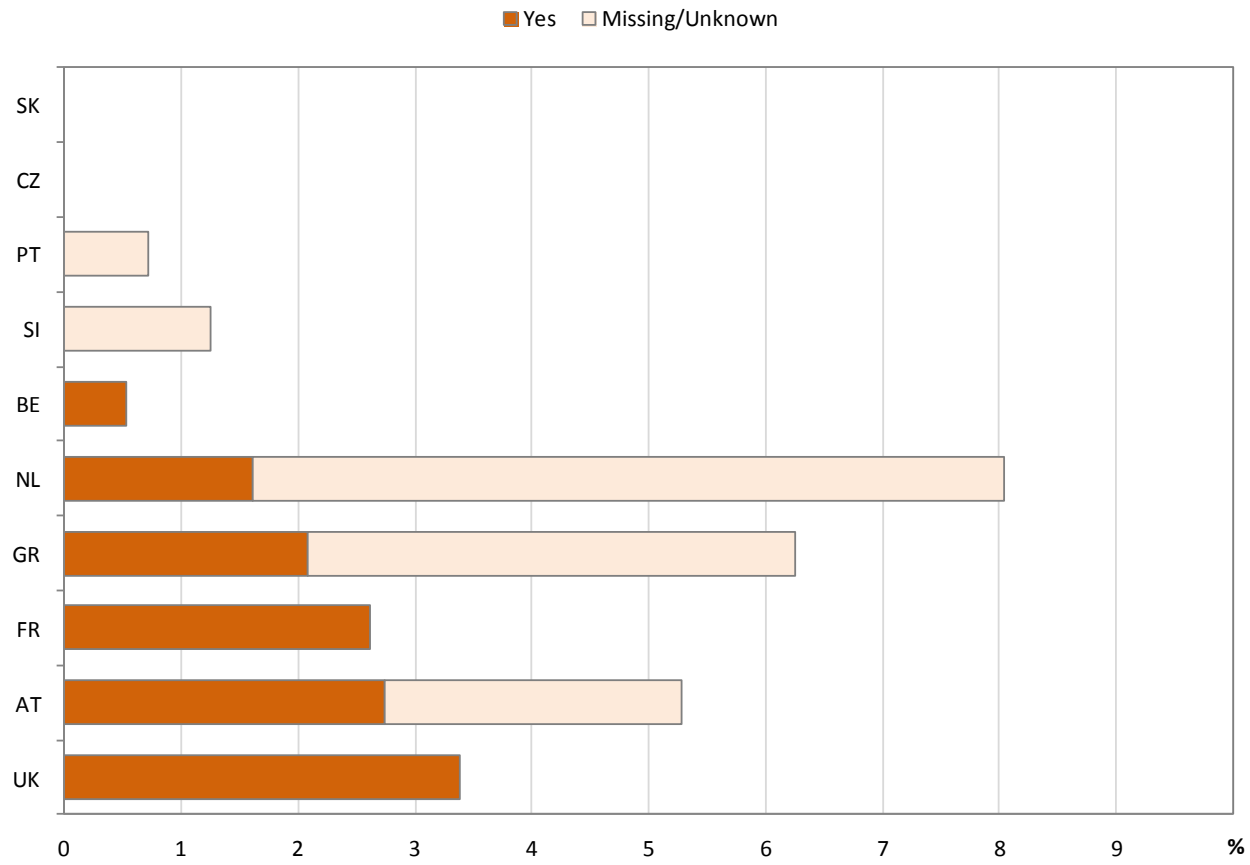
Table 5.2 Prevalence of non-tuberculous mycobacteria and Stenotrophomonas maltophilia infection in all patients seen in 2010, by country.

Country	Non-tuberculous mycobacteria (NTM) infection this year number (%)			*Stenotrophomonas maltophilia* infection this year number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	13 (2.6)	484 (94.7)	14 (2.7)	12 (2.4)	435 (85.1)	64 (12.5)
Belgium	0 (0.0)	1132 (99.5)	6 (0.5)	0 (0.0)	1045 (91.8)	93 (8.2)
Czech Republic	0 (0.0)	523 (100)	0 (0.0)	315 (60.2)	174 (33.3)	34 (6.5)
Denmark	450 (100)	-	-	450 (100)	-	-
France	0 (0.0)	5608 (97.4)	151 (2.6)	0 (0.0)	5268 (91.5)	491 (8.5)
Germany	5003 (100)	-	-	5003 (100)	-	-
Greece	4 (4.2)	90 (93.7)	2 (2.1)	5 (5.2)	87 (90.6)	4 (4.2)
Hungary	557 (100)	-	-	557 (100)	-	-
Israel	52 (12.1)	358 (83.5)	19 (4.4)	58 (13.5)	356 (83.0)	15 (3.5)
Italy	1004 (24.4)	3115 (75.6)	0 (0.0)	1004 (24.4)	3018 (73.3)	97 (2.3)
Latvia	29 (96.7)	1 (3.3)	0 (0.0)	14 (46.7)	16 (53.3)	0 (0.0)
Rep of Moldova	42 (100)	-	-	42 (100)	-	-
The Netherlands	84 (6.4)	1201 (92.0)	21 (1.6)	58 (4.5)	1134 (86.8)	114 (8.7)
Portugal	1 (0.7)	137 (99.3)	0 (0.0)	1 (0.7)	129 (93.5)	8 (5.8)
Russian Federation	356 (99.2)	3 (0.8)	0 (0.0)	3 (0.8)	343 (95.6)	13 (3.6)
Serbia	118 (97.5)	3 (2.5)	0 (0.0)	1 (0.8)	111 (91.7)	9 (7.5)
Slovak Republic	0 (0.0)	333 (100)	0 (0.0)	45 (13.5)	287 (86.2)	1 (0.3)
Slovenia	1 (1.3)	79 (98.7)	0 (0.0)	1 (1.3)	65 (81.2)	14 (17.5)
Spain	158 (17.2)	734 (80.0)	26 (2.8)	47 (5.1)	812 (88.5)	59 (6.4)
Sweden	509 (100)	-	-	509 (100)	-	-
Switzerland	61 (13.8)	370 (83.5)	12 (2.7)	10 (2.3)	359 (81.0)	74 (16.7)
United Kingdom	0 (0.0)	7667 (96.6)	269 (3.4)	363 (4.6)	7363 (92.8)	210 (2.6)

This table shows the frequency of two other infections, non-tuberculous mycobacteria (NTM) and *Stenotrophomonas maltophilia.* Both these infections seem to be relatively rare, in line with the

frequencies of *Burkholderia* infection. The identification rate of these bacteria may also be influenced by differences in culture techniques.

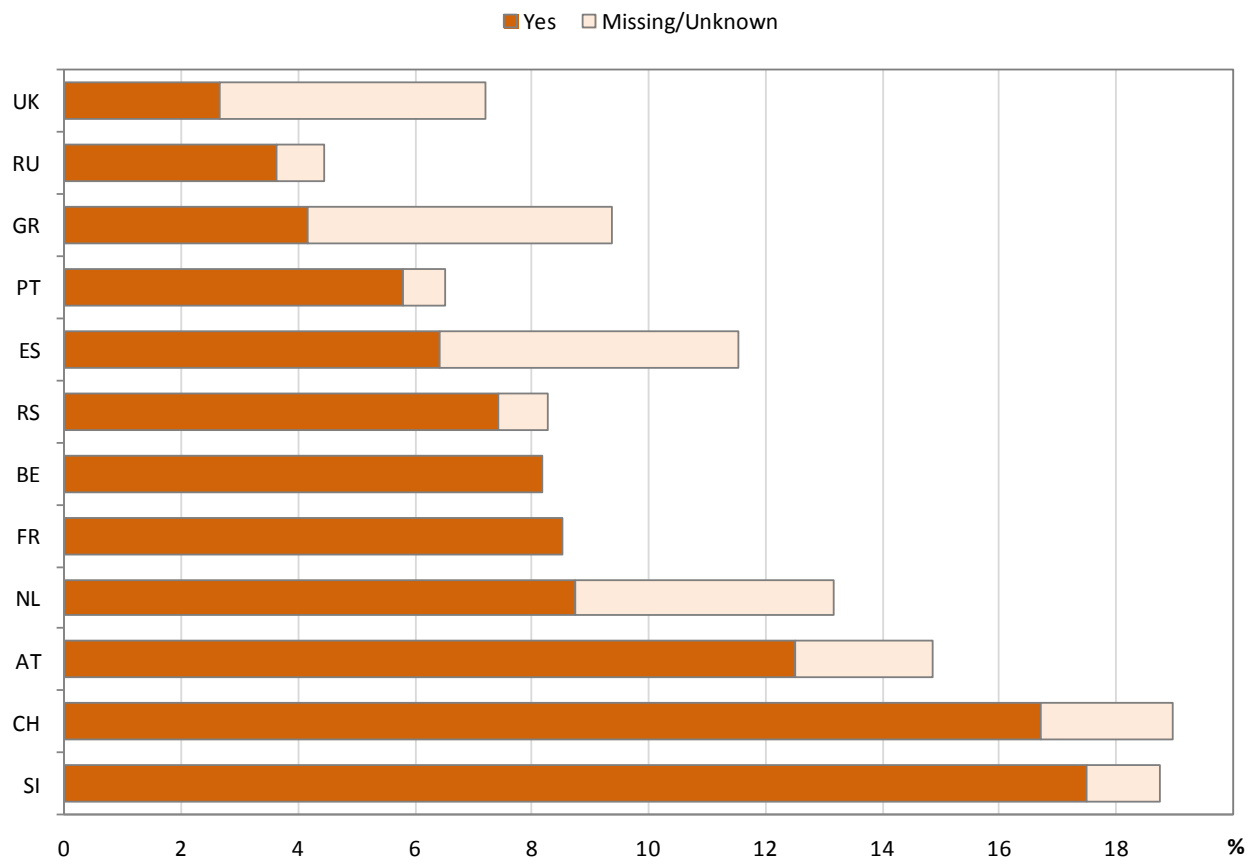
Figure 5.4 Prevalence of non-tuberculous mycobacteria in all patients seen in 2010, by country.



Note: we excluded from the graph the countries for which the information on non-tuberculous mycobacteria was missing for more than 10% of the patients.

The horizontal bars describe the percentage of patients with non-tuberculous mycobacteria infection (in dark orange) and the percentage of patients where information on non-tuberculous mycobacteria infection was missing (in light orange). Generally, infections from these bacteria are not very frequent in any country.

Figure 5.5 Prevalence of Stenotrophomonas maltophilia infection in all patients seen in 2010, by country.



Note: we excluded from the graph the countries for which the information on *Stenotrophomonas maltophilia* was missing for more than 10% of the patients.

The horizontal bars describe the percentage of patients with *Stenotrophomonas maltophilia* infection (in dark orange) and the percentage of patients where information on *Stenotrophomonas maltophilia* was missing (light orange). The frequency varies considerably between countries.

6. Nutrition

Pancreatic insufficiency is usually defined as absence of pancreatic enzymes in two stool samples (or elevated levels of fat in stools). However, since information on both was rarely collected by the national registries, we used information on the use of pancreatic enzymes as an indicator of pancreatic insufficiency.

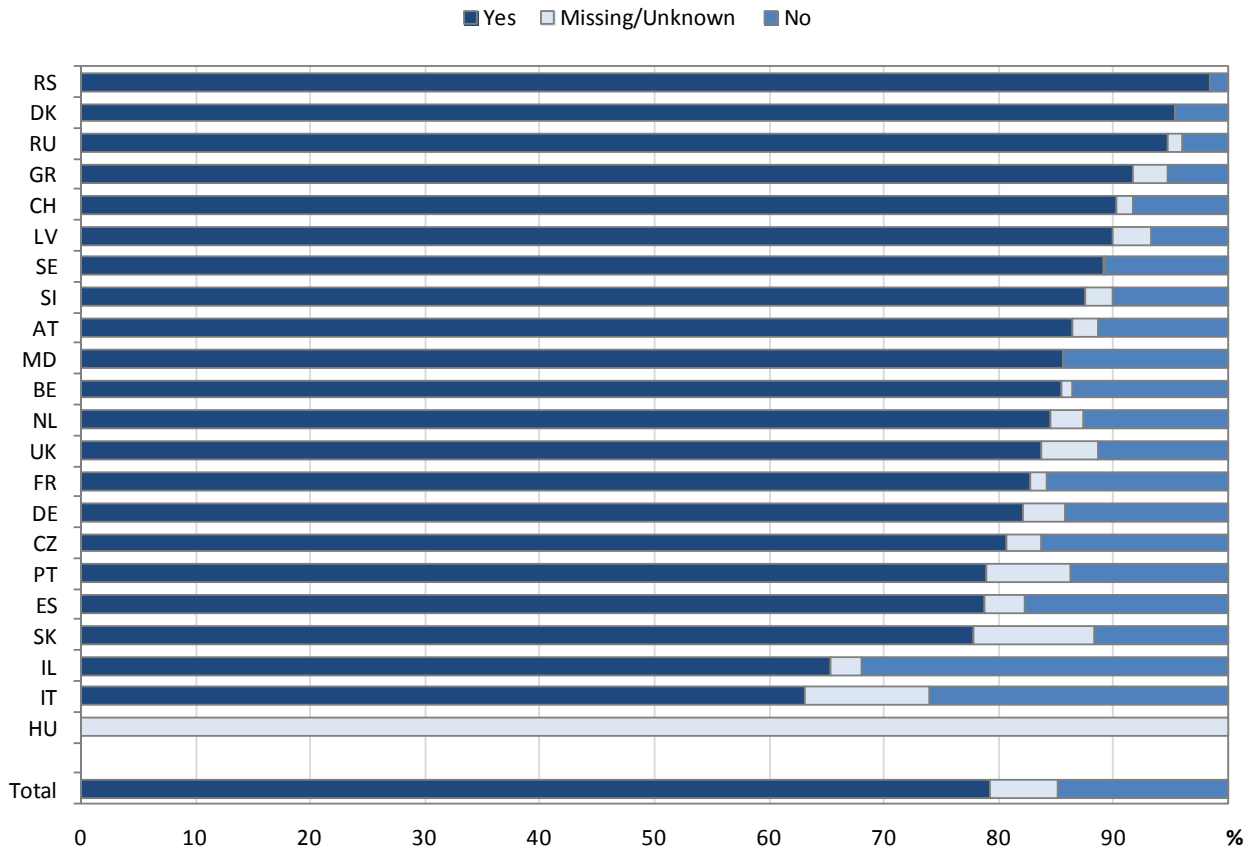
We collected weight and height measured at the time when the FEV1 value was recorded, and, for patients that did not perform spirometry, the last measurements in the year were considered. From the raw measurements we calculated body mass index (BMI). A patient with a low weight is not necessarily underweight if the height is also low, and BMI may better illustrate the nutritional status: BMI describes the weight/height relationship and is considered a good measure of nutritional status. A BMI of 18.5 kg/m^2 or less in adults is considered underweight by the World Health Organisation[2].

Weight, height and BMI were then expressed in terms of so-called z-scores by 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 1 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 of the reference population. A z-score of -2 means that the height/weight/BMI value is 2 standard deviations below the mean height/weight/BMI of people of the same age and sex of the reference population; a z-score of +2 means that the value is 2 standard deviations above that mean. In the reference population, 99.7% of all individuals have a z-score for weight between -3 and +3 (the same for height) and it is expected that the same happens for approximately 99.7% of individuals of a population without conditions that affect weight (or height). The average z-score for a largely healthy population should be very close to zero.

[2] http://apps.who.int/bmi/index.jsp?introPage=intro_3.html

Figure 6.1 Use of pancreatic enzymes in 2010 for all patients, by country and overall.



Note: Czech Republic: collects data on pancreatic sufficiency and insufficiency and supposes that if a patient is insufficient, the patient takes pancreatic enzymes.

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

Table 6.1 Number of patients for whom height and weight measurements were available. All patients seen in 2010.

Country	Number of patients	Height		Weight	
		N	N miss	N	N miss
Austria	511	493	18	494	17
Belgium	1138	1002	136	1001	137
Czech Republic	523	450	73	449	74
Denmark	450	429	21	429	21
France	5759	5449	310	5479	280
Germany	5003	4664	339	4664	339
Greece	96	84	12	84	12
Hungary	557	294	263	278	279
Israel	429	398	31	398	31
Italy	4119	2835	1284	2837	1282
Latvia	30	23	7	24	6
Rep of Moldova	42	42	0	42	0
The Netherlands	1306	1280	26	1276	30
Portugal	138	126	12	126	12
Russian Federation	359	256	103	260	99
Serbia	121	117	4	120	1
Slovak Republic	333	183	150	183	150
Slovenia	80	74	6	77	3
Spain	918	864	54	864	54
Sweden	509	499	10	499	10
Switzerland	443	435	8	436	7
United Kingdom	7936	7672	264	7730	206

Table 6.2 Z-scores for height: descriptive statistics by country. Patients aged 17 years or younger.

Country	N	Mean	Min	25th pctl (25% of the patients are below this z-score for height)	Median (50% of the patients are below this z-score for height)	75th pctl (75% of the patients are below this z-score for height)	Max
Austria	351	-0.2	-4.2	-0.9	-0.1	0.5	2.8
Belgium	542	-0.2	-3.9	-0.9	-0.2	0.6	6.3
Czech Republic	285	-0.1	-7.5	-0.9	-0.2	0.7	4.3
Denmark	196	-0.1	-2.5	-0.6	-0.1	0.5	2.6
France	2918	-0.3	-5.0	-1.2	-0.3	0.5	5.8
Germany	2345	-0.3	-7.7	-1.1	-0.3	0.5	4.3
Greece	55	-0.3	-2.4	-1.2	-0.5	0.7	3.2
Hungary	171	0.2	-7.9	-0.6	0.2	1.0	7.0
Israel	203	-0.7	-4.8	-1.4	-0.7	0.0	5.2
Italy	1234	-0.4	-3.7	-1.1	-0.4	0.3	4.0
Latvia	16	-0.5	-2.8	-1.2	-0.5	0.5	1.2
Rep of Moldova	36	-1.9	-7.7	-2.6	-2.0	-1.4	2.3
The Netherlands	611	0.1	-3.4	-0.6	0.2	0.8	4.0
Portugal	83	-0.7	-3.9	-1.3	-0.6	0.0	2.1
Russian Federation	157	-0.4	-4.7	-1.2	-0.3	0.4	3.7
Serbia	83	-0.5	-4.0	-1.2	-0.4	0.4	2.1
Slovak Republic	69	-0.2	-3.1	-1.1	-0.2	0.6	2.6
Slovenia	53	-0.1	-2.7	-0.7	-0.1	0.6	2.1
Spain	560	-0.4	-4.6	-1.1	-0.4	0.2	3.3
Sweden	225	-0.2	-4.3	-0.7	-0.1	0.5	2.3
Switzerland	277	-0.4	-3.4	-1.0	-0.3	0.3	2.2
United Kingdom	3836	-0.4	-5.6	-1.1	-0.3	0.3	8.1

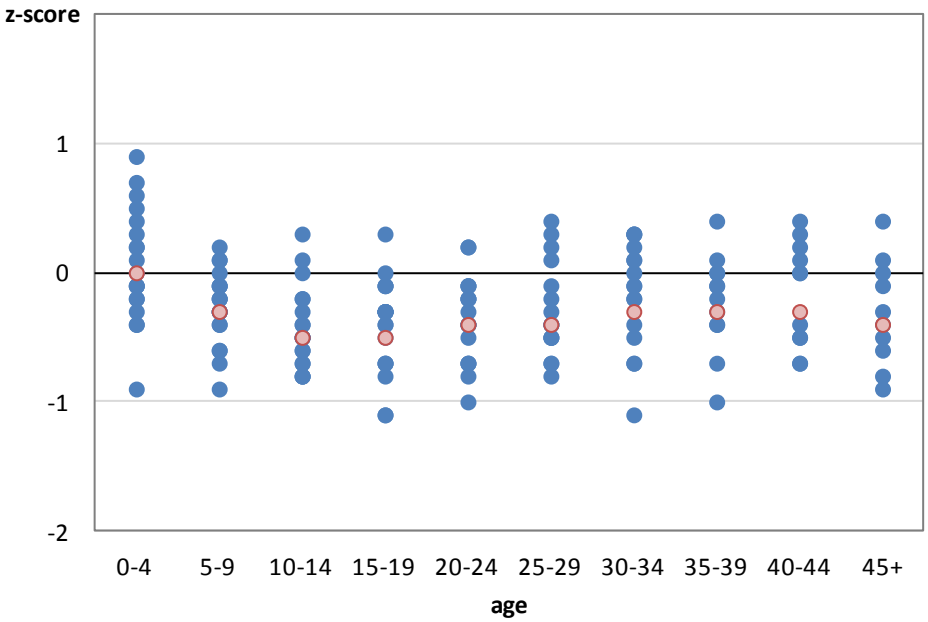
This table reports the median z-score for height (the value that separates the highest and lowest half of the patients), the mean z-score for height (the average) and other descriptive statistics for children (17 years or younger).

Table 6.3 Z-scores for height: descriptive statistics by country. Patients aged 18 years or older.

Country	N	Mean	Min	25th pctl (25% of the patients are below this z-score for height)	Median (50% of the patients are below this z-score for height)	75th pctl (75% of the patients are below this z-score for height)	Max
Austria	142	-0.2	-2.8	-0.7	-0.2	0.4	2.6
Belgium	460	-0.3	-3.6	-1.0	-0.3	0.4	2.4
Czech Republic	165	0.0	-2.5	-0.5	-0.1	0.4	3.1
Denmark	233	0.0	-3.4	-0.7	0.0	0.7	3.2
France	2531	-0.6	-5.1	-1.2	-0.5	0.1	3.0
Germany	2319	-0.1	-6.3	-0.8	-0.1	0.6	3.8
Greece	29	-0.4	-2.1	-1.0	-0.3	0.2	2.1
Hungary	123	-0.3	-3.0	-1.0	-0.2	0.3	2.1
Israel	195	-0.7	-4.7	-1.4	-0.7	-0.2	1.6
Italy	1601	-0.6	-3.7	-1.2	-0.6	0.0	2.6
Latvia	7	0.2	-0.8	-0.4	0.1	0.9	1.4
Rep of Moldova	6	-0.3	-3.4	-0.9	0.0	0.9	1.8
The Netherlands	669	0.2	-3.9	-0.4	0.3	0.9	3.3
Portugal	43	-0.8	-2.9	-1.4	-0.5	-0.3	1.5
Russian Federation	99	-0.2	-3.4	-1.0	-0.2	0.6	2.6
Serbia	34	-0.1	-2.1	-0.8	-0.1	0.6	2.1
Slovak Republic	114	0.0	-2.9	-0.5	-0.1	0.4	4.0
Slovenia	21	-0.2	-2.8	-0.8	0.0	0.4	2.3
Spain	304	-0.8	-4.7	-1.4	-0.8	-0.2	2.0
Sweden	274	0.1	-2.9	-0.5	0.2	0.7	3.4
Switzerland	158	-0.3	-2.6	-0.8	-0.3	0.3	1.8
United Kingdom	3836	-0.4	-5.1	-1.1	-0.4	0.3	5.1

This table reports the median z-score for height (the value that separates the highest and lowest half of the patients), the mean z-score for height (the average) and other descriptive statistics for adults (18 years or older).

