2012

ECFS Patient Registry
Annual Data Report

European Cystic Fibrosis Society
Kastanieparken 7
7470 Karup
Denmark

ECFS Patient Registry

Annual Data Report

2012 data

ecfs-pr@uzleuven.be

www.ecfs.eu/ecfspr

Published: August 2017

Table of contents

Preface

We are pleased to share with you the 2012 Annual Report from the European Cystic Fibrosis Society Patient Registry (ECFSPR). This report contains demographic and clinical data of 37,404 consenting CF patients from 27 countries. The epidemiological data is provided by national cystic fibrosis (CF) registries and individual CF centres throughout Europe and neighbouring countries.

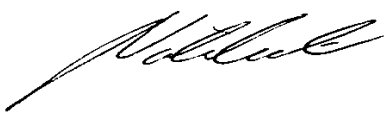
This 10th official report is published after the 2013 and 2014 reports. In the past two years we collected serial data from 2011 to 2014 with ECFSTracker, the ECFSPR data-collection software. We prioritised publication of the reports with the most recent data, hence the delay in production of the 2011 and 2012 reports.

The ECFSPR's primary goal is to facilitate comparison between CF clinical outcomes across Europe. The analysis presented in this report has been carried out by the ECFSPR statistician using all the raw data, in anonymised form, submitted by the participating countries. In merging this data, the results of the analysis for some countries as presented in the ECSFPR report may differ from the data published in their national annual registry report. Differences can originate from variation in patient inclusion criteria, the definitions used for disease complications, and the employment of different reference values. Further details on how this occurs and is dealt with can be found in the report and in the List of ECFSPR Variables and Definitions in Appendix 2 (page 119).

The management of the ECFSPR and the development of this report take a considerable amount of work. I would like to thank the national registries and individual centres, as well as the country representatives, for their participation in the ECFSPR, and the ECFSPR staff for their hard work in producing this report. Through the commitment of the members of the individual centres and countries who volunteer so much of their time, and the combined efforts of the ECFSPR staff and Executive Committee, serial data from 2011 to 2014 has been uploaded to the ECFSPR in the past two years. This is a considerable accomplishment that has hugely improved the value of the Registry as an instrument for research and quality improvement. For this, we at the ECFSPR are extremely grateful. Managing the Registry comes with a cost and we are also indebted to our sponsors whose unrestricted grants have helped support the running and expansion of the ECFSPR.

Finally, I would like to thank all the people with CF throughout Europe for their willingness to participate in the ECFSPR. Without them, this Registry would not exist. We hope that the ECFSPR's information is useful for people with CF, their families and caregivers and that it will lead to improved CF care throughout Europe.

Sincerely,



Lutz Nährlich, MD
ECFSPR Director

To the people with cystic fibrosis

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

If you have any suggestions on how we can improve the information or if something is unclear you are welcome to contact us. You can send an email to: ecfs-pr@uzleuven.be.

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

For more detailed information about the ECFSPR we invite you to visit the patient-dedicated page on our website, www.ecfs.eu/projects/ecfs-patient-registry/information-about-ecfspr-cf-patients.

List of centres and national registries that provided the data

List of individual centres and national registries that contributed to the ECFSPR.

In large print: the name of the country representative in the ECFSPR Steering Group;
Underlined: the name of the database manager for the national registry.

Country	Centre/National Registry name	Contact
Austria	9 individual centres:	Andreas Pfleger
	Medizinische Universität Graz, Universitätsklinik für Kinder- und Jugendheilkunde, Klinische Abteilung für Pädiatrische Pulmonologie und Allergologie und CF Zentrum für Kinder, Jugendliche und Erwachsene, Graz	Ernst Eber Maria Wagenhofer
	Medizinische Universität Innsbruck, Departement für Kinder- und Jugendheilkunde, CF Zentrum für Kinder, Jugendliche und Erwachsene, Innsbruck	Helmut Ellemunter Johannes Eder
	Klinikum Klagenfurt am Wörthersee, Abteilung für Kinder- und Jugendheilkunde, Pädiatrische Pulmologie/Allergologie, Klagenfurt	Franz Hubert Wadlegger
	Kardinal Schwarzenberg'sches Krankenhaus, Abteiling für Kinder- und Jugendmedizin, Schwarzach	Christoph Seelbach
	Landeskrankenhaus Steyr, Abteilung für Kinder- und Jugendheilkunde und Abteilung für Lungenheilkunde, Steyr	Josef Emhofer Alexander Ebner
	Universitätsklinik für Kinder- und Jugendheilkunde, Cystische Fibrose Ambulanz, Vienna	Sabine Renner Brigitte Mersi
	Wilhelminenspital, Abteilung für Kinder- und Jugendheilkunde mit Ambulanz, Vienna	Thomas Frischer Ajibade Mogaji Kerstin Tiringer
	Klinikum Wels-Grieskirchen, Abteilung für Kinder- und Jugendheilkunde, Wels	Elisabeth Steiner Vera Bauer Beatrix Wintersteiger Nadine Raffler
	Klinikum Wels-Grieskirchen, Abteilung für Lungenkrankheiten, Wels	Helmut Feizelmeier
Belgium	Belgian Cystic Fibrosis Registry	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	Lydie Lemonnier Sophie Ravilly
Germany	Qualitätssicherung Mukoviszidose	Lutz Nährlich Birgit Wiese
Greece	1 individual centre:	Elpis Hatziagorou
	Aristotle University of Thessaloniki, Hippokration General Hospital, Cystic Fibrosis Centre, Thessaloniki	John Tsanakas Elpis Hatziagorou Maria Fotoulaki John Kioumis

Country	Centre/National Registry name	Contact
Hungary	Cystic Fibrosis Registry of Hungary	Rita Ujhelyi Géza Marsal Attila Hornyák
Ireland	Cystic Fibrosis Registry of Ireland	Godfrey Fletcher Abaigeal Jackson Shijun Zhou
Israel	Cystic Fibrosis Registry of Israel	Meir Mei-Zahav
Italy	Cystic Fibrosis Registry of Italy	Rita Padoan Gianluca Ferrari Annalisa Amato Patrizia Iansa Marco Salvatore
Latvia	1 individual centre: Rīga Stradinš University, Children's Clinical University Hospital, Department of Pneumology, Riga	Karina Mahlina Vija Švabe Karina Mahlina
Lithuania	1 individual centre: Hospital of Lithuanian University of Health Sciences, Kaunas Clinics, Adult Cystic Fibrosis Centre, Kaunas	Kęstutis Malakauskas Kęstutis Malakauskas
Republic of Macedonia	1 individual centre: University Children's Hospital, Centre for Cystic Fibrosis, Skopje	Stojka Fustik Stojka Fustik
Republic of Moldova	Cystic Fibrosis Registry of Moldova	Svetlana Sciucca
Netherlands	Dutch Cystic Fibrosis Registry	Vincent Gulmans
Portugal	4 individual centres Cystic Fibrosis Centre, Centro Hospitalar de Lisboa Norte, Hospital Santa Maria Cystic Fibrosis Centre, Centro Hospitalar de Lisboa Central, Hospital de Dona Estefânia CH da Universidade de Coimbra, Pulmonology Dept. Centro Hospitalare do Porto, Centro Materno-Infantil do Norte, Largo da Maternidade de Jùlio Dinis, Porto	Luísa Pereira Celeste Barreto Luísa Pereira José Cavaco Fernanda Gamboa Teresa Reis Silva Telma Barbosa
Romania	1 individual centre: Clinical Children's Hospital, Grigore Alexandrescu, Bukarest, Romania	Simona Mosescu Simona Mosescu
Russian Federation	Cystic Fibrosis Registry of the Russian Federation	Nataliya Kashirskaya Alexander Chernyak Elena Amelina Stanislav Krasovskiy Elena Kondrtyeva Anna Voronkova
Serbia	1 individual centre: National Centre for Cystic Fibrosis, Mother and Child Health Institute of Serbia "Dr Vukan Cupic", Belgrade	Milan Rodic Milan Rodic

Country	Centre/National Registry name	Contact
Slovakia	Cystic Fibrosis Registry of Slovakia	Hana Kayserova Mariá Drugdova
Slovenia	2 individual centres:	Uroš Krivec
	University Clinic of Pulmonary and Allergic Diseases, Golnik	Matjaž Fležar Andraz Jakelj
	University Children`s Hospital, Pulmonary Department, Ljubljana	Uroš Krivec Ana Kotnik Pirs
Spain	14 individual centres:	Carlos Vazquez-Cordero
	Hospital de Sabadell, Corporació Sanitària Parc Taulí, Clinica Pediátrica, Unitat Clinica de Fibrosis Quística, Barcelona	Xavier Domingo Miró
	Hospital Vall d'Hebron, Unidad Fibrosis Quística e Neumologia Pediátrica, Barcelona	Silvia Gartner
	Hospital Universitario La Princesa, Neumologia Adultos, Madrid	Rosa María Girón
	Hospital Niño Jesús, Sección de Neumologia Pediátrica/Unidad de Fibrosis Quística, Madrid	Jose R. Villa Asensi Maribel Gonzalez Alvarez
	Hospital Universitario de Ramón y Cajal, Unidad de Fibrosis Quística, Madrid	Adelaida Lamas Ferreiro Lucrezia Suarez Ana de Blas Zapata Alejandro Lopez Neyra Veronika Sanz Santiago
	Hospital 12 de Octubre, Unidad de Fibrosis Quística, Madrid	Gloria Garcia Hernandez Carmen Luna Paredes
	Hospital Regionale Universitario de Málaga, Unidad Fibrosis Quística Adultos, Málaga	Casilda Olveira Fuster Gabriel Maria Olveira Fuster Nuria Porras Pèrez
	Hospital Regional Universitario de Málaga, Unidad de Fibrosis Quística Pediátrica, Málaga	Francisco Javier Perez-Frias Estela Perez-Ruiz Pilar Caro-Aguilera
	Hospital Universitario Virgen de la Arrixaca, Unidad de Fibrosis Quística, Murcia	Pedro Mondéjar-López
	Hospital Universitario Virgen del Rocío, Unidad de Fibrosis Quística, Sevilla	Isabel Delgado Pecellín Esther Quintana Gallego
	Hospital Clinico Universitario de Valencia, Unidad de Fibrosis Quística Pediátrica, Valencia	Amparo Escribano Montaner Silvia Castillo
	Hospital Universitario La Fe, Unidad de Trasplante Pulmonar y Fibrosis Quística, Valencia	Amparo Solé Jover Carmen Inés Perez Munoz
	Hospital Universitario de Cruces, Unidad de Fibrosis Quística, Bizkaya	Carlos Vazquez Cordero
	Hospital Universitario Miguel Servet, Unidad de Neumología Pediátrica y Fibrosis Quística, Zaragoza	Carlos Martín de Vicente
Sweden	Cystic Fibrosis Registry of Sweden	Isabelle de Monestrol Anders Lindblad

Country	Centre/National Registry name	Contact
Switzerland	12 individual centres:	Andreas Jung
	Kantonsspital Aarau AG, Klinik für Kinder und Jugendliche, Abteilung pädiatrische Pneumologie, Allergologie und Immunologie, Klinik für Pneumologie und Schlafmedizin, Aarau	Dominik Müller-Suter Sarosh Irani
	Lindenhofspital Bern, Praxis für Pneumologie "Quartier Bleu", Bern	Reta Fischer Carlo Mordasini
	Universitätsklinik für Kinderheilkunde, Zentrum für Cystische Fibrose und Pulmonologie, Inselspital, Bern	Carmen Casaulta Philipp Latzin
	Hôpital Cantonal Fribourg, Pädiatrie, Fribourg	Denise Herzog Johannes Wildhaber
	Hôpitaux Universitaires de Genève, Département de l'enfant et de l'adolescent, Unité de Pneumologie Pédiatrique, Genève	Constance Barrazzone Anne Mornand
	Centre Hospitalier Universitaire Vaudois (CHUV), Départment Médico-Chirurgical de Pédiatrie, Pneumologie Pédiatrique et Mucoviscidose, Lausanne	Gaudenz Hafen Macha Rochat
	Centre Hospitalier Universitaire Vaudois (CHUV), Policlinique Médicale Universitaire, Départment de Médecine, Consultation Adulte de Mucoviscidose, Lausanne	Laurent Nicod Marie Hofer
	Luzerner Kantonsspital, Zentrum für Zystische Fibrose für Kinder und Erwachsene, Abteilungen für Pneumologie, pädiatrische Pneumologie und pädiatrische Gastroenterologie, Luzern	Bernhard Schwizer Nicolas Regamey Johannes Spalinger
	Hôpital de Morges, Consultation de Mucoviscidose Adulte, Morges	Alain Sauty Marie Hofer
	Ostschweizer Kinderspital, Pädiatrische Pneumologie und CF-Zentrum, St. Gallen	Jürg Barben
	Universitäts-Kinderspital Zürich, Abteilung für Pneumologie, Zürich	Andreas Jung Romy Rodriguez Alexander Möller
	Universitätsspital Zürich, Klinik für Pneumologie, Adultes CF Zentrum, Zürich	Christian Benden Thomas Kurowski
Ukraine	1 individual centre:	Halyna Makukh
	Institute of Hereditary Pathology of Ukranian National Medical Academy, CF centre of Western Ukrainian Specialized Children's Medical Centre, Lviv	Lyudmyla Bober Halyna Makukh
United Kingdom	UK Cystic Fibrosis Registry	Rebecca Cosgriff Siobhán Carr Elaine Gunn

Authors

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

Anna Zolin, Italy, ECFSPR Statistician, Department of Clinical Sciences and Community Health, University of Milan;
Jacqui van Rens, Belgium, ECFSPR Executive Coordinator;
Alice Fox and **Patrizia Iansa**, Italy, ECFSPR Service Desk;
Edward McKone, Ireland, **Vincent Gulmans**, The Netherlands, **Andreas Jung**, Switzerland, **Rebecca Cosgriff**, United Kingdom;
Ulrike Pypops, Belgium: CF Europe representative in the ECFSPR;
Contributing country managers and national representatives (the names are listed on page 4);
Lutz Nährlich, Germany, ECFSPR Director.

We would like to thank Rosalba Ancona and Annalisa Orenti for their help with editing the tables and graphs.

Suggested citation for this report:

ECFSPR Annual Report 2012, Zolin A, McKone E, Nährlich L, van Rens J et al.

Introduction

The European Cystic Fibrosis Society Patient Registry (ECFSPR)

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

- National CF registries (or individual centres with local databases) extract patient data from their own database and import the data into the ECFSPR software;
- Individual centres enter 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. Data stored in the central database is anonymous, and only year/ month of birth and randomised centre numbers are used as identifiers. Data is available for scientific purposes on application. All requests are reviewed by the ECFSPR Scientific Committee and, based on their recommendation, the country representatives in the Steering Group (composed of national representatives of the countries that contribute data to the ECFSPR) decide if the data request is approved or not; this decision is final. Requests originating from the Industry are also reviewed by the ECFS Clinical Trials Network. All applications must meet the European and individual country data protection legislation regarding patient anonymity.

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

General Considerations

For the national registries it is possible that some of their definitions and data coding do not fully correspond to those employed by the ECFSPR, either because some types of information are not collected, or are collected by the national registry using a different method. When the national registries upload their data they are also asked if their variables definitions meet those of the ECFSPR or not. If there are major discrepancies between the definitions the affected variables have been omitted from the annual report; in the case of minor discrepancies a footnote has been added to the graphs and tables explaining the difference. For example, the ECFSPR collects information on the presence of chronic *Pseudomonas aeruginosa* infection according to the modified Leeds criteria and/or the presence of elevated *Pseudomonas* antibodies (see Appendix 2 on page 119). If a national registry collects such information as "at least one positive *Pseudomonas aeruginosa* culture this year", this information would be too different from the ECFSPR definition of chronic *Pseudomonas aeruginosa*, and we would set this variable to "missing" for that country. If, instead, a country defines chronic *Pseudomonas aeruginosa* as "the presence of more than four positive cultures in 6 months", the data of this variable would be included in the annual report, since the definition is much closer to the ECFSPR definition, and a footnote added to the relevant tables and graphs.

If a country does not collect a certain variable (or if it is completely different from the ECFSPR definitions as described above), we have omitted that country from the relevant graphs in the report. The same applies for countries where the information for a variable is missing for more than 10% of the patients. All data, however, is 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 a given complication has

this complication or not, which makes the given frequencies less accurate. For example, in a country where 7% of the patients have liver disease but 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 between the findings of the national registries' own reports and the ECFSPR report; this is because some variable values are recoded or computed in different ways. For example, some national registries compute the age at the annual visit and consider 16 years as the cut-off for adult age. The ECFSPR computes the age at FEV_1/height/weight measurement and the age at follow-up (the end of the year) and considers 18 years as the cut-off for adulthood. 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 such as FEV_1 the raw data values, 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 to be able to compare lung function between patients and countries. We used common reference populations for all data when calculating the values as a percentage of predicted from the raw data. Slightly different values can be obtained when another reference population is used 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.

Glossary and Abbreviations

Country codes:

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

Explanation of terms:

ABPA: allergic bronchopulmonary aspergillosis, an allergic reaction to the mould *Aspergillus.*
BMI: body mass index [weight (kg)/height (m^2)]
Bronchodilator: medication that relaxes the muscles of the airways, used also for asthma.
CFRD: CF related diabetes.
CFTR: CF transmembrane conductance regulator, is a protein at the cell surface that controls the salt and water balance across a cell. The gene that causes CF is the blueprint for the CFTR protein. Everyone has two copies of the gene for CFTR, but to be born with CF, both CFTR genes must be affected by a CF-causing mutation.
FEV_1: forced expiratory volume in one second (lung function parameter).
FEV_1%: the FEV_1 as a percentage of the average value for healthy people of the same age, height and sex.
Haemoptysis: coughing up blood. This happens frequently in small amounts in CF, so the complication we asked for here is major bleeding (more than 250 ml).
Homozygous: CF is caused by mutations of the CFTR gene, one on each allele. One is inherited from the mother and one from the father. If both mutations are the same, the person is said to be homozygous for this mutation.
Heterozygous: CF is caused by mutations of the CFTR gene, one on each allele. One is inherited from the mother and one from the father. If the two mutations are different, the person is said to be heterozygous.
Max: maximum. It is the highest value.
Mean: 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.
Meconium ileus: congenital obstruction of the gut with thick, sticky faeces.
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.
Min: minimum. It is the lowest value.
N: the number of patients in a group for whom the information is not missing.
N miss: number of missing values, or the number of patients for whom the information was missing.
NaCl: sodium chloride. Here: inhaled hypertonic saline.
Pancreatic insufficiency: the absence of pancreatic enzymes in the gut leading to malnutrition if not treated (pancreatic insufficiency is therefore defined as the use of pancreatic enzyme supplementation).
25^{th} Pctl: 25^{th} 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 25^{th} 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.
75^{th} Pctl: 75^{th} 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 75^{th} 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.
Pneumothorax: collapsed lung; in CF usually because of severe lung damage.
Quartiles: The 25^{th} Percentile, the median (the 50^{th} Percentile) and the 75^{th} percentile are collectively called quartiles, because they divide the set of measurements into quarters.
rhDNase: ribosomal human DNase – marketed as Pulmozyme®.
Z-score: it indicates how far 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 value 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 years old boy is -2, it means that the BMI for that boy is 2 standard deviations below the mean BMI of 10 years old boys of the reference population.

Summary of data report

Outcome		Females	Males	Total
Patients registered in the ECFSPR	n	17715	19682	37404*
	(%)	(47.4)	(52.6)	
Age at follow-up (in years; patients alive on 31/12/2012)	mean	19.4	20.2	19.8
	median	17.5	18.7	18.1
Patients ≥ 18 years (patients alive on 1/12/2012)	%	48.5	52.0	50.3
Age at diagnosis**	mean (years)	4.2	3.9	4.1
	median (months)	4.9	4.9	4.9
Patients with at least one F508del allele recorded**	%	82.5	82.5	82.5
Patients living with lung transplant**	n	746	760	1506
	(%)	(5.2)	(4.8)	(5.0)
Patients living with liver transplant**	n	55	107	162
	(%)	(0.4)	(0.7)	(0.5)
Patients deceased in 2012***	n	182	156	338
	(%)	(1.2)	(0.9)	(1.1)
Age at death (years)***	mean	28.1	29.9	28.9
	median	26.0	28.0	27.0

* For demographic purposes German 2010 data (N=5,003) has been included in this total. Gender is unknown for 7 patients.

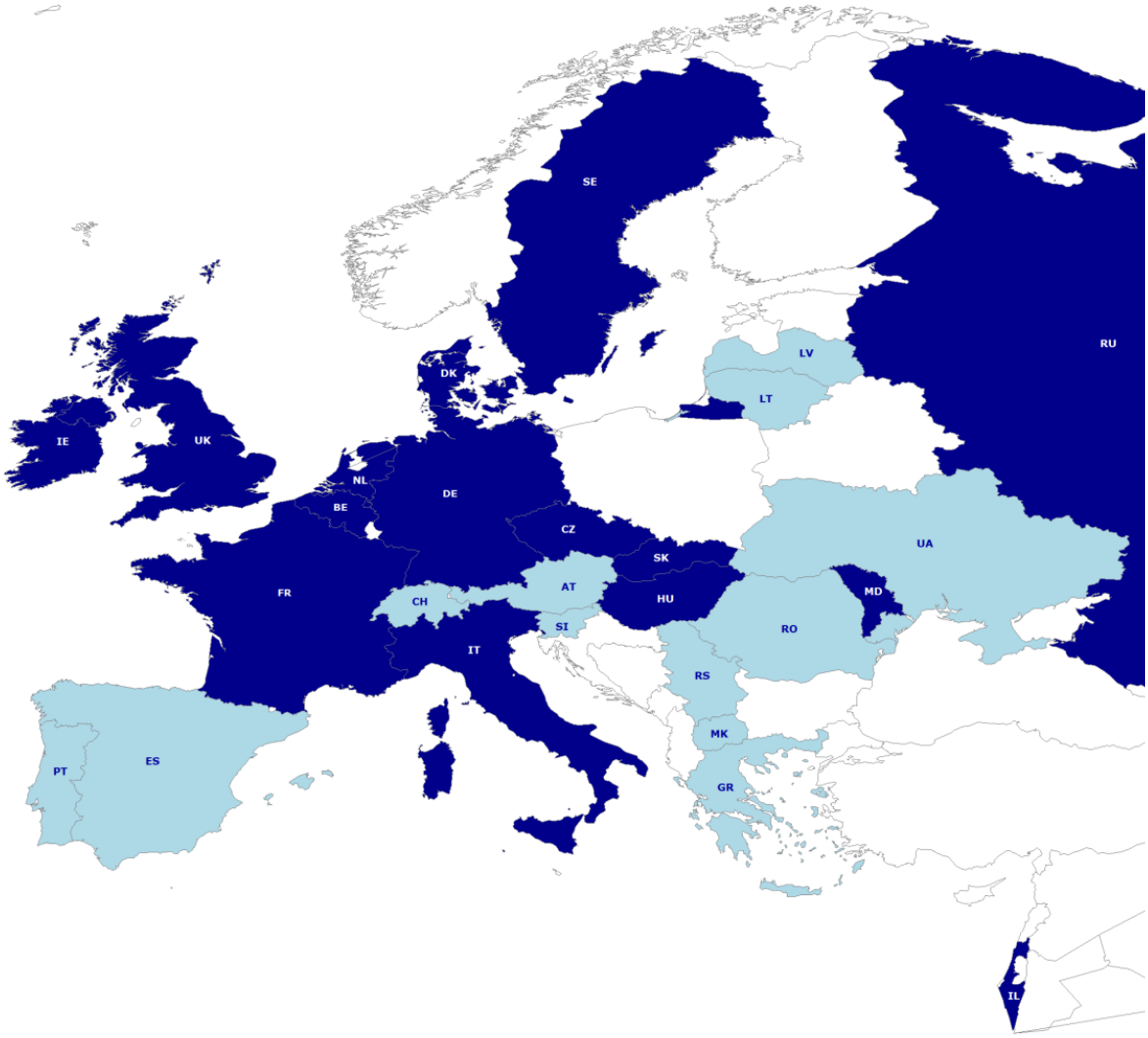
** Only patients seen during the year are presented; German 2010 data (N=5,003) is excluded. The total number of patients presented is 30,402.

*** Only patients seen during the year are presented; German 2010 data (N=5,003) is excluded. For the United Kingdom, all patients with confirmed diagnosis of CF are included (N=10,073). The total number of patients presented is 31,686.

Data report

1. Demographics

Figure 1.1 Map of countries that contributed to the ECFSPR in year 2012.



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

Table 1.1 Number of patients in year 2012, by country.

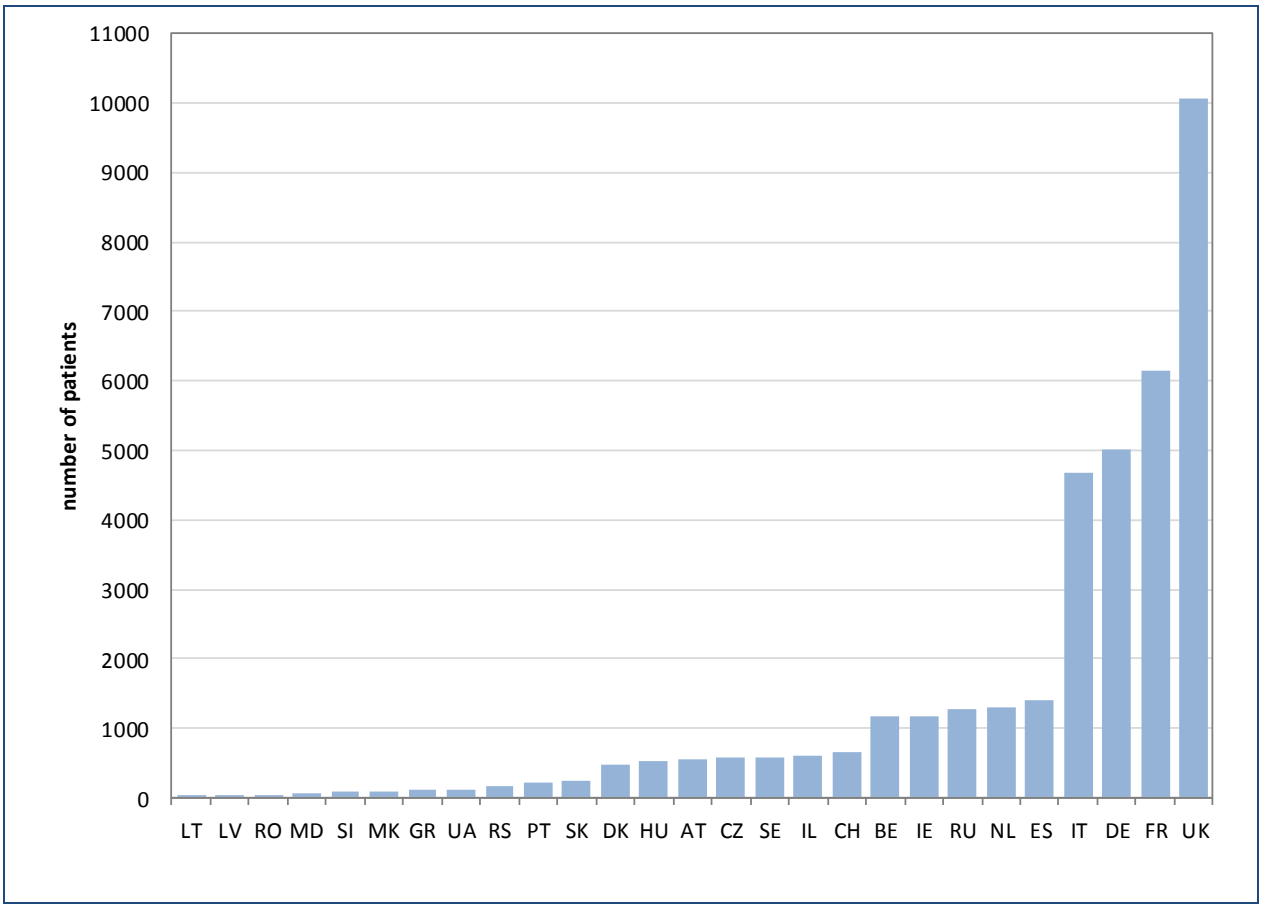
Country	Patients registered, not lost to follow-up	Patients seen	Estimated coverage 2012
Austria	553	523	85%
Belgium*	1168	1153	>90%
Czech Republic*	570	570	100%
Denmark*	469	449	100%
France*	6158	6158	90%
Germany*	5003	5003	>95%[1]
Greece	116	102	20%
Hungary*	526	526	90%
Ireland*	1181	1066	93%
Israel**	610	533	98%
Italy*	4688	4688	93%
Latvia	34	33	>90%
Lithuania	13	13	20%[2]
Rep of Macedonia	96	93	>90%
Rep of Moldova*	59	59	68-76%
The Netherlands*	1298	1277	98%
Portugal	206	119	>95%
Romania	36	36	11%[3]
Russian Federation*	1285	1274	62%
Serbia	156	144	>90%
Slovak Republic**	242	200	>90%
Slovenia	91	78	>95%
Spain	1406	1205	40%
Sweden*	590	590	95%
Switzerland	659	626	74%
Ukraine	118	98	13%
United Kingdom*	10073	8789	99%[4]
Total	37404	35405	

* Countries with an established national CF registry.
** These countries have a national registry, but use the direct data-entry function of ECFSTracker.
[1] Data are from 2010 and presented for demographic purposes. The 2012 data are submitted in 2017.
[2] Coverage is 100% for adults and 0% for children.
[3] Coverage is 0% for adults and 100% for children.
[4] The total number for UK is five patients less than the 2012 UK annual report due to the removal of CF diagnosis.

The column “Patients registered, not lost to follow-up” shows the patients that attend centres, and includes patients that have not been seen during the year but are known to be alive that year. The column “patients seen” presents only the patients who have attended the clinic during the year. The column “Estimated coverage 2012” shows the estimated percentage of CF patients living in that country who are included in the national registries/national data collections as reported by the country. For some countries one individual centre may include almost all patients, e.g. Latvia and Serbia.

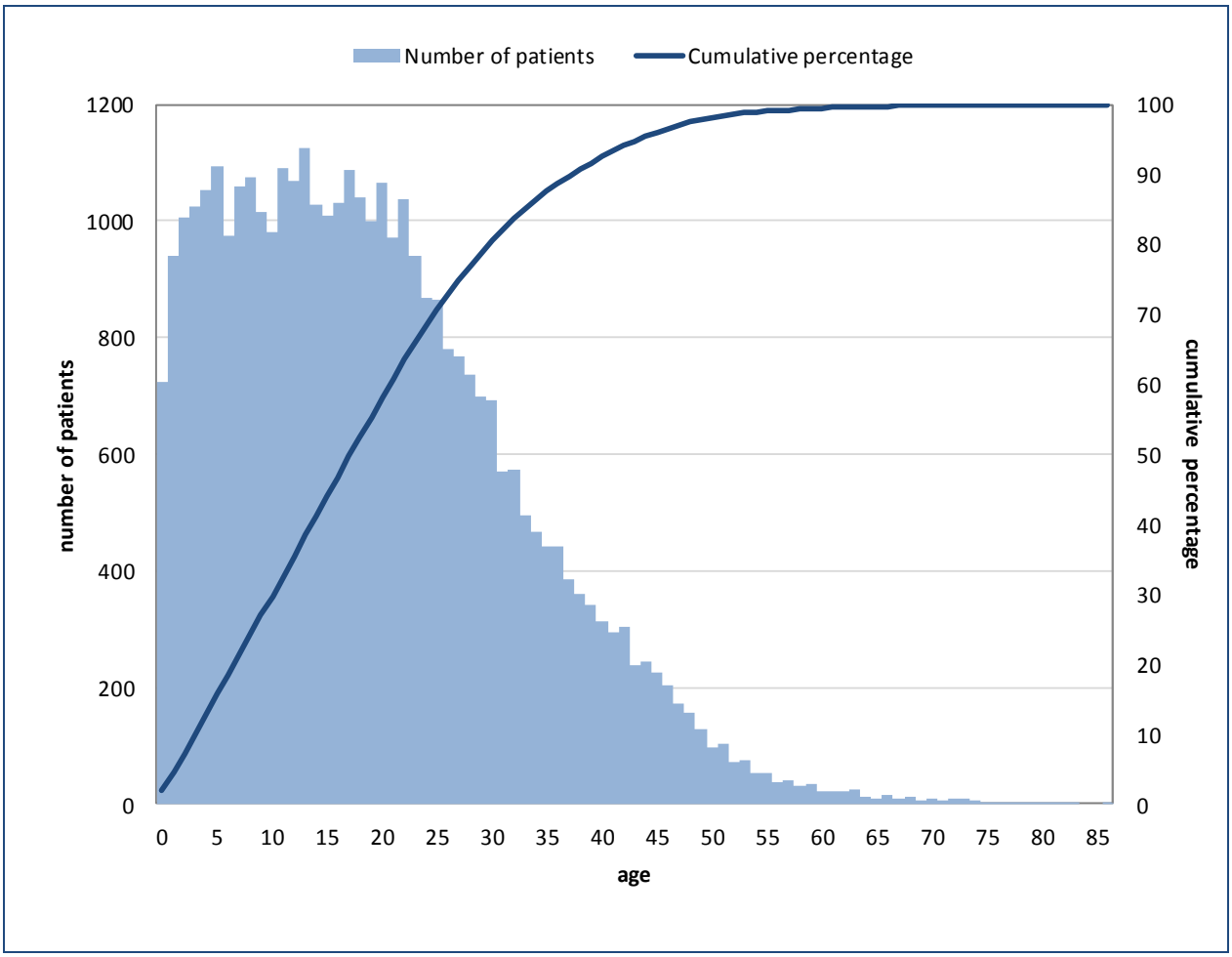
In all subsequent tables and graphs, the data referred to is for 2012, except for Germany, where the data referred to is for 2010. The German 2010 data is shown for demographic purposes and presented only in the demographic section.

Figure 1.2 Number of patients registered in the ECFSPR in 2012, by country.



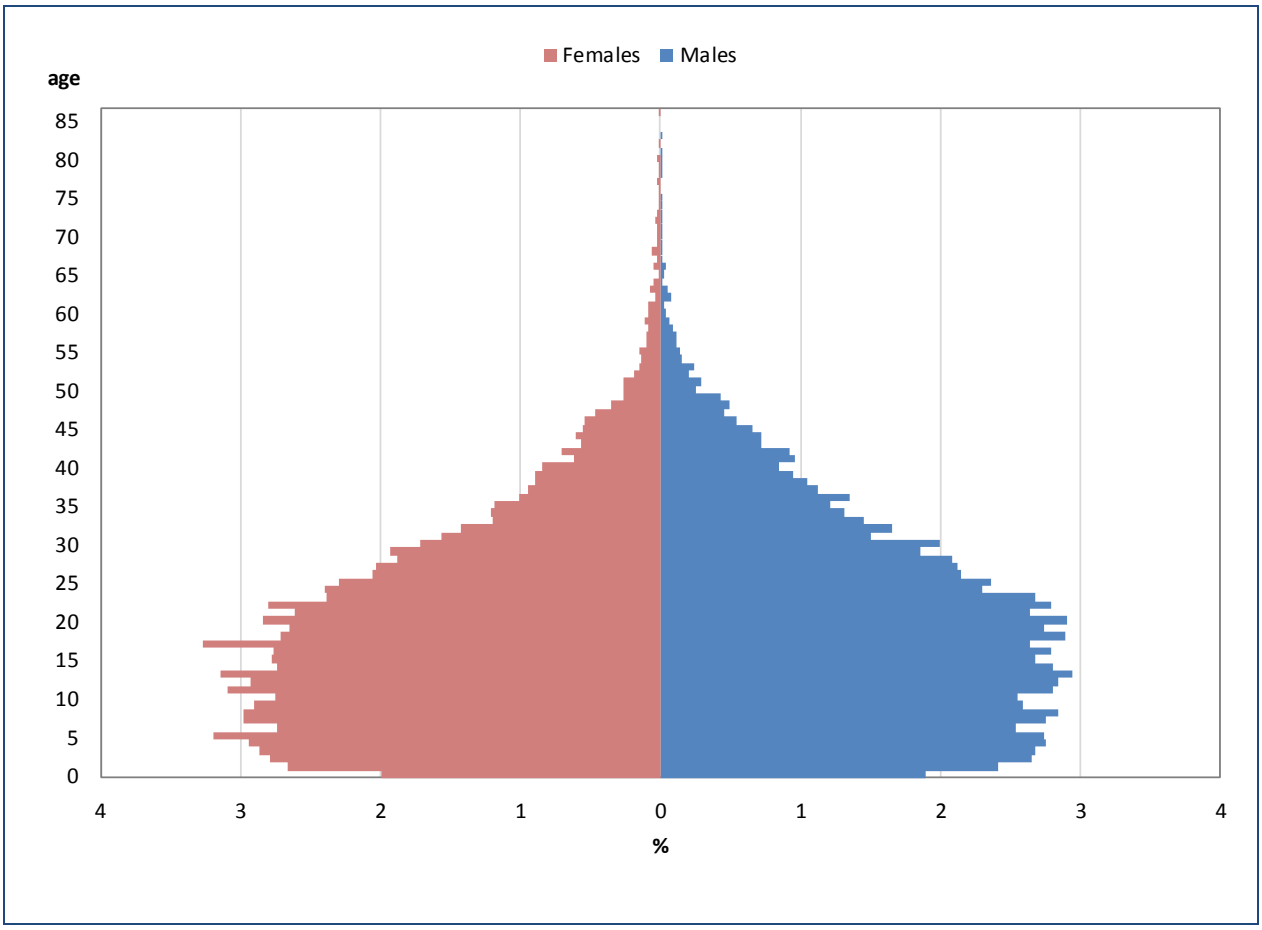
Each vertical bar shows the number of patients living in that country in 2012. Please refer to table 1.1 for the coverage in each country.

Figure 1.3 Age at follow-up distribution. Patients alive on 31/12/2012.



Each blue vertical bar represents the number of patients of that age alive in 2012. The cumulative percentage (the dark blue line) describes how many patients (as a percentage) are below a certain age (e.g. 50% of the patients are younger than 18.1 years of age).

Figure 1.4 Age at follow-up distribution by sex. Patients alive on 31/12/2012.



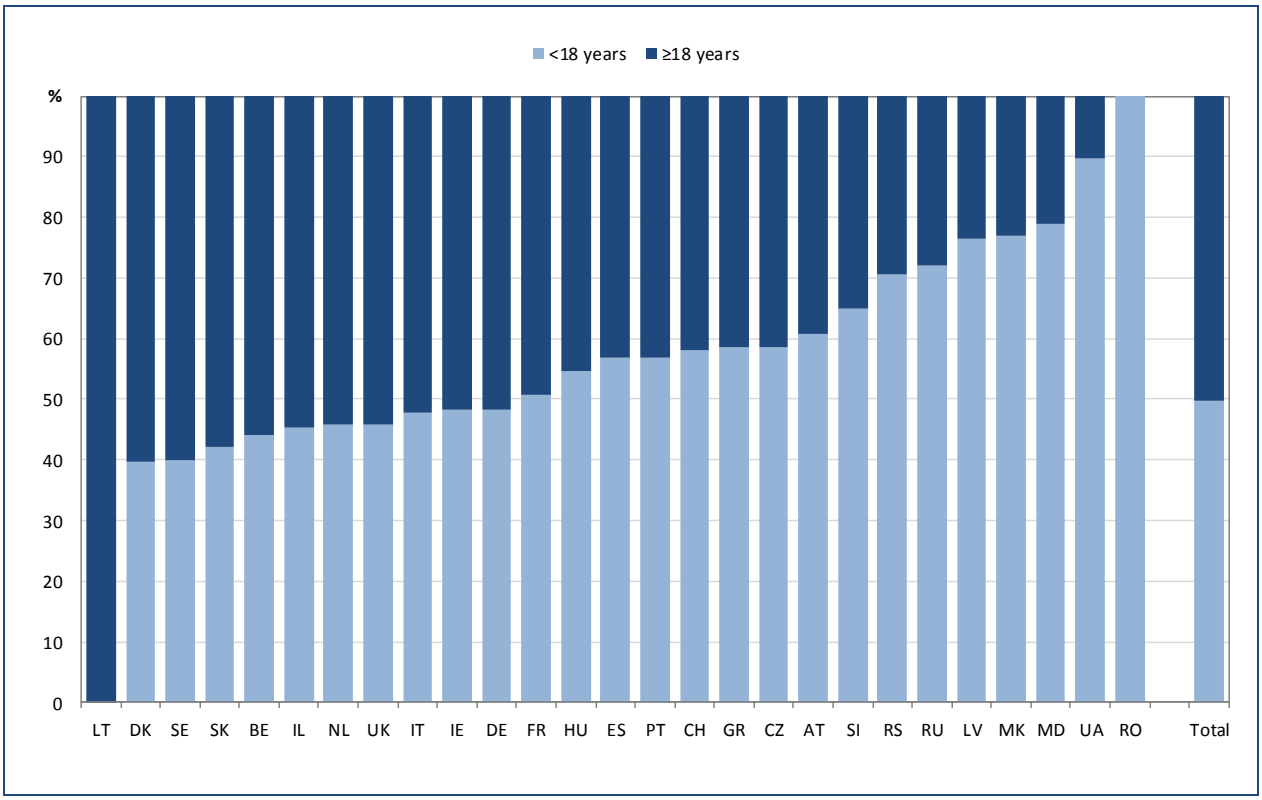
The pyramid shows the percentage of patients of different ages as horizontal bars. The right hand side of the pyramid (blue) shows, for males, how many patients (as a percentage) are a certain age, the left hand side (red) shows the same for females. The lower percentage of patients at the bottom of the pyramid is due to the fact that some patients have not yet been diagnosed (mean age at diagnosis is 4.05 years, see table 2.1).

Table 1.2 Proportion of adults (≥18 years) and children (<18 years), by country. Patients registered, alive on 31/12/2012.

Country	Children (<18 years) number (%)	Adults (≥18 years) number (%)
Austria	335 (60.80)	216 (39.20)
Belgium	511 (44.09)	648 (55.91)
Czech Republic	328 (58.57)	232 (41.43)
Denmark	185 (39.78)	280 (60.22)
France	3098 (50.75)	3006 (49.25)
Germany	2397 (48.34)	2562 (51.66)
Greece	65 (58.56)	46 (41.44)
Hungary	287 (54.77)	237 (45.23)
Ireland	562 (48.32)	601 (51.68)
Israel	275 (45.45)	330 (54.55)
Italy	2211 (47.71)	2423 (52.29)
Latvia	26 (76.47)	8 (23.53)
Lithuania	0 (0)	12 (100)
Rep of Macedonia	74 (77.08)	22 (22.92)
Rep of Moldova	45 (78.95)	12 (21.05)
The Netherlands	586 (45.71)	696 (54.29)
Portugal	116 (56.86)	88 (43.14)
Romania	36 (100)	0 (0)
Russian Federation	913 (72.12)	353 (27.88)
Serbia	108 (70.59)	45 (29.41)
Slovak Republic	101 (42.26)	138 (57.74)
Slovenia	59 (64.84)	32 (35.16)
Spain	791 (56.82)	601 (43.18)
Sweden	234 (40.00)	351 (60.00)
Switzerland	381 (58.08)	275 (41.92)
Ukraine	105 (89.74)	12 (10.26)
United Kingdom	4560 (45.75)	5407 (54.25)
Total	18389 (49.67)	18633 (50.33)

Lithuania: coverage is 100% for adults and 0% for children.
Romania: coverage is 100% for children and 0% for adults.

Figure 1.5 Proportion of adults (≥18 years) and children (<18 years). Patients alive on 31/12/2012.



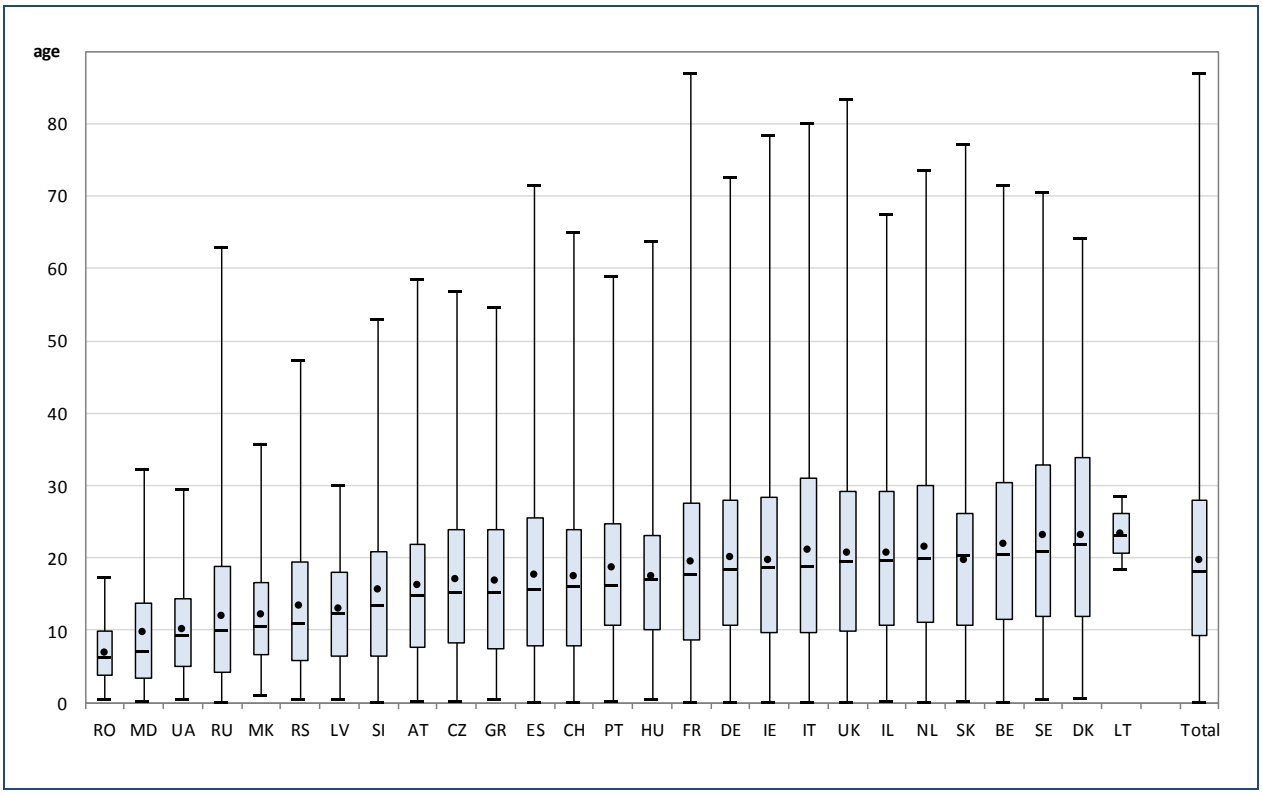
This graph shows the percentage of patients in each country who are adults (dark blue) or children (light blue). The percentage of adult patients varies considerably between the different countries, but this is partly an effect of the way the patients are included: for some countries only a few individual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

Table 1.3 Age at follow-up: descriptive statistics, by country and overall. Patients alive on 31/12/2012.

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)
Austria	551	16.2	0.3	7.7	14.9	21.8
Belgium	1159	22.0	0.1	11.5	20.5	30.5
Czech Republic	560	17.0	0.2	8.2	15.3	24.0
Denmark	465	23.2	0.6	12.0	21.9	33.8
France	6104	19.6	0.1	8.7	17.8	27.5
Germany	4959	20.2	0.1	10.8	18.5	28.0
Greece	111	16.9	0.5	7.5	15.3	24.0
Hungary	524	17.5	0.5	10.0	17.0	23.0
Ireland	1163	19.8	0.1	9.6	18.7	28.3
Israel	605	20.8	0.2	10.6	19.7	29.1
Italy	4634	21.1	0.0	9.6	18.9	31.0
Latvia	34	13.0	0.5	6.5	12.5	18.0
Lithuania	12	23.4	18.5	20.6	23.2	26.1
Rep of Macedonia	96	12.3	1.0	6.7	10.5	16.6
Rep of Moldova	57	9.7	0.2	3.4	7.1	13.8
The Netherlands	1282	21.5	0.1	11.1	19.9	29.9
Portugal	204	18.8	0.3	10.6	16.3	24.7
Romania	36	7.0	0.5	3.8	6.4	9.9
Russian Federation	1266	12.1	0.1	4.3	10.0	18.9
Serbia	153	13.5	0.4	5.8	11.0	19.5
Slovak Republic	239	19.7	0.2	10.8	20.3	26.2
Slovenia	91	15.6	0.1	6.4	13.5	20.8
Spain	1392	17.7	0.1	7.8	15.6	25.5
Sweden	585	23.2	0.4	12.0	21.0	32.9
Switzerland	656	17.6	0.1	7.8	16.0	23.9
Ukraine	117	10.2	0.4	5.0	9.4	14.4
United Kingdom	9967	20.8	0.0	9.9	19.5	29.1
Total	37022	19.8	0.0	9.3	18.1	28.0

This table shows the descriptive statistics for age at follow-up of the patients by country and overall. Only patients who were alive on 31 December 2012 are included.

Figure 1.6 Age at follow-up: box-plot, by country and overall. Patients alive on 31/12/2012.



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.

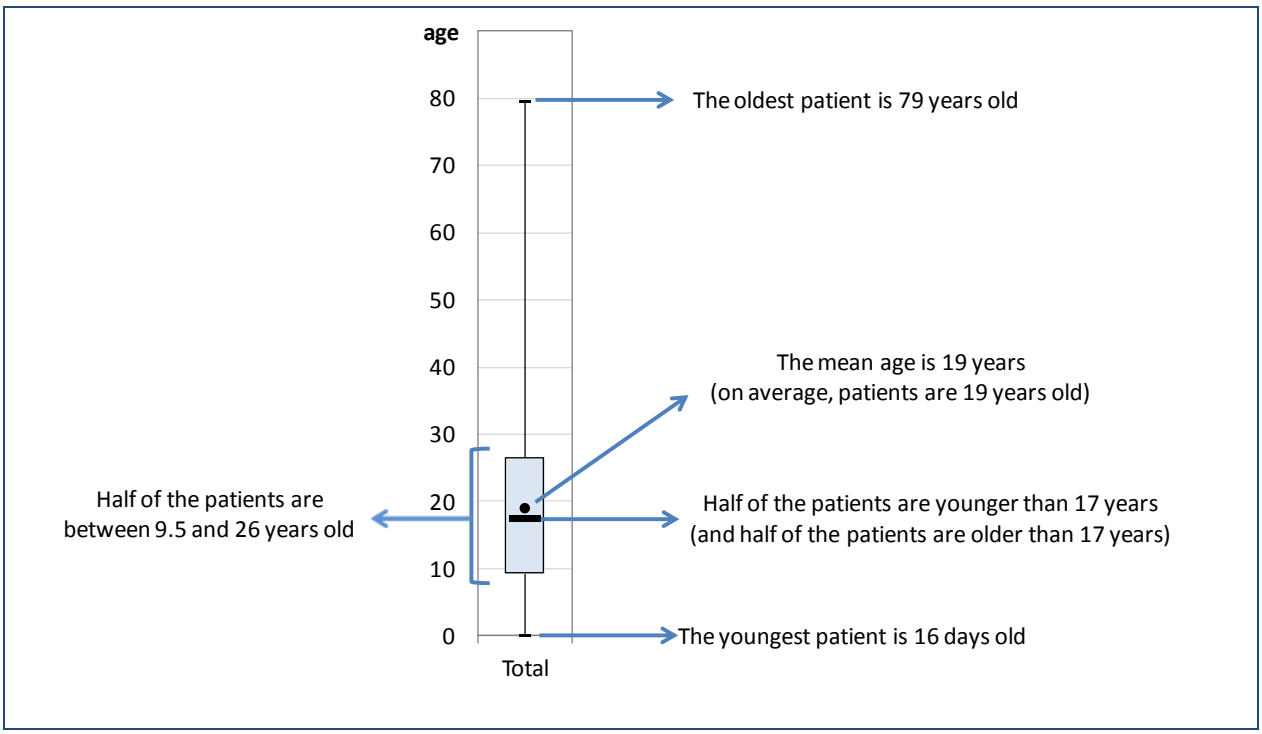
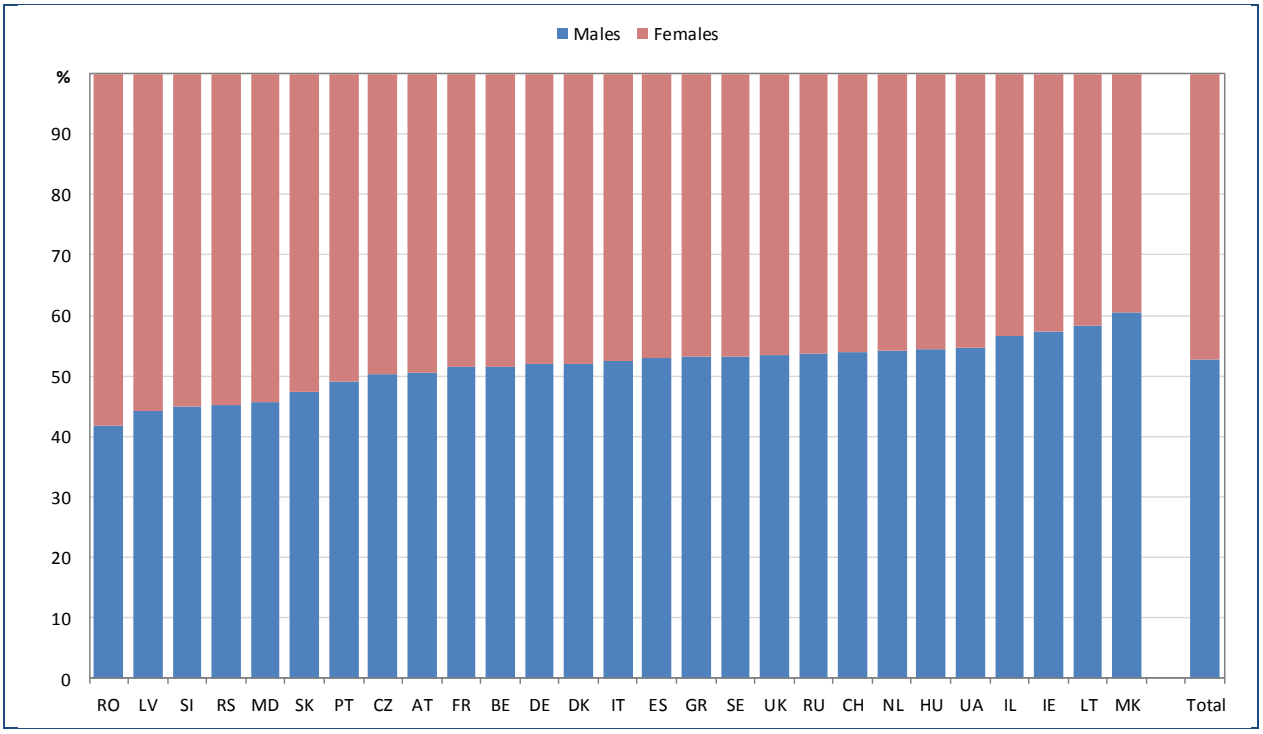


Figure 1.7 Sex distribution, by country and overall. Patients alive on 31/12/2012.



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

Figure 1.8 Sex distribution, by country and overall. Patients alive on 31/12/2012 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

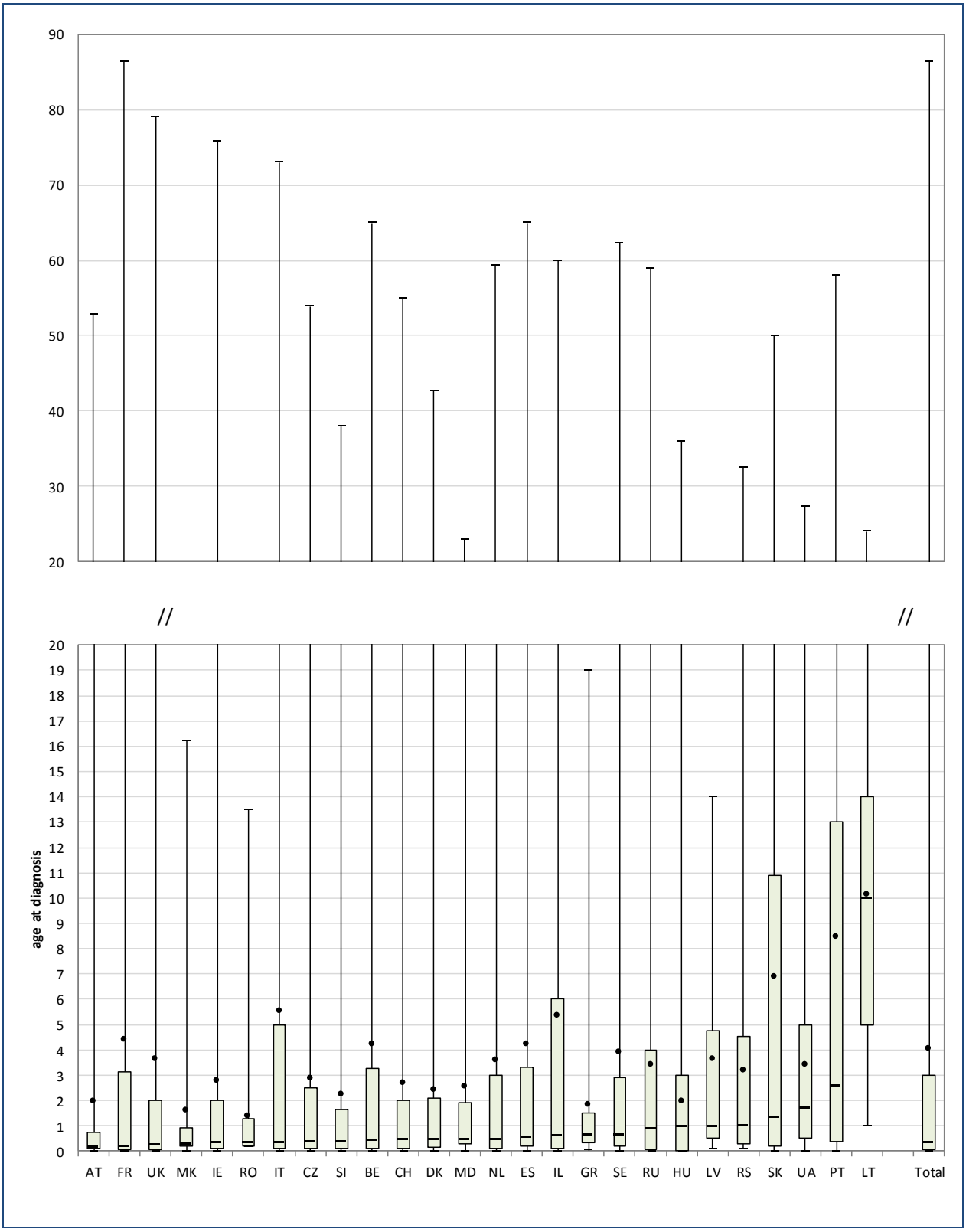
Hereafter, only patients who were seen during the year are presented and German 2010 data (N=5,003) is not included.