Figure 6.2 Median z-scores for height by age group and by country. All patients seen in 2010.



Note: we excluded from the analyses those age groups where the number of patients was <10.

This graph shows the median z-scores for height by age group. Each country is represented by a dot (in blue) and the overall estimate is in red. The median z-scores for height tend to slowly decrease up to the teenage years and then rise again before levelling out. Since the z-scores are computed using healthy people as a reference, this pattern can be explained by the fact that CF patients reach the puberty growth spurt later than their peers but then catch up. The graph also shows that there is large variability between countries.

Table 6.4 Z-scores for height: descriptive statistics by age group. All patients seen in 2010.

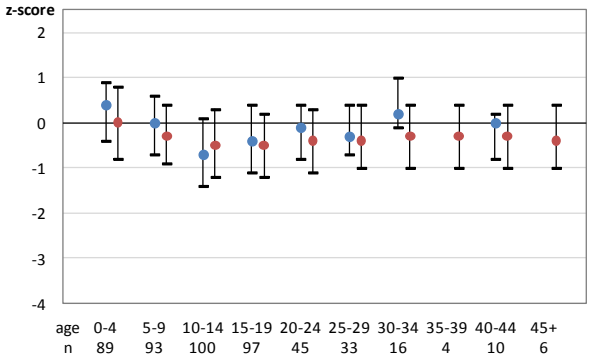
Age at height measurement	N	Mean	Min	25th pctl	Median	75th pctl	Max
0-4	3342	0.0	-7.7	-0.8	0.0	0.8	8.1
5-9	3995	-0.3	-4.8	-0.9	-0.3	0.4	6.6
10-14	4370	-0.5	-7.9	-1.2	-0.5	0.3	3.4
15-19	4259	-0.5	-4.7	-1.2	-0.5	0.2	4.0
20-24	3678	-0.4	-5.3	-1.1	-0.4	0.3	4.0
25-29	2784	-0.3	-6.3	-1.0	-0.4	0.4	5.1
30-34	1934	-0.3	-5.1	-1.0	-0.3	0.4	3.6
35-39	1324	-0.3	-3.7	-1.0	-0.3	0.4	3.0
40-44	1010	-0.3	-3.3	-1.0	-0.3	0.4	2.9
45+	973	-0.3	-3.6	-1.0	-0.4	0.4	3.3

This table reports the median z-score for height and other descriptive statistics by age group for all the patients seen in 2010. The median values reported in this table are shown as red dots in fig 6.2.

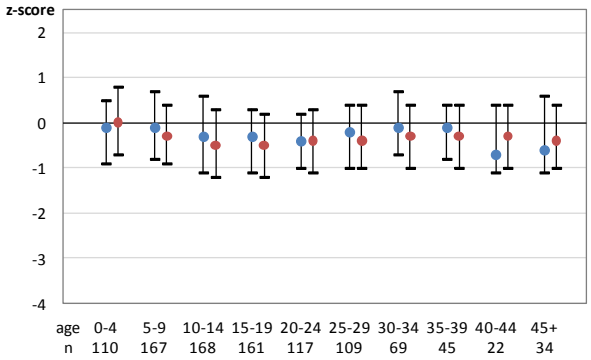
Figure 6.3 Quartiles of z-scores for height by age group and by country. All patients seen in 2010.

The figures below show the z-scores for height by country. The dot is the median and the whiskers show the 25th and 75th percentiles. In blue are the quartiles for the country, in red are the pooled quartiles computed on all other countries (i.e. excluding that country). We did not compute quartiles where the number of patients in the age group is <10, therefore there are no blue dots for those age groups (the number of patients in each age group is shown underneath the horizontal axis). We therefore excluded Latvia and the Republic of Moldova from the graphs because none of the age groups in these countries had more than 10 patients.

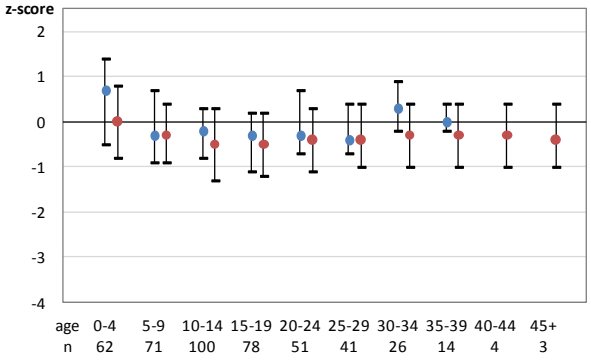
Quartiles of z-scores for height: Austria



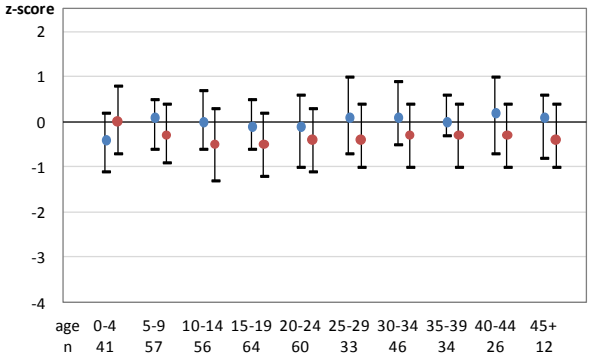
Quartiles of z-scores for height: Belgium



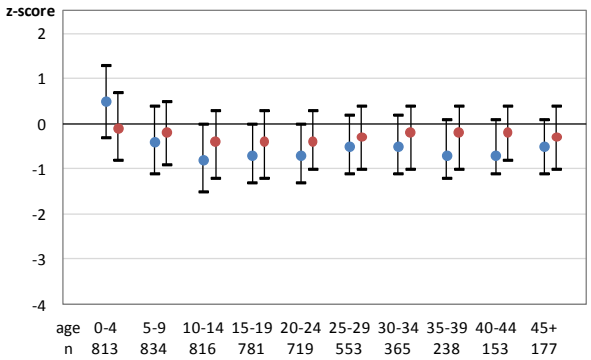
Quartiles of z-scores for height: Czech Republic



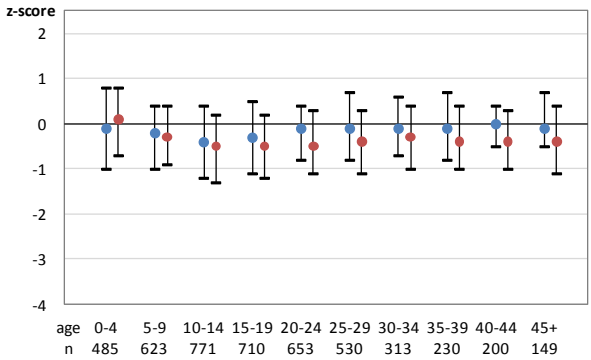
Quartiles of z-scores for height: Denmark



Quartiles of z-scores for height: France

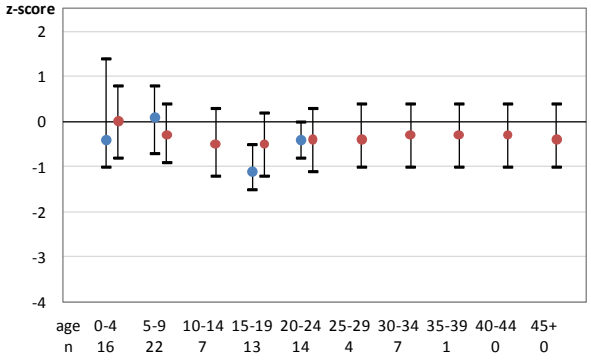


Quartiles of z-scores for height: Germany

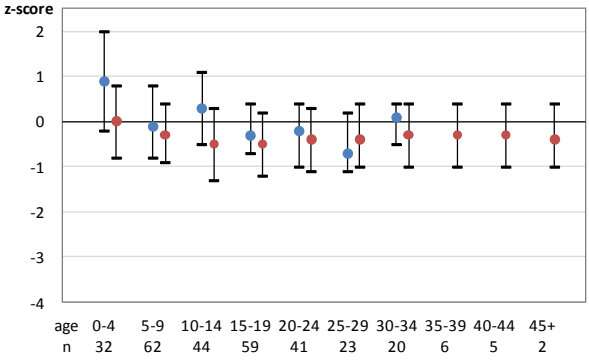


[figure 6.3 continued]

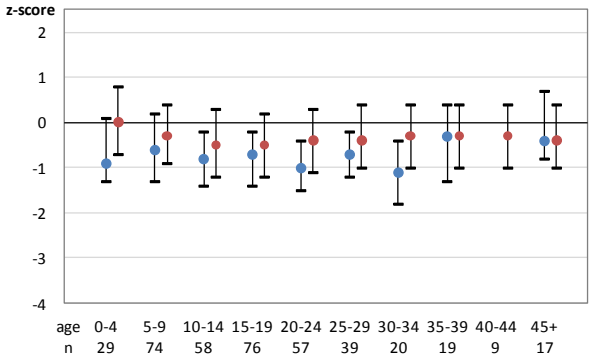
Quartiles of z-scores for height: Greece



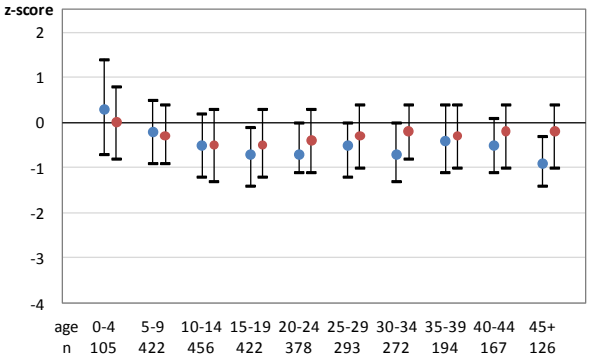
Quartiles of z-scores for height: Hungary



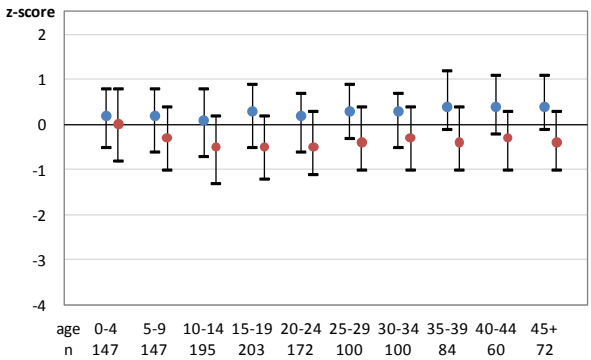
Quartiles of z-scores for height: Israel



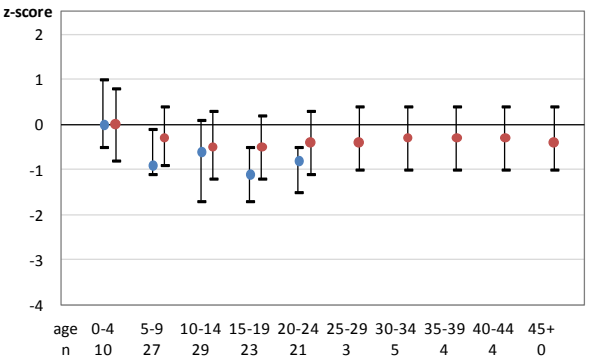
Quartiles of z-scores for height: Italy



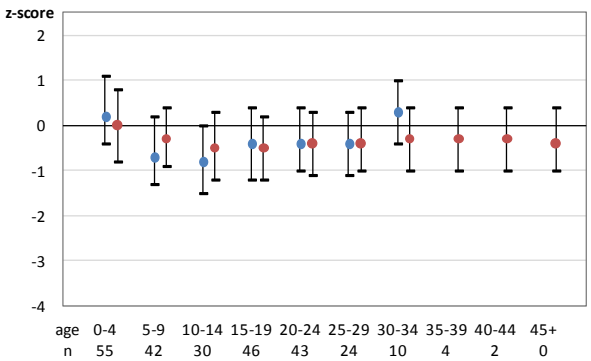
Quartiles of z-scores for height: The Netherlands



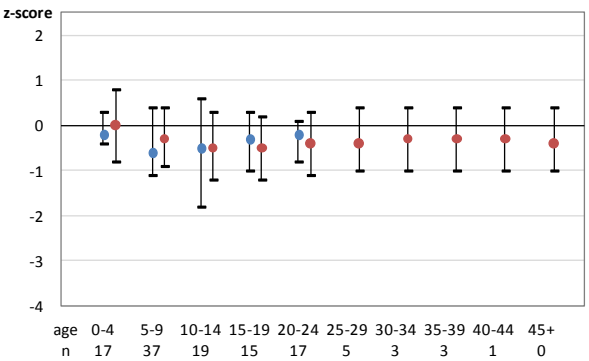
Quartiles of z-scores for height: Portugal



Quartiles of z-scores for height: Russian Federation

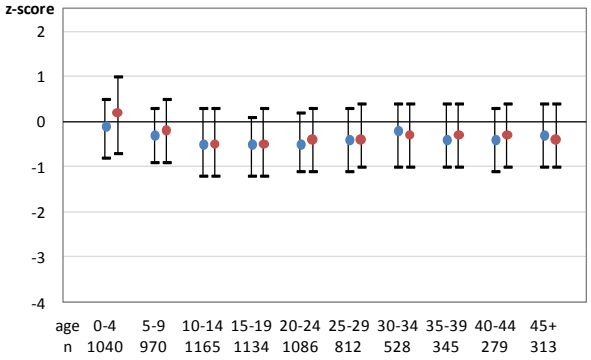


Quartiles of z-scores for height: Serbia

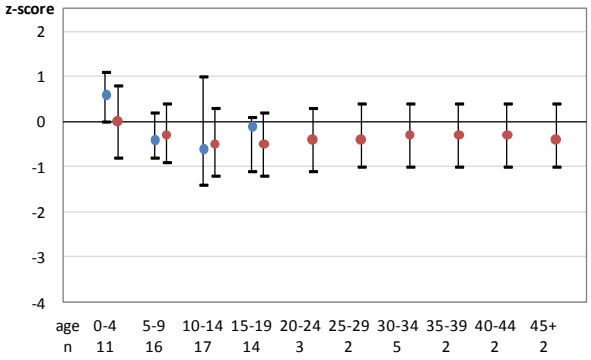


[figure 6.3 continued]

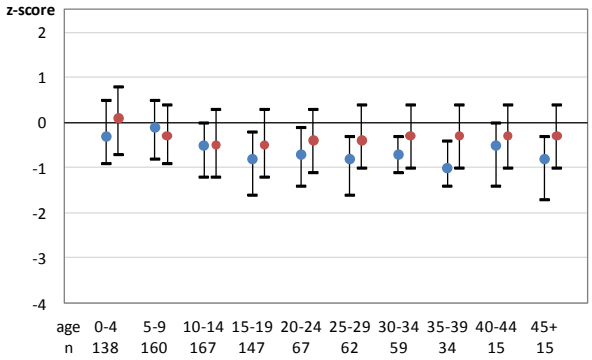
Quartiles of z-scores for height: Slovak Republic



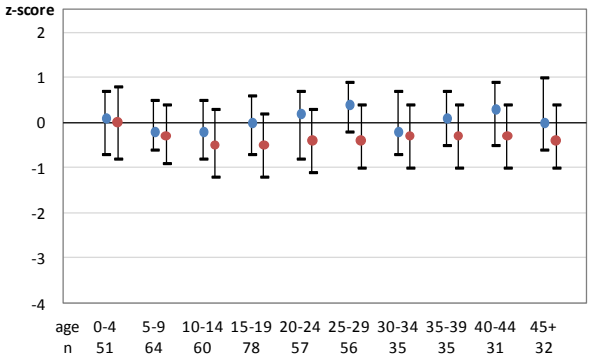
Quartiles of z-scores for height: Slovenia



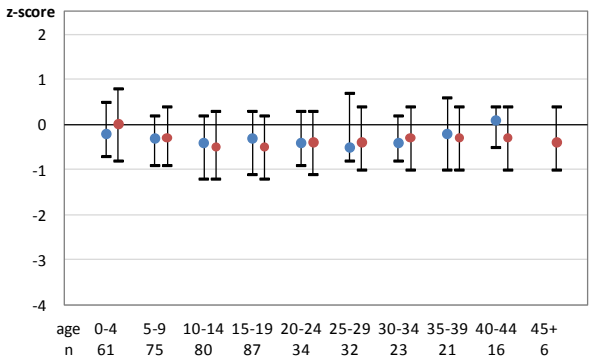
Quartiles of z-scores for height: Spain



Quartiles of z-scores for height: Sweden



Quartiles of z-scores for height: Switzerland



Quartiles of z-scores for height: United Kingdom

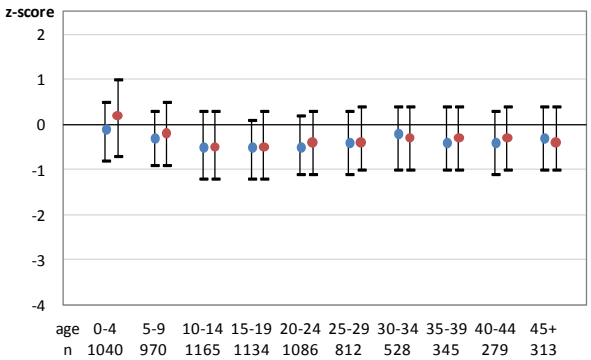


Table 6.5 Z-scores for weight: descriptive statistics by country. Patients aged 17 years or younger.

Country	N	Mean	Min	25th pctl (25% of the patients are below this z-score for weight)	Median (50% of the patients are below this z-score for weight)	75th pctl (75% of the patients are below this z-score for weight)	Max
Austria	352	-0.4	-5.6	-1.1	-0.3	0.4	2.3
Belgium	541	-0.4	-5.1	-1.0	-0.4	0.4	4.7
Czech Republic	286	-0.4	-4.8	-1.1	-0.3	0.5	3.1
Denmark	196	-0.3	-3.0	-0.8	-0.3	0.1	1.5
France	2925	-0.5	-5.6	-1.2	-0.5	0.2	5.9
Germany	2345	-0.6	-8.0	-1.3	-0.5	0.2	4.8
Greece	55	-0.3	-3.3	-1.3	-0.4	0.7	2.7
Hungary	171	-0.4	-4.1	-1.0	-0.3	0.5	3
Israel	203	-0.5	-4.4	-1.2	-0.5	0.1	2.8
Italy	1234	-0.2	-3.7	-0.9	-0.2	0.5	8.2
Latvia	17	-1.1	-4.6	-1.9	-0.7	-0.3	1.6
Rep of Moldova	36	-2.0	-4.8	-2.8	-2.0	-1.4	1.4
The Netherlands	612	0.0	-3.8	-0.6	0.0	0.6	2.2
Portugal	83	-0.8	-6.3	-1.2	-0.7	0.1	2.1
Russian Federation	161	-0.8	-4.7	-1.6	-0.7	0.1	2.4
Serbia	86	-0.7	-5.4	-1.6	-0.6	0.6	2.4
Slovak Republic	69	-0.6	-4.1	-1.2	-0.4	0.2	1.8
Slovenia	55	-0.6	-4.6	-1.2	-0.3	0.2	1.6
Spain	560	-0.4	-6.6	-1.0	-0.3	0.3	3.3
Sweden	225	-0.2	-3.6	-0.8	0.0	0.4	1.9
Switzerland	278	-0.5	-3.8	-1.2	-0.5	0.3	2.6
United Kingdom	3888	-0.3	-7.4	-0.9	-0.2	0.5	4.6

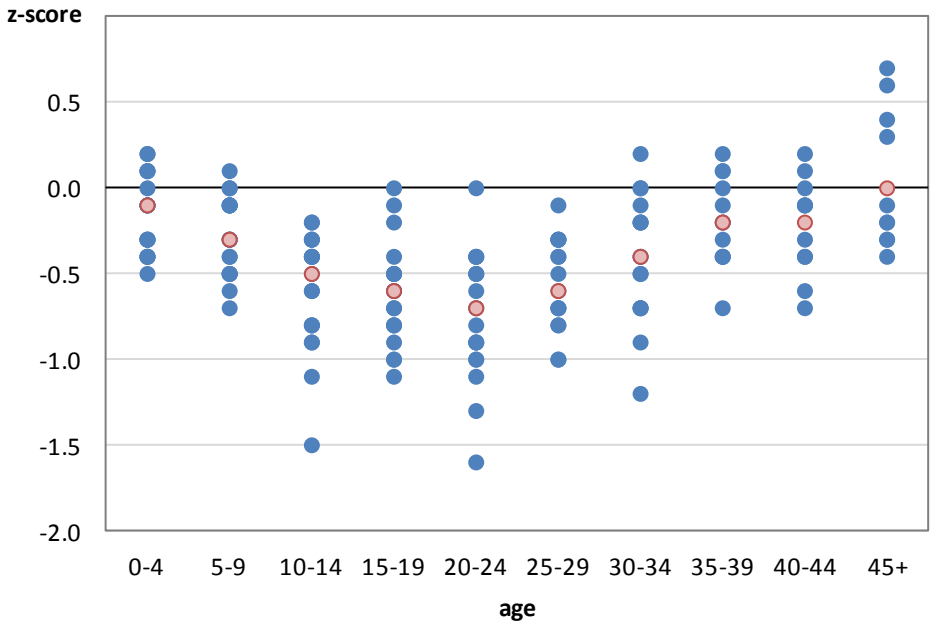
This table reports the median z-score for weight (the value that separates the highest and lowest half of the patients), the mean z-score for weight (the average) and other descriptive statistics for children (17 years or younger).

Table 6.6 Z-scores for weight: descriptive statistics by country. Patients aged 18 years or older.

Country	N	Mean	Min	25th pctl (25% of the patients are below this z-score for weight)	Median (50% of the patients are below this z-score for weight)	75th pctl (75% of the patients are below this z-score for weight)	Max
Austria	142	-0.6	-4.6	-1.3	-0.5	0.2	1.8
Belgium	460	-0.6	-5.8	-1.3	-0.6	0.2	2.8
Czech Republic	163	-0.5	-4.4	-1.2	-0.5	0.3	2.1
Denmark	233	-0.3	-5.1	-1.0	-0.2	0.5	2.4
France	2554	-1.0	-7.3	-1.7	-1.0	-0.2	3.1
Germany	2319	-0.6	-8.6	-1.3	-0.5	0.2	2.7
Greece	29	-0.8	-2.9	-1.6	-0.9	-0.1	1.0
Hungary	107	-1.0	-5.4	-1.7	-0.7	0.0	1.3
Israel	195	-0.5	-4.6	-1.3	-0.4	0.3	2.9
Italy	1603	-0.6	-8.7	-1.3	-0.6	0.1	3.1
Latvia	7	-1.4	-2.1	-2.1	-1.3	-1.2	0.1
Rep of Moldova	6	-1.4	-4.5	-2.8	-0.6	-0.3	0.4
The Netherlands	664	-0.2	-4.4	-0.8	-0.1	0.5	2.3
Portugal	43	-1.2	-4.2	-2.2	-1.1	-0.4	1.5
Russian Federation	99	-1.4	-7.3	-2.0	-1.3	-0.5	1.6
Serbia	34	-1.1	-5.8	-1.6	-0.9	-0.1	0.8
Slovak Republic	114	-0.7	-5.1	-1.3	-0.6	0.1	2.6
Slovenia	22	-1.0	-5.7	-1.6	-0.7	0.2	1.6
Spain	304	-0.7	-5.8	-1.3	-0.7	0.0	2.0
Sweden	274	-0.1	-3.7	-0.6	0.0	0.6	2.9
Switzerland	158	-0.7	-3.4	-1.3	-0.5	-0.1	1.4
United Kingdom	3842	-0.4	-7.4	-1.1	-0.3	0.4	2.8

This table reports the median z-score for weight (the value that separates the highest and lowest half of the patients), the mean z-score for weight (the average) and other descriptive statistics for adults (18 years or older).

Figure 6.4 Median z-scores for weight by age group and by country. All patients seen in 2010.



Note: we excluded from the analyses those age groups where the number of patients was <10.

This graph shows the median z-scores for weight by age group. Each country is represented by a dot (in blue) and the overall estimate is in red. Overall, the median z-scores for weight slightly decrease from the youngest age group to the second youngest, probably because some patients are underweight before diagnosis; afterwards the weight decreases again until the 20-24 year age group before it increases in the older age groups. Again, the patients in the oldest age groups are patients that survived, and may therefore represent the patients with less disease severity. There is considerable variability between countries.

Table 6.7 Z-scores for weight: descriptive statistics by age group. All patients seen in 2010.

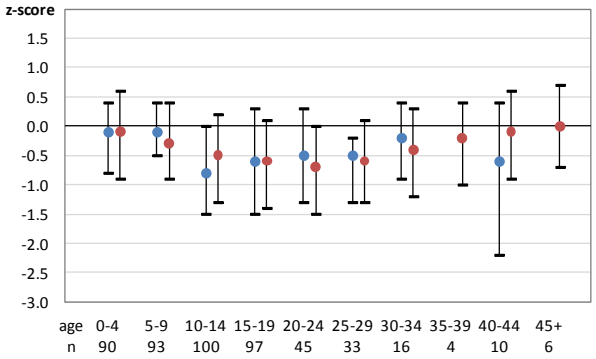
Age at weight measurement	N	Mean	Min	25th pctl	Median	75th pctl	Max
0-4	3406	-0.2	-7.7	-0.9	-0.1	0.6	8.2
5-9	4000	-0.3	-5.1	-0.9	-0.3	0.4	3.3
10-14	4372	-0.6	-8.0	-1.3	-0.5	0.2	2.7
15-19	4259	-0.7	-7.4	-1.4	-0.6	0.1	2.9
20-24	3683	-0.8	-7.2	-1.5	-0.7	0.0	3.1
25-29	2788	-0.7	-8.7	-1.3	-0.6	0.1	2.7
30-34	1939	-0.5	-5.0	-1.2	-0.4	0.3	3.1
35-39	1322	-0.3	-5.6	-1.0	-0.2	0.4	2.8
40-44	1007	-0.2	-4.6	-0.9	-0.2	0.6	2.8
45+	974	-0.1	-4.6	-0.7	0.0	0.7	2.9

This table reports the median z-score for weight and other descriptive statistics by age group for all the patients seen in 2010. The median values reported in this table are shown as red dots in fig 6.4.

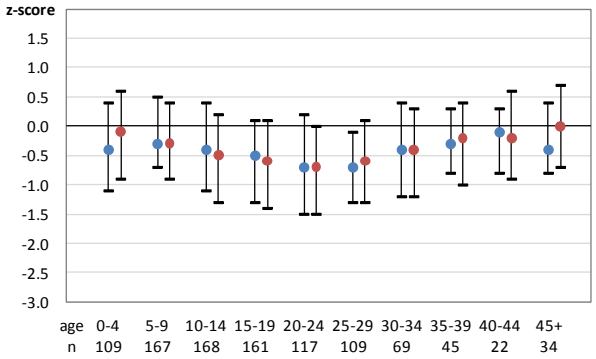
Figure 6.5 Quartiles of z-scores for weight by age group and by country. All patients seen in 2010.

The figures below show the z-scores for weight by country. The dot is the median, and the whiskers show the 25th and 75th percentiles. In blue are the quartiles for the country, in red are the pooled quartiles computed on all other countries (i.e. excluding that country). We did not compute quartiles where the number of patients in the age group is <10. Therefore there are no blue dots for those age groups (the number of patients in each age group is shown underneath the horizontal axis). We therefore excluded Latvia and the Republic of Moldova from the graphs because none of the age groups in these countries had more than 10 patients.

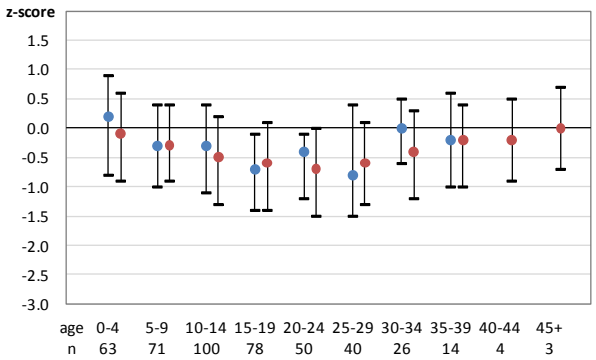
Quartiles of z-scores for weight: Austria



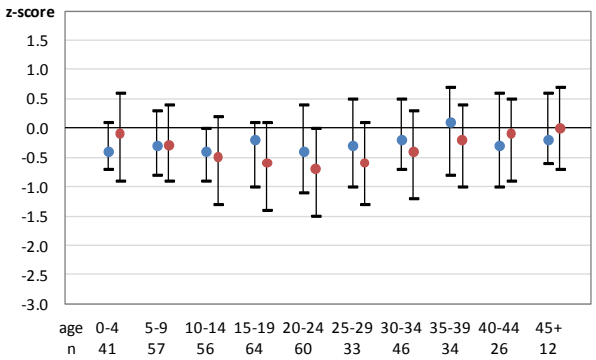
Quartiles of z-scores for weight: Belgium[1]



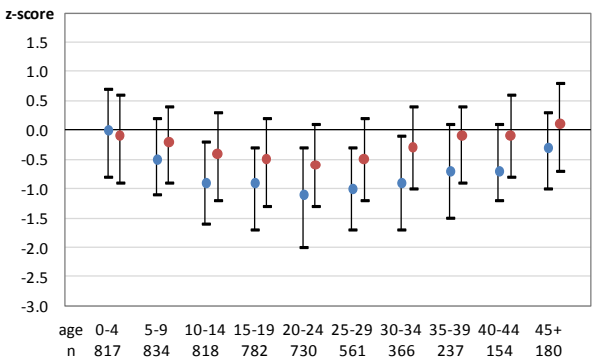
Quartiles of z-scores for weight: Czech Republic



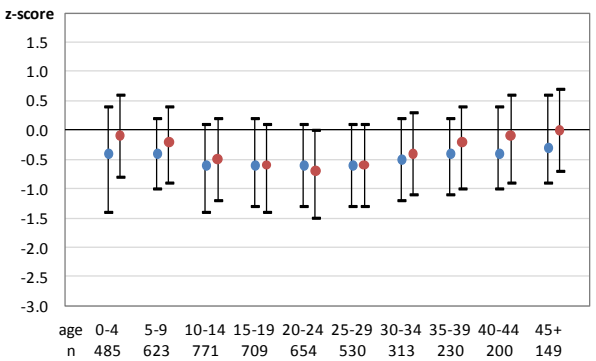
Quartiles of z-scores for weight: Denmark



Quartiles of z-scores for weight: France

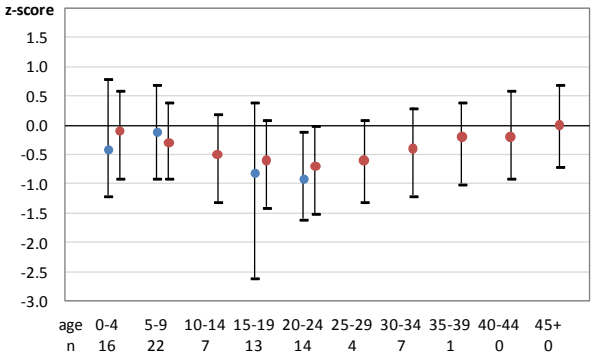


Quartiles of z-scores for weight: Germany

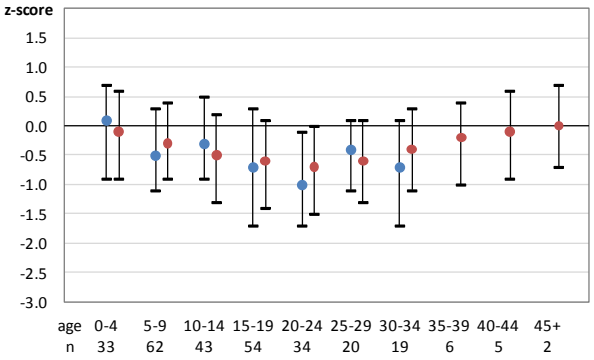


[figure 6.5 continued]

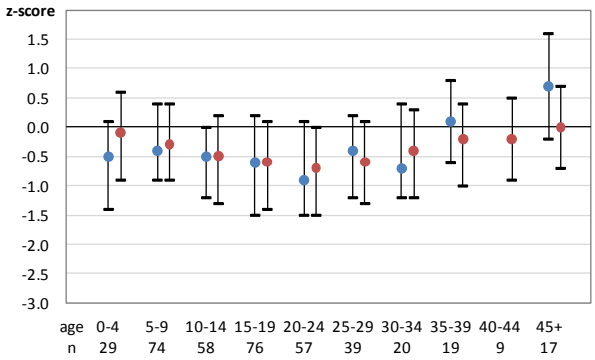
Quartiles of z-scores for weight: Greece



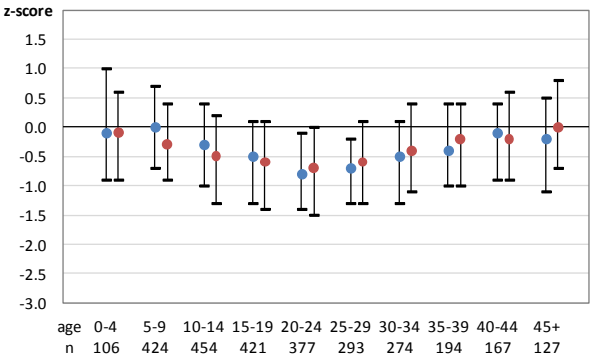
Quartiles of z-scores for weight: Hungary



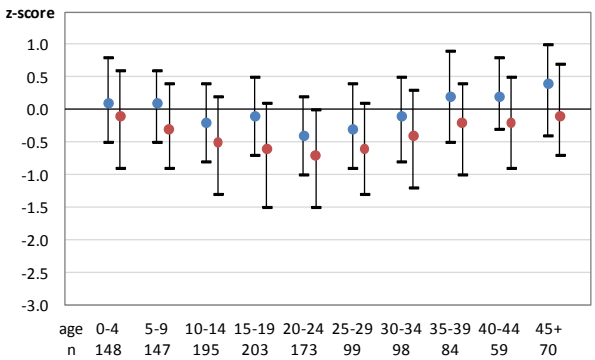
Quartiles of z-scores for weight: Israel



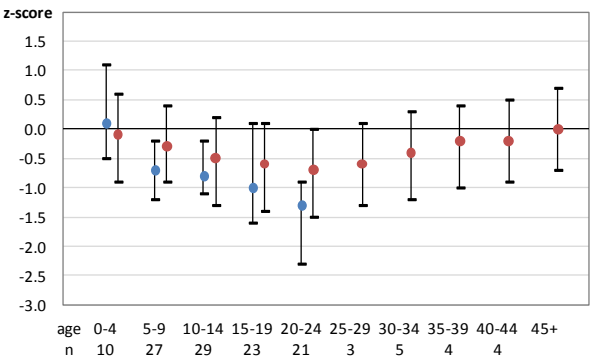
Quartiles of z-scores for weight: Italy



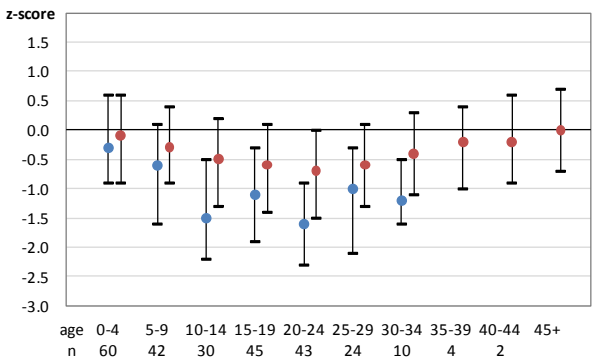
Quartiles of z-scores for weight: The Netherlands



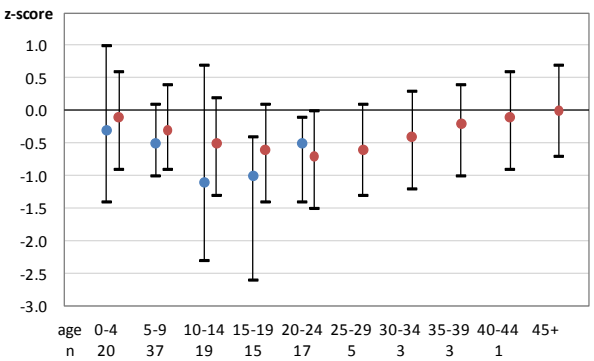
Quartiles of z-scores for weight: Portugal



Quartiles of z-scores for weight: Russian Federation

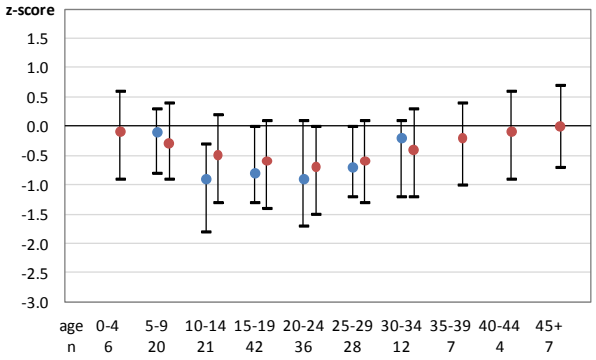


Quartiles of z-scores for weight: Serbia

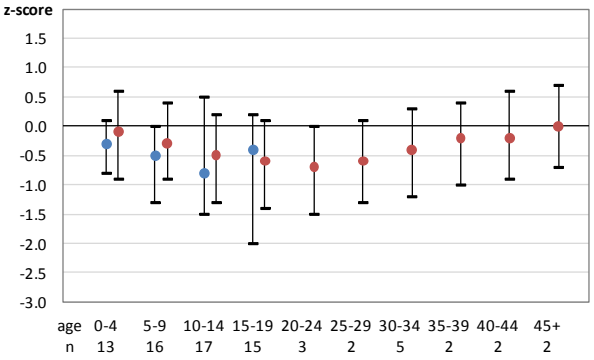


[figure 6.5 continued]

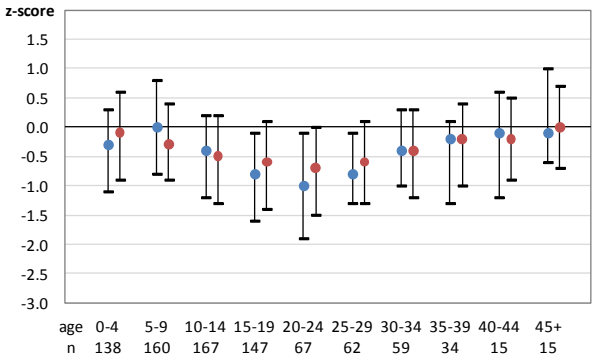
Quartiles of z-scores for weight: Slovak Republic



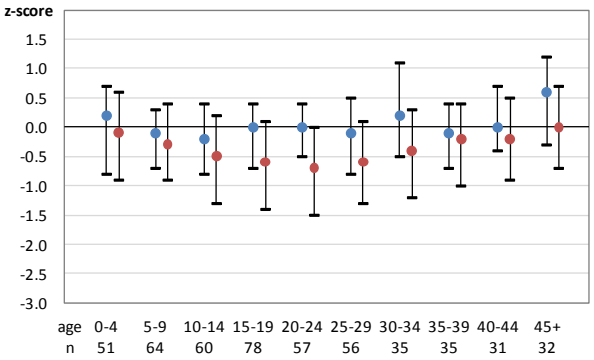
Quartiles of z-scores for weight: Slovenia



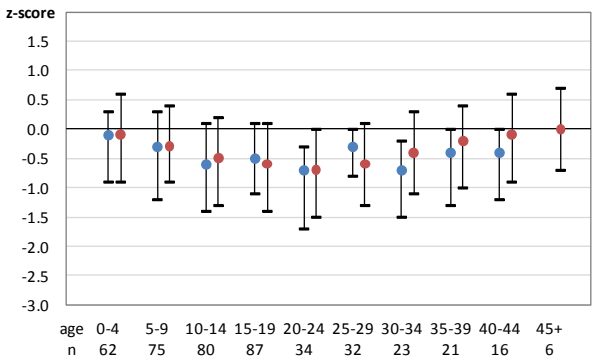
Quartiles of z-scores for weight: Spain



Quartiles of z-scores for weight: Sweden



Quartiles of z-scores for weight: Switzerland



Quartiles of z-scores for weight: United Kingdom

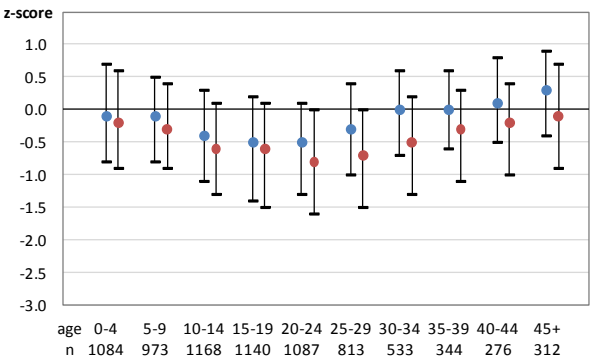


Table 6.8 Z-scores for BMI: descriptive statistics by country. All patients seen in 2010 aged 2-17 years.

Country	N	N Miss	Mean	Min	25th pctl (25% of the patients are below this z-score for BMI)	Median (50% of the patients are below this z-score for BMI)	75th pctl (75% of the patients are below this z-score for BMI)	Max
Austria	319	0	-0.4	-4.1	-1.0	-0.3	0.3	2.3
Belgium	505	0	-0.3	-4.2	-1.0	-0.3	0.4	2.3
Czech Republic	261	1	-0.4	-4.2	-1.0	-0.4	0.4	1.8
Denmark	187	0	-0.4	-3.0	-1.0	-0.3	0.2	1.6
France	2587	34	-0.5	-6.4	-1.1	-0.5	0.2	3.3
Germany	2190	42	-0.5	-8.2	-1.1	-0.4	0.2	2.3
Greece	49	0	-0.2	-2.8	-0.9	-0.3	0.8	2.9
Hungary	161	1	-0.8	-6.6	-1.6	-0.7	0.2	1.6
Israel	198	0	-0.2	-3.8	-0.7	-0.1	0.5	2.4
Italy	1197	108	0.0	-3.7	-0.7	0.0	0.7	2.9
Latvia	14	1	-1.2	-4.2	-2.4	-0.8	-0.4	1.0
Rep of Moldova	26	0	-1.0	-6.8	-1.9	-1.1	0.2	2.8
The Netherlands	556	1	-0.1	-3.8	-0.6	-0.1	0.4	2
Portugal	81	0	-0.7	-8.0	-1.4	-0.4	0.3	2.2
Russian Federation	136	2	-0.9	-6.2	-1.7	-0.9	-0.1	1.9
Serbia	79	0	-0.5	-6.6	-1.4	-0.3	0.6	2.8
Slovak Republic	69	0	-0.6	-3.5	-1.2	-0.7	0.2	1.7
Slovenia	49	0	-0.4	-2.7	-1.1	-0.5	0.1	1.8
Spain	514	0	-0.1	-7.4	-0.8	-0.1	0.6	2.8
Sweden	208	0	-0.1	-2.8	-0.5	0.0	0.5	2.1
Switzerland	252	1	-0.4	-4.1	-1.1	-0.4	0.3	2.4
United Kingdom	3457	55	-0.1	-9.1	-0.7	0.0	0.6	4.2

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

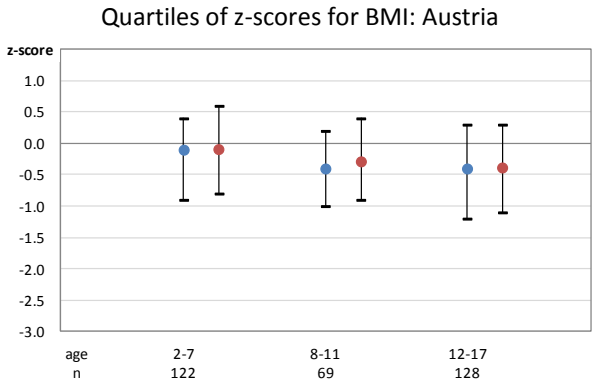
Table 6.9 BMI: descriptive statistics by country. All patients seen in 2010 aged 18 years or older.