Table 2.1 Age at diagnosis (in years): descriptive statistics, by country and overall. All patients seen in 2012.

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	495	28	2.00	0.00	0.10	0.20	0.76	52.81
Belgium	1152	1	4.25	0.00	0.10	0.46	3.29	65.00
Czech Republic	570	0	2.88	0.00	0.10	0.40	2.50	53.90
Denmark	449	0	2.42	0.00	0.17	0.50	2.08	42.67
France	5623	535	4.42	0.00	0.08	0.24	3.12	86.44
Greece	94	8	1.86	0.04	0.33	0.67	1.50	19.00
Hungary	355	171	1.99	0.00	0.00	1.00	3.00	36.00
Ireland	1065	1	2.78	0.00	0.09	0.34	2.00	75.83
Israel	528	5	5.36	0.00	0.11	0.64	6.00	60.00
Italy	4542	146	5.56	0.00	0.12	0.38	4.99	72.97
Latvia	32	1	3.65	0.10	0.50	1.00	4.75	14.00
Lithuania	13	0	10.15	1.00	5.00	10.00	14.00	24.00
Rep of Macedonia	93	0	1.63	0.00	0.20	0.30	0.90	16.20
Rep of Moldova	59	0	2.56	0.00	0.30	0.50	1.90	23.00
The Netherlands	1190	87	3.62	0.00	0.10	0.50	3.00	59.42
Portugal	118	1	8.50	0.00	0.40	2.60	13.00	58.00
Romania	36	0	1.38	0.20	0.20	0.35	1.30	13.50
Russian Federation	1271	3	3.42	0.00	0.08	0.92	4.00	59.00
Serbia	140	4	3.19	0.10	0.30	1.05	4.55	32.50
Slovak Republic	162	38	6.90	0.00	0.20	1.35	10.90	50.00
Slovenia	75	3	2.24	0.00	0.10	0.40	1.66	38.00
Spain	1158	47	4.23	0.00	0.20	0.58	3.33	65.00
Sweden	576	14	3.92	0.00	0.19	0.69	2.89	62.28
Switzerland	543	83	2.70	0.00	0.10	0.50	2.00	55.00
Ukraine	98	0	3.44	0.00	0.50	1.70	5.00	27.40
United Kingdom	8650	139	3.64	0.00	0.07	0.25	2.02	79.18
Total	29087	1315	4.05	0.00	0.08	0.35	3.00	86.44

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 2012.



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.

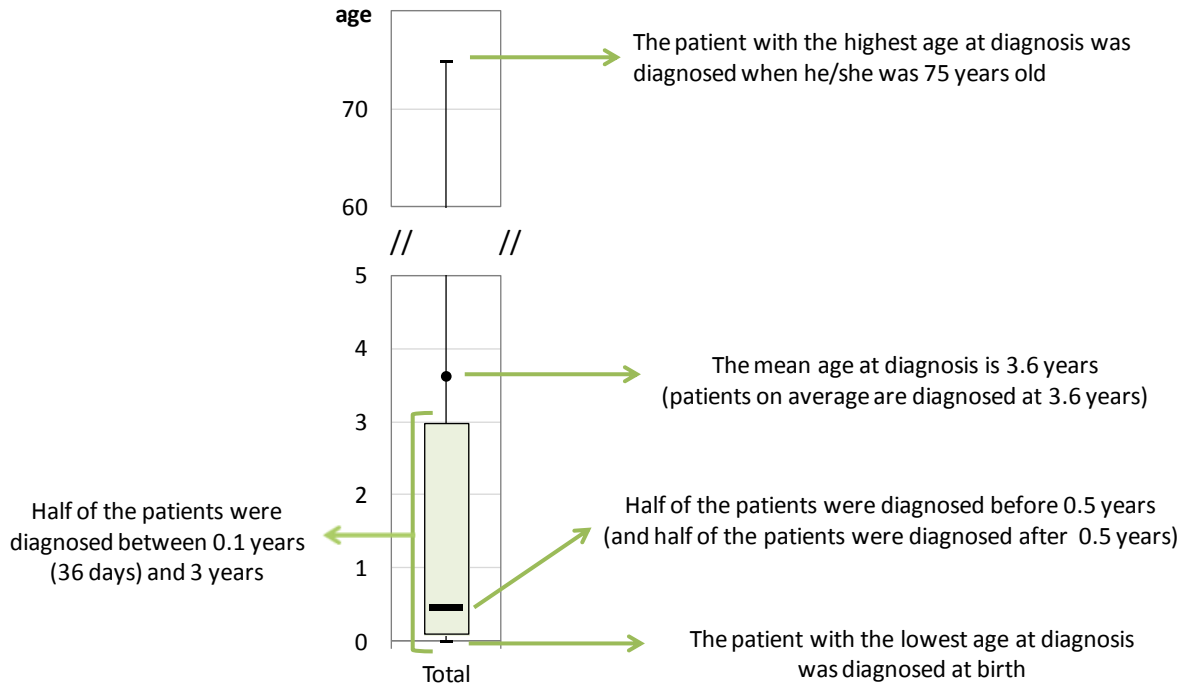
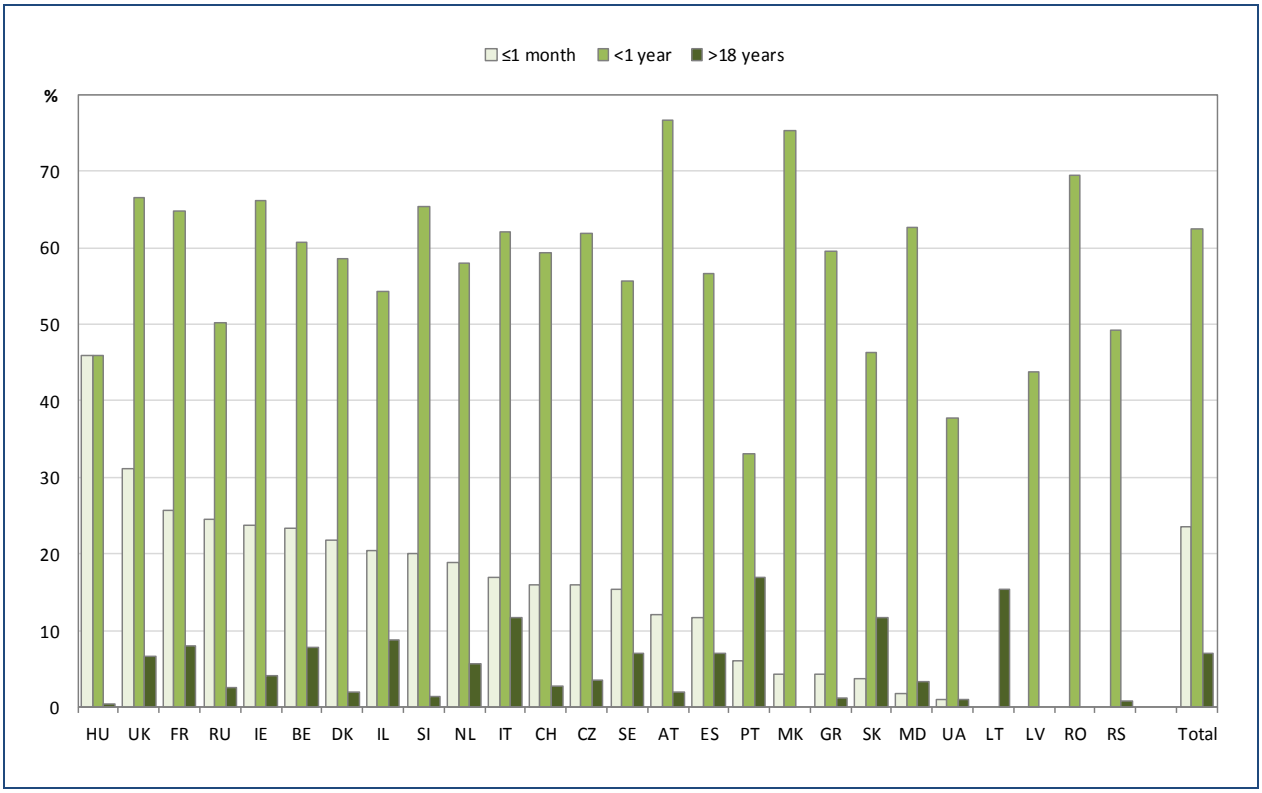

age
70
60
5
4
3
2
1
0
Total
The patient with the highest age at diagnosis was diagnosed when he/she was 75 years old
The mean age at diagnosis is 3.6 years (patients on average are diagnosed at 3.6 years)
Half of the patients were diagnosed before 0.5 years (and half of the patients were diagnosed after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

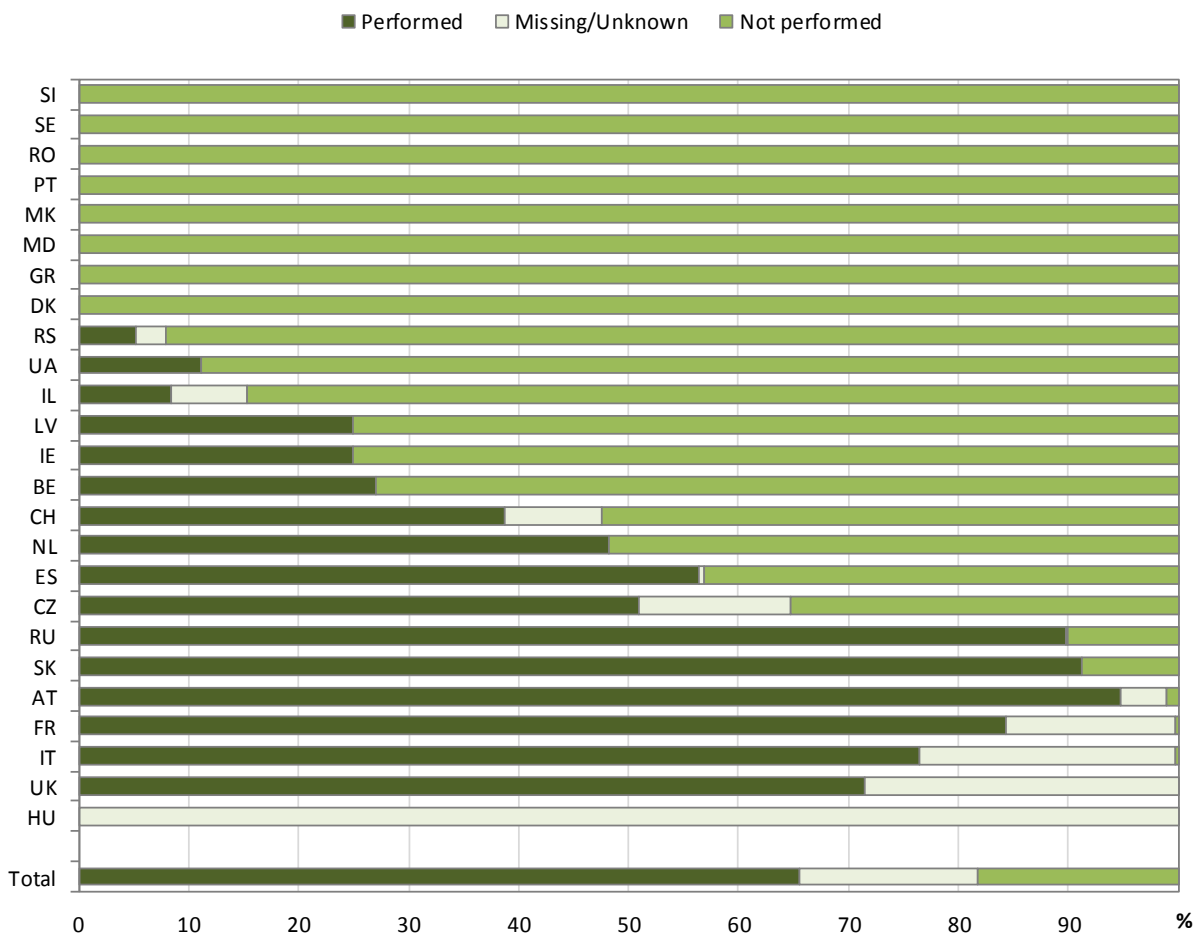
Figure 2.2 Proportion of patients diagnosed at age 1 month or younger, younger than 1 year and older than 18 years, by country and overall. All patients seen in 2012.



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 included in the sub-group for within 1 month are also part of the diagnoses in the sub-group for within the first year, and that diagnoses 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 2012.



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 2012 who were screened at birth, (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, in the five years previous to 2012, almost all of the CF patients underwent newborn screening. In total, 65% of all children of 5 years old or younger registered in the ECFSPR in 2012 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.

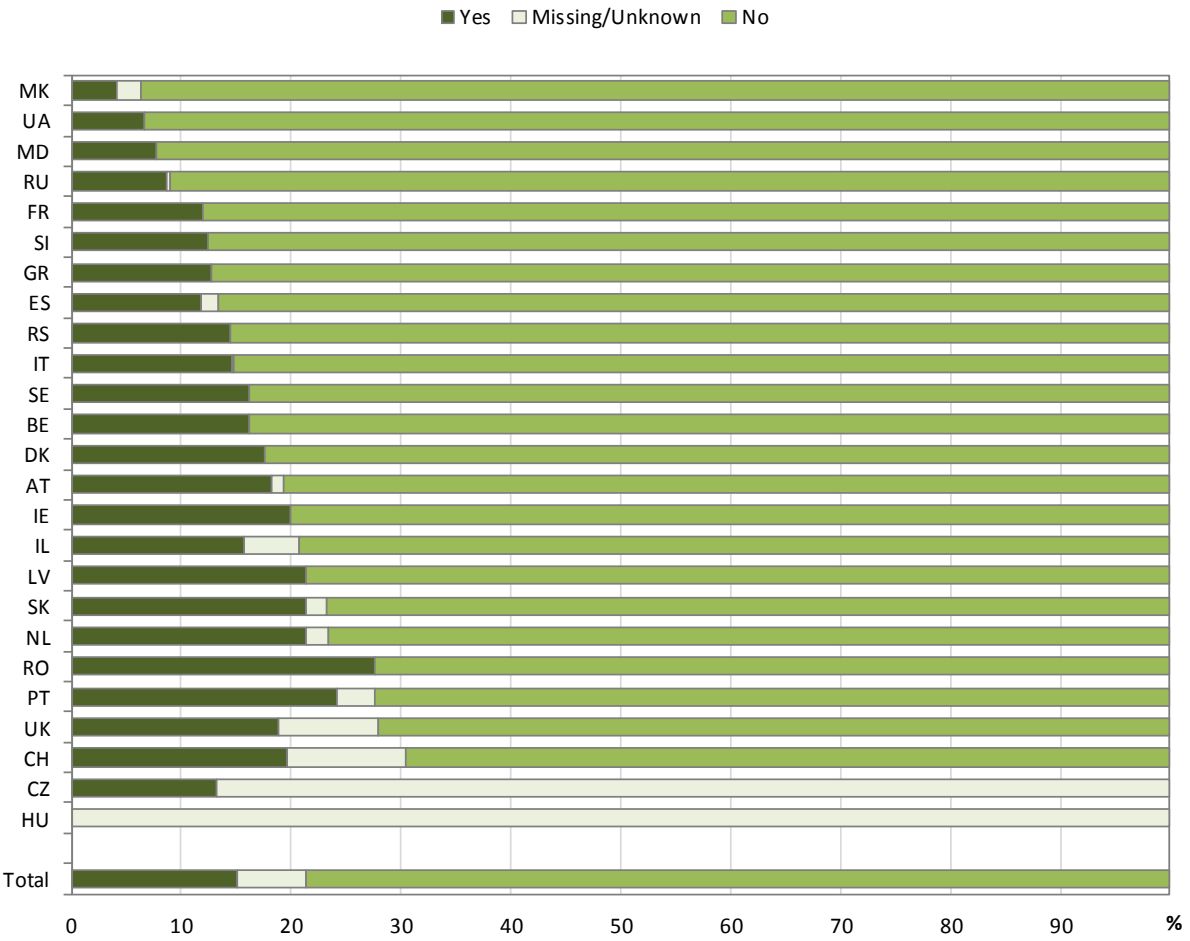
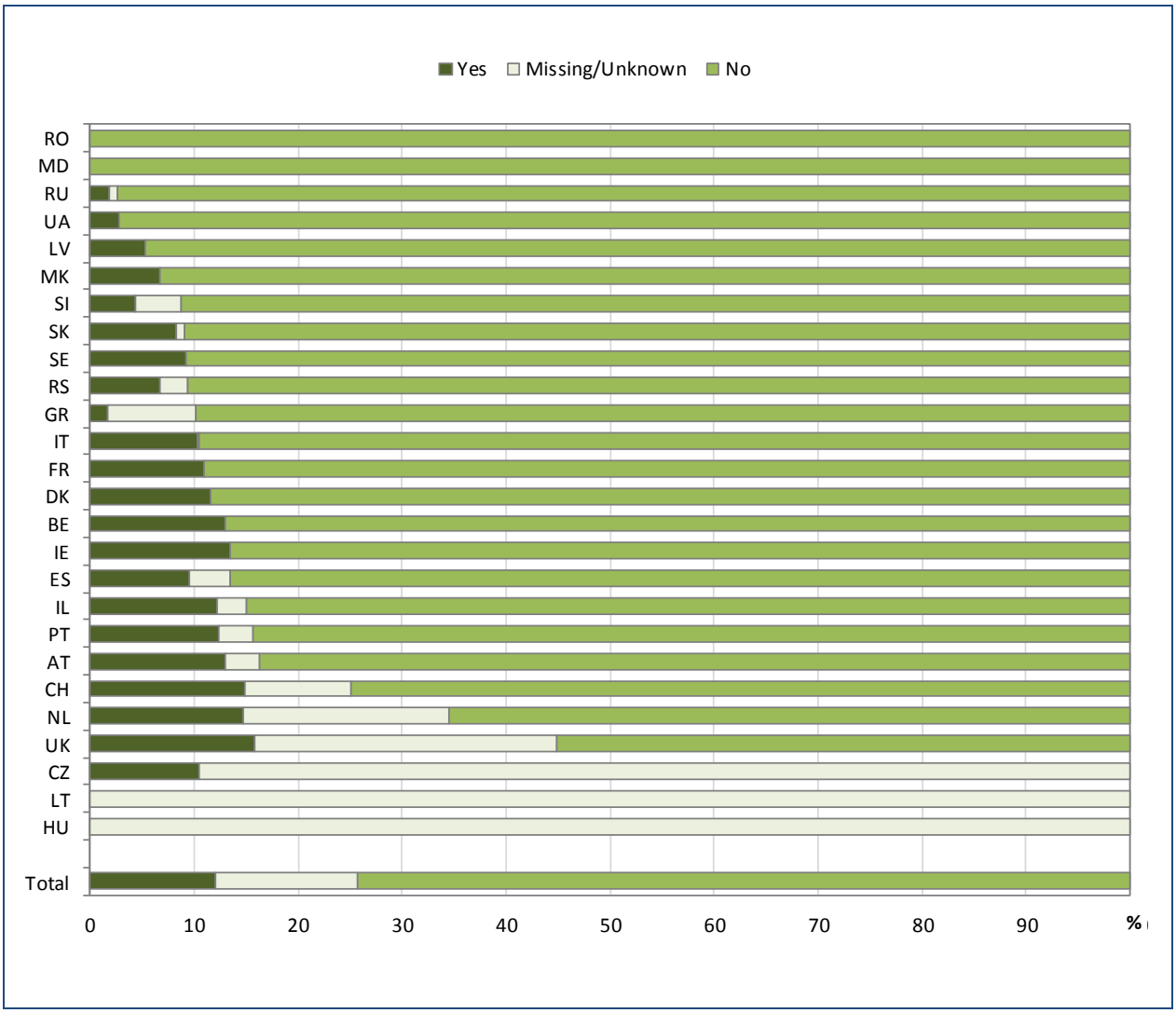


Figure 2.5 Patients with meconium ileus, by country and overall. Patients aged 11 years or older.



These two graphs show the prevalence of meconium ileus at birth (operated or not) 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 patients seen in 2012). The graphs also show that the frequency of reported meconium ileus varies between countries.

3. Genetics

Cystic fibrosis is caused by mutations of the 'CFTR' gene; one on each allele. One is inherited from the mother and one from the father. If both mutations are the same, the person is said to be homozygous for this mutation. If these are two different mutations, the person is said to be heterozygous.

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 identified as a known mutation, renamed. Although there are different naming conventions for mutations, we use the original mutation name (legacy name) in this report, since more than 90% of the mutations in the database use this nomenclature.

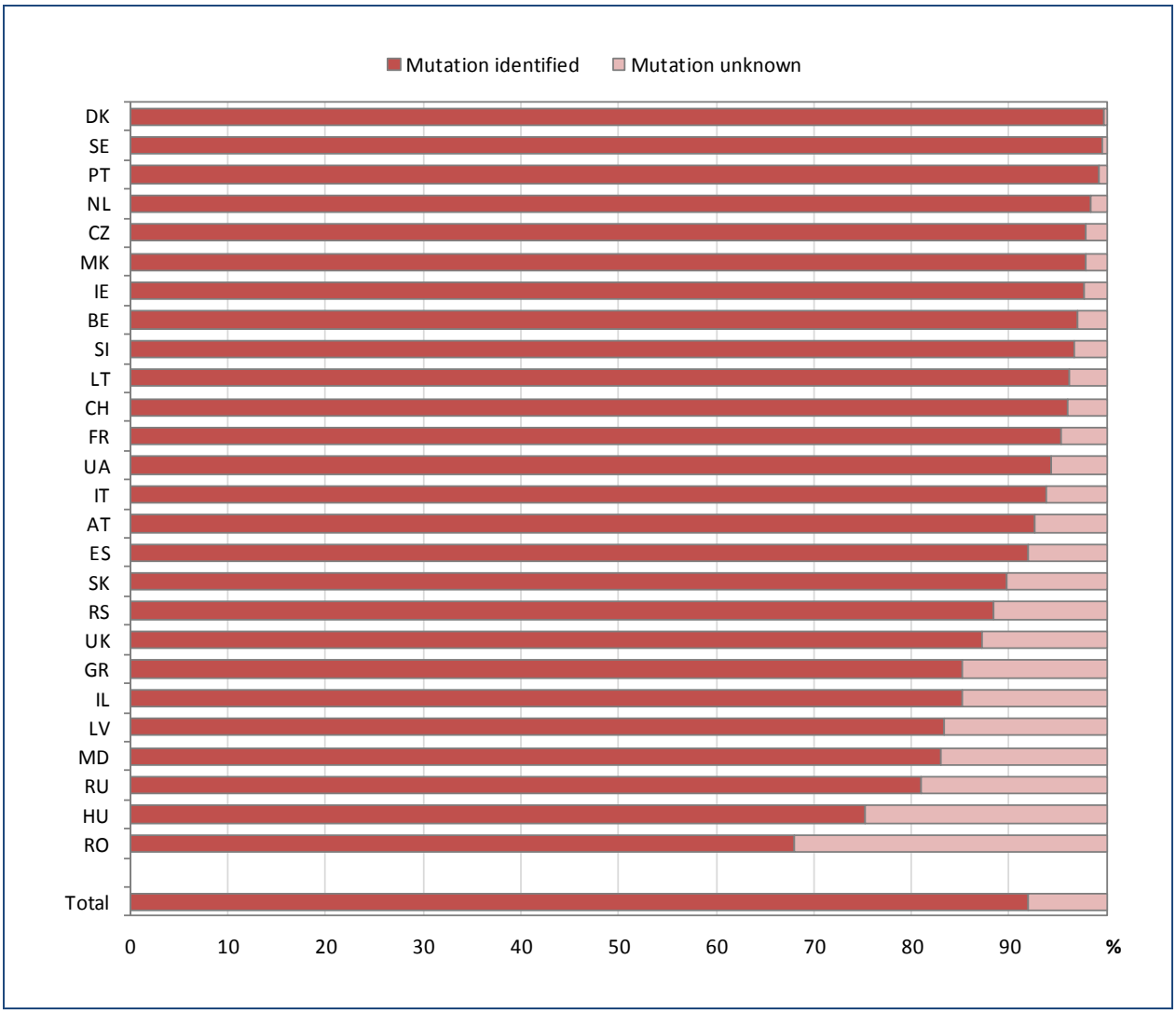
If DNA analysis to look for CFTR mutations had never been carried out, we asked the countries to report "not done" in the genotype field. If DNA analysis was done, but only one or no mutations were found, we asked the countries to use "unknown" for the unidentified mutations. Please note that there are 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 2012.

Country	N	Genotyping			Among genotyping done	
		not done	done	unknown	two mutations identified	at least one mutation unknown
		number (%)	number (%)	number (%)	number (%)	number (%)
Austria	523	2 (0.38)	521 (99.62)	0 (0)	465 (89.25)	56 (10.75)
Belgium	1153	0 (0)	1153 (100)	0 (0)	1100 (95.40)	53 (4.60)
Czech Republic	570	0 (0)	570 (100)	0 (0)	553 (97.02)	17 (2.98)
Denmark	449	0 (0)	449 (100)	0 (0)	448 (99.78)	1 (0.22)
France	6158	0 (0)	6158 (100)	0 (0)	5792 (94.06)	366 (5.94)
Greece	102	0 (0)	102 (100)	0 (0)	76 (74.51)	26 (25.49)
Hungary	526	3 (0.57)	523 (99.43)	0 (0)	339 (64.82)	184 (35.18)
Ireland	1066	11 (1.03)	1055 (98.97)	0 (0)	1017 (96.40)	38 (3.60)
Israel	533	1 (0.19)	532 (99.81)	0 (0)	430 (80.83)	102 (19.17)
Italy	4688	41 (0.87)	4647 (99.13)	0 (0)	4154 (89.39)	493 (10.61)
Latvia	33	0 (0)	33 (100)	0 (0)	22 (66.67)	11 (33.33)
Lithuania	13	0 (0)	13 (100)	0 (0)	12 (92.31)	1 (7.69)
Rep of Macedonia	93	0 (0)	93 (100)	0 (0)	90 (96.77)	3 (3.23)
Rep of Moldova	59	0 (0)	59 (100)	0 (0)	43 (72.88)	16 (27.12)
The Netherlands	1277	32 (2.51)	1245 (97.49)	0 (0)	1209 (97.11)	36 (2.89)
Portugal	119	0 (0)	119 (100)	0 (0)	117 (98.32)	2 (1.68)
Romania	36	0 (0)	36 (100)	0 (0)	21 (58.33)	15 (41.67)
Russian Federation	1274	114 (8.95)	1160 (91.05)	0 (0)	822 (70.86)	338 (29.14)
Serbia	144	5 (3.47)	139 (96.53)	0 (0)	111 (79.86)	28 (20.14)
Slovak Republic	200	0 (0)	200 (100)	0 (0)	166 (83.00)	34 (17.00)
Slovenia	78	2 (2.56)	76 (97.44)	0 (0)	72 (94.74)	4 (5.26)
Spain	1205	3 (0.25)	1202 (99.75)	0 (0)	1041 (86.61)	161 (13.39)
Sweden	590	0 (0)	590 (100)	0 (0)	585 (99.15)	5 (0.85)
Switzerland	626	7 (1.12)	618 (98.72)	1 (0.16)	576 (93.20)	42 (6.80)
Ukraine	98	0 (0)	98 (100)	0 (0)	87 (88.78)	11 (11.22)
United Kingdom	8789	331 (3.77)	8458 (96.23)	0 (0)	6570 (77.68)	1888 (22.32)
Total	30402	552 (1.82)	29849(98.18)	1 (0)	25918 (86.83)	3931 (13.17)

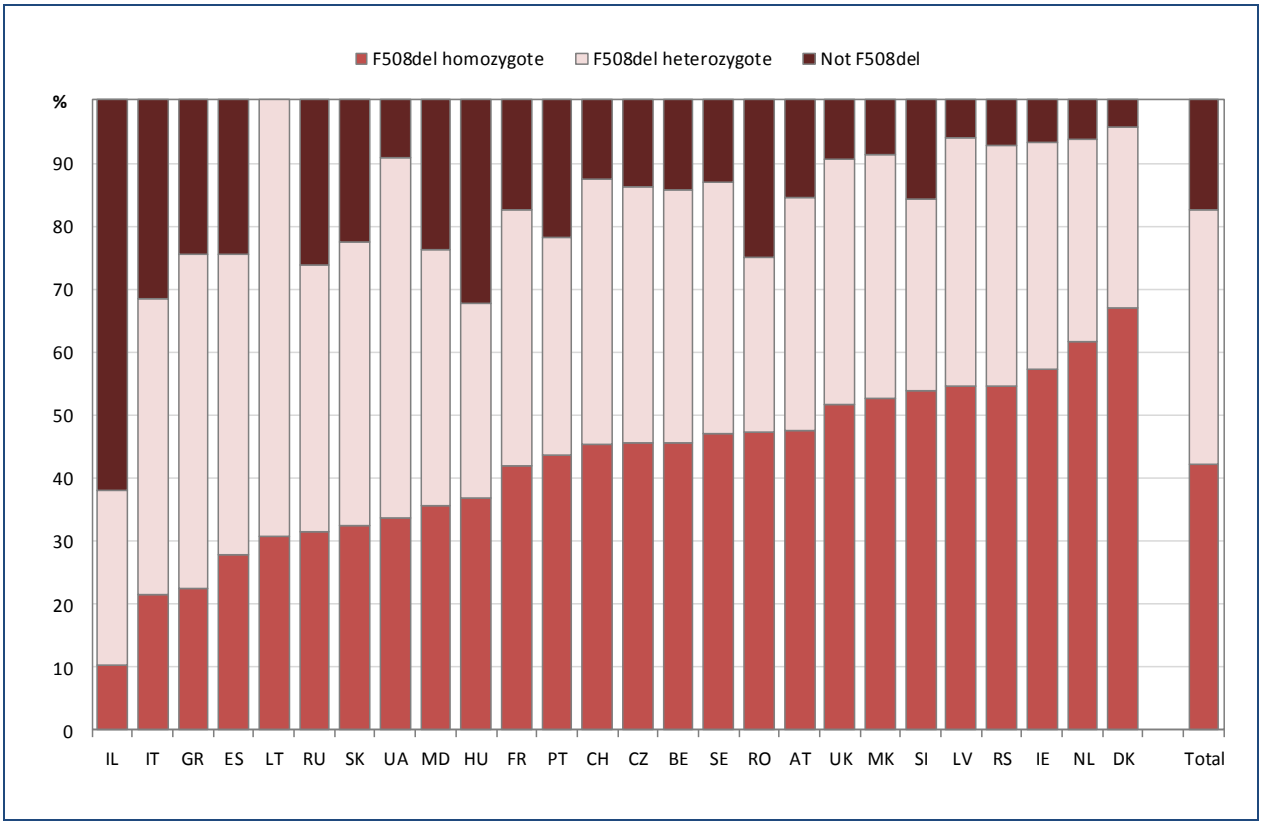
The table shows how many patients underwent DNA analysis to identify the CFTR mutations (column “genotyping done”) and, for those patients, how many patients had both mutations identified (column “two mutations identified”) and for how many one or both mutations remained unidentified (column “at least 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 remain unidentified (unknown in light pink) after DNA analysis, by country and overall. One “allele” means one of the two CFTR genes. The number of un-identified alleles varies greatly from country to country; this is partly due to the different approaches to DNA testing. Overall, almost 10% of mutations remain unidentified after DNA analysis, leaving 13.17% of the patients with at least one mutation unidentified.