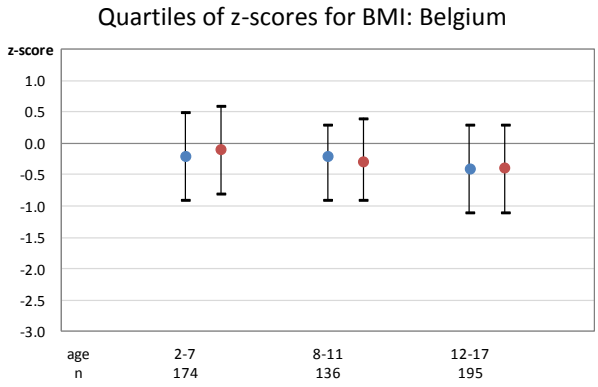
Country	N	N Miss	Mean	Min	25th pctl (25% of the patients are below this BMI)	Median (50% of the patients are below this BMI)	75th pctl (75% of the patients are below this BMI)	Max
Austria	142	0	21.0	14.4	19.0	20.5	22.9	30.9
Belgium	460	0	21.3	13.1	19.3	20.8	23.1	42.7
Czech Republic	163	25	21.0	14.8	18.9	20.4	22.6	34.2
Denmark	233	0	21.8	14.5	19.6	21.2	23.4	38.9
France	2519	80	20.6	13.3	18.5	20.1	22.0	44.5
Germany	2318	60	20.9	13.3	18.9	20.5	22.5	34.6
Greece	29	0	20.7	17.1	18.8	19.8	22.1	26.4
Hungary	104	22	20.3	13.6	17.8	20.0	22.4	26.9
Israel	195	0	22.7	15.9	20.0	22.2	24.3	39.9
Italy	1599	219	21.7	11.8	19.6	21.2	23.3	41.7
Latvia	7	0	17.9	16.4	16.8	18.3	18.8	19.9
Rep of Moldova	6	0	19.0	16.6	17.3	19.2	20.6	21.1
The Netherlands	663	8	21.8	13.7	19.8	21.6	23.5	38.4
Portugal	43	0	20.5	15.2	18.3	20.7	22.1	33.4
Russian Federation	99	1	19.1	12.6	17.2	18.9	20.8	25.6
Serbia	34	0	19.5	13.7	17.7	19.7	20.5	26.3
Slovak Republic	114	0	20.5	14.4	18.6	20.2	22.2	35.7
Slovenia	21	1	20.5	15.4	18.5	20.2	22.1	26.2
Spain	304	2	21.8	13.8	19.7	21.5	23.3	37
Sweden	274	3	22.4	14.9	20.3	22.0	23.9	35.2
Switzerland	158	0	20.8	14.4	19.2	20.7	22.0	27.7
United Kingdom	3790	141	22.4	12.0	19.9	21.9	24.3	48.7

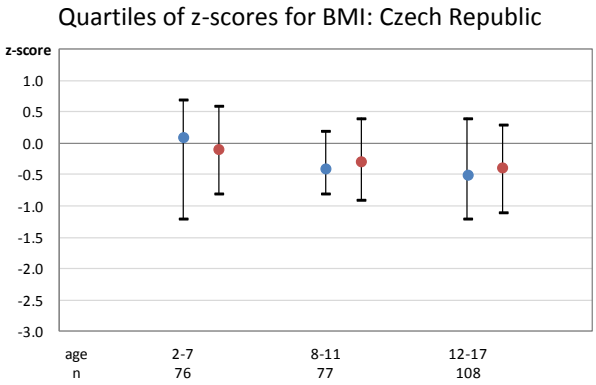
This table reports the median BMI (expressed as absolute values, not as z-scores), the mean BMI and other descriptive statistics for patients aged 18 years or older, by country.

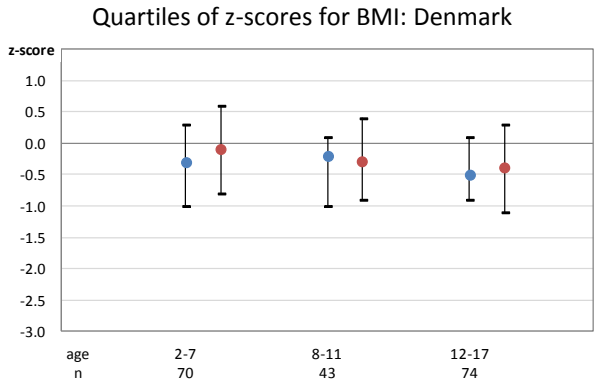
Figure 6.6 Quartiles of z-scores for BMI by age group and country. Patients aged 2-17 years in 2010.

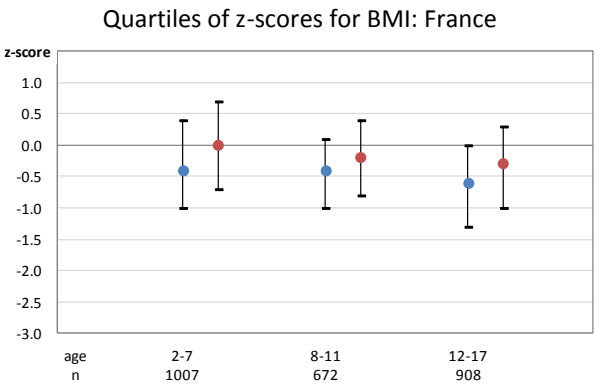
The figures below show the z-scores for weight by country. The dot is the median, and the whiskers show the 25th and 75th percentiles. In blue are the quartiles for the country, in red are the pooled quartiles computed on all other countries (i.e. excluding that country). We did not compute quartiles where the number of patients in the age group is <10. Therefore there are no blue dots for those age groups (the number of patients in each age group is shown underneath the horizontal axis). We therefore excluded Latvia and the Republic of Moldova from the graphs because none of the age groups in these countries had more than 10 patients.

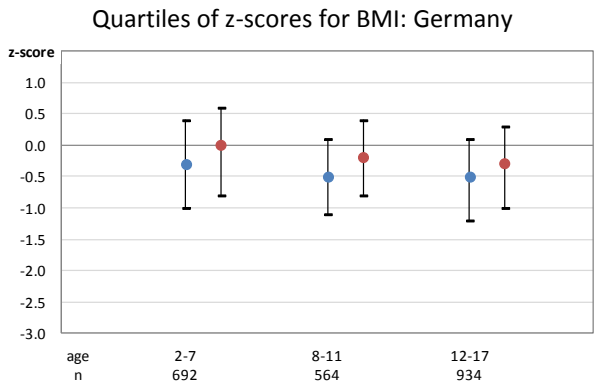






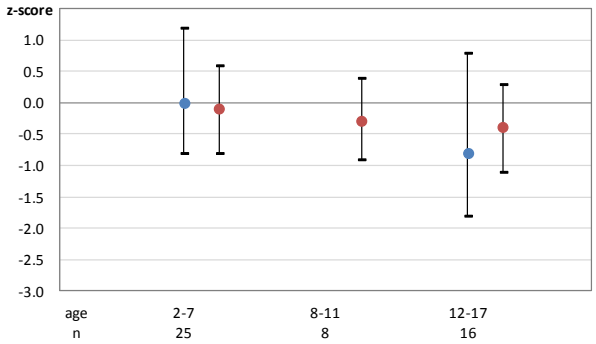




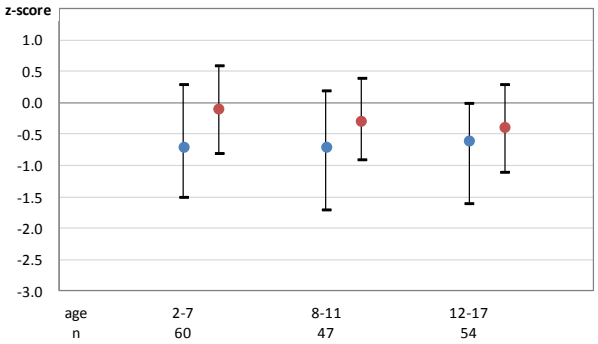


[figure 6.6 continued]

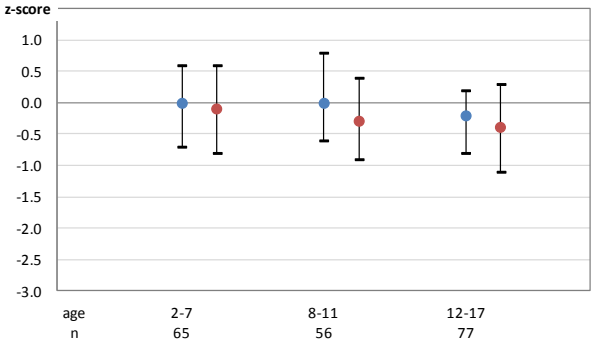
Quartiles of z-scores for BMI: Greece



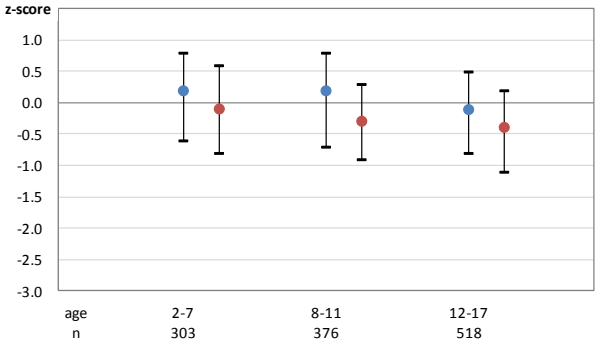
Quartiles of z-scores for BMI: Hungary



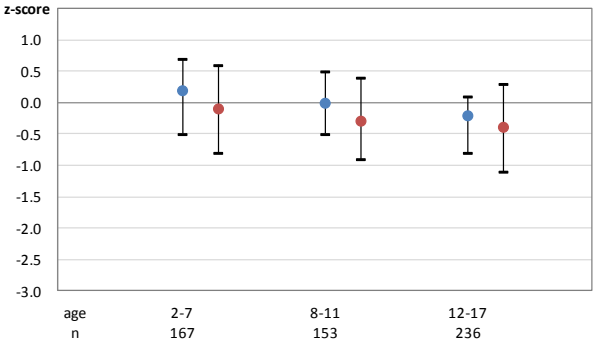
Quartiles of z-scores for BMI: Israel



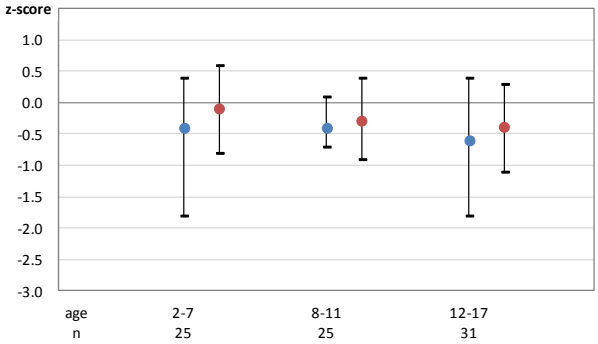
Quartiles of z-scores for BMI: Italy



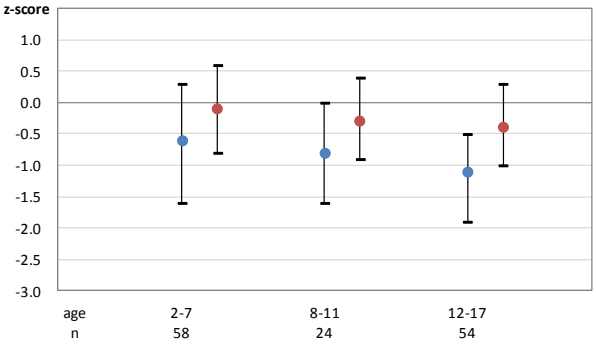
Quartiles of z-scores for BMI: The Netherlands



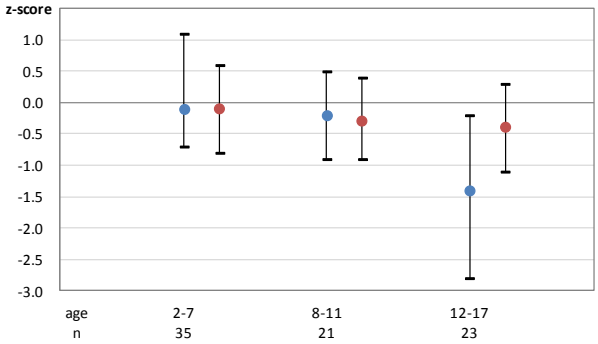
Quartiles of z-scores for BMI: Portugal



Quartiles of z-scores for BMI: Russian Federation

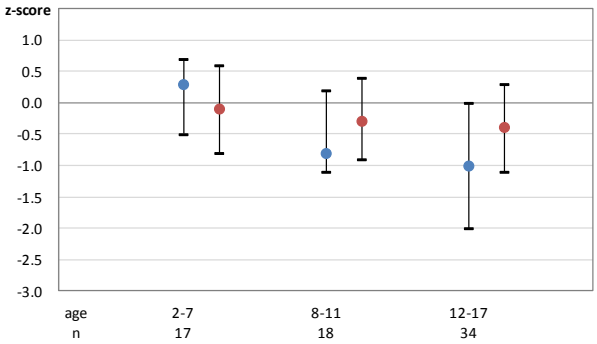


Quartiles of z-scores for BMI: Serbia

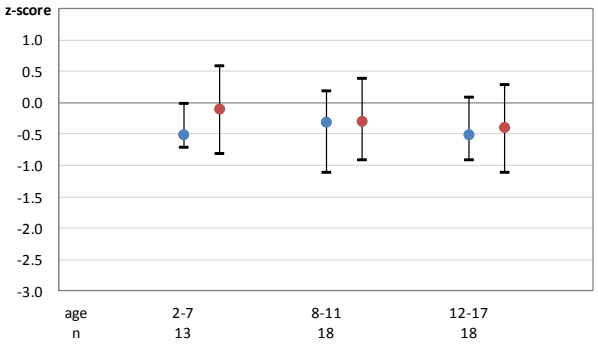


[figure 6.6 continued]

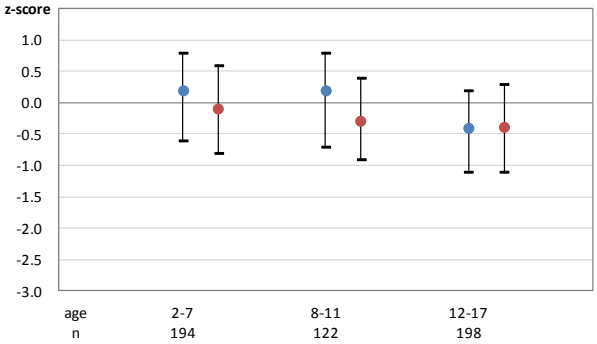
Quartiles of z-scores for BMI: Slovak Republic



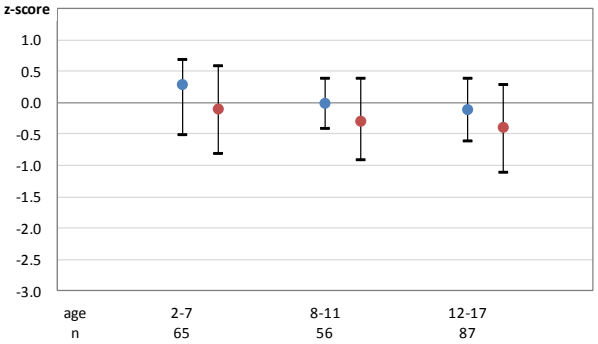
Quartiles of z-scores for BMI: Slovenia



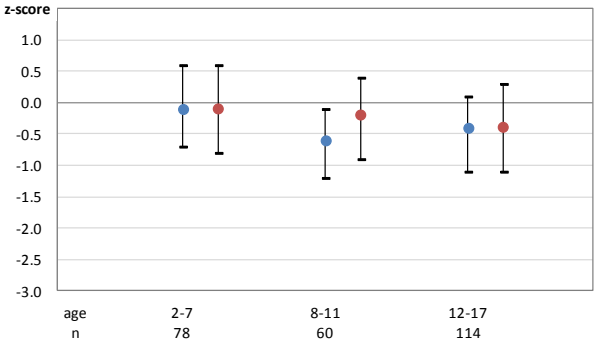
Quartiles of z-scores for BMI: Spain



Quartiles of z-scores for BMI: Sweden



Quartiles of z-scores for BMI: Switzerland



Quartiles of z-scores for BMI: United Kingdom

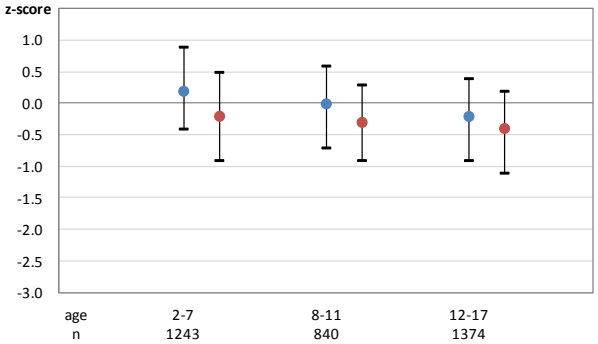
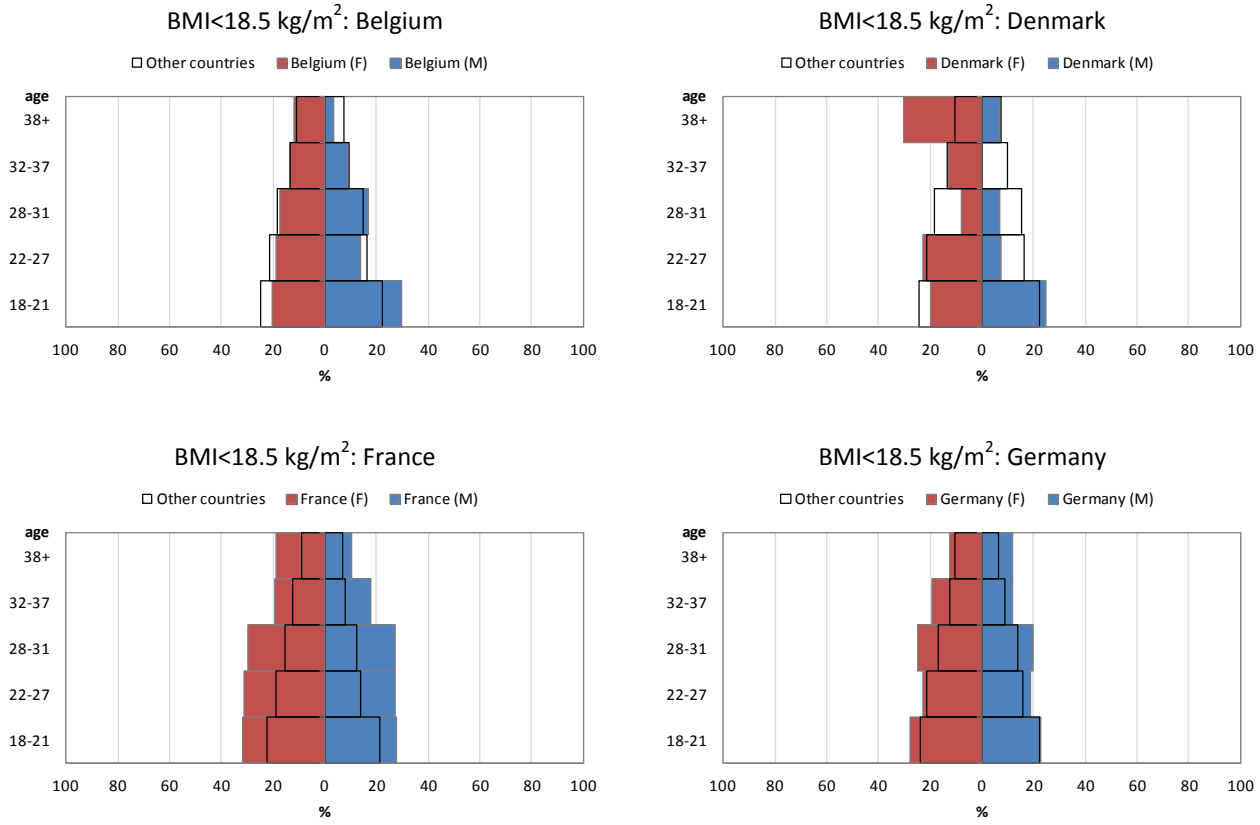


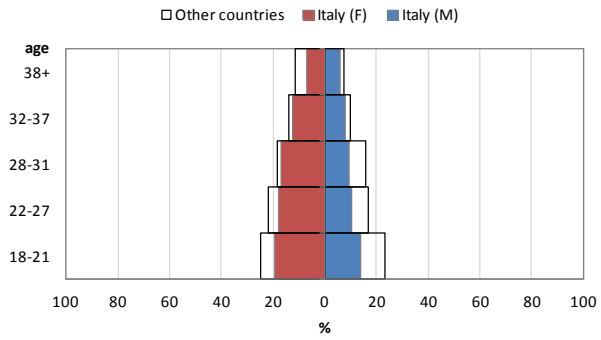
Figure 6.7 Proportion of adult patients underweight (BMI<18.5): age and sex pyramids, by country and overall. Patients aged 18 years or older in 2010.

The coloured bars (red for females, blue for males) represent the percentage of underweight patients in the selected country, whereas the non coloured bars represent the percentage of underweight patients in all the remaining countries (i.e. excluding that country). We excluded from the analyses those age groups where the number of patients was <10. We therefore excluded from the graph Austria, the Czech Republic, Greece, Hungary, Israel, Latvia, the Republic of Moldova, Russian Federation, Portugal, Serbia, Slovak Republic, Slovenia and Switzerland because none of the age groups in these countries had more than 10 patients.