Figure 3.2 Prevalence of F508del homozygous and heterozygous patients, by country and overall. All patients seen in 2012.



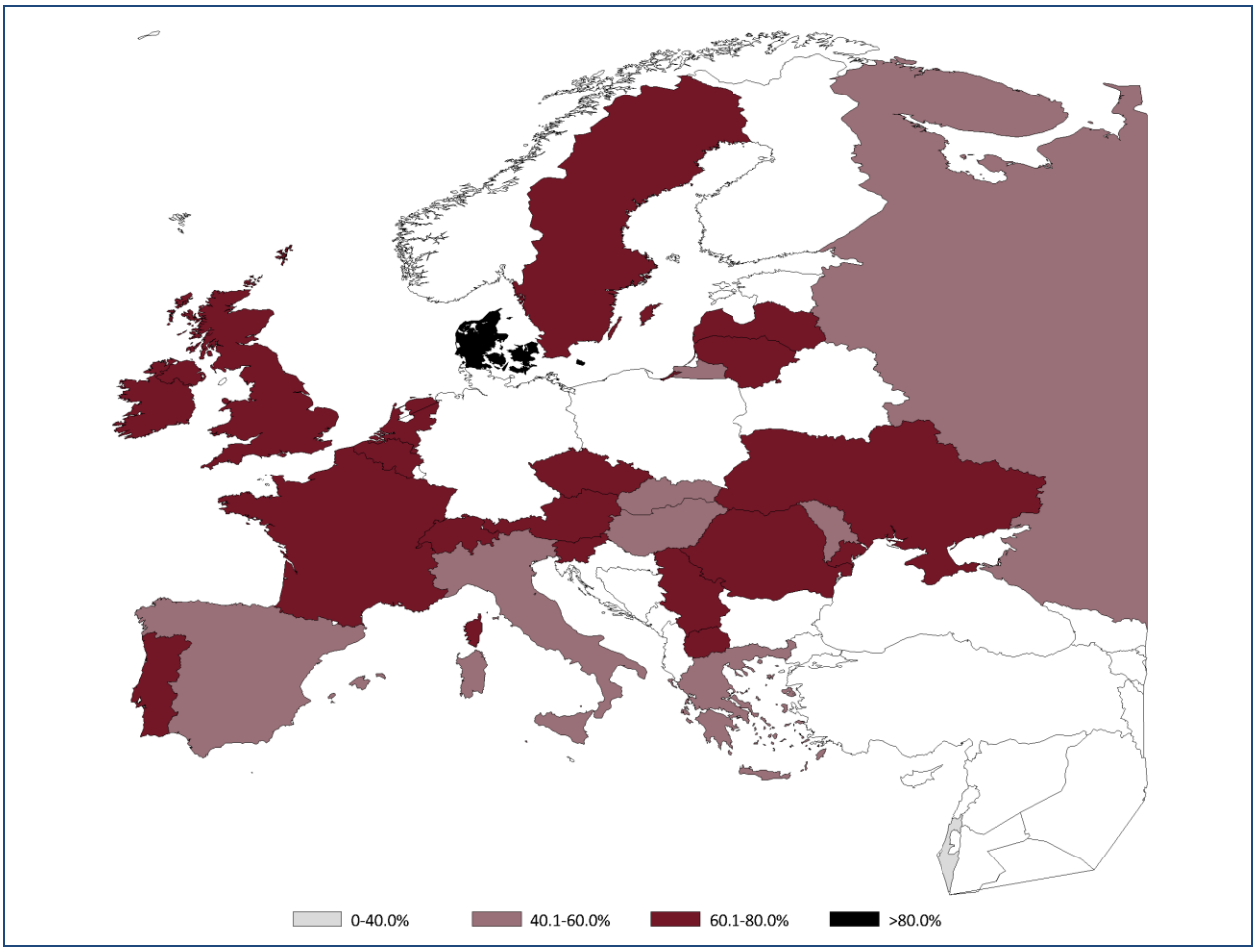
F508del is the name of the most commonly occurring CFTR mutation in the world. Patients who carry two F508del mutations are often described as having “classic CF”, but other combinations of mutations may cause the same degree of disease. We have grouped the patients in F508del homozygous (have two F508del mutations), F508del heterozygous (have one F508del mutation and another mutation, different from F508del), and patients without F508del mutations. Only patients for whom the genotype is known 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 15 most common mutations in the ECFSPR database.

Mutation name	Number of alleles	Percentage among tested	Country with highest allele frequency
F508del	37202	62.32	Denmark (81.40%)
G542X	1681	2.82	Greece (7.35%)
N1303K	1281	2.15	Italy (5.70%)
G551D	825	1.38	Ireland (7.87%)
W1282X	686	1.15	Israel (23.59%)
R117H	656	1.10	Ireland (2.46%)
2789+5G->A	578	0.97	Moldova (3.39%)
1717-1G->A	564	0.94	Switzerland (2.67%)
3849+10kbC->T	458	0.77	Lithuania (15.38%)
R553X	448	0.75	Lithuania (7.69%)
621+1G->T	355	0.59	Greece (9.31%)
2183AA->G	350	0.59	Italy (2.11%)
R1162X	346	0.58	Slovenia (5.26%)
CFTRdele2,3	313	0.52	Russian Federation (6.12%)
G85E	301	0.50	Portugal (4.20%)

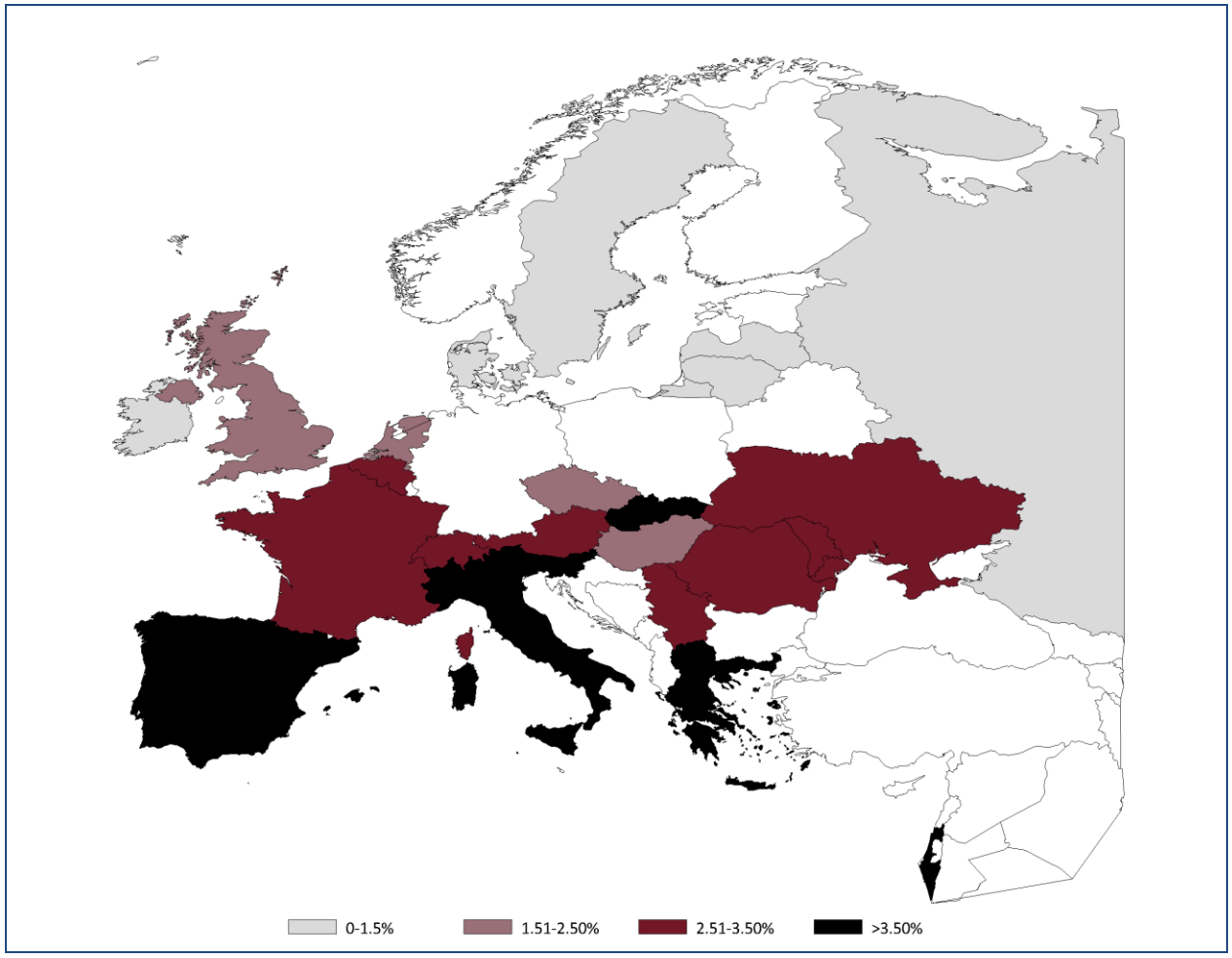
This table presents the allele frequency of the 15 most commonly occurring mutations found in the ECFSPR database. In the last column the country in which this particular mutation is most frequent is reported. F508del is by far the most frequent mutation. Additionally, since F508del is included in all genetic screening tests, this is also the mutation with the highest detection rate.

Figure 3.3 Geographical distribution of mutation F508del.



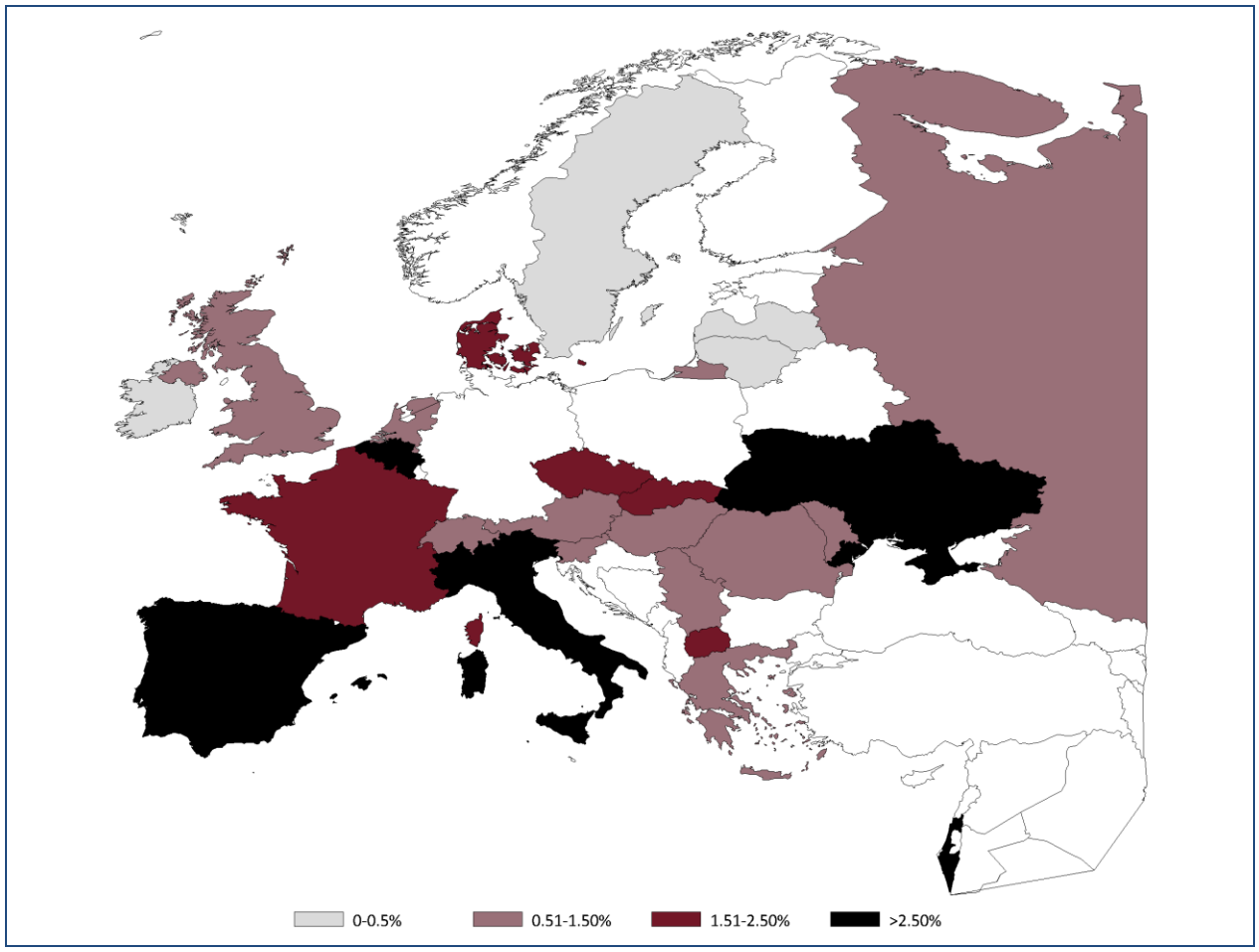
Although this mutation is the most common in all countries, the allele frequency still varies from 24.15% in Israel to 81.40% in Denmark.

Figure 3.4 Geographical distribution of mutation G542X.



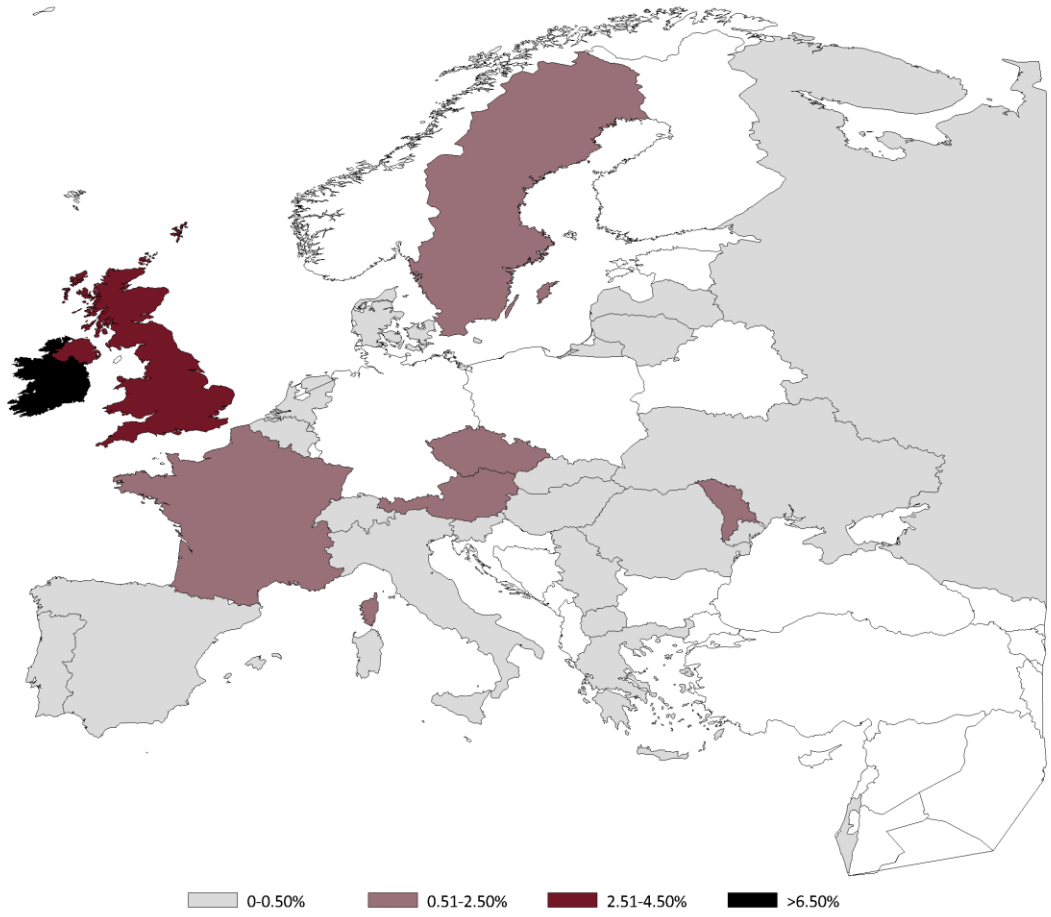
This mutation is most frequent in Southern Europe, with the highest allele frequency being in Greece (7.92%), whereas it is very rarely found in Scandinavia (0.81% in Denmark and 0.60% in Sweden), Latvia (0.0%) and Lithuania.

Figure 3.5 Geographical distribution of mutation N1303K.



This mutation is most frequent in Italy (5.70%) and other countries in Southern Europe as well as in Eastern Europe, but rare in Northern Europe.

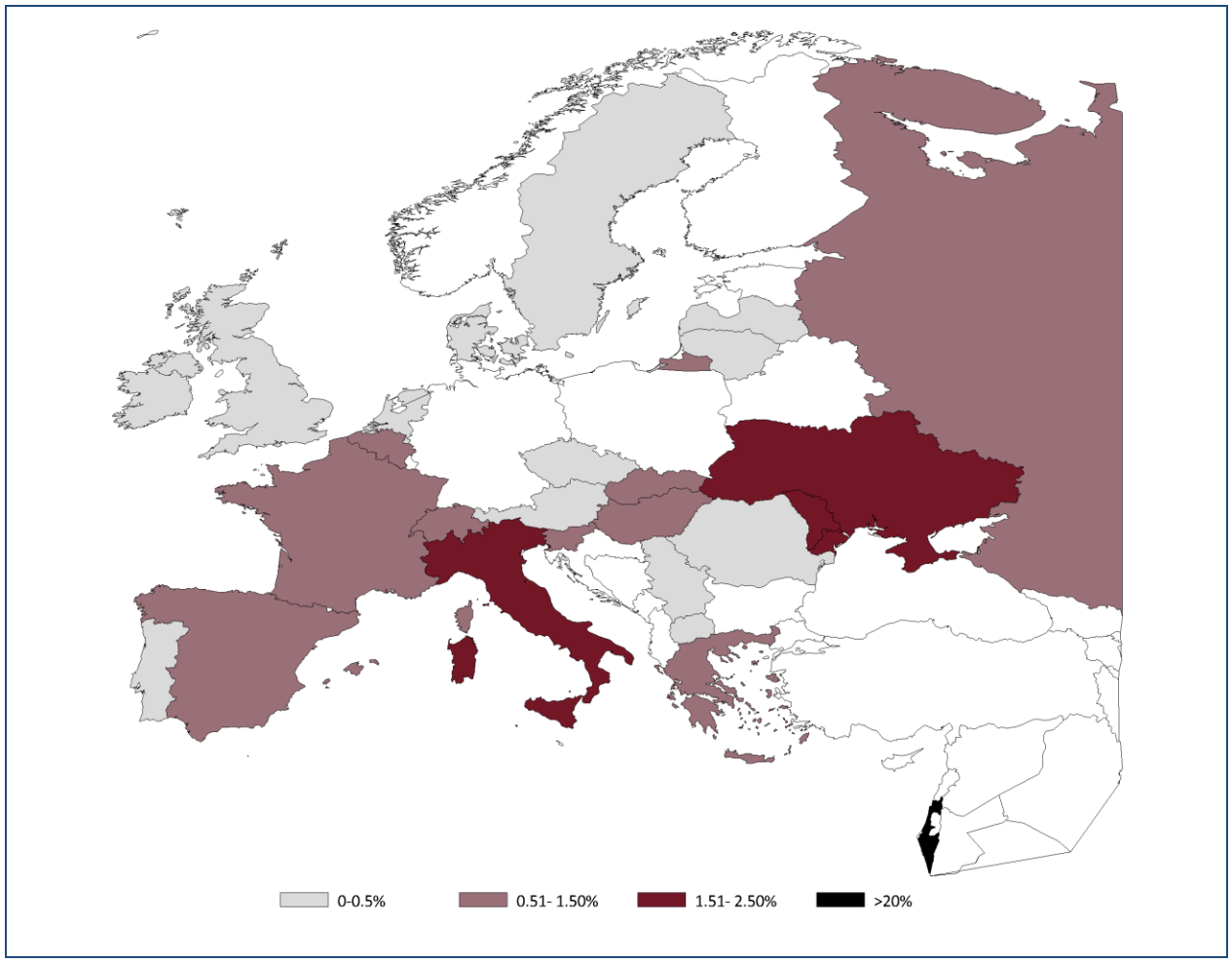
Figure 3.6 Geographical distribution of mutation G551D.



Note: Israel: G551D was not in the mutation panel for 2012, therefore the prevalence is unknown.

This mutation is most frequent in Ireland (7.87%), whereas it is very rare in Southern Europe (less than 0.5%).

Figure 3.7 Geographical distribution of mutation W1282X.



This mutation, of Middle-Eastern origin, is by far most frequent in Israel (23.59%) with a very high allele frequency in Ashkenazi Jews.

4. Lung function

FEV_1 is measured in litres but it is normally expressed as a percentage of the expected value (FEV_1%). The expected value is based on values of healthy individuals of the same sex, height and age, 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, page 118, for full reference). An FEV_1% of 100 means that the lung function is equal to the mean lung function of people of the same age, sex and height in the healthy reference population.

Spirometry, the test that measures FEV_1, requires a certain amount of coordination, and usually cannot be performed until a person with CF is about six years old. We have therefore computed FEV_1% values only for patients aged 6 years or older.

We asked the countries to report the best FEV_1 recorded in the year (according to the FEV_1% computed at the CF centres). A few national registries do not record the best value but other FEV_1 values, not necessarily the patient's best value of the year, so a footnote has been added to the tables and graphs describing which FEV_1 was reported by those countries. Others try to align with the ECFSPR, for example France, that since 2011 reports the best FEV_1 of the year instead of the last.

Research has shown that when comparing groups of patients, the difference between the best FEV_1% 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, since lung function in CF deteriorates with age, differences in FEV_1 may reflect an older CF population in a particular country.

We excluded from the analyses on FEV_1 patients who have had one or more lung transplants, since their lung function does not reflect the severity of their CF lung disease.

[1] Wanyama et al, JCF 2013; 9, S1:428

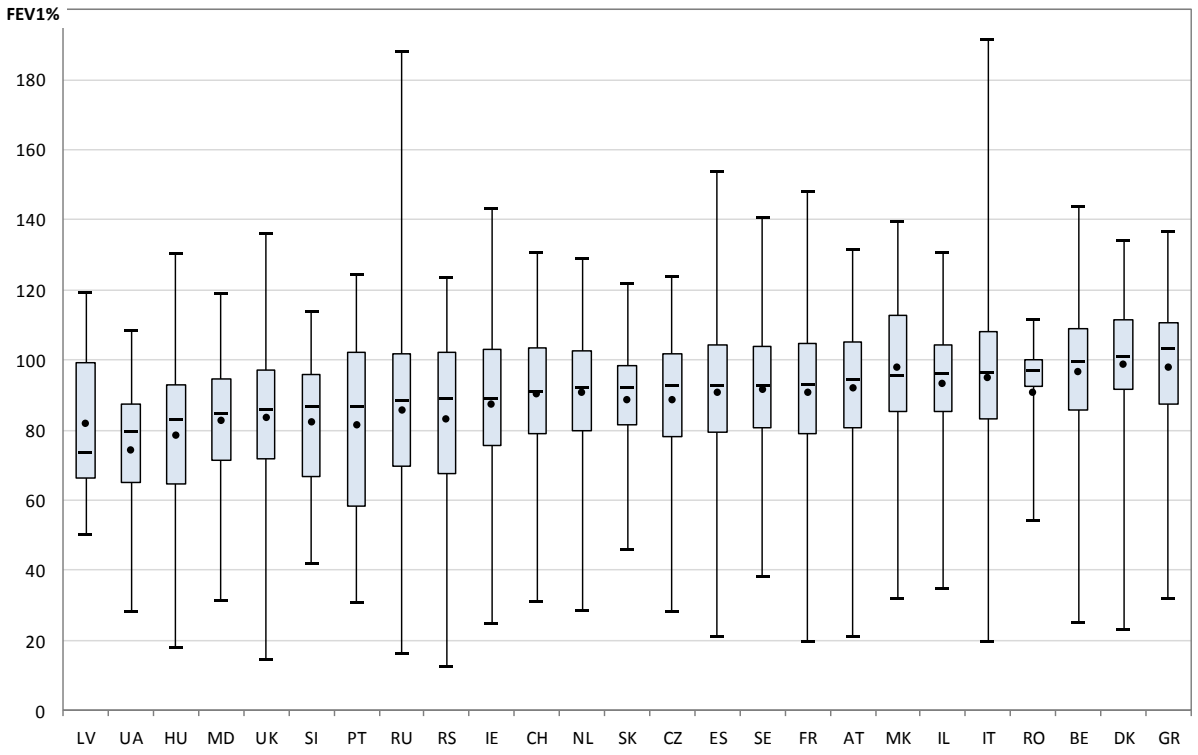
Table 4.1 FEV_1% of predicted: descriptive statistics, by country. Patients aged 6-17 years who have never had a lung transplant.

Country	N	N Miss	Mean (average FEV_1%)	Min	25th pctl (25% of patients have FEV_1% below this value)	Median (50% of patients have FEV_1% below this value)	75th pctl (75% of patients have FEV_1% below this value)	Max
Austria	231	2	91.7	20.9	80.6	94.4	105.1	131.5
Belgium	382	5	96.5	25.2	85.8	99.4	108.9	143.6
Czech Republic	179	32	88.6	28.3	78.3	92.5	101.6	123.8
Denmark	141	3	98.6	22.9	91.6	101.3	111.5	134.0
France	1943	153	90.5	19.8	79.0	93.2	104.8	148.0
Greece	45	0	97.6	32.0	87.6	103.3	110.6	136.6
Hungary	180	41	78.5	17.8	64.7	83.2	93.0	130.1
Ireland	303	45	87.4	24.7	75.7	89.0	103.1	143.4
Israel	176	3	93.3	34.7	85.3	95.9	104.2	130.8
Italy	895	195	94.7	19.7	83.1	96.4	108.3	191.6
Latvia	<10	0	81.8	49.9	66.5	73.8	99.2	119.5
Rep of Macedonia	49	2	97.6	32.1	85.3	95.5	112.8	139.4
Rep of Moldova	18	2	82.4	31.4	71.5	84.8	94.7	119.0
The Netherlands	406	8	90.7	28.6	79.9	92.1	102.8	129.2
Portugal	27	7	81.5	30.7	58.4	87.0	102.4	124.2
Romania	18	0	90.6	54.4	92.5	97.0	99.9	111.9
Russian Federation	296	175	85.5	16.5	69.9	88.5	101.8	188.1
Serbia	65	2	83.2	12.6	67.4	88.8	102.3	123.7
Slovak Republic	40	0	88.4	46.0	81.4	92.3	98.3	122.0
Slovenia	38	0	82.0	41.9	66.7	86.7	96.0	114.0
Spain	407	8	90.4	21.0	79.5	92.6	104.3	153.8
Sweden[1]	153	11	91.3	38.4	80.6	92.6	104.1	140.9
Switzerland	226	10	90.2	31.2	79.0	91.0	103.4	130.6
Ukraine	47	5	74.1	28.3	64.9	79.5	87.6	108.5
United Kingdom[2]	2625	159	83.4	14.7	71.8	85.9	97.3	136.0

[1] Sweden reports FEV_1 collected at the date of the patient's annual review.
[2] United Kingdom reports FEV_1 collected at the date of the patient's annual review. All analyses of FEV_1 in the UK 2012 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

This table shows some descriptive statistics for FEV_1 in children, expressed as % of predicted. Note that transplanted patients and children below 6 years of age have been excluded from the analyses.