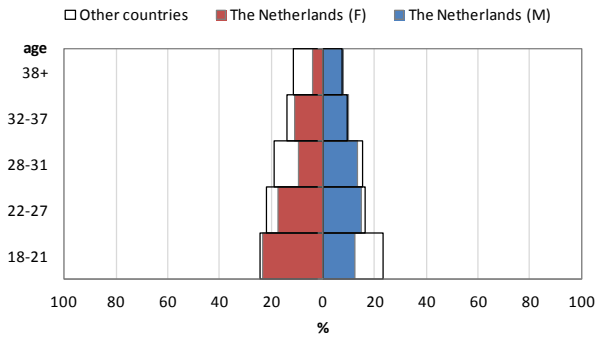


[figure 6.7 continued]

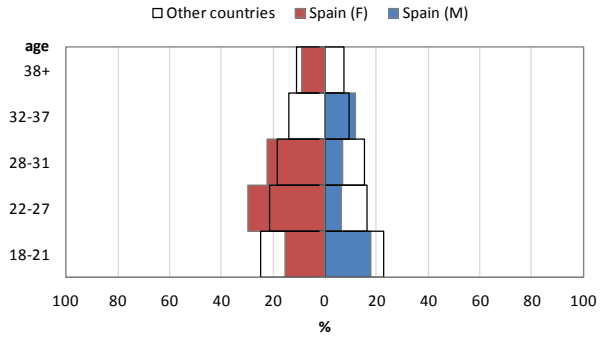
BMI<18.5 kg/m^2: Italy



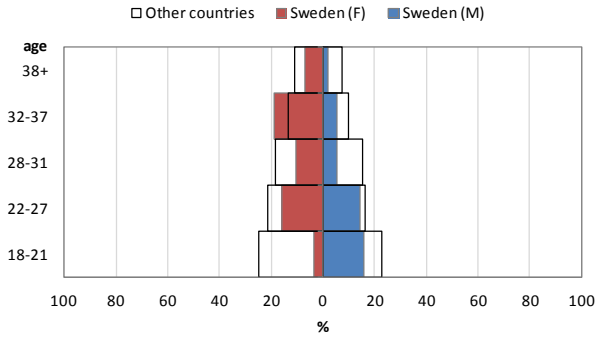
BMI<18.5 kg/m^2: The Netherlands



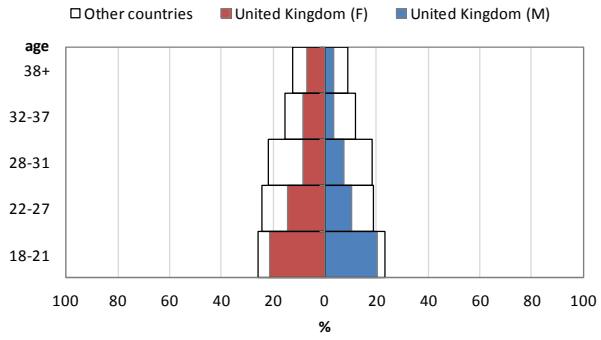
BMI<18.5 kg/m^2: Spain



BMI<18.5 kg/m^2: Sweden



BMI<18.5 kg/m^2: United Kingdom



7. Complications and therapy

The information in this section should not be considered complete either because national registries do not collect data about the complication, because they use a different definition or because the status of the complication is truly unknown (e.g. liver disease, where the definition requires ultrasound examination). In the tables therefore, we show the number of missing values for the various complications, but in the graphs we have included only countries where less than 10% of the data were missing. For a full list of complications and definitions please see Appendix 2.

In this section we also present data on selected therapies. We collected information on therapies using the generic name of the drug (i.e. not the brand name), in order to avoid data collection bias due to brand names. For example, we ask whether the patient has been taking ”inhaled antibiotics for more than three months this year”, instead of naming individual antibiotics.

Like the complications section, the information presented in the therapy section should not be considered complete, and we will show only selected results, in accordance with the same criteria used for complications.

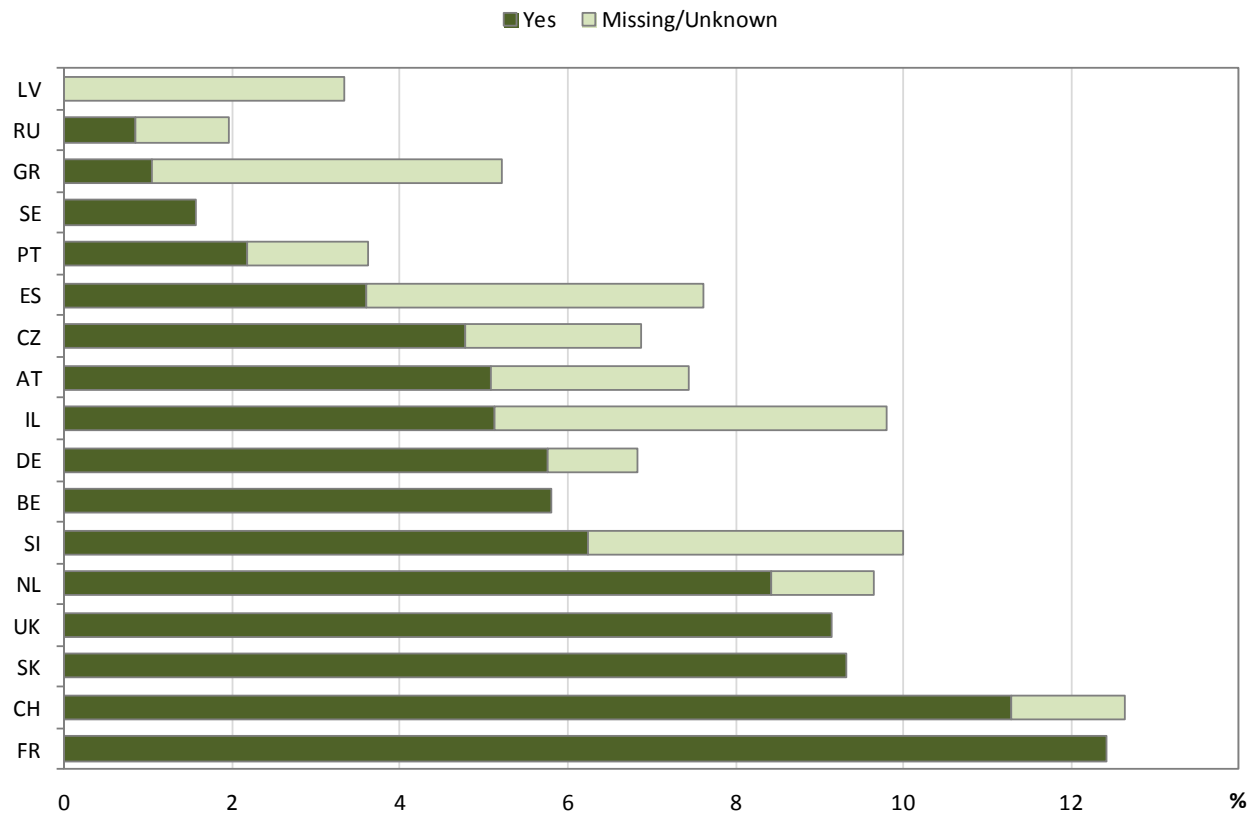
Table 7.1 Prevalence of allergic broncho-pulmonary aspergillosis (all patients seen in 2010) and CF related diabetes treated with insulin in 2010 (patients aged 10 years or older), by country.

Country	ABPA this year number (%)			CF related diabetes with daily use of insulin this year number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	12 (2.3)	473 (92.6)	26 (5.1)	9 (2.8)	270 (83.1)	46 (14.1)
Belgium	0 (0.0)	1072 (94.2)	66 (5.8)	20 (2.3)	682 (77.4)	179 (20.3)
Czech Republic	11 (2.1)	487 (93.1)	25 (4.8)	10 (2.6)	299 (79.1)	69 (18.3)
Denmark	450 (100)	-	-	0 (0.0)	259 (73.2)	95 (26.8)
France	0 (0.0)	5043 (87.6)	716 (12.4)	0 (0.0)	3359 (83.4)	667 (16.6)
Germany	54 (1.1)	4661 (93.2)	288 (5.7)	40 (1.0)	3008 (77.3)	842 (21.7)
Greece	4 (4.2)	91 (94.8)	1 (1.0)	3 (5.2)	48 (82.8)	7 (12.0)
Hungary	557 (100)	-	-	0 (0.0)	345 (87.6)	49 (12.4)
Israel	20 (4.7)	387 (90.2)	22 (5.1)	9 (2.9)	246 (79.6)	54 (17.5)
Italy	1077 (26.1)	2923 (71.0)	119 (2.9)	268 (9.1)	2154 (73.2)	519 (17.7)
Latvia	1 (3.3)	29 (96.7)	0 (0.0)	0 (0.0)	15 (88.2)	2 (11.8)
Rep of Moldova	42 (100)	-	-	0 (0.0)	14 (100)	0 (0.0)
The Netherlands	16 (1.2)	1180 (90.4)	110 (8.4)	7 (0.7)	777 (75.8)	241 (23.5)
Portugal	2 (1.4)	133 (96.4)	3 (2.2)	2 (2.1)	85 (86.7)	11 (11.2)
Russian Federation	4 (1.1)	352 (98.1)	3 (0.8)	0 (0.0)	182 (94.3)	11 (5.7)
Serbia	0 (0.0)	121 (100)	0 (0.0)	0 (0.0)	58 (89.2)	7 (10.8)
Slovak Republic	0 (0.0)	302 (90.7)	31 (9.3)	0 (0.0)	251 (93.0)	19 (7.0)
Slovenia	3 (3.7)	72 (90.0)	5 (6.3)	1 (1.9)	45 (84.9)	7 (13.2)
Spain	37 (4.0)	848 (92.4)	33 (3.6)	30 (4.9)	479 (79.2)	96 (15.9)
Sweden	0 (0.0)	501 (98.4)	8 (1.6)	509 (100)	-	-
Switzerland	6 (1.3)	387 (87.4)	50 (11.3)	6 (1.9)	264 (84.1)	44 (14.0)
United Kingdom	0 (0.0)	7211 (90.9)	725 (9.1)	153 (2.6)	4445 (75.2)	1309 (22.2)

[1] France: ABPA was collected as: Aspergillosis (ABPA and other) if treated.

This table shows the frequency of allergic broncho-pulmonary aspergillosis (see Appendix 2 for ABPA definitions) and CF related diabetes (defined here as treated daily with insulin) by country. For CFRD only patients 10 years or older are included.

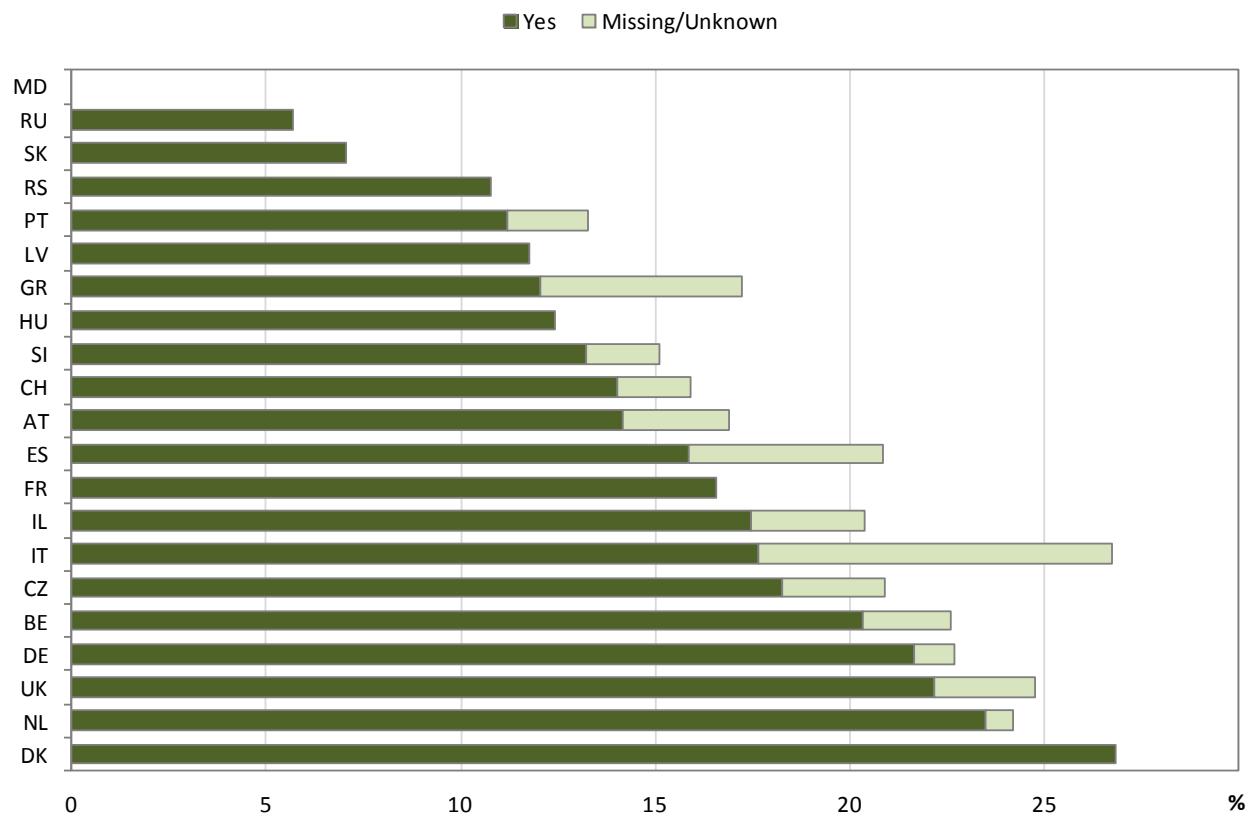
Figure 7.1 Prevalence of allergic broncho-pulmonary aspergillosis in all patients seen in 2010, by country.



Note: we excluded from the graph the countries for which the information on allergic broncho-pulmonary aspergillosis was missing for more than 10% of the patients.
Note: France collected ABPA as Aspergillosis (ABPA and other) if treated.

This graph shows the frequency of allergic broncho-pulmonary aspergillosis by country. For the definition of ABPA see Appendix 2. The dark green part of the bar shows the percentage of patients with ABPA, the light green part shows the percentage of patients for which this information was missing.

Figure 7.2 Prevalence of CFRD requiring daily insulin treatment, by country. All patients seen in 2010 aged 10 years or older.



Note: we excluded from the graph the countries for which the information on CFRD was missing for more than 10% of the patients.

This graph shows the prevalence of CF related diabetes (CFRD) by country. CFRD is recorded differently in different national registries. As a substitute marker of diabetes, we have collected data on the use of insulin on a daily basis. The dark green part of the bar shows the percentage of patients who use insulin daily, the light green part shows the percentage of patients for which this information was missing. Only patients aged 10 years or older were included in this graph.

Table 7.2 Prevalence of pneumothorax, haemoptysis and malignancy in all patients seen in 2010, by country.

Country	Pneumothorax requiring chest tube this year number (%)			Haemoptysis major over 250 ml this year number (%)			Malignancy occurred this year number(%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	12 (2.3)	499 (97.7)	0 (0.0)	15 (2.9)	494 (96.7)	2 (0.4)	12 (2.3)	498 (97.5)	1 (0.2)
Belgium	0 (0.0)	1136 (99.8)	2 (0.2)	0 (0.0)	1119 (98.3)	19 (1.7)	0 (0.0)	1133 (99.6)	5 (0.4)
Czech Republic	13 (2.5)	506 (96.7)	4 (0.8)	13 (2.5)	505 (96.6)	5 (0.9)	11 (2.1)	512 (97.9)	0 (0.0)
Denmark	450 (100)	-	-	450 (100)	-	-	0 (0.0)	449 (99.8)	1 (0.2)
France[1,2]	0 (0.0)	5691 (98.8)	68 (1.2)	0 (0.0)	5450 (94.6)	309 (5.4)	0 (0.0)	5735 (99.6)	24 (0.4)
Germany	57 (1.1)	4927 (98.5)	19 (0.4)	55 (1.1)	4835 (96.6)	113 (2.3)	5003 (100)	-	-
Greece	4 (4.2)	92 (95.8)	0 (0.0)	4 (4.2)	91 (94.8)	1 (1.0)	4 (4.2)	92 (95.8)	0 (0.0)
Hungary	0 (0.0)	552 (99.1)	5 (0.9)	557 (100)	-	-	557 (100)	-	-
Israel	16 (3.7)	413 (96.3)	0 (0.0)	19 (4.4)	405 (94.4)	5 (1.2)	16 (3.7)	412 (96.0)	1 (0.3)
Italy	451 (11.0)	3648 (88.5)	20 (0.5)	456 (11.0)	3607 (87.6)	56 (1.4)	451 (11.0)	3648 (88.5)	20 (0.5)
Latvia	2 (6.7)	28 (93.3)	0 (0.0)	1 (3.3)	28 (93.3)	1 (3.3)	0 (0.0)	30 (100)	0 (0.0)
Rep of Moldova	0 (0.0)	42 (100)	0 (0.0)	0 (0.0)	42 (100)	0 (0.0)	0 (0.0)	42 (100)	0 (0.0)
The Netherlands[3]	24 (1.8)	1272 (97.4)	10 (0.8)	29 (2.2)	1233 (94.4)	44 (3.4)	10 (0.8)	1293 (99.0)	3 (0.2)
Portugal	1 (0.7)	135 (97.9)	2 (1.4)	2 (1.4)	125 (90.6)	11 (8.0)	3 (2.2)	134 (97.1)	1 (0.7)
Russian Federation	3 (0.8)	349 (97.2)	7 (2.0)	3 (0.8)	353 (98.3)	3 (0.8)	3 (0.8)	353 (98.3)	3 (0.8)
Serbia	0 (0.0)	120 (99.2)	1 (0.8)	0 (0.0)	119 (98.4)	2 (1.6)	0 (0.0)	121 (100)	0 (0.0)
Slovak Republic	0 (0.0)	331 (99.4)	2 (0.6)	0 (0.0)	318 (95.5)	15 (4.5)	0 (0.0)	333 (100)	0 (0.0)
Slovenia	1 (1.2)	78 (97.6)	1 (1.2)	1 (1.2)	78 (97.6)	1 (1.2)	1 (1.2)	79 (98.8)	0 (0.0)
Spain	37 (4.0)	876 (95.4)	5 (0.6)	41 (4.5)	862 (93.9)	15 (1.6)	36 (3.9)	875 (95.3)	7 (0.8)
Sweden	0 (0.0)	509 (100)	0 (0.0)	0 (0.0)	506 (99.4)	3 (0.6)	0 (0.0)	509 (100)	0 (0.0)
Switzerland	6 (1.4)	434 (98.0)	3 (0.6)	8 (1.8)	421 (95.0)	14 (3.2)	6 (1.4)	435 (98.2)	2 (0.4)
United Kingdom	0 (0.0)	7886 (99.4)	50 (0.6)	0 (0.0)	7876 (99.2)	60 (0.8)	0 (0.0)	7920 (99.8)	16 (0.2)

[1] France: pneumothorax only
[2] France: haemoptysis, no quantification
[3] The Netherlands: haemoptysis, no quantification

This table shows the frequency of three rare complications: Pneumothorax (collapsed lung) requiring chest tube, haemoptysis (coughing up of blood) of more than 250 ml and occurrence of malignancy (cancer). All these complications are extremely rare.

Table 7.3 Prevalence of liver disease and use of ursodeoxycholic acid in all patients seen in 2010, by country.

Country	Liver disease this year number (%)						Ursodeoxycholic acid this year number (%)		
	Missing/ unknown	No liver disease	Cirrhosis			Liver disease without cirrhosis	Missing/ unknown	No	Yes
			Cirrhosis with hypertension/ hypersplenism	Cirrhosis no hypertension/ hypersplenism	Cirrhosis, hypertension unknown				
Austria	11 (2.1)	265 (51.9)	16 (3.1)	23 (4.5)	4 (0. 8)	192 (37.6)	13 (2.6)	246 (48.1)	252 (49.3)
Belgium[1]	0 (0.0)	1103 (96.9)	35 (3.1)	0 (0.0)	0 (0.0)	0 (0.0)	12 (1.1)	841 (73.9)	285 (25.0)
Czech Republic	176 (33.7)	200 (38.2)	8 (1.5)	3 (0.6)	0 (0.0)	136 (26.0)	11 (2.1)	286 (54.7)	226 (43.2)
Denmark[2]	421 (93.6)	0 (0.0)	0 (0.0)	0 (0.0)	29 (6.4)	0 (0.0)	0 (0.0)	347 (77.1)	103 (22.9)
France[3]	0 (0.0)	5550 (96.4)	0 (0.0)	0 (0.0)	209 (3.6)	0 (0.0)	0 (0.0)	3969 (68.9)	1790 (31.1)
Germany	5003 (100)	-	-	-	-	-	34 (0.7)	2697 (53.9)	2272 (45.4)
Greece	4 (4.2)	67 (69.8)	0 (0.0)	0 (0.0)	0 (0.0)	25 (26.0)	3 (3.1)	52 (54.2)	41 (42.7)
Hungary	557 (100)	-	-	-	-	-	557 (100)	-	-
Israel	16 (3.7)	338 (78.7)	5 (1.2)	5 (1.2)	2 (0.5)	63 (14.7)	18 (4.2)	332 (77.4)	79 (18.4)
Italy	459 (11.1)	2859 (69.5)	51 (1.2)	20 (0.5)	8 (0.2)	722 (17.5)	449 (10.9)	2585 (62.8)	1085 (26.3)
Latvia	2 (6.7)	15 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	13 (43.3)	1 (3.3)	17 (56.7)	12 (40.0)
Rep of Moldova	0 (0.0)	30 (71.4)	0 (0.0)	0 (0.0)	0 (0.0)	12 (28.6)	0 (0.0)	22 (52.4)	20 (47.6)
The Netherlands	69 (5.3)	1085 (83.1)	52 (4.0)	8 (0.6)	81 (6.2)	11 (0.8)	149 (11.4)	792 (60.6)	365 (28.0)
Portugal	1 (0.7)	125 (90.6)	1 (0.7)	0 (0.0)	0 (0.0)	11 (8.0)	9 (6.5)	96 (69.6)	33 (23.9)
Russian Federation	3 (0.8)	335 (93.3)	6 (1.7)	9 (2.5)	4 (1.1)	2 (0.6)	5 (1.4)	10 (2.8)	344 (95.8)
Serbia[4]	0 (0.0)	84 (69.4)	6 (5.0)	30 (24.8)	0 (0.0)	1 (0.8)	0 (0.0)	87 (71.9)	34 (28.1)
Slovak Republic	51 (15.3)	221 (66.4)	5 (1.5)	8 (2.4)	4 (1.2)	44 (13.2)	164 (49.3)	26 (7.8)	143 (42.9)
Slovenia	6 (7.5)	51 (63.8)	0 (0.0)	1 (1.2)	0 (0.0)	22 (27.5)	1 (1.2)	45 (56.3)	34 (42.5)
Spain	36 (3.9)	718 (78.2)	9 (1.0)	5 (0.5)	8 (0.9)	142 (15.5)	32 (3.5)	634 (69.1)	252 (27.4)
Sweden[5]	0 (0.0)	477 (93.7)	32 (6.3)	0 (0.0)	0 (0.0)	0 (0.0)	28 (5.5)	379 (74.5)	102 (20.0)
Switzerland	9 (2.0)	336 (75.8)	11 (2.5)	3 (0.7)	2 (0.5)	82 (18.5)	9 (2.0)	312 (70.4)	122 (27.6)
United Kingdom	0 (0.0)	6815 (85.9)	133 (1.7)	90 (1.1)	5 (0.1)	893 (11.2)	491 (6.2)	5902 (74.4)	1543 (19.4)

[1] Belgium: collects only cirrhosis with portal hypertension yes or no. No liver disease therefore means no cirrhosis with portal hypertension, but other liver disease unknown.

[2] Denmark: collects only cirrhosis yes or no. Missing/unknown therefore means no cirrhosis, but other liver disease unknown.

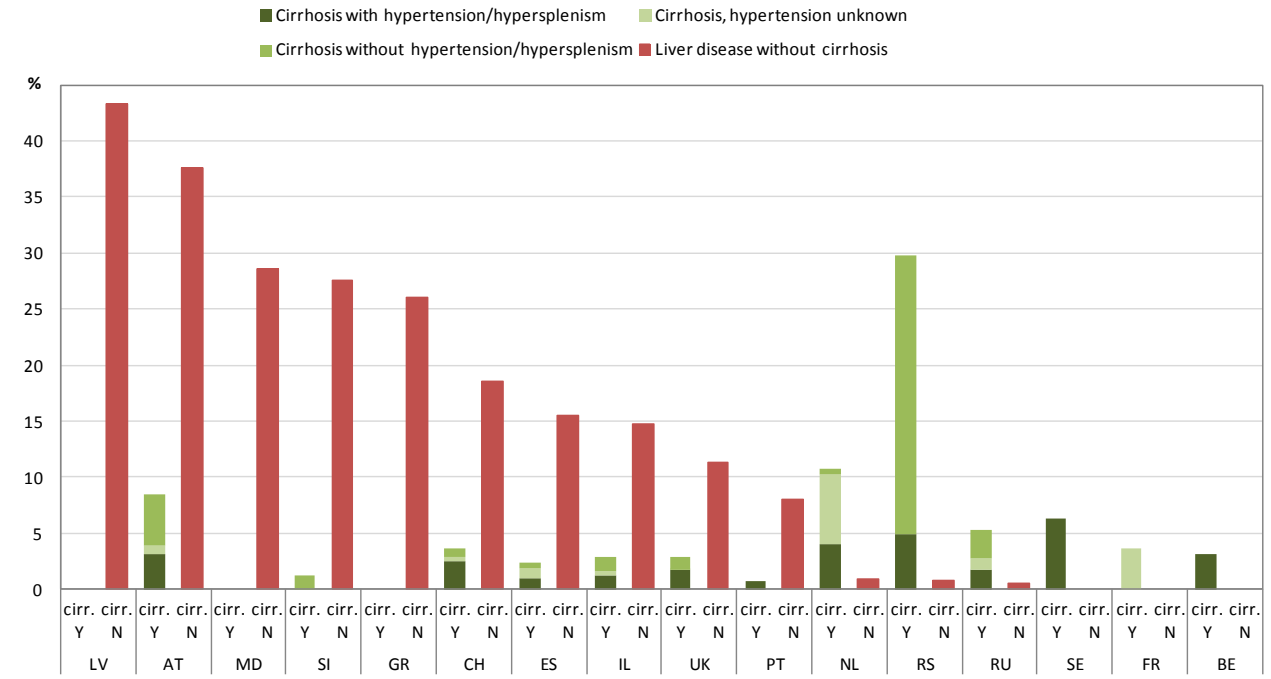
[3] France: collects cirrhosis/liver disease yes or no – these have been pooled under cirrhosis, hypertension unknown.

[4] Serbia: cirrhosis without hypertension/hypersplenism means the presence of CF related liver disease with normal liver function.

[5] Sweden: have only collected cirrhosis with portal hypertension yes or no this year. The rest have been set to No liver disease due to software issues. The prevalence of use of ursodeoxycholic acid could be used as an indicator of the total amount of liver disease of all categories.

This table shows the frequency and severity of liver disease according to the ECFSPR definitions (see Appendix 2) and use of ursodeoxycholic acid, a liver-protective drug. The frequency and severity of liver disease differs greatly, and does not correspond to the number of patients on ursodeoxycholic acid.

Figure 7.3 Prevalence and severity of liver disease in all patients seen in 2010, by country.

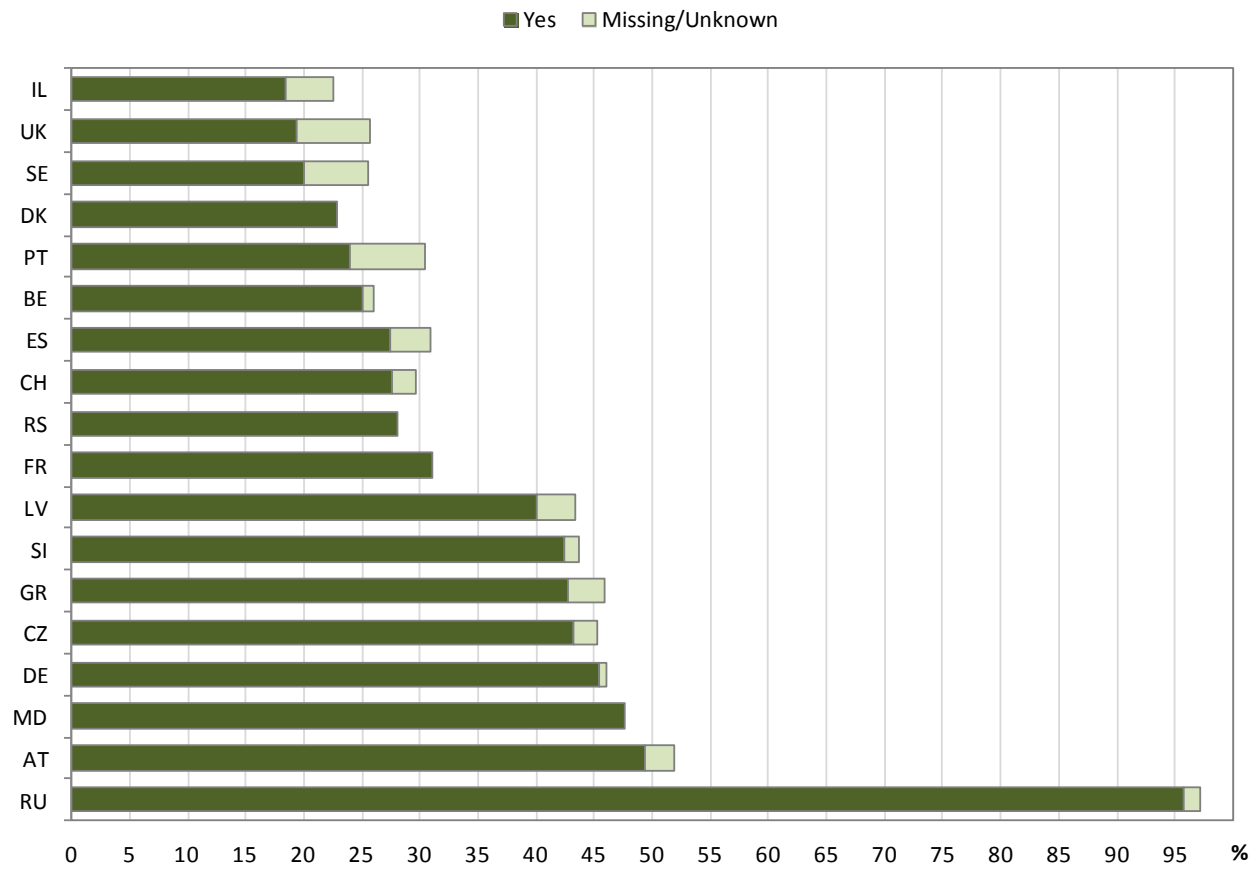


Note: we excluded from the graph the countries for which the information on liver disease was missing for more than 10% of the patients.

Note: Belgium: collects only cirrhosis with portal hypertension. No liver disease therefore means NO cirrhosis with portal hypertension, but other liver disease unknown.
France: collects cirrhosis/liver disease – these have been pooled under cirrhosis, hypertension unknown.
Serbia: cirrhosis without hypertension/hypersplenism means the presence of CF related disease with normal liver function.
Sweden: have only collected cirrhosis with portal hypertension yes or no this year. The rest have been set to No liver disease due to software issues. The prevalence of use of ursodeoxycholic acid could be used as an indicator of the total amount of liver disease of all categories.

This graph 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 2). This graph emphasises better than the table the vast differences in frequency and severity, which may be due to problems in definitions and diagnostic tools.

Figure 7.4 Use of ursodeoxycholic acid in all patients seen in 2010, by country.



Note: we excluded from the graph the countries for which the information on ursodeoxycholic acid was missing for more than 10% of the patients.

This graph shows how many patients used ursodeoxycholic acid during the survey year. Ursodeoxycholic acid is used as a treatment for CF liver disease. The dark green part of the bar indicates the percentage of patients taking this drug, the light green part shows the percentage of patients for which this information is missing.

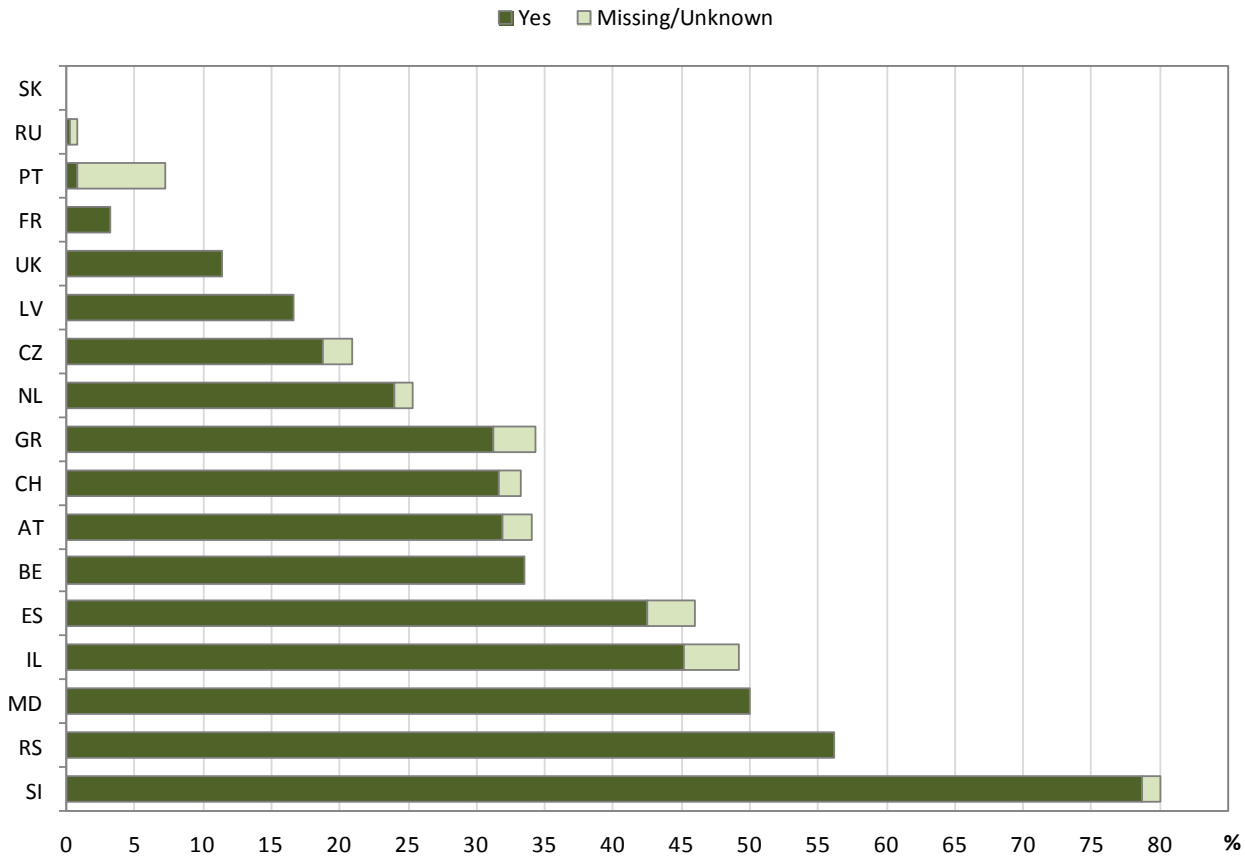
Table 7.4 Use of hypertonic saline, rhDNase and bronchodilators in all patients seen in 2010, by country.

Country	Hypertonic saline (NaCl) inhaled > 3 months this year number (%)			rhDNase inhaled > 3 months this year number (%)			Bronchodilators inhaled > 3 months this year number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	11 (2.2)	337 (65.9)	163 (31.9)	11 (2.2)	272 (53.2)	228 (44.6)	12 (2.3)	78 (15.3)	421 (82.4)
Belgium	0 (0.0)	757 (66.5)	381 (33.5)	0 (0.0)	500 (43.9)	638 (56.1)	0 (0.0)	387 (34.0)	751 (66.0)
Czech Republic	11 (2.1)	414 (79.2)	98 (18.7)	11 (2.1)	213 (40.7)	299 (57.2)	11 (2.1)	273 (52.2)	239 (45.7)
Denmark	450 (100)	-	-	0 (0.0)	102 (22.7)	348 (77.3)	450 (100)	-	-
France	0 (0.0)	5575 (96.8)	184 (3.2)	0 (0.0)	3164 (54.9)	2595 (45.1)	0 (0.0)	2947 (51.2)	2812 (48.8)
Germany	5003 (100)	-	-	25 (0.5)	2540 (50.8)	2438 (48.7)	5003 (100)	-	-
Greece	3 (3.1)	63 (65.6)	30 (31.3)	3 (3.1)	41 (42.7)	52 (54.2)	3 (3.1)	42 (43.8)	51 (53.1)
Hungary	557 (100)	-	-	557 (100)	-	-	557 (100)	-	-
Israel	17 (4.0)	218 (50.8)	194 (45.2)	12 (2.8)	193 (45.0)	224 (52.2)	15 (3.5)	162 (37.8)	252 (58.7)
Italy	990 (24.0)	2225 (54.0)	904 (22.0)	448 (10.9)	2713 (65.9)	958 (23.2)	989 (24.0)	896 (21.8)	2234 (54.2)
Latvia	0 (0.0)	25 (83.3)	5 (16.7)	0 (0.0)	13 (43.3)	17 (56.7)	1 (3.3)	0 (0.0)	29 (96.7)
Rep of Moldova	0 (0.0)	21 (50.0)	21 (50.0)	0 (0.0)	42 (100)	0 (0.0)	0 (0.0)	27 (64.3)	15 (35.7)
The Netherlands	18 (1.4)	975 (74.6)	313 (24.0)	15 (1.1)	471 (36.1)	820 (62.8)	31 (2.4)	682 (52.2)	593 (45.4)
Portugal	9 (6.5)	128 (92.8)	1 (0.7)	10 (7.3)	53 (38.4)	75 (54.3)	9 (6.5)	78 (56.5)	51 (37.0)
Russian Federation	2 (0.6)	356 (99.2)	1 (0.2)	6 (1.6)	20 (5.6)	333 (92.8)	7 (1.9)	160 (44.6)	192 (53.5)
Serbia	0 (0.0)	53 (43.8)	68 (56.2)	0 (0.0)	66 (54.5)	55 (45.5)	0 (0.0)	4 (3.3)	117 (96.7)
Slovak Republic	0 (0.0)	333 (100)	0 (0.0)	0 (0.0)	172 (51.6)	161 (48.4)	64 (19.2)	130 (39.0)	139 (41.8)
Slovenia	1 (1.3)	16 (20.0)	63 (78.7)	1 (1.3)	48 (60.0)	31 (38.7)	1 (1.3)	69 (86.2)	10 (12.5)
Spain	32 (3.5)	496 (54.0)	390 (42.5)	32 (3.5)	691 (75.3)	195 (21.2)	33 (3.6)	260 (28.3)	625 (68.1)
Sweden	181 (35.6)	198 (38.9)	130 (25.5)	56 (11.0)	356 (69.9)	97 (19.1)	116 (22.8)	15 (3.0)	378 (74.2)
Switzerland	7 (1.6)	296 (66.8)	140 (31.6)	6 (1.3)	259 (58.5)	178 (40.2)	7 (1.6)	33 (7.4)	403 (91.0)
United Kingdom[1]	0 (0.0)	7038 (88.7)	898 (11.3)	0 (0.0)	4545 (57.3)	3391 (42.7)	0 (0.0)	3766 (47.4)	4170 (52.6)

[1] United Kingdom: the duration of use of inhaled hypertonic saline and of bronchodilators is not specified.

This table shows the use of three different inhaled medications: hypertonic saline, rhDNase (Pulmozyme®) and bronchodilators (see page 11 for abbreviations). All of these medications are widely used, but still with marked differences between the countries.

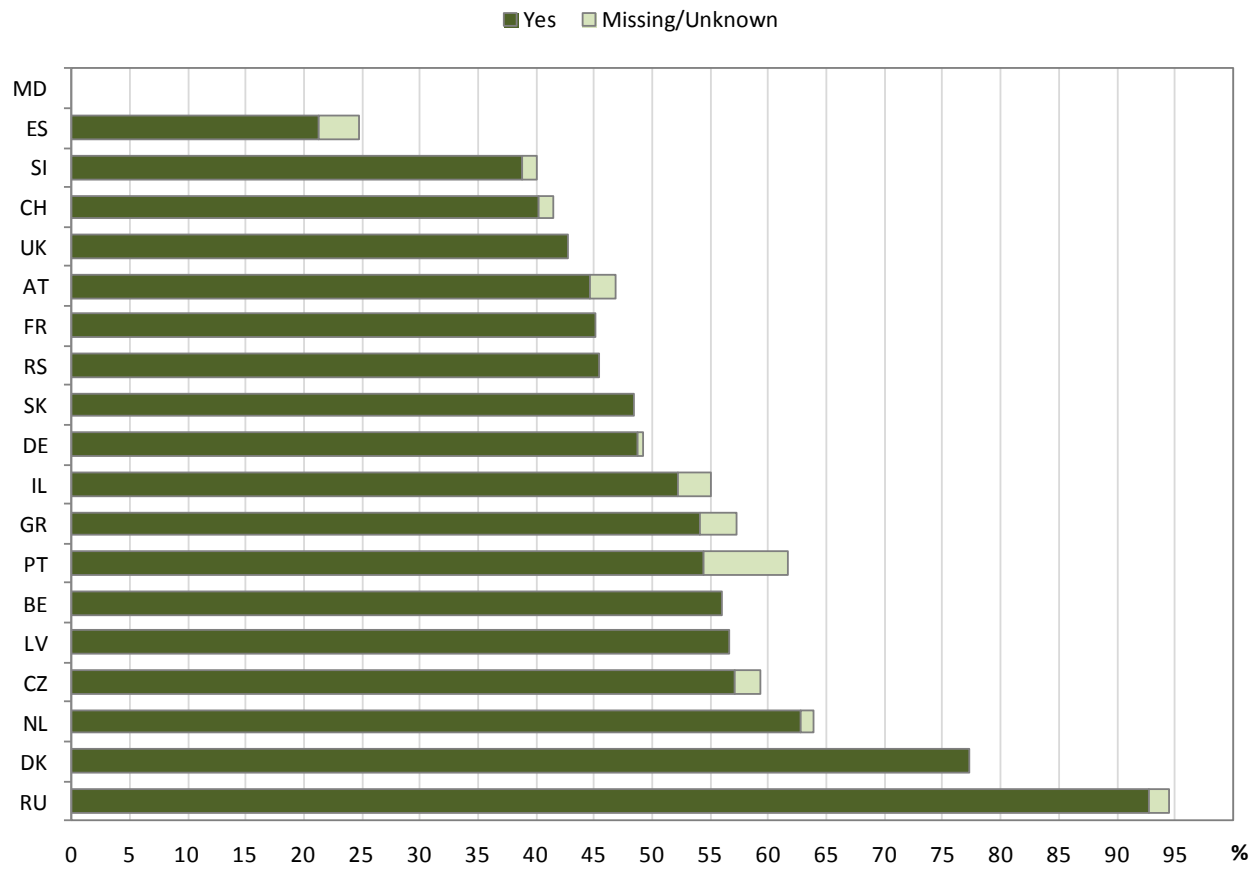
Figure 7.5 Use of inhaled hypertonic saline in all patients seen in 2010, by country.



Note: we excluded from the graph the countries for which the information on inhaled hypertonic saline was missing for more than 10% of the patients.
Note: United Kingdom: the duration of use of inhaled hypertonic saline is not specified.

This table shows the use of inhaled hypertonic saline for more than three months during the survey year. The dark green part of the bar indicates the percentage of patients taking the medication, the light green part shows the percentage of patients for which this information is missing.

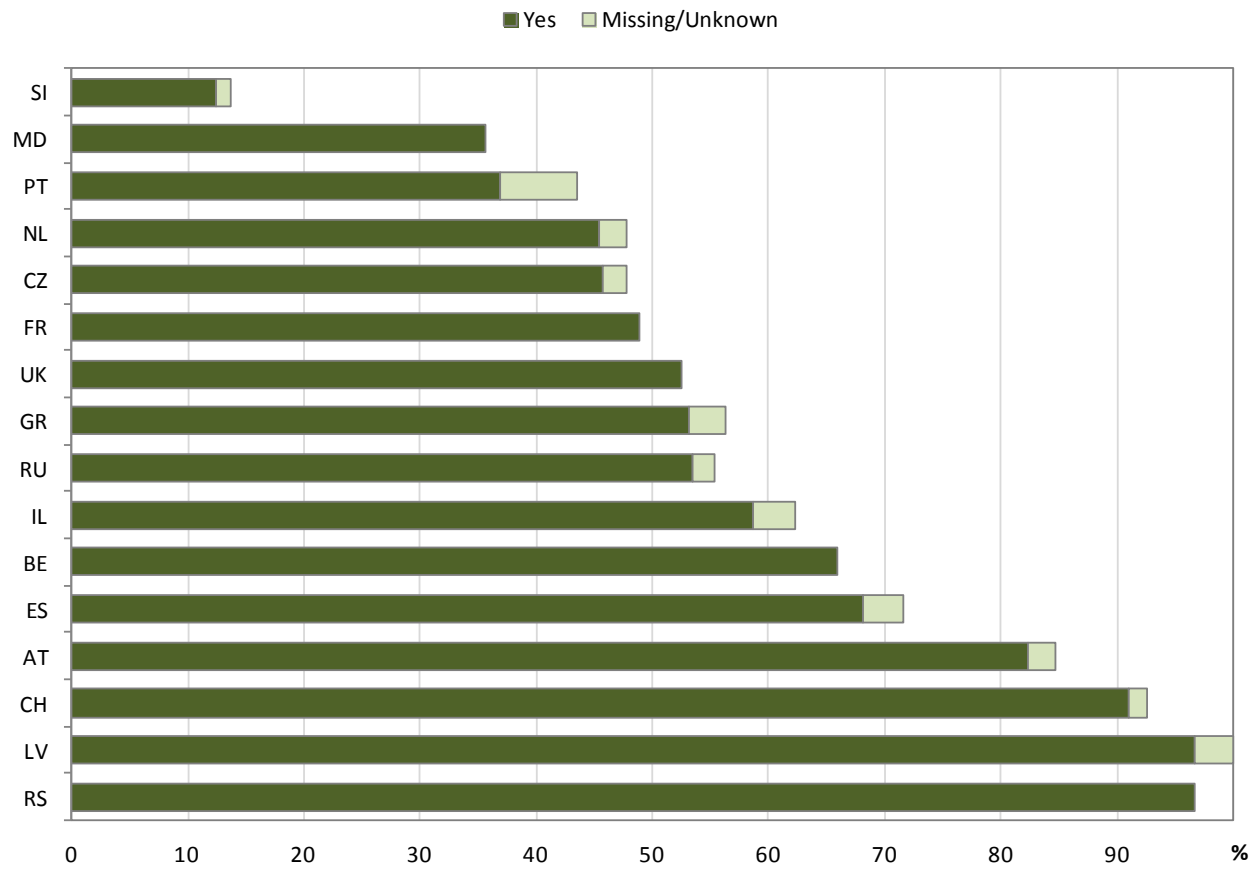
Figure 7.6 Use of rhDNase in all patients seen in 2010, by country.