Figure 4.1 FEV_1% of predicted: box-plot, by country and overall. Patients aged 6-17 years who have never had a lung transplant.



Note: Sweden reports FEV_1 collected at the date of the patient's annual review.
United Kingdom reports FEV_1 collected at the date of the patient's annual review. All analyses of FEV_1 in the UK 2012 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

This box-plot is a graphic representation of the FEV_1 in children, expressed as a % of predicted, detailed in table 4.1. 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.

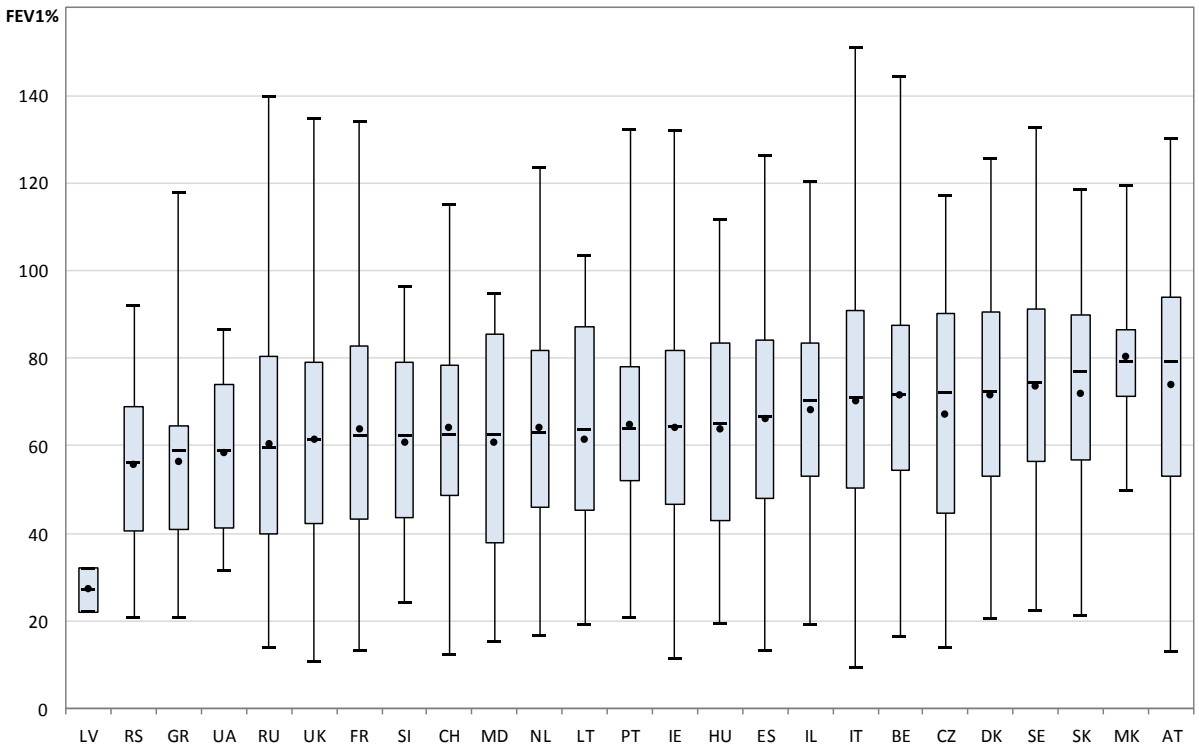
Table 4.2 FEV_1% of predicted: descriptive statistics, by country. Patients aged 18 years or older who have never had a lung transplant.

Country	N	N Miss	Mean (average FEV_1%)	Min	25th pctl (25% of patients have FEV_1% below this value)	Median (50% of patients have FEV_1% below this value)	75th pctl (75% of patients have FEV_1% below this value)	Max
Austria	170	3	73.7	12.9	53.2	79.2	93.9	130.1
Belgium	479	6	71.5	16.3	54.4	71.8	87.6	144.3
Czech Republic	107	81	67.1	14.2	44.5	72.0	90.2	116.9
Denmark	218	1	71.5	20.5	52.9	72.5	90.6	125.4
France	2330	46	63.8	13.4	43.4	62.2	82.9	133.8
Greece	32	0	56.4	20.9	40.8	58.9	64.4	117.7
Hungary	136	28	63.8	19.5	43.0	64.9	83.4	111.7
Ireland	277	122	64.2	11.4	46.7	64.4	81.7	131.9
Israel	266	0	68.2	19.0	52.9	70.3	83.6	120.5
Italy	1506	244	70.2	9.3	50.2	71.1	90.9	150.7
Latvia	<10	0	27.1	22.1	22.1	27.1	32.1	32.1
Lithuania	13	0	61.2	19.2	45.2	63.7	87.3	103.6
Rep of Macedonia	18	0	80.4	50.0	71.4	79.1	86.6	119.4
Rep of Moldova	12	0	60.8	15.4	38.0	62.7	85.4	94.6
The Netherlands	587	9	64.1	16.9	46.0	62.9	81.9	123.5
Portugal	56	0	64.7	20.9	52.1	64.1	78.1	132.4
Russian Federation	243	47	60.4	14.2	39.9	59.7	80.4	139.6
Serbia	36	0	55.5	20.9	40.4	56.4	68.8	91.9
Slovak Republic	101	0	71.8	21.3	56.8	76.7	89.9	118.4
Slovenia	17	0	60.7	24.1	43.5	62.5	79.2	96.5
Spain	406	12	66.2	13.4	48.1	66.6	84.0	126.2
Sweden[1]	284	11	73.4	22.4	56.5	74.6	91.3	132.6
Switzerland	225	4	63.9	12.2	48.8	62.7	78.4	114.9
Ukraine	<10	1	58.4	31.6	41.2	59.0	74.0	86.7
United Kingdom[2]	4052	193	61.4	10.8	42.3	61.4	79.1	134.6

[1] Sweden reports FEV_1 collected at the date of the patient's annual review.
[2] United Kingdom reports FEV_1 collected at the date of the patient's annual review. All analyses of FEV_1 in the UK 2012 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

This table shows some descriptive statistics for FEV_1 in adults, expressed as a % of predicted. Note that transplanted patients have been excluded from the analyses.

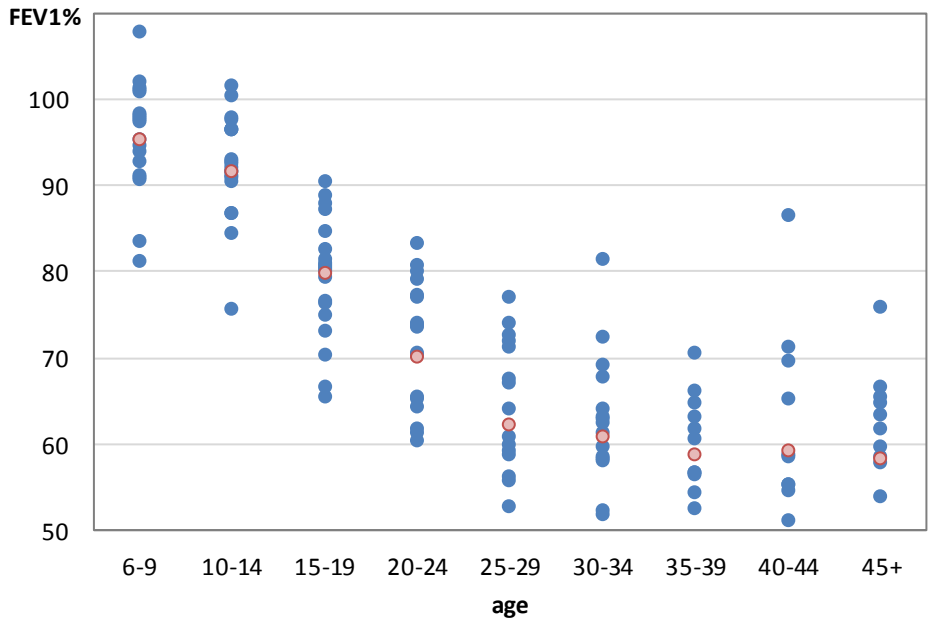
Figure 4.2 FEV_1% of predicted: box-plot, by country and overall. Patients aged 18 years or older who have never had a lung transplant.



Note: Sweden reports FEV_1 collected at the date of the patient's annual review.
United Kingdom reports FEV_1 collected at the date of the patient's annual review. All analyses of FEV_1 in the UK 2012 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

This box-plot is a graphic representation of the FEV_1 in adults, expressed as % of predicted detailed in table 4.2. 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.

Figure 4.3 Median FEV_1% 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 with <10 patients.
Note: Not all the countries reported the best FEV_1 value of the year (see tables 4.1 and 4.2).

This graph shows the median FEV_1% (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_1% slowly decreases until the age of 35-39, 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 FEV_1% of predicted: descriptive statistics by age group (patients aged 6 years or older) who have never had a lung transplant.

Age at FEV_1 measurement	N	N Miss	Mean	Min	25th pctl	Median	75th pctl	Max
6-9	2855	409	94.3	17.8	84.3	95.5	105.9	188.1
10-14	3752	289	89.5	16.5	78.0	91.8	103.2	191.6
15-19	3682	267	77.1	12.6	62.1	79.9	93.4	148.0
20-24	3232	266	68.0	15.2	49.2	70.1	86.4	138.9
25-29	2374	164	63.3	9.3	44.1	62.3	81.2	133.7
30-34	1681	108	61.8	10.8	42.3	60.9	78.8	144.3
35-39	1109	74	60.4	12.2	41.3	58.8	77.3	132.5
40-44	752	41	60.8	12.2	41.4	59.2	78.2	127.5
45+	1039	58	61.0	13.0	41.3	58.4	79.9	150.7

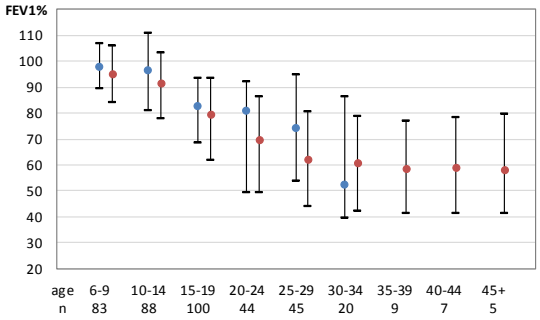
Note: not every country reported the best FEV_1 value of the year (see tables 4.1 and 4.2).

This table shows FEV_1% by age group for the total data set. The median values reported in this table are shown as red dots in fig 4.3.

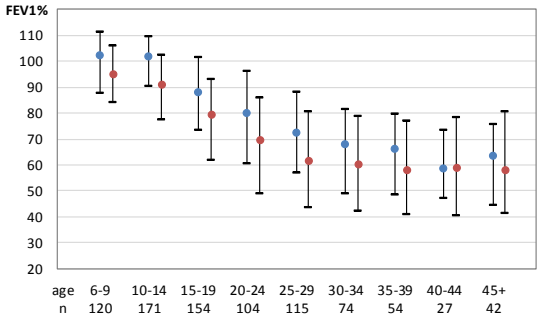
Figure 4.4 Quartiles of FEV$_1$% of predicted by age group and by country. Patients aged 6 years or older and who have never had a lung transplant.

The figures below show, for each country, the FEV$_1$% for different age groups. 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 the pooled quartiles computed on all other countries (i.e. excluding that country). We did not compute quartiles where there are <10 patients in an age group, so there are no blue dots for those age groups (the number of patients in each age group is shown below the horizontal axis). We therefore excluded Latvia, Lithuania and the Republic of Moldova from the graphs because none of the age groups had more than 10 patients.

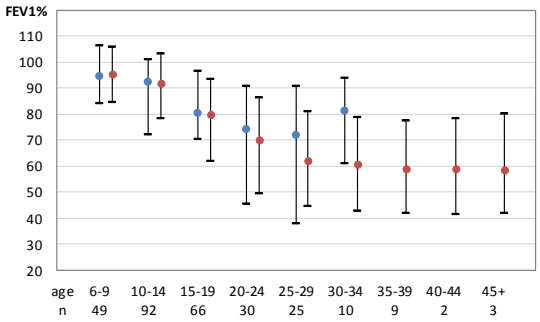
Quartiles of FEV$_1$%: Austria



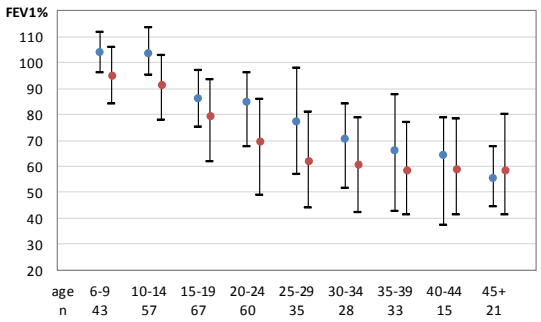
Quartiles of FEV$_1$%: Belgium



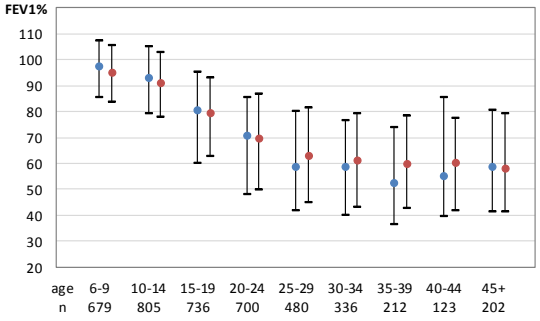
Quartiles of FEV$_1$%: Czech Republic



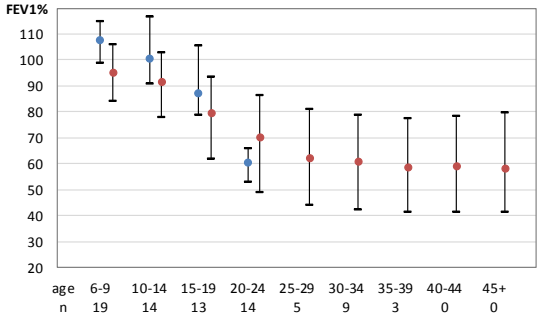
Quartiles of FEV$_1$%: Denmark



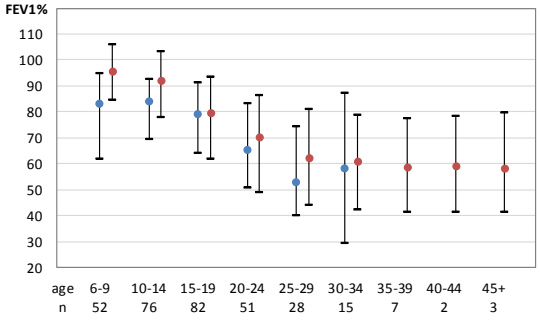
Quartiles of FEV$_1$%: France



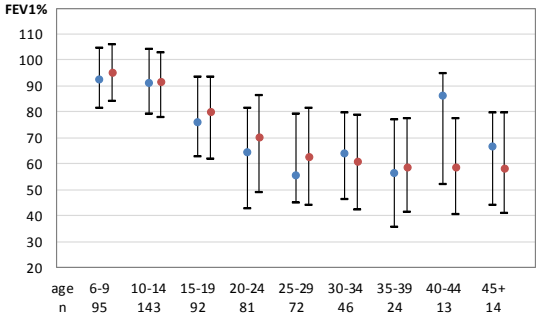
Quartiles of FEV$_1$%: Greece



Quartiles of FEV$_1$%: Hungary

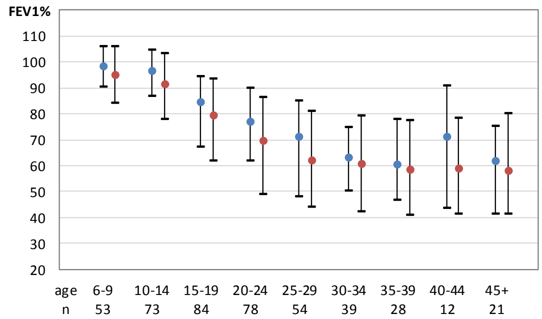


Quartiles of FEV$_1$%: Ireland

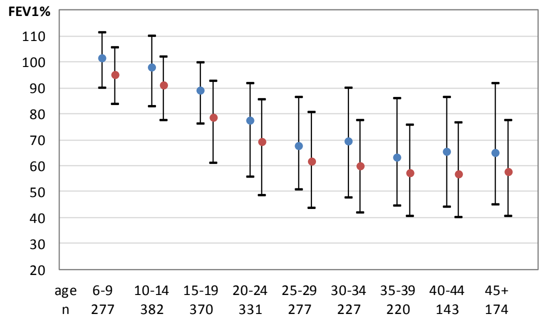


[figure 4.4 continued]

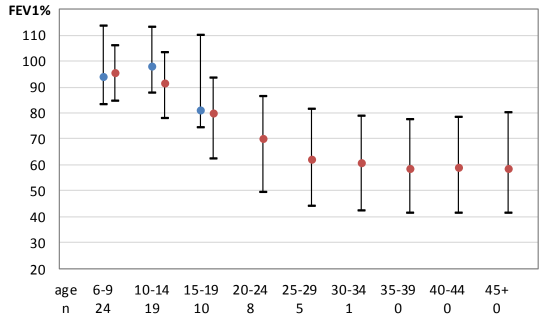
Quartiles of FEV₁%: Israel



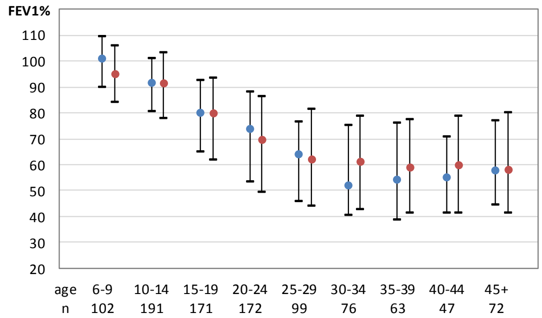
Quartiles of FEV₁%: Italy



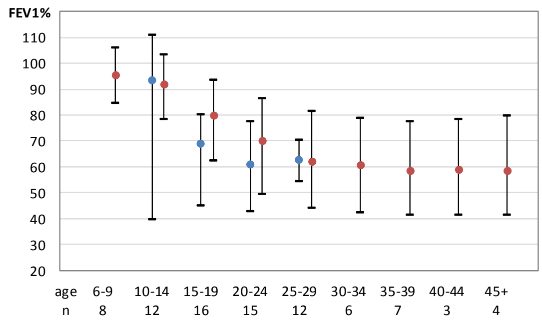
Quartiles of FEV₁%: Rep of Macedonia



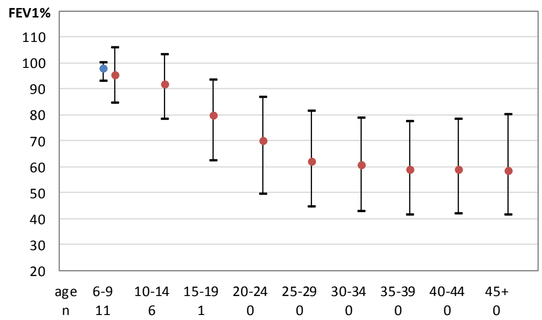
Quartiles of FEV₁%: The Netherlands



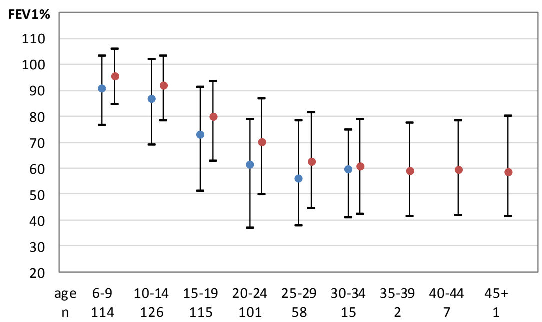
Quartiles of FEV₁%: Portugal



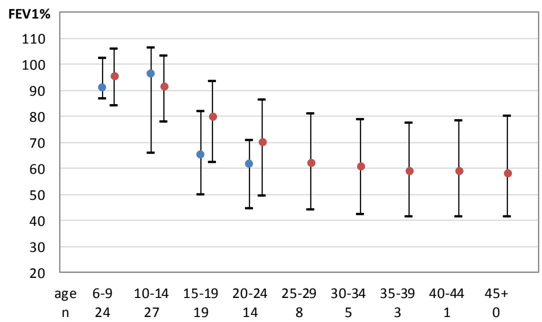
Quartiles of FEV₁%: Romania



Quartiles of FEV1%: Russian Federation

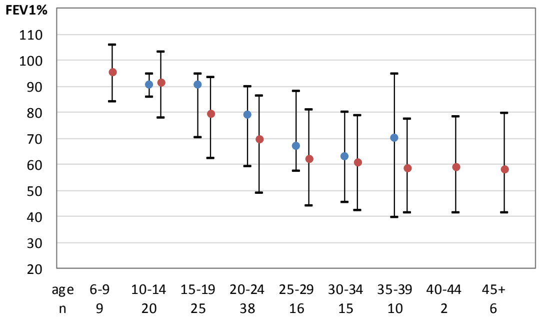


Quartiles of FEV1%: Serbia

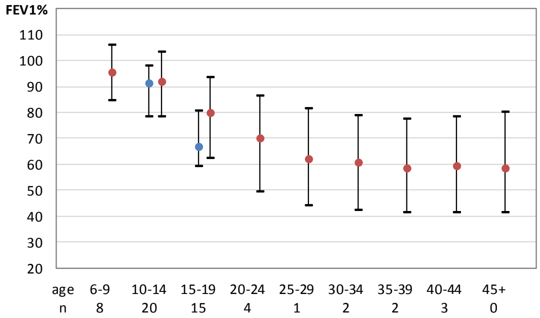


[figure 4.4 continued]

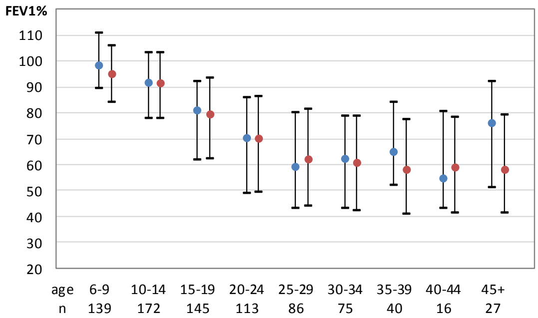
Quartiles of FEV_1%: Slovak Republic



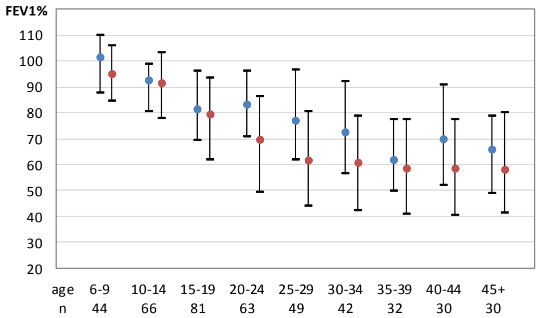
Quartiles of FEV_1%: Slovenia



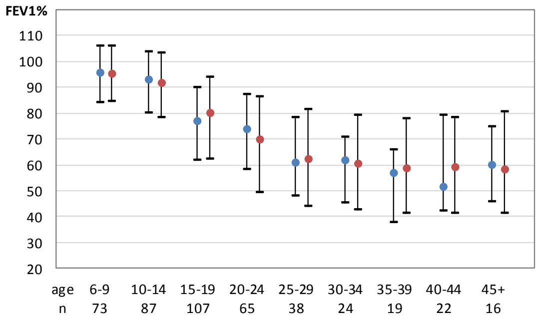
Quartiles of FEV_1%: Spain



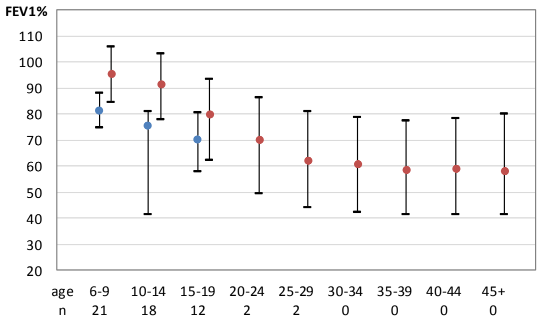
Quartiles of FEV_1%: Sweden[1]



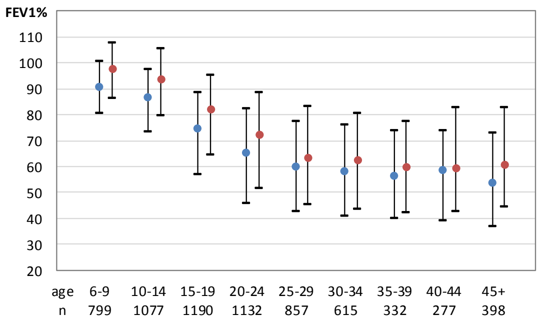
Quartiles of FEV1%: Switzerland



Quartiles of FEV1%: Ukraine



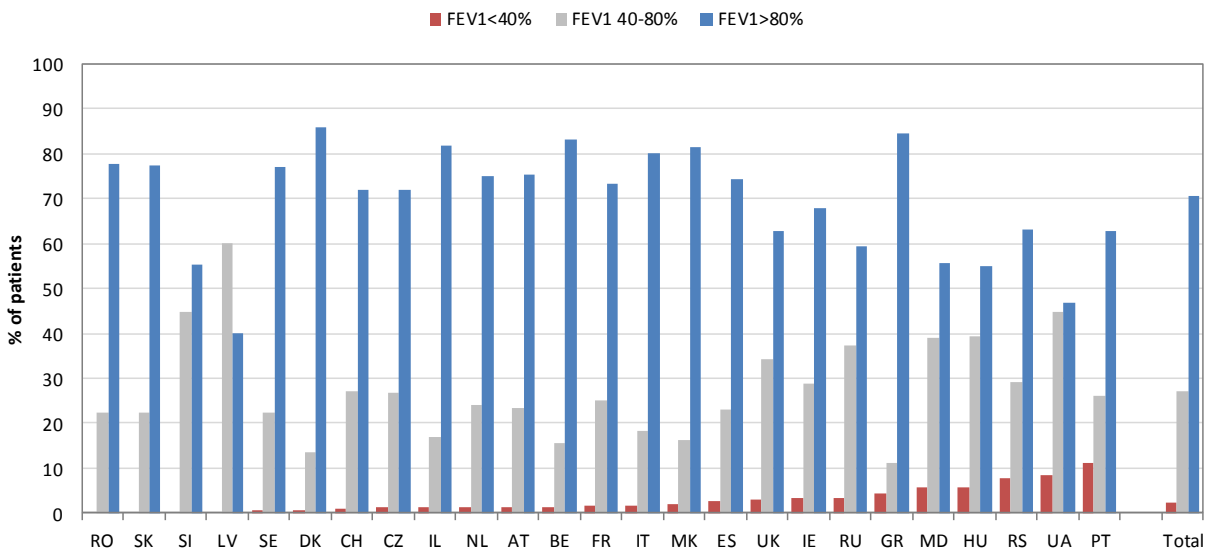
Quartiles of FEV1%: United Kingdom[2]



[1] Sweden reports FEV_1 collected at the date of the patient's annual review.

[2] United Kingdom reports FEV_1 collected at the date of the patient's annual review. All analyses of FEV_1 in the UK 2012 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

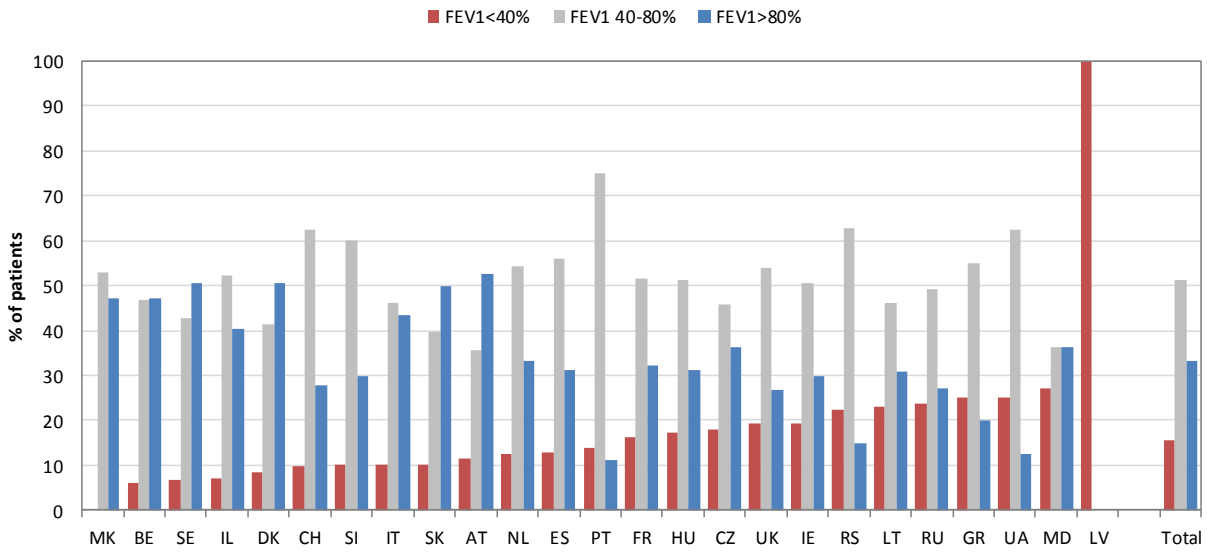
Figure 4.5 FEV_1% of predicted according to severity group and age group, by country and overall. Patients aged 6-17 years who have never had a lung transplant.