Note: we excluded from the graph the countries for which the information on rhDNase was missing for more than 10% of the patients.

This graph shows the use of rhDNase (marketed as Pulmozyme®) as inhalations for more than 3 months during the survey year. The dark green part of the bar indicates the percentage of patients taking this drug, the light green part shows the percentage of patients for which this information is missing.

Figure 7.7 Use of bronchodilators in all patients seen in 2010, by country.



Note: we excluded from the graph the countries for which the information on use of bronchodilators was missing for more than 10% of the patients.
Note: United Kingdom: the duration of use of bronchodilators is not specified.

This graph shows the use of bronchodilators for more than three months during the survey year. This is the most widely used inhaled medication, but still there are large differences in frequency of use between countries. The dark green part of the bar indicates the percentage of patients taking this drug, the light green part shows the percentage of patients for which this information is missing.

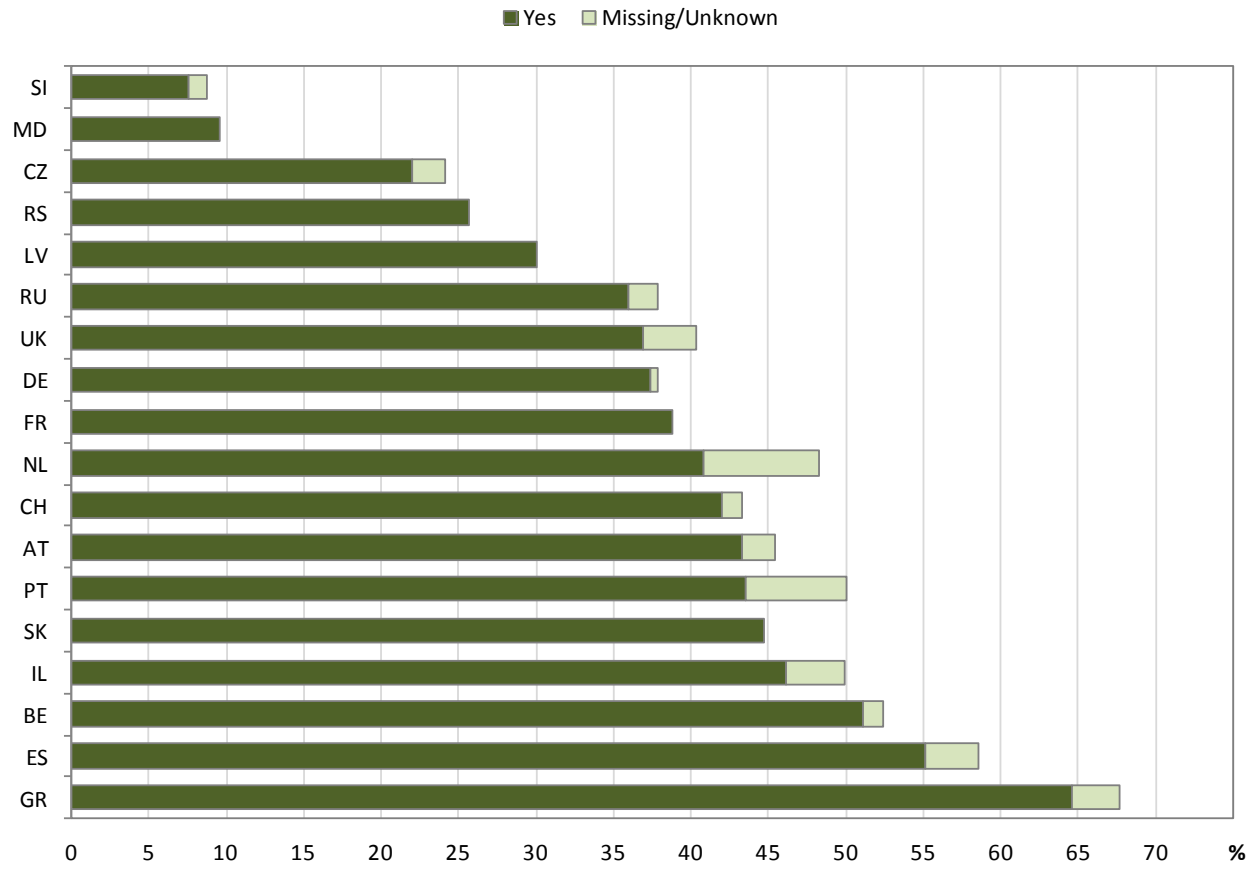
Table 7.5 Use of inhaled antibiotics, macrolides and oxygen in all patients seen in 2010, by country.

Country	Inhaled antibiotics inhaled > 3 months this year number (%)			Oxygen therapy this year number (%)			Macrolides > 3 months this year number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	11 (2.2)	279 (54.6)	221 (43.2)	13 (2.6)	484 (94.7)	14 (2.7)	11 (2.2)	424 (83.0)	76 (14.8)
Belgium	15 (1.3)	541 (47.5)	582 (51.1)	2 (0.2)	1105 (97.1)	31 (2.7)	0 (0.0)	697 (61.3)	441 (38.7)
Czech Republic	11 (2.1)	397 (75.9)	115 (22.0)	11 (2.1)	506 (96.7)	6 (1.2)	11 (2.1)	411 (78.6)	101 (19.3)
Denmark	450 (100)	-	-	450 (100)	-	-	450 (100)	-	-
France[1]	0 (0.0)	3525 (61.2)	2234 (38.8)	0 (0.0)	5385 (93.5)	374 (6.5)	0 (0.0)	3317 (57.6)	2442 (42.4)
Germany	25 (0.5)	3111 (62.2)	1867 (37.3)	47 (0.9)	4779 (95.6)	177 (3.5)	5003 (100)	-	-
Greece	3 (3.1)	31 (32.3)	62 (64.6)	3 (3.1)	89 (92.7)	4 (4.2)	3 (3.1)	76 (79.2)	17 (17.7)
Hungary	557 (100)	-	-	557 (100)	-	-	557 (100)	-	-
Israel	16 (3.7)	215 (50.1)	198 (46.2)	13 (3.0)	406 (94.6)	10 (2.4)	14 (3.3)	207 (48.2)	208 (48.5)
Italy	989 (24.0)	2019 (49.0)	1111 (27.0)	448 (10.9)	3477 (84.4)	194 (4.7)	991 (24.1)	2303 (55.9)	825 (20.0)
Latvia	0 (0.0)	21 (70.0)	9 (30.0)	0 (0.0)	29 (96.7)	1 (3.3)	0 (0.0)	21 (70.0)	9 (30.0)
Rep of Moldova	0 (0.0)	38 (90.5)	4 (9.5)	0 (0.0)	39 (92.9)	3 (7.1)	0 (0.0)	21 (50.0)	21 (50.0)
The Netherlands	97 (7.4)	676 (51.8)	533 (40.8)	43 (3.3)	1193 (91.3)	70 (5.4)	23 (1.8)	685 (52.4)	598 (45.8)
Portugal	9 (6.5)	69 (50.0)	60 (43.5)	9 (6.5)	116 (84.1)	13 (9.4)	9 (6.5)	83 (60.1)	46 (33.4)
Russian Federation	7 (2.0)	223 (62.1)	129 (35.9)	5 (1.4)	346 (96.4)	8 (2.2)	230 (64.1)	68 (18.9)	61 (17.0)
Serbia	0 (0.0)	90 (74.4)	31 (25.6)	0 (0.0)	111 (91.7)	10 (8.3)	0 (0.0)	104 (85.9)	17 (14.1)
Slovak Republic	0 (0.0)	184 (55.3)	149 (44.7)	0 (0.0)	330 (99.1)	3 (0.9)	11 (3.3)	219 (65.8)	103 (30.9)
Slovenia	1 (1.3)	73 (91.2)	6 (7.5)	1 (1.3)	76 (95.0)	3 (3.7)	1 (1.3)	72 (90.0)	7 (8.7)
Spain	32 (3.5)	380 (41.4)	506 (55.1)	33 (3.6)	849 (92.5)	36 (3.9)	33 (3.6)	589 (64.2)	296 (32.2)
Sweden	224 (44.0)	173 (34.0)	112 (22.0)	201 (39.5)	305 (59.9)	3 (0.6)	179 (35.2)	215 (42.2)	115 (22.6)
Switzerland	6 (1.3)	251 (56.7)	186 (42.0)	6 (1.3)	412 (93.0)	25 (5.7)	6 (1.3)	303 (68.4)	134 (30.3)
United Kingdom[1]	270 (3.4)	4737 (59.7)	2929 (36.9)	427 (5.4)	7006 (88.3)	503 (6.3)	0 (0.0)	4620 (58.2)	3316 (41.8)

[1] France: collects only use of azithromycin.
[2] United Kingdom: the duration of use of macrolides is not specified.

This table shows the use of three treatments: inhaled antibiotics for more than 3 months during the survey year (any kind); macrolides (e.g. azithromycin) for more than three months; oxygen for home treatment. Both inhaled antibiotics and macrolides are frequently used but with marked differences between countries. Oxygen is used less frequently (severe lung disease).

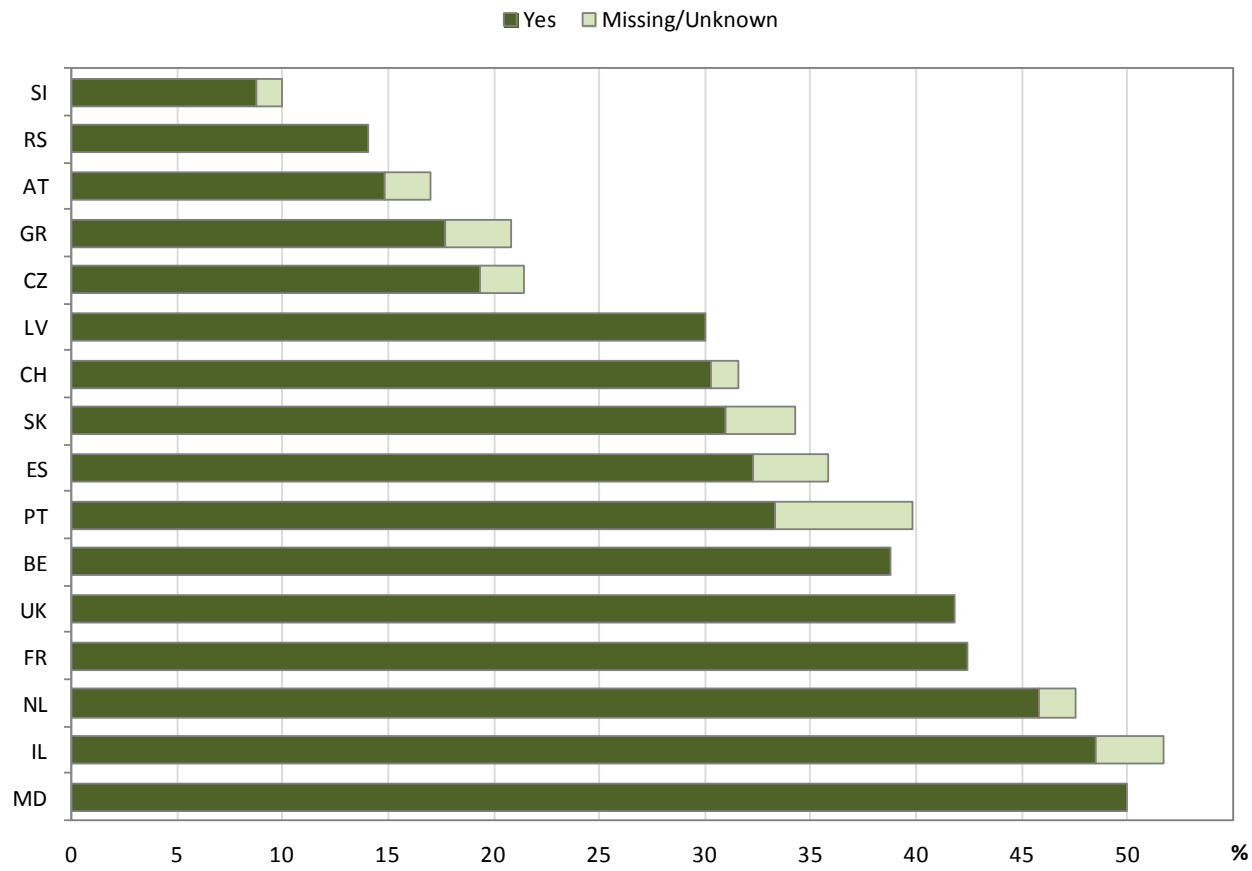
Figure 7.8 Use of inhaled antibiotics in all patients seen in 2010, by country.



Note: we excluded from the graph the countries for which the information on inhaled antibiotics was missing for more than 10% of the patients.

This graph shows the use of inhaled antibiotics (of any kind) for more than three months during the survey year. The frequency varies considerably, from 10 to 70%. The dark green part of the bar shows the percentage of patients taking this drug, the light green part shows the percentage of patients for which this information is missing.

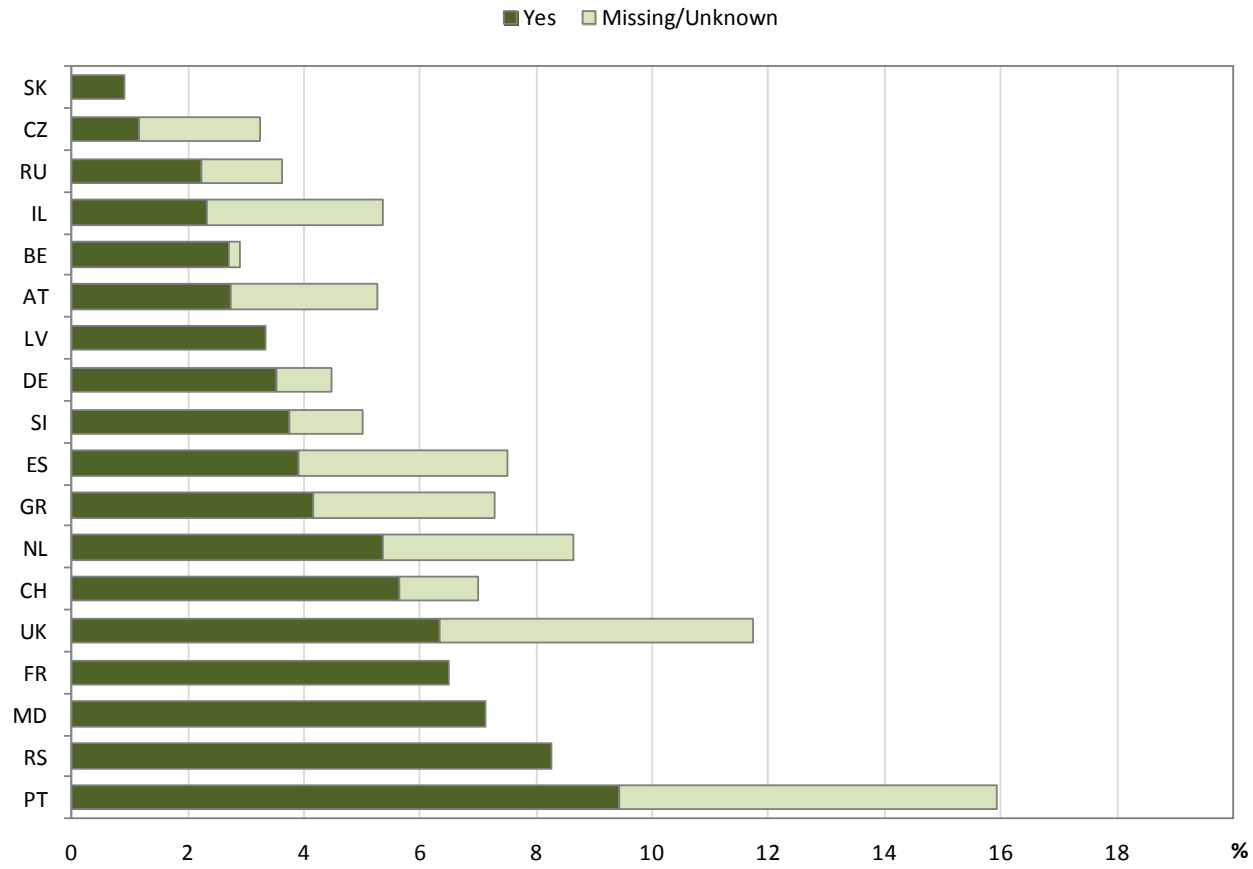
Figure 7.9 Use of macrolides in all patients seen in 2010, by country.



Note: we excluded from the graph the countries for which the information on use of macrolides was missing for more than 10% of the patients.
Note: United Kingdom: the duration of use of macrolides is not specified.

This graph shows the use of macrolides for more than 3 months during the survey year (e.g. azithromycin). Macrolides are antibiotics, but taken continuously they also modulate the immune system. The dark green part of the bar indicates the percentage of patients taking this drug, the light green part shows the percentage of patients for which this information is missing.

Figure 7.10 Use of oxygen in all patients seen in 2010, by country.



Note: we excluded from the graph the countries for which the information on the use of oxygen was missing for more than 10% of the patients.

This graph shows the use of oxygen at home during the survey year. Oxygen is used for severe lung disease. The dark green part of the bar indicates the percentage of patients using oxygen supplementation, the light green part shows the percentage of patients for which this information is missing.

8. Transplantation

We ask the countries whether their patients are transplanted or not, and if they are, in which year they had their (latest) transplant.

In some countries, such as in The Netherlands, transplanted patients are no longer registered in the CF centres database/CF national registries, usually because the patients have been transferred to a transplant centre. For this reason, the figures below may report a lower number of transplanted patients than the true number, but it has not been possible to acquire more accurate data.

Table 8. 1 Number of patients living in 2010 with transplanted lungs, by age and sex.

Age	Males	Females	Total	Transplants performed during the survey year
0-4	5	4	9	0
5-9	6	3	9	1
10-14	10	15	25	11
15-19	36	52	88	19
20-24	74	98	172	52
25-29	114	128	242	45
30-34	129	120	249	28
35-39	116	103	219	23
40-44	91	83	174	14
45+	63	56	119	8
Total	644	662	1306	201

Note: Sweden: the number of transplants is underestimated.

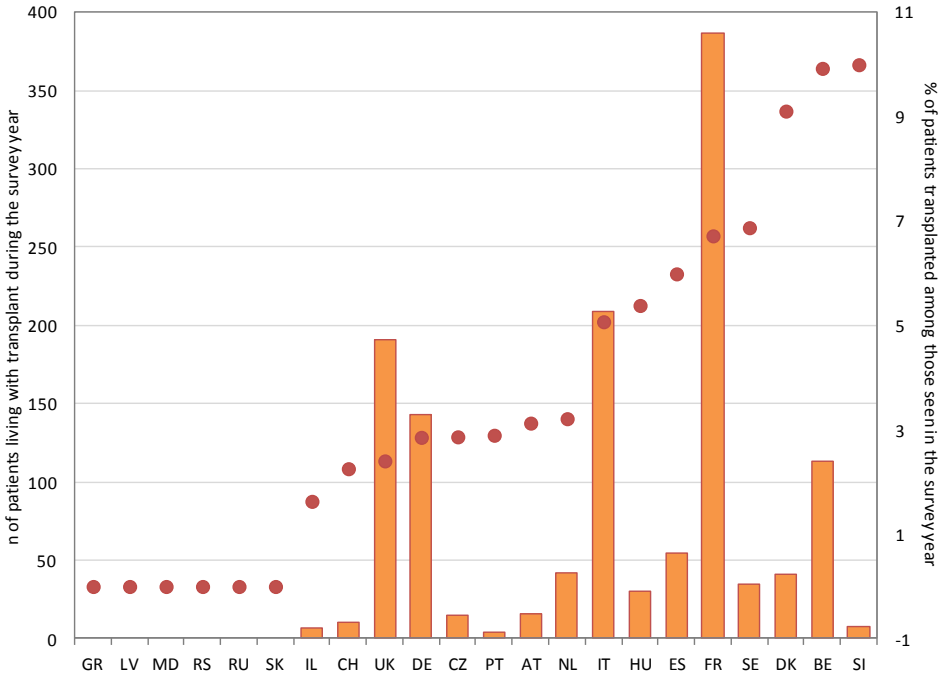
This table shows the number of patients alive in 2010 who have had a lung transplant at some time in their life, by age group, as well as the number of patients transplanted during 2010.

Table 8. 2 Number of patients living in 2010 with transplanted liver, by age and sex.

Age	Males	Females	Total	Transplants performed during the survey year
0-4	1	1	2	1
5-9	1	0	1	0
10-14	8	9	17	3
15-19	19	10	29	4
20-24	25	14	39	3
25-29	19	10	29	0
30-34	16	5	21	0
35-39	7	5	12	0
40-44	5	5	10	0
45+	2	0	2	0
Total	103	59	162	11

This table shows the number of patients alive in 2010 who have had a liver transplant at some time in their life, by age group, as well as the number of patients transplanted during the 2010.