Note: Not every country reported the best FEV_1 value of the year.
Sweden reports FEV_1 collected at the date of the patient's annual review.
United Kingdom reports FEV_1 collected at the date of the patient's annual review. All analyses of FEV_1 in the UK 2012 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.
Note: Lithuania has 0% coverage for children.

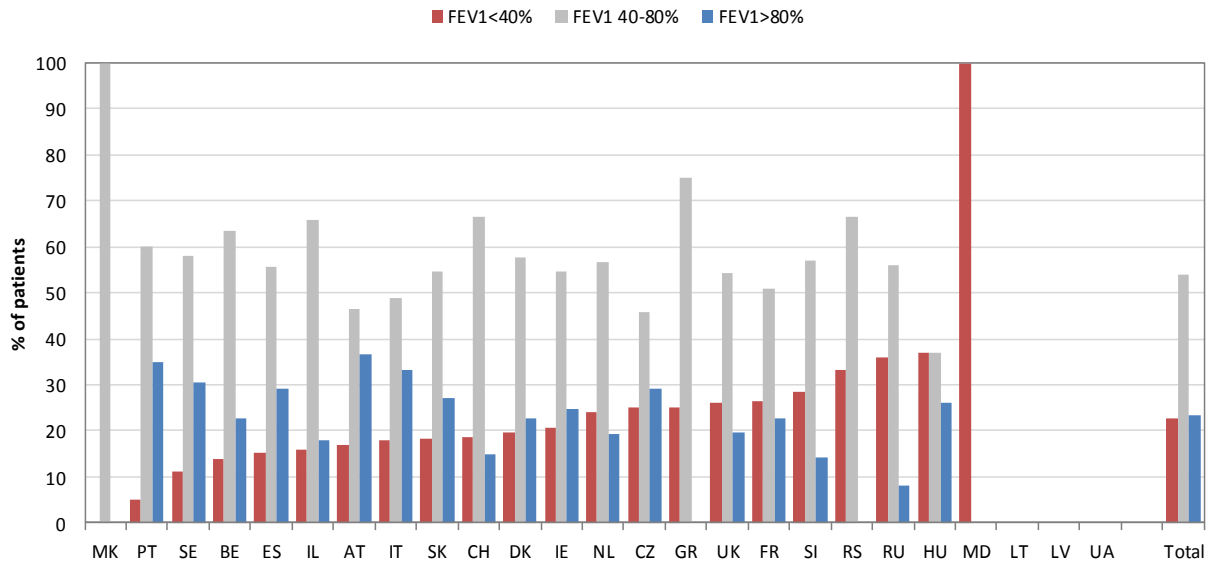
Figures 4.5, 4.6 and 4.7 show the FEV_1% by severity group, by country and overall. Patients with an FEV_1% higher than 80% are generally considered to have mild lung disease, patients with FEV_1% between 80% and 40% moderate lung disease, and patients with FEV_1 <40% severe lung disease. However, since 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 FEV_1%, and the age distribution is not the same in all countries, we have chosen to present children (fig 4.5) and adults (fig 4.6 and 4.7) separately.

Figure 4.6 FEV_1% 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 FEV_1 value of the year.
Sweden reports FEV_1 collected at the date of the patient's annual review;
United Kingdom reports FEV_1 collected at the date of the patient's annual review. All analyses of FEV_1 in the UK 2012 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.
Note: Romania has 0% coverage for adults.
Latvia: only two patients aged 18-29 years.

Figure 4.7 FEV_1% 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: Not every country reported the best FEV_1 value of the year.
Sweden reports FEV_1 collected at the date of the patient's annual review;
United Kingdom reports FEV_1 collected at the date of the patient's annual review. All analyses of FEV_1 in the UK 2012 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.
Note: Romania has 0% coverage for adults.
Rep. of Macedonia and Rep. of Moldova: only one patient aged 30 years or older.

5. Microbiology

We collected 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, page 119) 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.

If differences are considered minor 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 2012, by country.

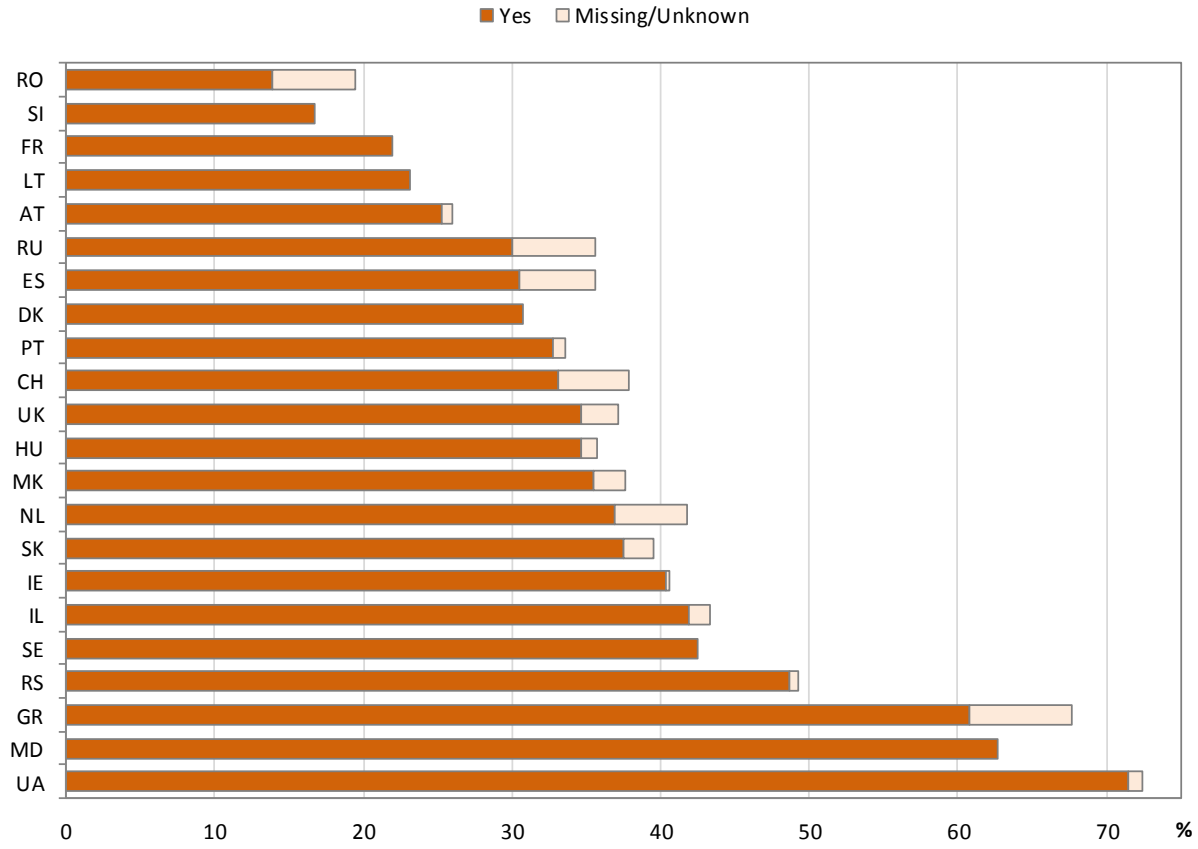
Country	Chronic *Pseudomonas aeruginosa* number (%)			Chronic *Burkholderia cepacia complex species* number (%)			Chronic *Staphylococcus aureus* number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	4 (0.76)	387 (74.00)	132 (25.24)	4 (0.76)	504 (96.37)	15 (2.87)	9 (1.72)	258 (49.33)	256 (48.95)
Belgium[1]	209 (18.13)	668 (57.93)	276 (23.94)	204 (17.69)	922 (79.97)	27 (2.34)	1153 (100)	-	-
Czech Republic	230 (40.35)	222 (38.95)	118 (20.70)	258 (45.26)	260 (45.62)	52 (9.12)	215 (37.72)	130 (22.81)	225 (39.47)
Denmark	0 (0)	311 (69.27)	138 (30.73)	0 (0)	420 (93.54)	29 (6.46)	449 (100)	-	-
France	0 (0)	4804 (78.01)	1354 (21.99)	0 (0)	6093 (98.94)	65 (1.06)	6158 (100)	-	-
Greece	7 (6.86)	33 (32.35)	62 (60.79)	6 (5.88)	96 (94.12)	0 (0)	7 (6.86)	64 (62.75)	31 (30.39)
Hungary	6 (1.14)	338 (64.26)	182 (34.60)	12 (2.28)	496 (94.30)	18 (3.42)	63 (11.98)	310 (58.93)	153 (29.09)
Ireland	3 (0.28)	633 (59.38)	430 (40.34)	3 (0.28)	1045 (98.03)	18 (1.69)	3 (0.28)	596 (55.91)	467 (43.81)
Israel	8 (1.50)	302 (56.66)	223 (41.84)	12 (2.25)	517 (97.00)	4 (0.75)	8 (1.50)	369 (69.23)	156 (29.27)
Italy	719 (15.34)	2496 (53.24)	1473 (31.42)	719 (15.34)	3845 (82.01)	124 (2.65)	719 (15.34)	1906 (40.66)	2063 (44.00)
Latvia	8 (24.24)	12 (36.36)	13 (39.40)	9 (27.27)	23 (69.70)	1 (3.03)	9 (27.27)	7 (21.21)	17 (51.52)
Lithuania	0 (0)	10 (76.92)	3 (23.08)	0 (0)	11 (84.62)	2 (15.38)	0 (0)	5 (38.46)	8 (61.54)
Rep of Macedonia	2 (2.15)	58 (62.37)	33 (35.48)	2 (2.15)	90 (96.77)	1 (1.08)	2 (2.15)	65 (69.89)	26 (27.96)
Rep of Moldova	0 (0)	22 (37.29)	37 (62.71)	57 (96.61)	2 (3.39)	0 (0)	0 (0)	29 (49.15)	30 (50.85)
The Netherlands	62 (4.86)	743 (58.18)	472 (36.96)	59 (4.62)	1192 (93.34)	26 (2.04)	60 (4.70)	731 (57.24)	486 (38.06)
Portugal	1 (0.84)	79 (66.39)	39 (32.77)	2 (1.68)	110 (92.44)	7 (5.88)	1 (0.84)	73 (61.34)	45 (37.82)
Romania	2 (5.56)	29 (80.56)	5 (13.88)	0 (0)	36 (100)	0 (0)	0 (0)	33 (91.67)	3 (8.33)
Russian Federation	71 (5.58)	820 (64.36)	383 (30.06)	70 (5.49)	1129 (88.62)	75 (5.89)	72 (5.65)	492 (38.62)	710 (55.73)
Serbia	1 (0.69)	73 (50.69)	70 (48.62)	1 (0.69)	117 (81.25)	26 (18.06)	1 (0.69)	68 (47.22)	75 (52.09)
Slovak Republic	4 (2.00)	121 (60.50)	75 (37.50)	4 (2.00)	185 (92.50)	11 (5.50)	4 (2.00)	126 (63.00)	70 (35.00)
Slovenia	0 (0)	65 (83.33)	13 (16.67)	0 (0)	76 (97.44)	2 (2.56)	0 (0)	41 (52.56)	37 (47.44)
Spain	61 (5.06)	776 (64.40)	368 (30.54)	65 (5.40)	1099 (91.20)	41 (3.40)	60 (4.98)	689 (57.18)	456 (37.84)
Sweden	0 (0)	339 (57.46)	251 (42.54)	0 (0)	574 (97.29)	16 (2.71)	590 (100)	-	-
Switzerland	30 (4.79)	389 (62.14)	207 (33.07)	22 (3.51)	589 (94.09)	15 (2.40)	23 (3.68)	299 (47.76)	304 (48.56)
Ukraine	1 (1.02)	27 (27.55)	70 (71.43)	3 (3.06)	94 (95.92)	1 (1.02)	1 (1.02)	15 (15.31)	82 (83.67)
United Kingdom[2]	227 (2.58)	5521 (62.82)	3041 (34.60)	0 (0)	8483 (96.52)	306 (3.48)	284 (3.23)	7051 (80.23)	1454 (16.54)

[1] Belgium: most of the patients that have missing values are transplanted patients.

[2] 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.

Table 5.1 shows the frequency of chronic *Pseudomonas aeruginosa*, chronic *Burkholderia cepacia complex species* and chronic *Staphylococcus aureus* by country. 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 2012, by country.

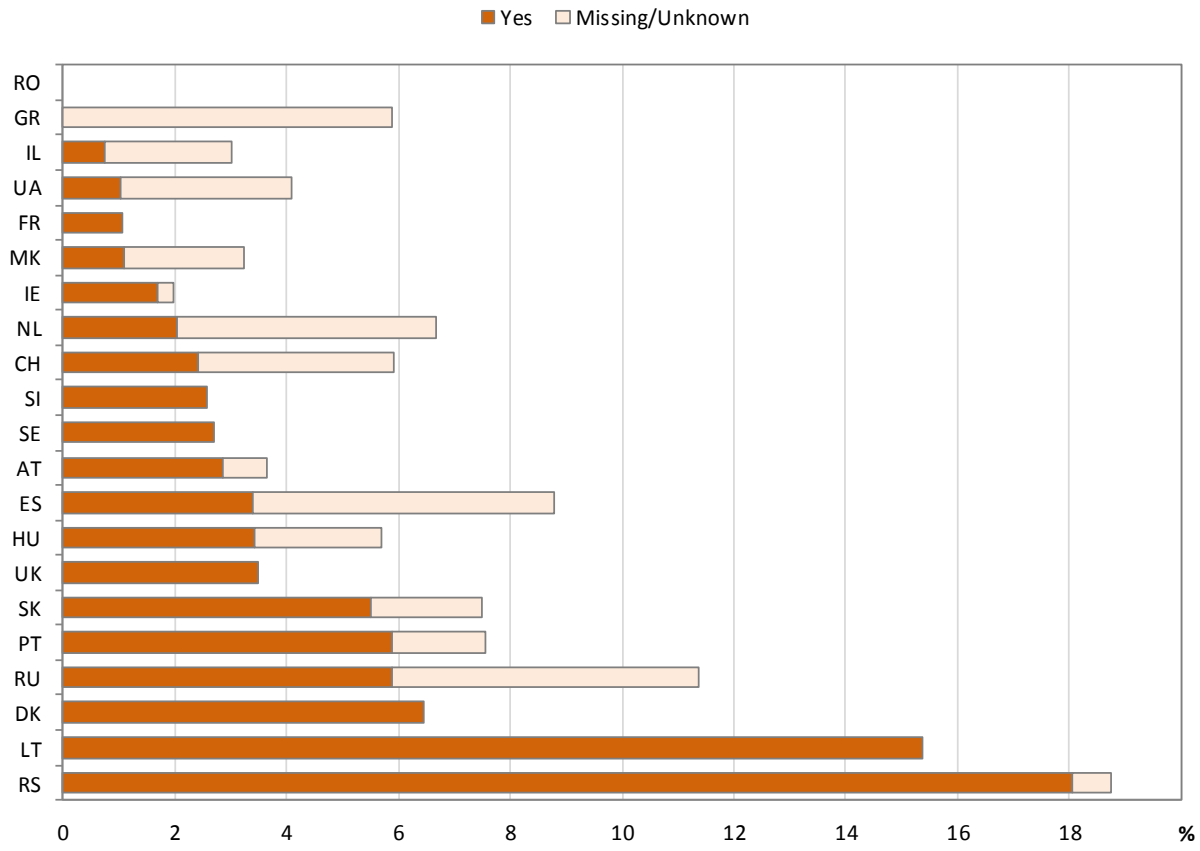


Note: We excluded from the graph the countries for which the information on *Pseudomonas aeruginosa* was missing for more than 10% of the patients.

Note: United Kingdom: for chronic *Pseudomonas aeruginosa* the definition is: 3 or more positive isolates during the last 12 months.

The horizontal bars represent 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 2012, by country.

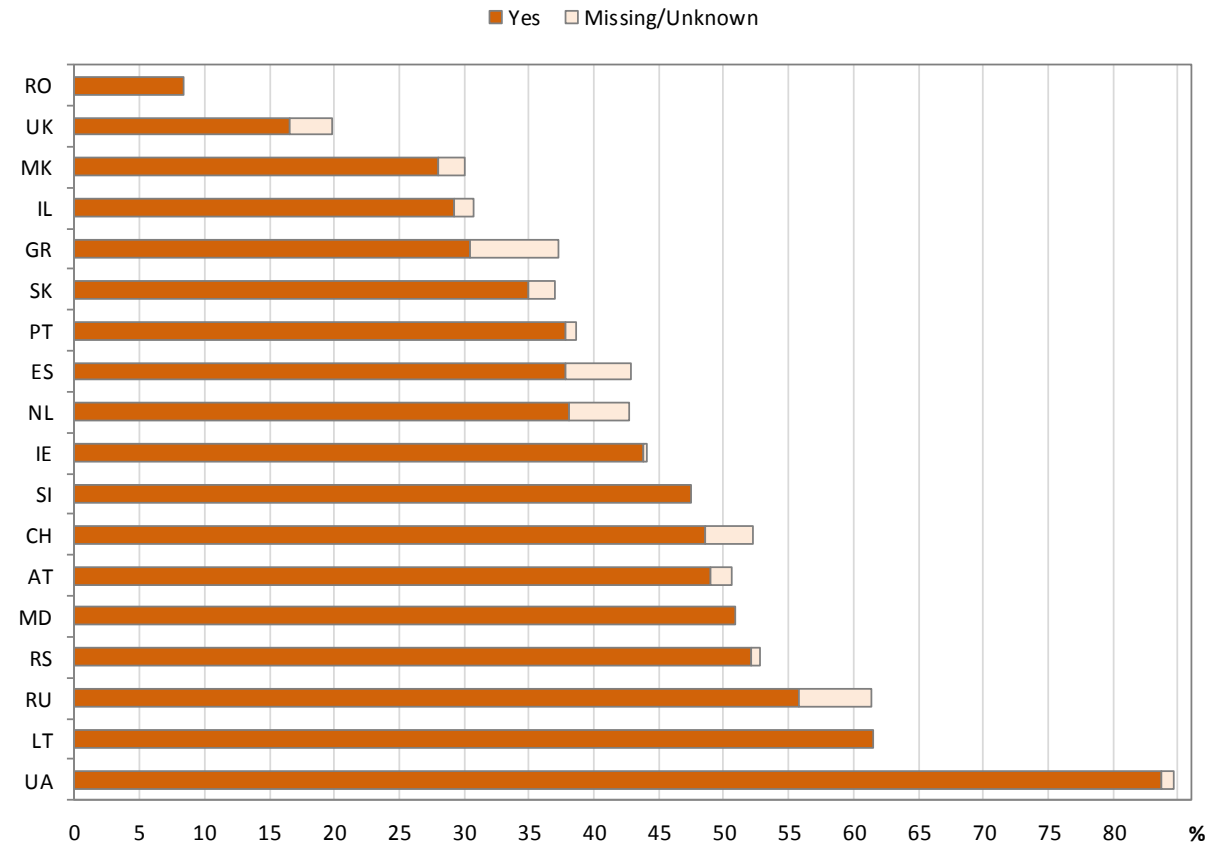


Note: We excluded from the graph the countries for which the information on *Burkholderia cepacia complex species* was missing for more than 10% of the patients.

Note: United Kingdom: information on *Burkholderia* is collected as follows: *Burkholderia* grown at annual review, not necessarily chronic.

The horizontal bars represent 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 2012, 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 represent 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 chronic bacterial infection in children seen in 2012, 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	2 (0.61)	285 (86.89)	41 (12.50)	1 (0.30)	323 (98.48)	4 (1.22)	6 (1.82)	161 (49.09)	161 (49.09)
Belgium[1]	28 (5.48)	429 (83.95)	54 (10.57)	26 (5.09)	480 (93.93)	5 (0.98)	511 (100)	-	-
Czech Republic	130 (39.51)	158 (48.03)	41 (12.46)	140 (42.55)	185 (56.23)	4 (1.22)	127 (38.60)	88 (26.75)	114 (34.65)
Denmark	0 (0)	169 (91.35)	16 (8.65)	0 (0)	184 (99.46)	1 (0.54)	185 (100)	-	-
France	0 (0)	2868 (92.46)	234 (7.54)	0 (0)	3086 (99.48)	16 (0.52)	3102 (100)	-	-
Greece	2 (3.28)	24 (39.34)	35 (57.38)	2 (3.28)	59 (96.72)	0 (0)	3 (4.92)	32 (52.46)	26 (42.62)
Hungary	3 (1.04)	200 (69.45)	85 (29.51)	2 (0.69)	278 (96.53)	8 (2.78)	27 (9.38)	192 (66.66)	69 (23.96)
Ireland	0 (0)	415 (76.15)	130 (23.85)	0 (0)	539 (98.90)	6 (1.10)	0 (0)	245 (44.95)	300 (55.05)
Israel	3 (1.22)	194 (78.86)	49 (19.92)	4 (1.63)	240 (97.56)	2 (0.81)	3 (1.22)	165 (67.07)	78 (31.71)
Italy	427 (19.25)	1439 (64.88)	352 (15.87)	427 (19.25)	1782 (80.34)	9 (0.41)	427 (19.25)	766 (34.54)	1025 (46.21)
Latvia	7 (28.00)	10 (40.00)	8 (32.00)	7 (28.00)	18 (72.00)	0 (0)	8 (32.00)	4 (16.00)	13 (52.00)
Rep of Macedonia	0 (0)	53 (73.61)	19 (26.39)	0 (0)	71 (98.61)	1 (1.39)	0 (0)	50 (69.44)	22 (30.56)
Rep of Moldova	0 (0)	16 (34.78)	30 (65.22)	46 (100)	-	-	0 (0)	21 (45.65)	25 (54.35)
The Netherlands	2 (0.34)	444 (76.16)	137 (23.50)	2 (0.34)	575 (98.63)	6 (1.03)	2 (0.34)	315 (54.03)	266 (45.63)
Portugal	0 (0)	44 (91.67)	4 (8.33)	0 (0)	45 (93.75)	3 (6.25)	0 (0)	35 (72.92)	13 (27.08)
Romania	2 (5.56)	29 (80.55)	5 (13.89)	0 (0)	36 (100)	0 (0)	0 (0)	33 (91.67)	3 (8.33)
Russian Federation	32 (3.50)	660 (72.13)	223 (24.37)	31 (3.39)	858 (93.77)	26 (2.84)	34 (3.72)	346 (37.81)	535 (58.47)
Serbia	1 (0.99)	64 (63.37)	36 (35.64)	1 (0.99)	81 (80.20)	19 (18.81)	1 (0.99)	47 (46.53)	53 (52.48)
Slovak Republic	0 (0)	74 (83.15)	15 (16.85)	0 (0)	88 (98.88)	1 (1.12)	0 (0)	56 (62.92)	33 (37.08)
Slovenia	0 (0)	52 (89.66)	6 (10.34)	0 (0)	58 (100)	0 (0)	0 (0)	34 (58.62)	24 (41.38)
Spain	15 (2.25)	555 (83.34)	96 (14.41)	20 (3.00)	634 (95.20)	12 (1.80)	15 (2.25)	410 (61.56)	241 (36.19)
Sweden	0 (0)	186 (79.49)	48 (20.51)	0 (0)	231 (98.72)	3 (1.28)	234 (100)	-	-
Switzerland	12 (3.31)	293 (80.94)	57 (15.75)	9 (2.49)	351 (96.96)	2 (0.55)	8 (2.21)	165 (45.58)	189 (52.21)
Ukraine	1 (1.12)	26 (29.21)	62 (69.67)	3 (3.37)	85 (95.51)	1 (1.12)	1 (1.12)	15 (16.85)	73 (82.03)
United Kingdom2	79 (1.91)	3570 (86.17)	494 (11.92)	0 (0)	4077 (98.41)	66 (1.59)	96 (2.32)	3700 (89.30)	347 (8.38)

[1] Belgium: most of the patients that have missing values are transplanted patients.

[2] 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.

Note: Lithuania has 0% coverage for children.

Table 5.2 shows, separately by country, the frequency of chronic *Pseudomonas aeruginosa*, chronic *Burkholderia cepacia complex species* and chronic *Staphylococcus aureus* in children. 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.

Table 5.3 Prevalence of chronic bacterial infection in adults seen in 2012, 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	2 (1.03)	102 (52.30)	91 (46.67)	3 (1.54)	181 (92.82)	11 (5.64)	3 (1.54)	97 (49.74)	95 (48.72)
Belgium[1]	181 (28.19)	239 (37.23)	222 (34.58)	178 (27.73)	442 (68.85)	22 (3.42)	642 (100)	-	-
Czech Republic	100 (41.49)	64 (26.56)	77 (31.95)	118 (48.96)	75 (31.12)	48 (19.92)	88 (36.51)	42 (17.43)	111 (46.06)
Denmark	0 (0)	142 (53.79)	122 (46.21)	0 (0)	236 (89.39)	28 (10.61)	264 (100)	-	-
France	0 (0)	1935 (63.34)	1120 (36.66)	0 (0)	3006 (98.40)	49 (1.60)	3055 (100)	-	-
Greece	1 (2.70)	9 (24.32)	27 (72.98)	0 (0)	37 (100)	0 (0)	0 (0)	32 (86.49)	5 (13.51)
Hungary	3 (1.26)	138 (58.23)	96 (40.51)	10 (4.22)	218 (91.98)	9 (3.80)	35 (14.77)	118 (49.79)	84 (35.44)
Ireland	3 (0.58)	218 (41.84)	300 (57.58)	3 (0.58)	506 (97.12)	12 (2.30)	3 (0.58)	351 (67.37)	167 (32.05)
Israel	5 (1.74)	108 (37.63)	174 (60.63)	8 (2.79)	277 (96.51)	2 (0.70)	5 (1.74)	204 (71.08)	78 (27.18)
Italy	292 (11.88)	1049 (42.68)	1117 (45.44)	292 (11.88)	2051 (83.44)	115 (4.68)	292 (11.88)	1129 (45.93)	1037 (42.19)
Latvia	1 (12.50)	2 (25.00)	5 (62.50)	2 (25.00)	5 (62.50)	1 (12.50)	1 (12.50)	3 (37.50)	4 (50.00)
Lithuania	0 (0)	10 (76.92)	3 (23.08)	0 (0)	11 (84.62)	2 (15.38)	0 (0)	5 (38.46)	8 (61.54)
Rep of Macedonia	2 (9.52)	5 (23.81)	14 (66.67)	2 (9.52)	19 (90.48)	0 (0)	2 (9.52)	15 (71.43)	4 (19.05)
Rep of Moldova	0 (0)	6 (46.15)	7 (53.85)	11 (84.62)	2 (15.38)	0 (0)	0 (0)	8 (61.54)	5 (38.46)
The Netherlands	60 (8.65)	299 (43.08)	335 (48.27)	57 (8.21)	617 (88.90)	20 (2.89)	58 (8.36)	416 (59.94)	220 (31.70)
Portugal	1 (1.43)	35 (50.00)	34 (48.57)	2 (2.86)	64 (91.43)	4 (5.71)	1 (1.43)	37 (52.86)	32 (45.71)
Russian Federation	39 (10.86)	160 (44.57)	160 (44.57)	39 (10.86)	271 (75.49)	49 (13.65)	38 (10.58)	146 (40.67)	175 (48.75)
Serbia	0 (0)	9 (20.93)	34 (79.07)	0 (0)	36 (83.72)	7 (16.28)	0 (0)	21 (48.84)	22 (51.16)
Slovak Republic	4 (3.60)	47 (42.35)	60 (54.05)	4 (3.60)	97 (87.39)	10 (9.01)	4 (3.60)	70 (63.07)	37 (33.33)
Slovenia	0 (0)	13 (65.00)	7 (35.00)	0 (0)	18 (90.00)	2 (10.00)	0 (0)	7 (35.00)	13 (65.00)
Spain	45 (8.36)	221 (41.08)	272 (50.56)	44 (8.18)	465 (86.43)	29 (5.39)	44 (8.18)	279 (51.86)	215 (39.96)
Sweden	0 (0)	153 (42.98)	203 (57.02)	0 (0)	343 (96.35)	13 (3.65)	356 (100)	-	-
Switzerland	18 (6.82)	96 (36.36)	150 (56.82)	13 (4.92)	238 (90.16)	13 (4.92)	15 (5.68)	134 (50.76)	115 (43.56)
Ukraine	0 (0)	1 (11.11)	8 (88.89)	0 (0)	9 (100)	0 (0)	0 (0)	0 (0)	9 (100)
United Kingdom[2]	148 (3.19)	1951 (41.99)	2547 (54.82)	0 0	4406 (94.83)	240 (5.17)	188 (4.05)	3351 (72.13)	1107 (23.82)

[1] Belgium: most of the patients that have missing values are transplanted patients.

[2] 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.

Note: Romania has 0% coverage for adults.

This table shows, separately by country, the frequency of chronic *Pseudomonas aeruginosa*, chronic *Burkholderia cepacia complex species* and chronic *Staphylococcus aureus in adults*. 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.

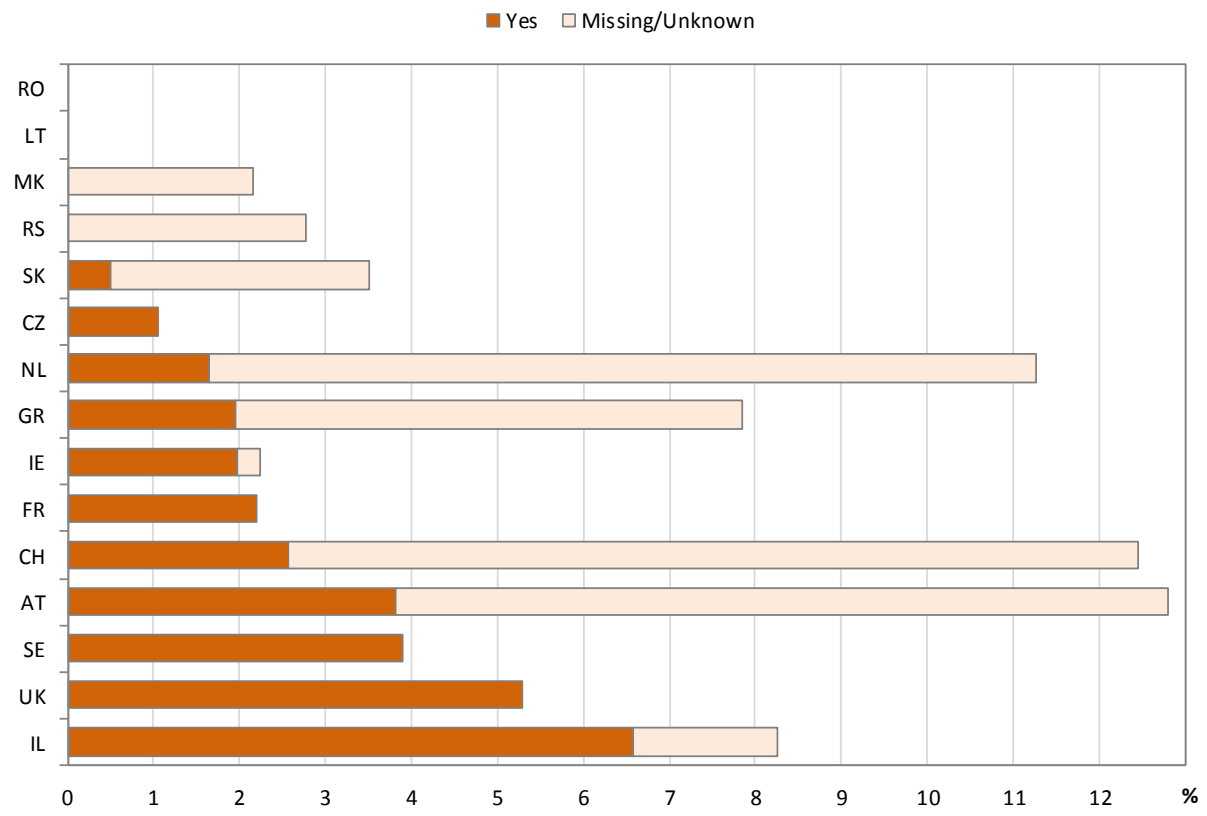
Table 5.4 Prevalence of non-tuberculous mycobacteria and Stenotrophomonas maltophilia infection in all patients seen in 2012, by country.

Country	Non-tuberculous mycobacteria (NTM) infection this year number (%)			*Stenotrophomonas maltophilia* infection this year number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	47 (8.99)	456 (87.19)	20 (3.82)	8 (1.53)	456 (87.19)	59 (11.28)
Belgium[1]	136 (11.80)	1006 (87.25)	11 (0.95)	136 (11.80)	899 (77.97)	118 (10.23)
Czech Republic	0 (0)	564 (98.95)	6 (1.05)	275 (48.25)	254 (44.56)	41 (7.19)
Denmark	449 (100)	-	-	449 (100)	-	-
France	0 (0)	6023 (97.81)	135 (2.19)	0 (0)	5551 (90.14)	607 (9.86)
Greece	6 (5.88)	94 (92.16)	2 (1.96)	6 (5.88)	89 (87.25)	7 (6.87)
Hungary	145 (27.57)	376 (71.48)	5 (0.95)	67 (12.74)	445 (84.60)	14 (2.66)
Ireland	3 (0.28)	1042 (97.75)	21 (1.97)	3 (0.28)	958 (89.87)	105 (9.85)
Israel	9 (1.69)	489 (91.74)	35 (6.57)	9 (1.69)	496 (93.06)	28 (5.25)
Italy	719 (15.34)	3940 (84.04)	29 (0.62)	719 (15.34)	3786 (80.76)	183 (3.90)
Latvia	8 (24.24)	25 (75.76)	0 (0)	8 (24.24)	23 (69.70)	2 (6.06)
Lithuania	0 (0)	13 (100)	0 (0)	0 (0)	12 (92.31)	1 (7.69)
Rep of Macedonia	2 (2.15)	91 (97.85)	0 (0)	2 (2.15)	91 (97.85)	0 (0)
Rep of Moldova	57 (96.61)	2 (3.39)	0 (0)	55 (93.22)	4 (6.78)	0 (0)
The Netherlands	123 (9.63)	1133 (88.73)	21 (1.64)	60 (4.70)	1098 (85.98)	119 (9.32)
Portugal	16 (13.45)	103 (86.55)	0 (0)	2 (1.68)	102 (85.71)	15 (12.61)
Romania	0 (0)	36 (100)	0 (0)	35 (97.22)	1 (2.78)	0 (0)
Russian Federation	608 (47.72)	658 (51.65)	8 (0.63)	88 (6.91)	1140 (89.48)	46 (3.61)
Serbia	4 (2.78)	140 (97.22)	0 (0)	3 (2.08)	127 (88.19)	14 (9.73)
Slovak Republic	6 (3.00)	193 (96.50)	1 (0.50)	4 (2.00)	186 (93.00)	10 (5.00)
Slovenia	8 (10.26)	70 (89.74)	0 (0)	12 (15.38)	63 (80.77)	3 (3.85)
Spain	239 (19.84)	941 (78.09)	25 (2.07)	62 (5.14)	1083 (89.88)	60 (4.98)
Sweden	0 (0)	567 (96.10)	23 (3.90)	0 (0)	548 (92.88)	42 (7.12)
Switzerland	62 (9.90)	548 (87.54)	16 (2.56)	49 (7.83)	500 (79.87)	77 (12.30)
Ukraine	69 (70.41)	29 (29.59)	0 (0)	30 (30.61)	67 (68.37)	1 (1.02)
United Kingdom	0 (0)	8324 (94.71)	465 (5.29)	0 (0)	8380 (95.35)	409 (4.65)

[1] Belgium: most of the patients that have missing values are transplanted patients.

Table 5.4 shows the frequency of two other infections, non-tuberculous mycobacteria (NTM) and *Stenotrophomonas maltophilia.* Both these infections seem to be relatively rare and are in line with the frequencies of *Burkholderia* infection. The identification rate of these bacteria may also be influenced by differences in culture techniques employed.

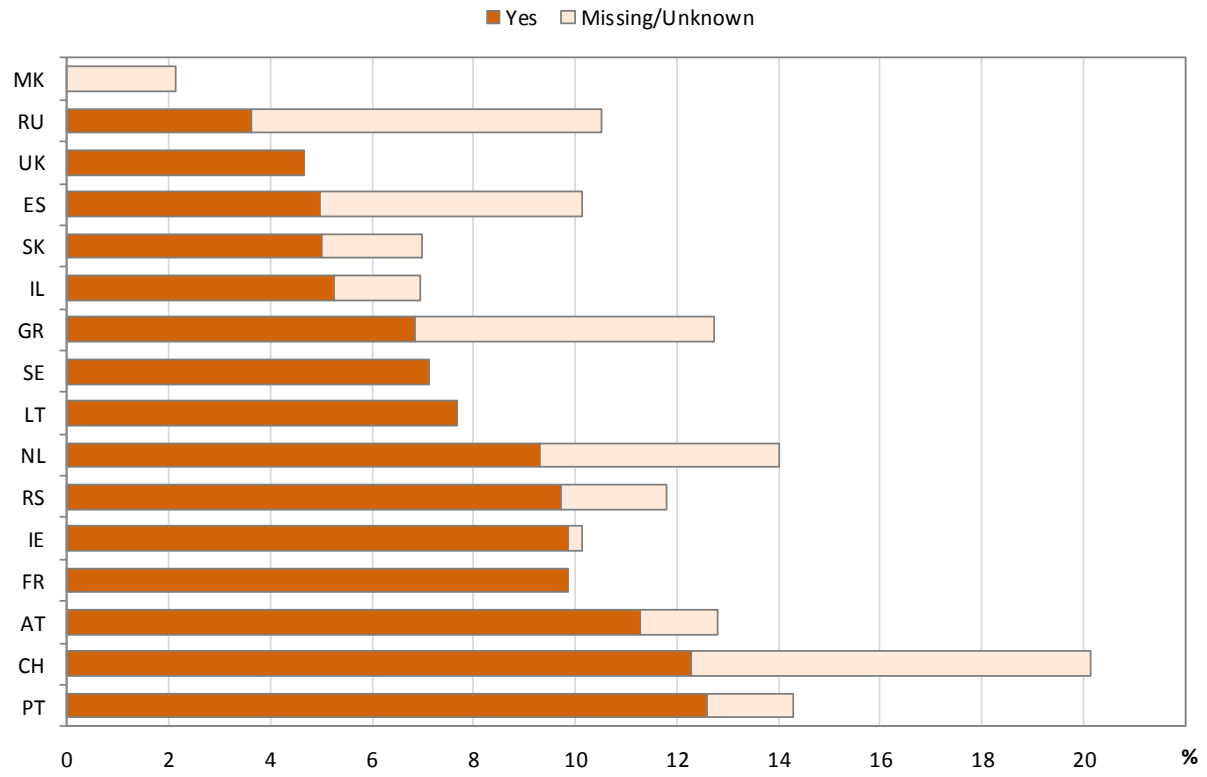
Figure 5.4 Prevalence of non-tuberculous mycobacteria in all patients seen in 2012, by country.



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 represent 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 2012, 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 represent 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.

Table 5.5 Prevalence of non-tuberculous mycobacteria and Stenotrophomonas maltophilia infection in children seen in 2012, 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	36 (10.97)	286 (87.20)	6 (1.83)	3 (0.91)	294 (89.64)	31 (9.45)
Belgium[1]	6 (1.17)	502 (98.24)	3 (0.59)	6 (1.17)	450 (88.07)	55 (10.76)
Czech Republic	0 (0)	329 (100)	0 (0)	143 (43.47)	152 (46.20)	34 (10.33)
Denmark	185 (100)	-	-	185 (100)	-	-
France	0 (0)	3061 (98.68)	41 (1.32)	0 (0)	2761 (89.01)	341 (10.99)
Greece	2 (3.28)	58 (95.08)	1 (1.64)	2 (3.28)	54 (88.52)	5 (8.20)
Hungary	89 (30.90)	199 (69.10)	0 (0)	34 (11.81)	250 (86.80)	4 (1.39)
Ireland	0 (0)	537 (98.53)	8 (1.47)	0 (0)	479 (87.89)	66 (12.11)
Israel	4 (1.63)	233 (94.72)	9 (3.65)	3 (1.22)	228 (92.68)	15 (6.10)
Italy	427 (19.25)	1781 (80.30)	10 (0.45)	427 (19.25)	1700 (76.65)	91 (4.10)
Latvia	7 (28.00)	18 (72.00)	0 (0)	7 (28.00)	16 (64.00)	2 (8.00)
Rep of Macedonia	0 (0)	72 (100)	0 (0)	0 (0)	72 (100)	0 (0)
Rep of Moldova	46 (100)	-	-	45 (97.83)	1 (2.17)	0 (0)
The Netherlands	25 (4.29)	547 (93.82)	11 (1.89)	2 (0.34)	516 (88.51)	65 (11.15)
Portugal	7 (14.58)	41 (85.42)	0 (0)	0 (0)	39 (81.25)	9 (18.75)
Romania	0 (0)	36 (100)	0 (0)	35 (97.22)	1 (2.78)	0 (0)
Russian Federation	401 (43.82)	510 (55.74)	4 (0.44)	36 (3.93)	847 (92.57)	32 (3.50)
Serbia	4 (3.96)	97 (96.04)	0 (0)	2 (1.98)	86 (85.15)	13 (12.87)
Slovak Republic	0 (0)	88 (98.88)	1 (1.12)	0 (0)	83 (93.26)	6 (6.74)
Slovenia	0 (0)	58 (100)	0 (0)	0 (0)	56 (96.55)	2 (3.45)
Spain	130 (19.52)	526 (78.98)	10 (1.50)	17 (2.55)	613 (92.04)	36 (5.41)
Sweden	0 (0)	226 (96.58)	8 (3.42)	0 (0)	224 (95.73)	10 (4.27)
Switzerland	41 (11.32)	318 (87.85)	3 (0.83)	31 (8.56)	286 (79.01)	45 (12.43)
Ukraine	60 (67.42)	29 (32.58)	0 (0)	30 (33.71)	58 (65.17)	1 (1.12)
United Kingdom	0 (0)	4024 (97.13)	119 (2.87)	0 (0)	3942 (95.15)	201 (4.85)

[1] Belgium: most of the patients that have missing values are transplanted patients.
Note: Lithuania has 0% coverage for children.

Table 5.6 Prevalence of non-tuberculous mycobacteria and Stenotrophomonas maltophilia infection in adults seen in 2012, 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	11 (5.64)	170 (87.18)	14 (7.18)	5 (2.56)	162 (83.08)	28 (14.36)
Belgium[1]	130 (20.25)	504 (78.50)	8 (1.25)	130 (20.25)	449 (69.94)	63 (9.81)
Czech Republic	0 (0)	235 (97.51)	6 (2.49)	132 (54.77)	102 (42.33)	7 (2.90)
Denmark	264 (100)	-	-	264 (100)	-	-
France	0 (0)	2961 (96.92)	94 (3.08)	0 (0)	2790 (91.33)	265 (8.67)
Greece	0 (0)	36 (97.30)	1 (2.70)	0 (0)	35 (94.59)	2 (5.41)
Hungary	56 (23.63)	176 (74.26)	5 (2.11)	33 (13.92)	194 (81.86)	10 (4.22)
Ireland	3 (0.57)	505 (96.93)	13 (2.50)	3 (0.57)	479 (91.94)	39 (7.49)
Israel	5 (1.74)	256 (89.20)	26 (9.06)	6 (2.09)	268 (93.38)	13 (4.53)
Italy	292 (11.88)	2147 (87.35)	19 (0.77)	292 (11.88)	2074 (84.38)	92 (3.74)
Latvia	1 (12.50)	7 (87.5)	0 (0)	1 (12.50)	7 (87.50)	0 (0)
Lithuania	0 (0)	13 (100)	0 (0)	0 (0)	12 (92.31)	1 (7.69)
Rep of Macedonia	2 (9.52)	19 (90.48)	0 (0)	2 (9.52)	19 (90.48)	0 (0)
Rep of Moldova	11 (84.62)	2 (15.38)	0 (0)	10 (76.92)	3 (23.08)	0 (0)
The Netherlands	98 (14.12)	586 (84.44)	10 (1.44)	58 (8.36)	582 (83.86)	54 (7.78)
Portugal	9 (12.86)	61 (87.14)	0 (0)	2 (2.86)	62 (88.57)	6 (8.57)
Russian Federation	207 (57.66)	148 (41.23)	4 (1.11)	52 (14.48)	293 (81.62)	14 (3.90)
Serbia	0 (0)	43 (100)	0 (0)	1 (2.33)	41 (95.35)	1 (2.33)
Slovak Republic	6 (5.41)	105 (94.59)	0 (0)	4 (3.60)	103 (92.80)	4 (3.60)
Slovenia	8 (40.00)	12 (60.00)	0 (0)	12 (60.00)	7 (35.00)	1 (5.00)
Spain	108 (20.07)	415 (77.14)	15 (2.79)	44 (8.18)	470 (87.36)	24 (4.46)
Sweden	0 (0)	341 (95.79)	15 (4.21)	0 (0)	324 (91.01)	32 (8.99)
Switzerland	21 (7.95)	230 (87.13)	13 (4.92)	18 (6.82)	214 (81.06)	32 (12.12)
Ukraine	9 (100)	-	-	0 (0)	9 (100)	0 (0)
United Kingdom	0 (0)	4300 (92.55)	346 (7.45)	0 (0)	4438 (95.52)	208 (4.48)

[1] Belgium: most of the patients that have missing values are transplanted patients.
Note: Romania has 0% coverage for adults.

6. Nutrition

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

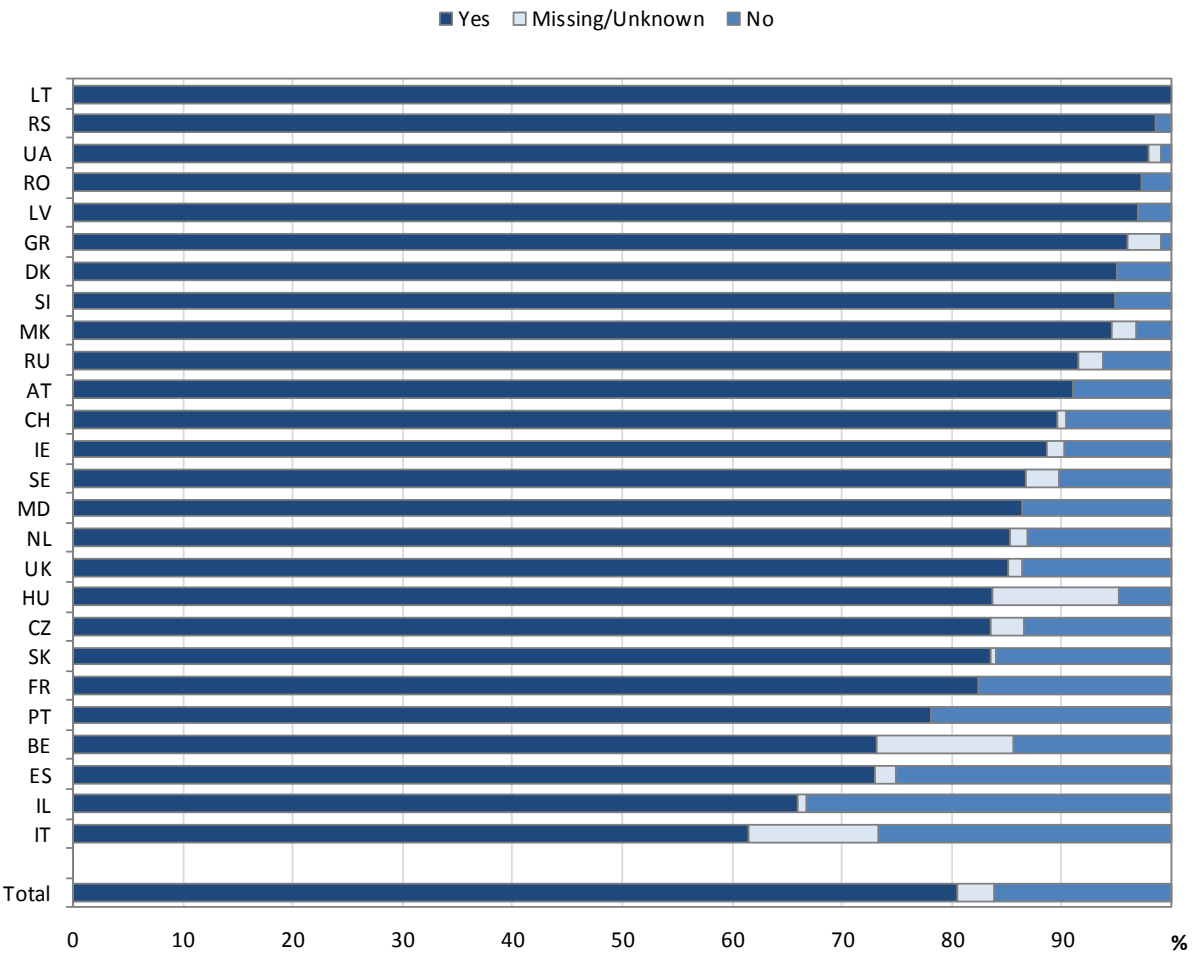
We collected weight and height measured on the date the best FEV1 value was recorded and, for patients that did not perform spirometry, the last measurements of the year were considered; from these raw values we calculated body mass index (BMI). A patient with a low weight is not necessarily underweight 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 measurement of nutritional status. The ECFS Standards of Care guidelines recommend: for adults, a BMI of above 20 kg/m^2; for older children and adolescents, the 50th percentile for BMI; for infants and children up to 2 years of age, weight and height percentiles similar to those for the non-CF population.[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, page 118, for details).

A z-score of 0 means that the height/weight/BMI is equal to the mean height/weight/BMI for people of the same age and sex from 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 for people of the same age and sex from the reference population; a z-score of +2 means that the value is 2 standard deviations above that mean. In the reference population, 95% of all individuals have a z-score for weight between -2 and +2 (the same for height) and it is expected that the same happens for approximately 95% of individuals 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] A.R. Smyth et al, JCF 2014;13, S23–S42

Figure 6.1 Use of pancreatic enzymes in 2012 for all patients, by country and overall.



Note: For Belgium most of the patients that have missing values are transplanted patients.

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

Table 6.1 Number of patients for whom height and weight measurements were available. All patients seen in 2012.

Country	Number of patients	Height		Weight	
		N	N miss	N	N miss
Austria	523	512	11	513	10
Belgium[1]	1153	1004	149	1005	148
Czech Republic	570	507	63	507	63
Denmark	449	444	5	444	5
France	6158	5908	250	5920	238
Greece	102	80	22	80	22
Hungary	526	487	39	485	41
Ireland	1066	881	185	895	171
Israel	533	500	33	500	33
Italy	4688	3284	1404	3284	1404
Latvia	33	7	26	7	26
Lithuania	13	13	0	13	0
Rep of Macedonia	93	91	2	91	2
Rep of Moldova	59	58	1	58	1
The Netherlands	1277	1263	14	1263	14
Portugal	119	104	15	103	16
Romania	36	34	2	34	2
Russian Federation	1274	1151	123	1167	107
Serbia	144	138	6	142	2
Slovak Republic	200	157	43	157	43
Slovenia	78	77	1	77	1
Spain	1205	1093	112	1099	106
Sweden	590	583	7	581	9
Switzerland	626	609	17	607	19
Ukraine	98	83	15	83	15
United Kingdom	8789	8597	192	8665	124

[1] Belgium: most of the patients that have missing values are transplanted patients.

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	333	-0.1	-4.7	-0.8	-0.1	0.6	3.1
Belgium	520	-0.4	-4.2	-1.0	-0.4	0.3	3.2
Czech Republic	325	0.0	-6.9	-0.7	0.0	0.8	3.2
Denmark	193	0.0	-3.0	-0.5	0.0	0.6	2.5
France	3036	-0.5	-4.0	-1.2	-0.4	0.2	6.9
Greece	48	-0.3	-2.9	-1.3	-0.4	0.6	1.7
Hungary	288	-0.2	-8.2	-1.0	-0.1	0.8	9.6
Ireland	516	-0.7	-7.6	-1.4	-0.6	0.1	3.7
Israel	229	-0.6	-3.2	-1.3	-0.6	0.1	2.0
Italy	1332	-0.3	-7.3	-1.0	-0.3	0.3	3.1
Latvia	<10	-0.7	-1.7	-1.6	-1.1	0.1	0.5
Rep of Macedonia	73	-0.7	-4.3	-1.5	-0.8	0.0	2.3
Rep of Moldova	46	-1.2	-5.3	-2.2	-1.5	-0.1	5.3
The Netherlands	598	0.2	-3.2	-0.5	0.2	0.8	2.5
Portugal	44	-0.7	-4.3	-1.5	-0.7	0.0	4.6
Romania	34	-0.6	-2.5	-1.7	-0.9	0.5	3.8
Russian Federation	873	-0.5	-7.1	-1.4	-0.4	0.4	5.2
Serbia	101	-0.3	-3.4	-1.1	-0.2	0.5	2.8
Slovak Republic	51	-0.2	-2.0	-1.1	-0.2	0.5	4.9
Slovenia	60	-0.2	-3.0	-1.0	-0.3	0.6	2.9
Spain	615	-0.3	-4.1	-1.0	-0.3	0.3	6.8
Sweden	241	-0.1	-2.6	-0.8	-0.1	0.4	3.4
Switzerland	365	-0.4	-4.2	-1.0	-0.3	0.3	2.6
Ukraine	74	-0.8	-4.6	-1.5	-0.7	-0.1	1.9
United Kingdom	4178	-0.4	-9.0	-1.0	-0.3	0.3	3.6

Note: Lithuania has 0% coverage for children.

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).

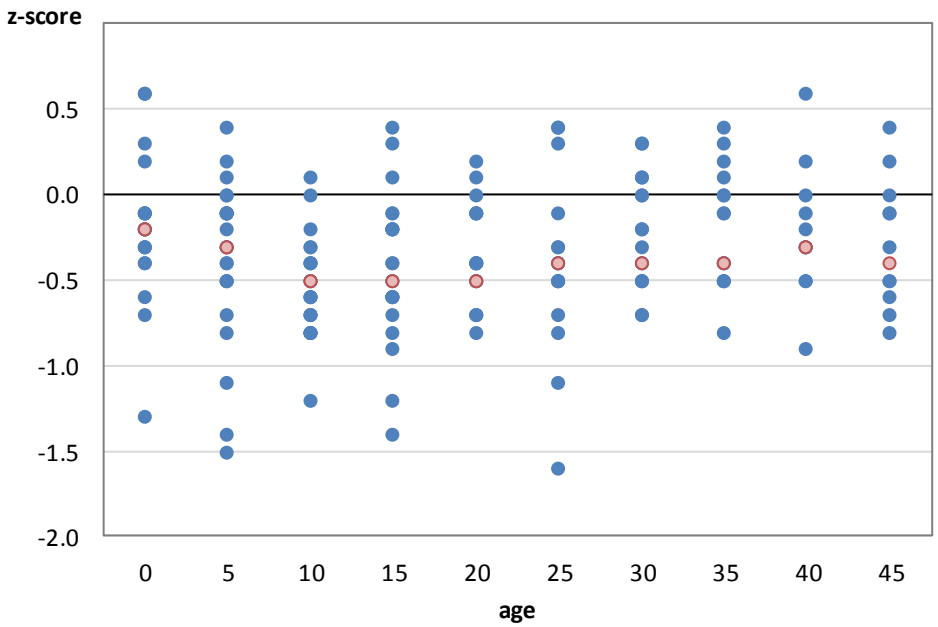
Table 6.3 Z-scores for height: descriptive statistics by country. Patients aged 18 years or older.

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	179	-0.2	-3.3	-0.8	-0.1	0.4	2.7
Belgium	484	-0.3	-3.6	-1.0	-0.3	0.4	2.4
Czech Republic	182	-0.1	-2.6	-0.7	-0.1	0.4	3.1
Denmark	251	0.0	-2.7	-0.7	0.0	0.7	3.2
France	2872	-0.6	-5.7	-1.2	-0.5	0.2	2.9
Greece	32	-0.5	-2.3	-1.3	-0.5	0.0	2.0
Hungary	199	-0.3	-3.3	-1.0	-0.2	0.4	2.6
Ireland	365	-0.4	-4.9	-1.1	-0.5	0.2	3.0
Israel	271	-0.7	-4.7	-1.3	-0.7	0.0	2.3
Italy	1952	-0.6	-4.4	-1.2	-0.5	0.0	2.4
Latvia	<10	-0.4	-0.8	-0.8	-0.4	0.0	0.0
Lithuania	13	0.5	-2.1	-0.1	0.5	1.4	2.3
Rep of Macedonia	18	-0.6	-2.7	-1.1	-0.9	-0.3	2.6
Rep of Moldova	12	-0.3	-2.6	-1.0	-0.7	1.0	2.0
The Netherlands	665	0.3	-3.4	-0.4	0.3	1.0	3.9
Portugal	60	-0.8	-3.2	-1.5	-1.0	-0.2	1.3
Russian Federation	278	-0.3	-4.5	-1.0	-0.4	0.4	3.1
Serbia	37	0.0	-1.9	-0.5	-0.1	0.6	2.1
Slovak Republic	106	0.1	-4.1	-0.5	0.2	1.0	2.4
Slovenia	17	-0.2	-1.7	-0.8	0.0	0.5	1.3
Spain	478	-0.7	-3.8	-1.3	-0.7	-0.1	2.3
Sweden	342	0.1	-2.9	-0.5	0.2	0.7	3.3
Switzerland	244	-0.3	-3.7	-1.0	-0.3	0.3	2.4
Ukraine	<10	-0.6	-4.4	-0.9	-0.4	0.6	1.3
United Kingdom	4419	-0.4	-5.1	-1.1	-0.4	0.3	3.4

Note: Romania has 0% coverage for adults.

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 2012.



Note: We excluded from the analyses those age groups with <10 patients.