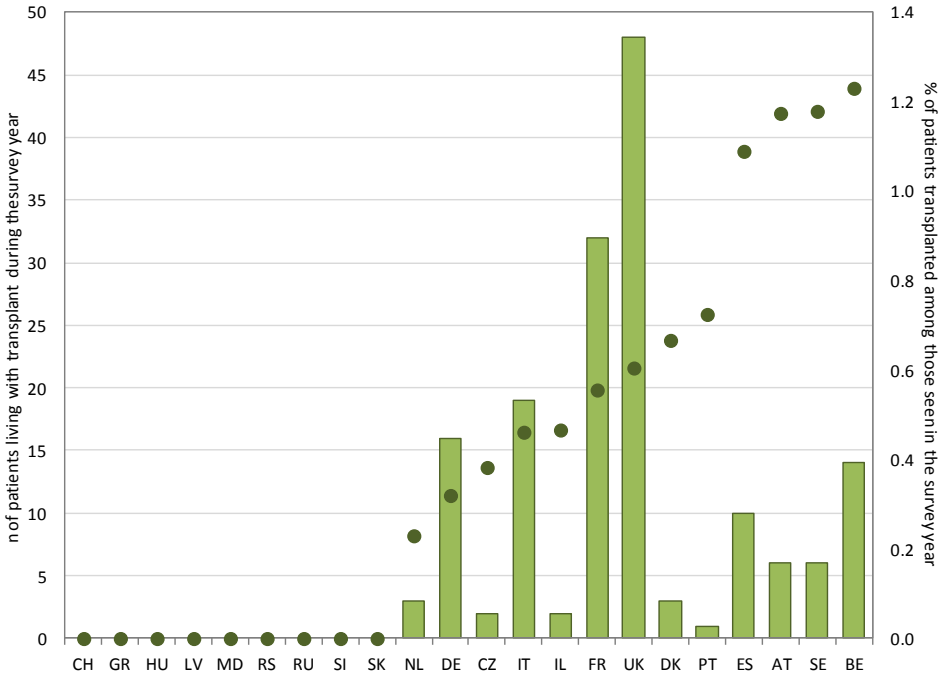
Figure 8. 1 Number of patients living in 2010 with transplanted lungs, by country.



Note: Sweden: the number of transplants is underestimated.

This graph shows the number of patients alive in 2010 who have had a lung transplant (orange bars) at some point in their life. The red dots (right axis) show the percentage of patients that are living with lung transplant in 2010 among the patients that were seen in 2010.

Figure 8. 2 Number of patients living in 2010 with transplanted liver, by country.



This graph shows the number of patients alive in 2010 who have had a (green bars) at some point in their life. The dark green dots (right axis) show the percentage of patients that are living with liver transplant in 2010 among the patients that were seen in 2010.
Note that on the vertical axis the number of patients with liver transplant is much lower than the number with lung transplant. The main reason for this is that liver disease is only found in a subset of CF patients, whereas lung disease affects almost all patients.

9. Mortality

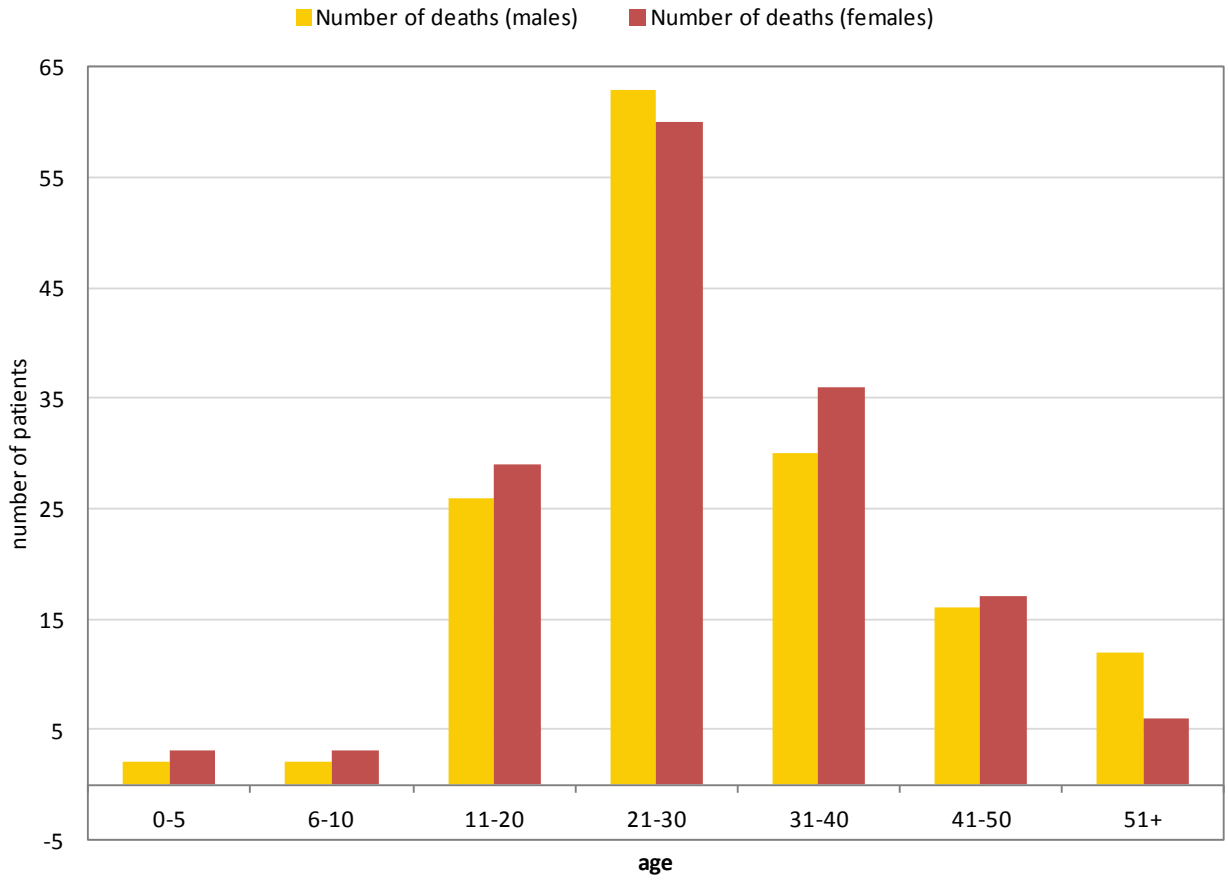
Table 9.1 Number of deaths in 2010, by age and sex.

Age at death	Number of male patients	% of deaths in this age group of all male deaths	Number of female patients	% of deaths in this age group of all female deaths	Total	% Total
0-5	2	1.3	3	2.0	5	1.6
6-10	2	1.3	3	2.0	5	1.6
11-20	26	17.2	29	18.8	55	18.1
21-30	63	41.7	60	39.0	123	40.3
31-40	30	19.9	36	23.3	66	21.7
41-50	16	10.6	17	11.0	33	10.8
51+	12	8.0	6	3.9	18	5.9
Total	151	100	154	100	305	100

Note: Sweden: the number of deaths is underestimated.
United Kingdom: for mortality outcomes, all UK patients with confirmed diagnosis of CF were included (9384).
Note: for 10 patients (6 males and 4 females) date at death, and thereby age at death, was unknown.

This table shows the number of deaths in 2010 by age group and sex. Death in small children is very rare, and the most frequent range of age of death for both sexes is 21-30 years.

Figure 9.1 Age at death distribution of patients deceased in 2010, by sex.



Note: Sweden: the number of deaths is underestimated.

This graph shows the distribution of age at death of patients who died in 2010, separately by males (yellow) and females (red).

Table 9.2 Cause of death distribution of deaths in 2010.

Cause of death	Number of deaths	Percentage of all deaths
Respiratory disease	180	57.14
Transplantation related	43	13.65
Non-CF related	23	7.3
Liver related	7	2.22
Suicide	2	0.63
Trauma	1	0.32
Unknown	59	18.7
Total	315	100

Note: United Kingdom collects cause of death “respiratory disease” as “cardio/respiratory”.
Sweden: the number of deaths is underestimated.

This table shows the list of causes of death for the deceased patients. The most frequent cause of death is respiratory disease. Please note that only a limited number of causes of death are collected, therefore if some deaths are due to rare complications of CF, they may have been classified as “Unknown”.

Publications

The ECFSPR data have been actively used for research in the years 2010 to 2013 and were handled in accordance with the ECFSPR guidelines (www.ecfs.eu/projects/efcs-patient-registry/guidelines).

Several of these research project resulted in publications, and other publications are in the pipe-line. We have made a complete overview of the articles published or accepted for publication in the period 2010 to 2013:

- Comparative demographics of the European cystic fibrosis population: a cross-sectional database analysis. McCormick J, Mehta G, Olesen HV, Viviani L, Macek M, Mehta A. The Lancet 2010 (375): 1007-1013.
- European Registry Working Group. Cystic fibrosis across Europe: EuroCareCF analysis of demographic data from 35 countries. Mehta G, Macek M Jr, Mehta A. Journal of Cystic Fibrosis 2010 (9 Suppl 2): S5-S21.
- French CF Modifier Gene Study Investigators; European CF Registry Working Group. Reference percentiles for FEV(1) and BMI in European children and adults with cystic fibrosis. Boëlle PY, Viviani L, Busson PF, Olesen HV, Ravilly S, Stern M, Assael BM, Barreto C, Drevinek P, Thomas M, Krivec U, Mei-Zahav M, Vibert JF, Clement A, Mehta A, Corvol H; Orphanet Journal of Rare Diseases 2012 (1): 64.
- Epidemiology of Cystic Fibrosis Lung Disease progression in adolescents in ECFS. Dutch VanDevanter. Book on Healthcare Issues and challenges in Adolescents in CF, December 2012.
- A new era in the treatment of cystic fibrosis: correction of the underlying CFTR defect. Boyle MP, De Boeck K. The Lancet Respiratory Medicine 2013(1): 158-163.
- Evidence of diminished FEV1 and FVC in 6-year-olds followed in the European cystic fibrosis patient registry, 2007-2009. VanDevanter DR, Pasta DJ. Journal of Cystic Fibrosis 2013(12):786-789.
- Cystic Fibrosis. European Respiratory Society: European Lung White Book 2013; chapter 14.
- Factors associated with FEV1 decline in cystic fibrosis: analysis of the data of the ECFS Patient Registry. Kerem E, Viviani L, Zolin A, Macneill S, Hatziagorou E, Ellemunter H, Drevinek P, Gulmans V, Krivec U, Olesen H; on behalf of the ECFS Patient Registry Steering Group. The European Respiratory Journal 2014 Jan;43(1):125-33.
- The relative frequency of CFTR mutation classes in European patients with cystic fibrosis. De Boeck K, Zolin A, Cuppens H, Olesen HV, Viviani L. Journal of Cystic Fibrosis 2014, in press.

Four abstracts were accepted for the 1st Rare Disease and Orphan Drug Registries (EPIRARE) International Workshop in Rome on 8-9 October 2012 (www.epirare.eu/_meet/20121008/ AbstractBook.pdf):

- The European Cystic Fibrosis Society Patient Registry: a useful tool to improve patient care in CF centres. Zolin A, Viviani L, Bossi A on behalf of the ECFS Patient Registry Executive Committee.
- The European Cystic Fibrosis Society Patient Registry: a rare disease registry promoting care improvement. Viviani L, Zolin A, Olesen HV on behalf of the ECFS Patient Registry Executive Committee.
- Research from the European Cystic Fibrosis Society Patient Registry (ECFSPR). Van Rens J, Mehta A, Olesen H on behalf of the European Cystic Fibrosis Patient Registry.

- The European Cystic Fibrosis Society Patient Registry: Information to patients. Van Rens J, Olesen HV on behalf of the European Cystic Fibrosis Society Patient Registry.

Two abstracts were accepted for the 2nd Rare Disease and Orphan Drug Registries (EPIRARE) International Workshop in Rome on 21-22 October 2013 (www.epirare.eu/_meet/20131021/ 2ndWorkshop_EPIRARE_AbstractBook.pdf):

- Pharmacovigilance using patient registries; Van Rens J, McKone E, Olesen HV on behalf of the ECFSPR.
- Improving quality of European Cystic Fibrosis Society Patient Registry Data, Zolin A, Gulmans V on behalf of the ECFSPR Data Quality Group.

Contact and information

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Use of ECFSPR data for research: Executive Coordinator, ecfs-pr@uzleuven.be.

Website: www.ecfs.eu/projects/ecfs-patient-registry/intro.

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Appendix 1: Technical notes

Patient inclusion criteria

The ECFSPR registers patients diagnosed with CF according to agreed definitions (see Appendix 2). Data of patients with a diagnosis that does not meet the agreed definitions are accepted in the database but not included in the analyses.

Data manipulation

To ensure that the data were anonymous, we collected only year and month of birth and days of birth were set to 15 (for Belgium month of birth was set to 7 for adults).

Unknown dates of lung function tests and of height/weight measurements were set to July 1st of the survey year.

For pre-natal diagnoses, we set age at diagnosis equal to 0.

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

Reference populations used for computing z-scores

The value of a z-score depends on the reference anthropometric chart: if different reference values are used, the same value of height (or weight or BMI) will result in different values of z-scores, and these differences might be of clinical importance. To compare the nutritional status of CF patients with that of healthy individuals an appropriate reference population must be used: ideally, a fair comparison requires that CF patients and healthy individuals belong to the same population. This implies the availability of a national reference.

The lack of a national reference for most countries participating in the ECFSPR forced us to use an international reference to compute z-scores for height, weight and BMI. We decided to use the CDC 2000 reference charts (Kuczmarski RJ, Ogden CL, Guo SS et al. 2000 CDC Growth Charts for the United States: Methods and Development. National Centre for Health Statistics. Vital Health Stat 2002; 11(246):1-190.), which were derived from samples of U.S. healthy individuals[3]. The choice of CDC charts as a reference, although not the most suitable to assess the nutritional status of European CF patients, is justified by the widespread use of these charts at international level.

Reference populations used for computing FEV1 predicted values

We computed percent of predicted values for FEV1 and FVC using:

- for male children (6-17 years) and female children (6-15 years):
  Wang X, Dockery DW, Wypij D, Fay ME, Ferris BG. Pulmonary function between 6 and 18 years of age. Pediatr Pulmonol 1993;15:75-88.
- for male adults (≥18 years) and female adults (≥16 years):
  Hankinson JL, Odencrantz RJ, Fedan KB. Spirometric reference values from a sample of the general U.S. population. Am J Respr Crit Care Med 1999; 159:179-87.

Software used for data management and statistical analyses

SAS software, Version 9.2. 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.

[3] For details on the target population, please see http://www.cdc.gov/growthcharts/2000growthchart-us.pdf.

Appendix 2: List of variables, inclusion criteria and definitions used by the ECFSPR

List of variables

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

Therapy
Inhaled continuous hypertonic NaCl this year
Inhaled continuous antibiotic this year
Inhaled continuous bronchodilators this year
In Oxygen therapy this year
Use of rhDNase this year
Use of continuous azithromycin (or other macrolide) this year
Use of ursodeoxycholic acid this year
Use of pancreatic enzymes this year

Diagnosis
Diagnosis confirmed
Age at diagnosis
Type of sweat test
Electrolytes
Chloride value
Meconium Ileus
Neonatal screening

Complications
Allergic broncho-pulmonary aspergillosis this year
Diabetes: daily insulin treated this year
Pneumothorax requiring chest drain this year
Liver disease this year
Haemoptysis major over 250 ml this year
Pancreatic status: faecal elastase
Pancreatic status: faecal fat
Occurrence of malignancy this year

Genotype
First mutation
Second mutation

Microbiology
Chronic *Burkholderia cepacia complex*
Nontuberculous mycobacteria this year
Chronic *Pseudomonas aeruginosa*
Chronic *Staphylococcus aureus*
Stenotrophomonas maltophilia this year

Follow-up
Date of best FEV_1 recorded this year
Value of best FEV_1 recorded this year
Value of best FVC recorded this year
Height measured at date of best FEV_1 (or in case of no FEV_1 last height of the year)
Weight measured at date of best FEV_1 (or in case of no FEV_1 last height of the year)

Transplant
Liver transplant
Year of latest liver transplant (if occurred before or during this year)
Lung transplant
Year of latest lung transplant (if occurred before or during this year)

Inclusion criteria

Only patients who fulfil the diagnostic criteria below should be included the registry.

a. **Two sweat tests value > 60 mmol/L chloride**: CF diagnosis accepted
b. **One sweat test value > 60 mmol/L chloride and DNA Analysis/Genotyping – two identified disease causing CF mutations**: CF diagnosis accepted
c. **Sweat value less than or equal to 60 mmol/L chloride**: if the sweat value is less than or equal to 60 mmol/L chloride, then at least 2 of these should be fulfilled
    i. DNA Analysis/Genotyping – two identified disease causing CF mutations.
    ii. Transepithelial (Nasal) Potential Difference – study consistent with a diagnosis of CF.
    iii. Clinical Presentation – typical features of CF.
d. **Diagnosis reversal**: if the patient's CF diagnosis reversed during the year, identify the reason from the options listed.
    i. DNA Analysis – unable to identify two disease causing CF mutations.
    ii. Transepithelial (Nasal) Potential Difference – study not consistent with a diagnosis of CF.
    iii. Repeat normal sweat testing – confirm with clinical team.

Definitions for EFCSPR

SWEAT TEST

If a sweat test was not performed on a patient, record "not done". If a sweat test is "not done" then two known genotype mutations must be reported.

i. Sweat Test: record the patient's sweat test.
ii. Electrolytes: Chloride concentration measurement is the preferred analysis.
iii. Chloride value: report the Chloride value in millimols per litre (mmol/L). If duplicate tests were completed on the same day, report the highest positive value.

NOTE: The acceptable range for Chloride values is 1-160 mmol/L. Anyone who has a Chloride value above 160 mmol/L must be re-tested.

SPIROMETRY

The purpose of recording data on spirometry values for the ECFS Patient Registry is to obtain standardised comparable data for comparison with other centres/countries and for use in specific epidemiological studies. Some of the conditions for this (see below) may not be met at every clinic visit for all patients. Therefore, for the purpose of the registry, only the spirometry tests fulfilling the criteria should be recorded/extracted for the ECFS Patient Registry. For all tests the spirometry should be performed according to the common ATS/ERS guidelines: (http://www.thoracic.org/statements/resources/pfet/PFT2.pdf).

Furthermore for the values reported to the registry the following criteria should be met

1. Pre-test
    a. date of birth, gender and height should be recorded for calculation of predicted values
    b. 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

    *This was decided according to the PortCF official definitions.
2. Reported values
    a. for values reported to national registries or to centres and extracted to the ECFS Patient Registry, the value in litres of the highest available value of FEV_1% of predicted (according to local references) of the year should be extracted
    b. each patient's FVC and FEV_1 measurement must be reported in litres (L), with up to two places to the right of the decimal
    c. the FVC measurement must be greater than or equal to the FEV_1 measurement
    d. for each reported spirometry value, the date of the test and the patient's height at that date should be reported in order to perform the calculation of percent of predicted values
    e. only tests deemed valid according to ATS/ERS guidelines should be reported
3. Calculation of percent of predicted values. A common set of reference values will be used
    a. for male children 6-17 yrs and female children 6-15 yrs: Wang et al (1993)
    b. for male adults ≥ 18 yrs and females ≥ 16 yrs: Hankinson et al (1999)
    c. for children < 6 yrs no calculation of percent of predicted values will be performed because of lack of valid reference values

The ECFSPR Definition Group considered the issue of race-specific reference values and decided not to do this calculation and not to record race for European patients.

References:
a) Miller et al. Standardisation of spirometry. Eur Respir J 2005; 26: 319–338
b) Miller et al. General considerations for lung function testing. Eur Respir J 2005; 26: 153–161
c) Cystic Fibrosis Foundation Patient Registry User's Guide, Version 4.0. 2006
d) 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
e) Hankinson JL, Odencrantz RJ, Fedan KB. Spirometric reference values from a sample of the general U.S. population. Am J Respr Crit Care Med 1999;159:179-87
f) Wang X, Dockery DW, Wypij D, Fay ME, Ferris BG. Pulmonary function between 6 and 18 years of age. Pediatr Pulmonol 1993;15:75-88

NUTRITION

Measurements: weight and height are measured according to EuroCareCF guidelines

a. weight: removal of outer clothing, shoes and socks
b. height: without shoes and socks - stadiometer - top of head in contact with head board, slight pressure
c. it should be the value at the day of the recorded FEV_1

z-scores for height, weight and BMI will be calculated using the CDC reference values [Kuczmarski et al (2002)]

References:
a) 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
b) Lai H-C, Corey M, FitzSimmons S, Kosorok MR, Farrell M. Comparision of growth status of patients with cystic fibrosis between the United States and Canada. Am J Clin Nutr 1999; 69:531-538
c) Public Use File BGS98, German National Health Interview and Examination Survey 1998, Robert-Koch-Institut, Berlin, Germany, 2000
d) 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
e) 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

DEFINITION OF CHRONIC INFECTION IN THE LOWER AIRWAYS

1. Chronic PA infection should be defined by local physician according to modified Leeds criteria[a] and/or anti-pseudomonas antibodies[b]. 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 the status has changed
    a. modified Leeds criteria, chronic infection: >50% of the sputum samples, collected during the last 12 months were positive. At least 4 sputum samples during that period
    b. and/or significantly raised anti-pseudomonas antibodies according to local laboratories
2. Chronic infection with other gram-negative bacteria should be recorded by the same criteria as above

References:
a) 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
b) Proesmans M, Balinska-Miskiewiscz, Dupont L et al. Evaluating the "Leeds criteria" for Pseudomonas aeruginosa infectionin a cystic fibrosis centre. Eur Resp J 2006;27:937-943.
c) 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

ALLERGIC BRONCHO-PULMONARY ASPERGILLOSIS (ABPA)

Diagnostic criteria:

1. 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.
2. Total IgE > 500 IU/ml.
3. Positive skin prick test for Aspergillus antigen (> 3 mm) or positive specific IgE for *A. fumigatus*.
4. Either:
   a. precipitins to *A. fumigatus* or in vitro demonstration of IgG antibody to *A. fumigatus*;
   b. or 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:

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

LIVER DISEASE

We adopt the definitions for Liver Disease used by the UK Registry. These definitions discriminate patients with severe liver disease (with portal hypertension) from milder cases (cirrhosis without portal hypertension).

Cirrhosis with Hypertension: scaring 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: scaring of the liver relating to underlying CF.

Liver disease without cirrhosis: this includes fatty liver or viral hepatitis but not biliary cirrhosis.

PANCREATIC STATUS

Definition:

Stool fat (van de Kamer) > 4-5 g/d in young children, > 7g/d in children above 10 yrs and adults and/or faecal pancreatic elastase-1 < 200 ug/g.

Two determinations are mandatory. Faecal fat excretion values of infants below 3 months are contradictory. Other than pancreatic causes of steatorrhoea must have been excluded.

Pancreatic status will be assessed at the registry level, according to the following:

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)*

*according to definition above

References:

a) 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.
b) 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.