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. Up to the teenage years the median z-scores for height tend to slowly decrease up and they 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 2012.

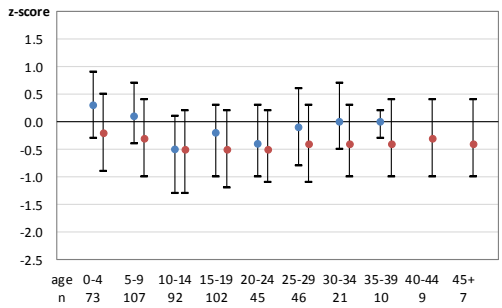
Age at height measurement	N	Mean	Min	25th pctl	Median	75th pctl	Max
0-4	3499	-0.2	-9.0	-0.9	-0.2	0.5	6.9
5-9	4109	-0.3	-5.5	-1.0	-0.3	0.4	9.6
10-14	4106	-0.5	-8.2	-1.3	-0.5	0.2	3.4
15-19	3982	-0.5	-7.5	-1.2	-0.5	0.2	3.2
20-24	3589	-0.5	-4.6	-1.1	-0.5	0.3	3.9
25-29	2730	-0.4	-5.1	-1.1	-0.4	0.3	3.2
30-34	2025	-0.3	-5.7	-1.0	-0.4	0.3	3.1
35-39	1413	-0.3	-4.1	-1.0	-0.4	0.4	3.3
40-44	967	-0.3	-3.7	-1.0	-0.3	0.4	2.7
45+	1245	-0.3	-4.9	-1.0	-0.4	0.4	3.3

This table reports the median z-scores for height and other descriptive statistics by age group for all the patients seen in 2012. The median values reported in this table are shown as red dots in fig 6.2.

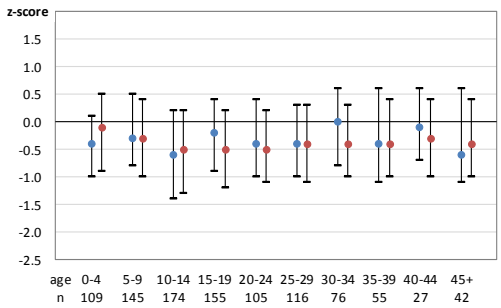
Figure 6.3 Quartiles of z-scores for height by age group and by country. All patients seen in 2012.

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 Lithuania from the graphs because none of the age groups in these countries had more than 10 patients.

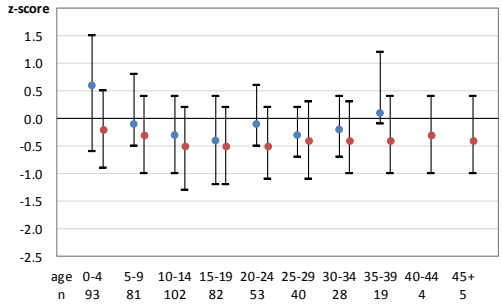
Quartiles of z-scores for height: Austria



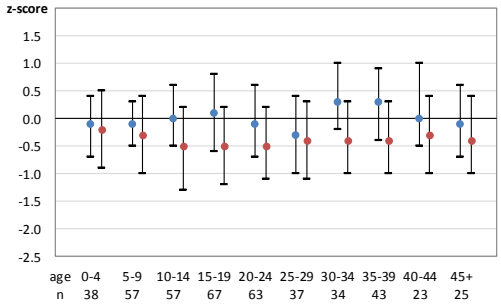
Quartiles of z-scores for height: Belgium



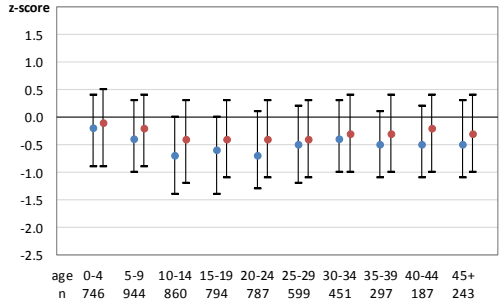
Quartiles of z-scores for height: Czech Republic



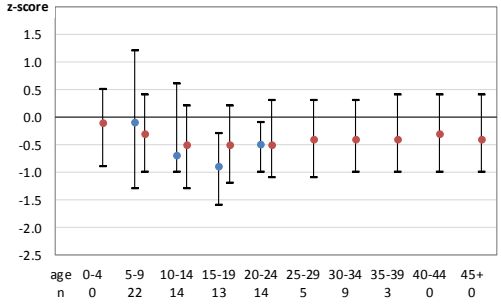
Quartiles of z-scores for height: Denmark



Quartiles of z-scores for height: France

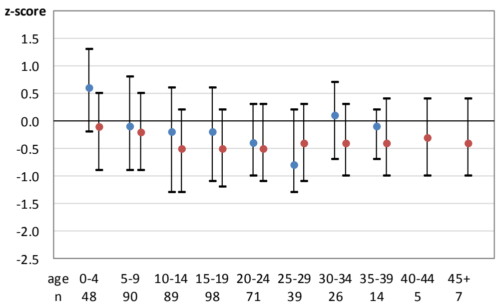


Quartiles of z-scores for height: Greece

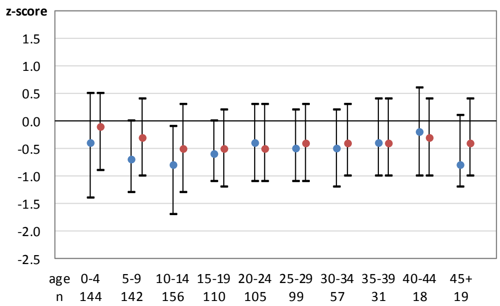


[figure 6.3 continued]

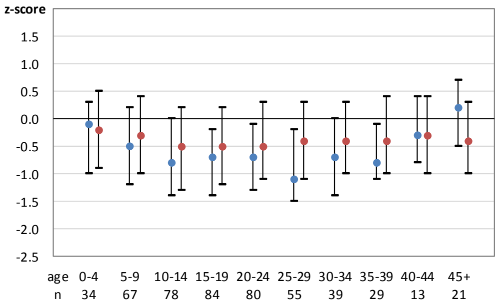
Quartiles of z-scores for height: Hungary



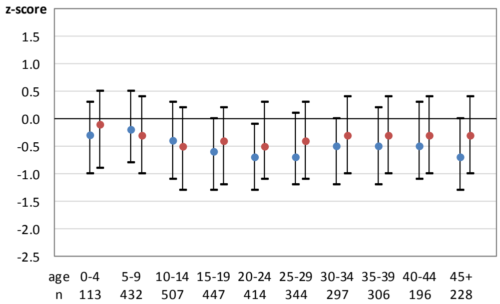
Quartiles of z-scores for height: Ireland



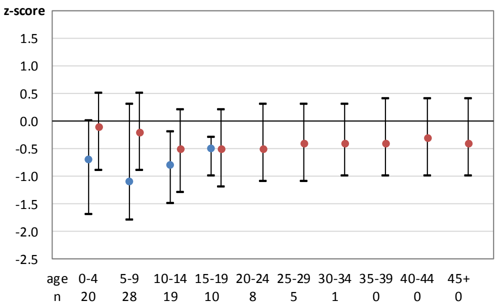
Quartiles of z-scores for height: Israel



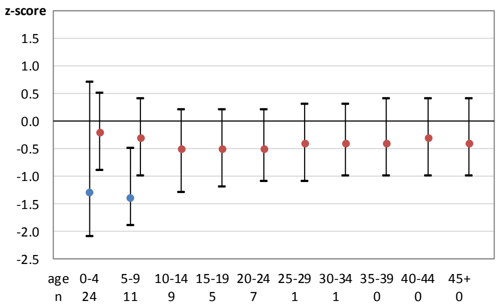
Quartiles of z-scores for height: Italy



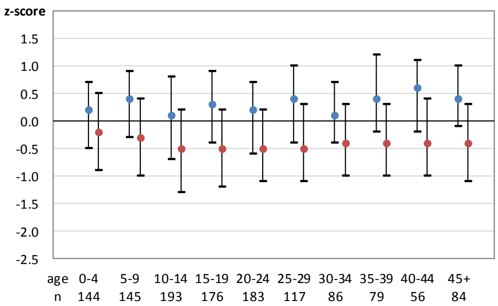
Quartiles of z-scores for height: Rep of Macedonia



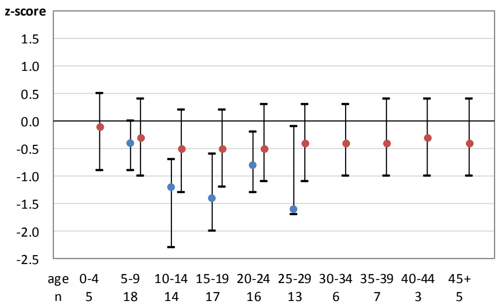
Quartiles of z-scores for height: Rep of Moldova



Quartiles of z-scores for height: The Netherlands

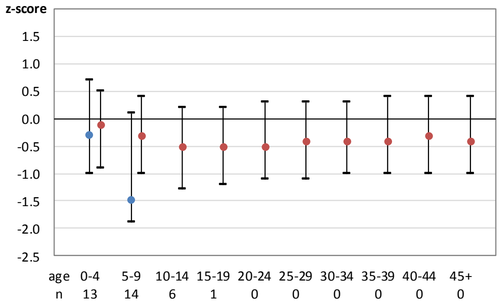


Quartiles of z-scores for height: Portugal

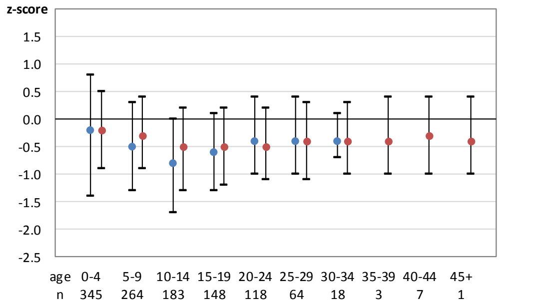


[figure 6.3 continued]

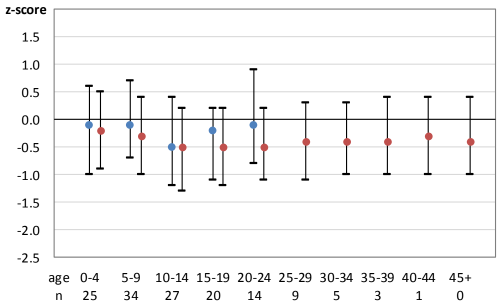
Quartiles of z-scores for height: Romania



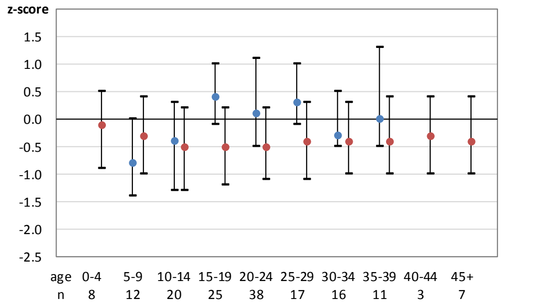
Quartiles of z-scores for height: Russian Federation



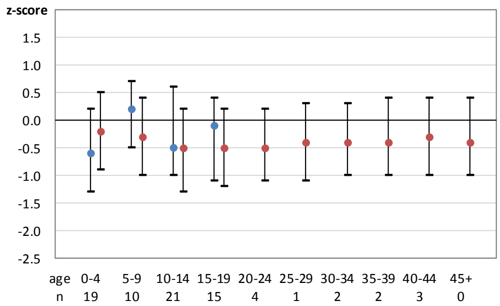
Quartiles of z-scores for height: Serbia



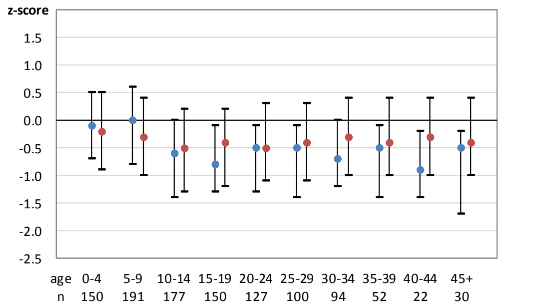
Quartiles of z-scores for height: Slovak Republic



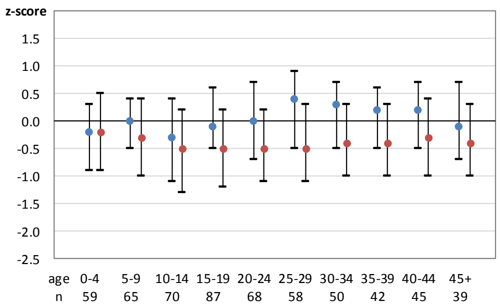
Quartiles of z-scores for height: Slovenia



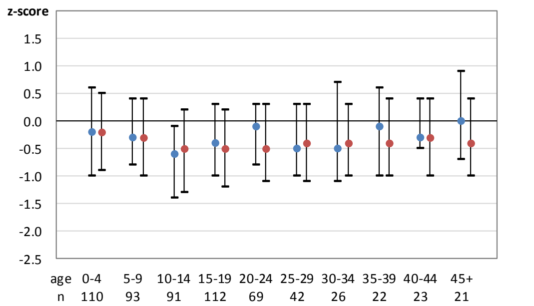
Quartiles of z-scores for height: Spain



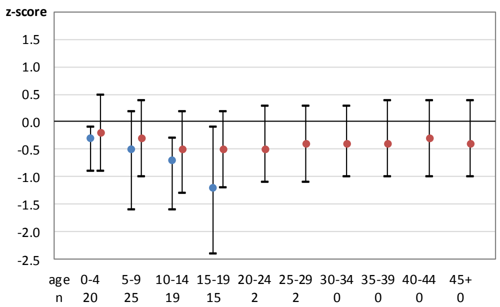
Quartiles of z-scores for height: Sweden



Quartiles of z-scores for height: Switzerland



Quartiles of z-scores for height: Ukraine



Quartiles of z-scores for height: United Kingdom

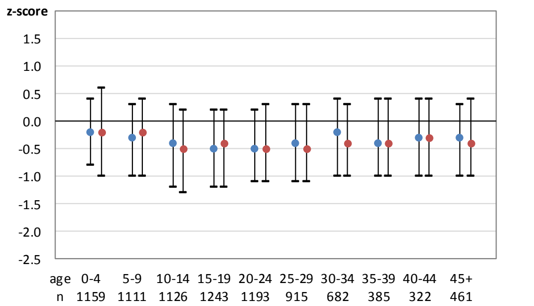


Table 6.5 Z-scores for weight: descriptive statistics by country. Patients aged 17 years or younger.

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	333	-0.4	-7.1	-1.0	-0.2	0.4	2.4
Belgium	520	-0.4	-6.6	-1.1	-0.4	0.3	2.6
Czech Republic	325	-0.3	-7.1	-1.0	-0.2	0.5	3.6
Denmark	193	-0.3	-3.2	-0.9	-0.3	0.2	1.5
France	3045	-0.6	-8.2	-1.3	-0.6	0.1	9.5
Greece	48	-0.3	-4.6	-1.1	-0.5	0.7	2.6
Hungary	290	-0.8	-8.2	-1.6	-0.6	0.1	7.7
Ireland	508	-0.5	-4.7	-1.2	-0.5	0.2	3.6
Israel	229	-0.5	-3.7	-1.2	-0.4	0.3	2.5
Italy	1332	-0.3	-6.1	-1.0	-0.2	0.5	3.2
Latvia	<10	-1.8	-2.8	-2.7	-2.0	-1.9	0.7
Rep of Macedonia	73	-0.6	-4.6	-1.4	-0.7	0.3	2.5
Rep of Moldova	46	-1.2	-8.6	-2.4	-1.2	0.6	4.0
The Netherlands	598	-0.1	-4.0	-0.6	-0.1	0.5	2.9
Portugal	44	-1.0	-5.9	-1.6	-0.8	-0.3	6.2
Romania	34	-0.9	-3.2	-1.8	-1.2	0.0	2.4
Russian Federation	887	-0.9	-7.9	-1.8	-0.8	0.1	4.3
Serbia	105	-0.6	-6.4	-1.3	-0.4	0.1	2.3
Slovak Republic	51	-0.6	-3.2	-1.3	-0.6	0.2	1.6
Slovenia	60	-0.6	-4.2	-1.4	-0.5	0.3	1.7
Spain	619	-0.3	-4.6	-1.0	-0.3	0.4	3.0
Sweden	241	-0.2	-3.2	-0.7	-0.1	0.5	1.7
Switzerland	366	-0.5	-3.7	-1.2	-0.4	0.2	2.1
Ukraine	74	-1.3	-8.6	-1.8	-1.0	-0.2	1.5
United Kingdom	4211	-0.2	-7.7	-0.9	-0.2	0.5	6.1

Note: Lithuania has 0% coverage for children.

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).

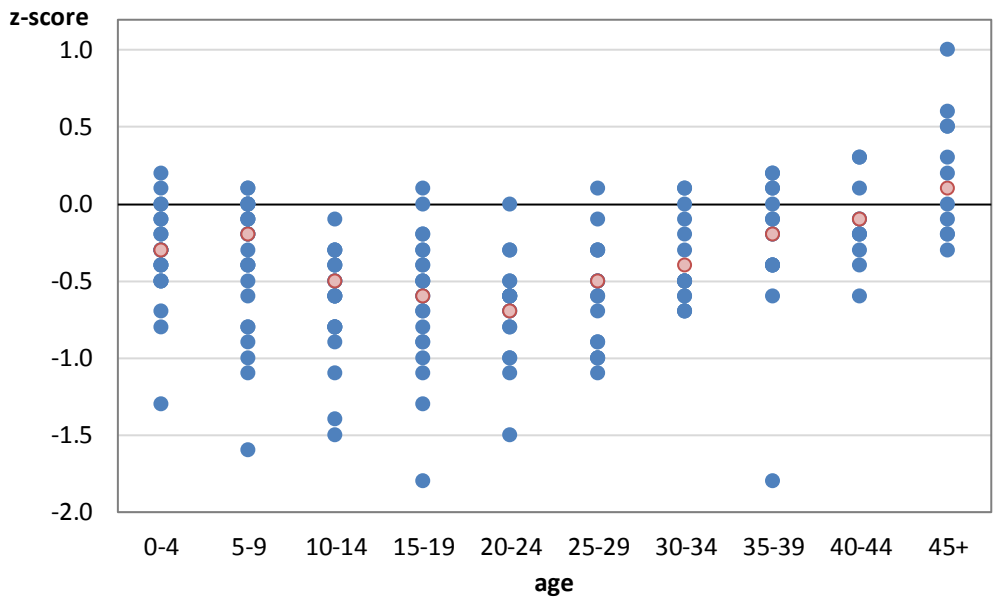
Table 6.6 Z-scores for weight: descriptive statistics by country. Patients aged 18 years or older.

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	180	-0.6	-3.8	-1.3	-0.5	0.2	2.2
Belgium	485	-0.5	-5.8	-1.2	-0.4	0.3	2.7
Czech Republic	182	-0.8	-6.1	-1.3	-0.6	0.1	2.0
Denmark	251	-0.3	-5.7	-1.0	-0.2	0.5	2.1
France	2875	-0.9	-8.2	-1.6	-0.9	-0.1	2.5
Greece	32	-0.7	-3.5	-1.3	-0.6	0.0	1.4
Hungary	195	-1.1	-4.4	-1.9	-1.0	0.0	1.1
Ireland	387	-0.4	-5.7	-1.1	-0.4	0.3	2.8
Israel	271	-0.5	-4.6	-1.2	-0.4	0.4	3.2
Italy	1952	-0.6	-5.4	-1.3	-0.5	0.2	3.2
Latvia	<10	-2.0	-2.5	-2.5	-2.0	-1.5	-1.5
Lithuania	13	-1.2	-5.2	-1.7	-0.6	-0.1	0.2
Rep of Macedonia	18	-0.9	-2.3	-1.5	-0.7	-0.3	0.4
Rep of Moldova	12	-1.4	-3.6	-2.7	-1.1	0.0	0.6
The Netherlands	665	-0.2	-4.1	-0.7	-0.1	0.5	2.3
Portugal	59	-0.6	-3.1	-1.3	-0.5	0.3	2.2
Russian Federation	280	-1.3	-8.8	-2.0	-1.2	-0.4	2.3
Serbia	37	-1.0	-4.9	-1.5	-0.7	-0.3	1.3
Slovak Republic	106	-0.5	-3.9	-1.2	-0.3	0.4	2.6
Slovenia	17	-0.8	-2.3	-1.7	-0.7	0.1	0.4
Spain	480	-0.6	-5.2	-1.3	-0.6	0.1	3.1
Sweden	340	-0.1	-3.9	-0.7	-0.1	0.5	2.8
Switzerland	241	-0.6	-4.5	-1.1	-0.5	0.0	2.3
Ukraine	<10	-2.2	-8.0	-1.7	-1.1	-0.7	-0.5
United Kingdom	4454	-0.3	-8.0	-1.0	-0.2	0.5	3.1

Note: Romania has 0% coverage for adults.

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 2012.



Note: we excluded from the analyses those age groups with <10 patients.

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 decrease from the age group 10-14 years to the age group 20-24 years before they increase in the older age groups. Again, the patients in the older 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 2012.

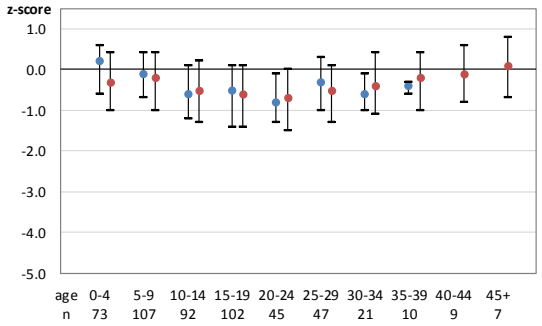
Age at weight measurement	N	Mean	Min	25th pctl	Median	75th pctl	Max
0-4	3560	-0.3	-7.3	-1.0	-0.3	0.4	9.5
5-9	4108	-0.3	-6.1	-0.9	-0.2	0.4	4.5
10-14	4106	-0.6	-8.2	-1.3	-0.5	0.2	2.9
15-19	3982	-0.7	-8.8	-1.4	-0.6	0.1	2.6
20-24	3614	-0.8	-8.0	-1.5	-0.7	0.0	2.8
25-29	2749	-0.6	-7.5	-1.3	-0.5	0.1	3.2
30-34	2029	-0.4	-6.1	-1.1	-0.4	0.4	2.9
35-39	1412	-0.3	-5.4	-1.0	-0.2	0.4	3.1
40-44	968	-0.1	-4.5	-0.8	-0.1	0.6	2.9
45+	1252	0.0	-6.3	-0.7	0.1	0.8	3.2

This table reports the median z-scores for weight and other descriptive statistics by age group for all the patients seen in 2012. The median values reported in this table are shown as red dots in fig 6.4.

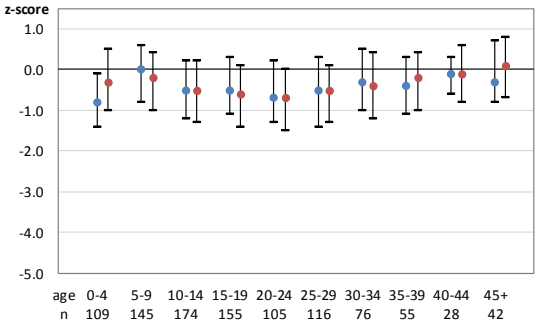
Figure 6.5 Quartiles of z-scores for weight by age group and by country. All patients seen in 2012.

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 the pooled quartiles computed on all other countries (i.e. excluding that country). We did not compute quartiles for the age groups with <10 patients, which explains why 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 Lithuania from the graphs because none of the age groups in these countries had more than 10 patients.

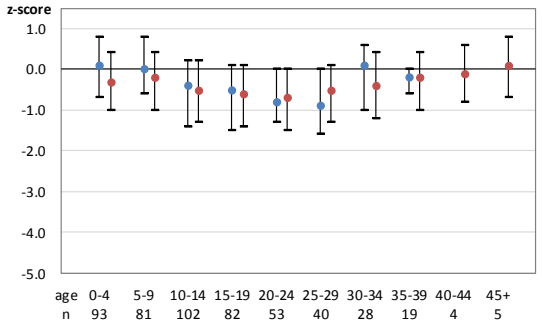
Quartiles of z-scores for weight: Austria



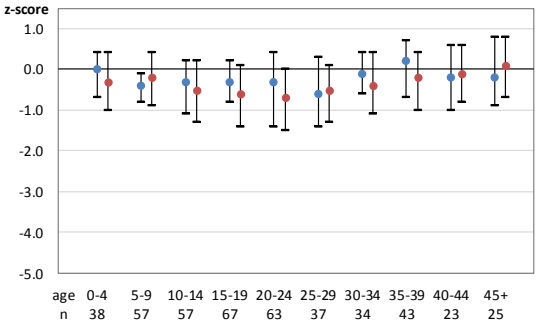
Quartiles of z-scores for weight: Belgium



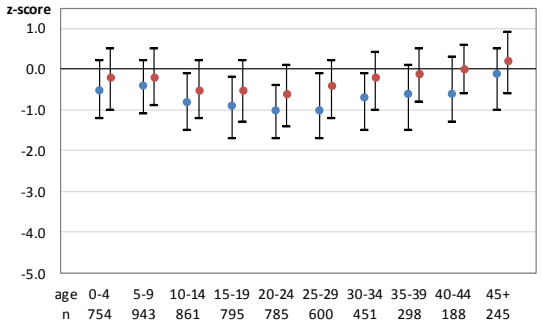
Quartiles of z-scores for weight: Czech Republic



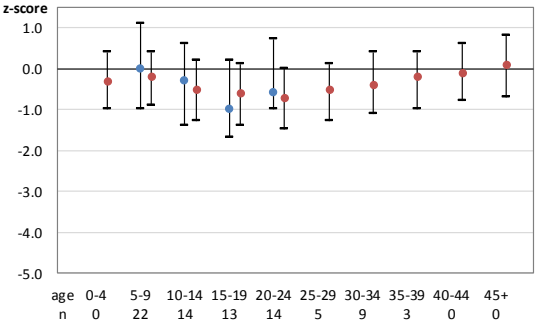
Quartiles of z-scores for weight: Denmark



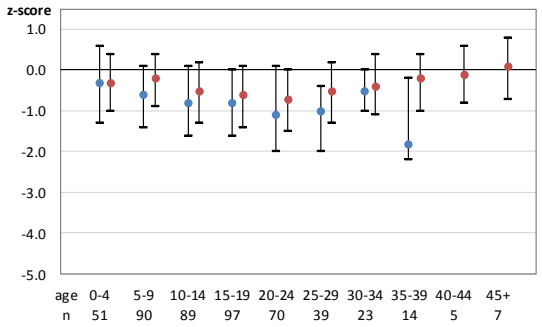
Quartiles of z-scores for weight: France



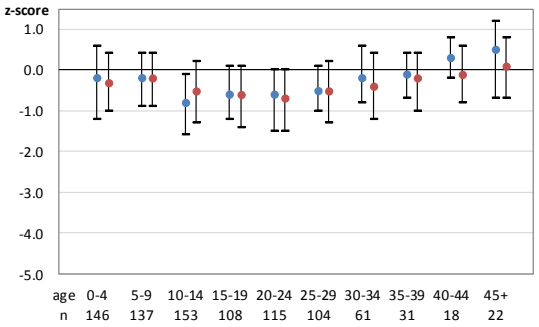
Quartiles of z-scores for weight: Greece



Quartiles of z-scores for weight: Hungary

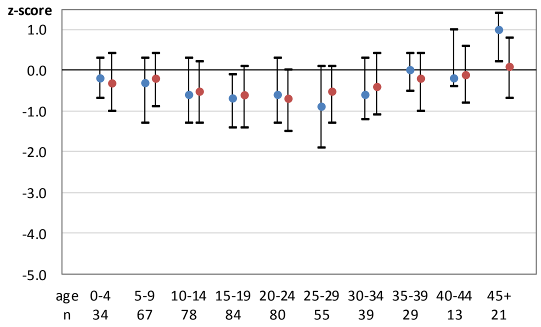


Quartiles of z-scores for weight: Ireland

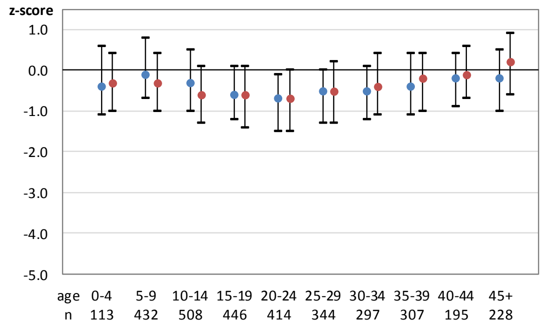


[figure 6.5 continued]

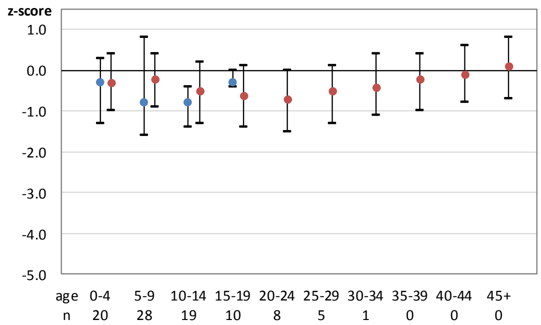
Quartiles of z-scores for weight: Israel



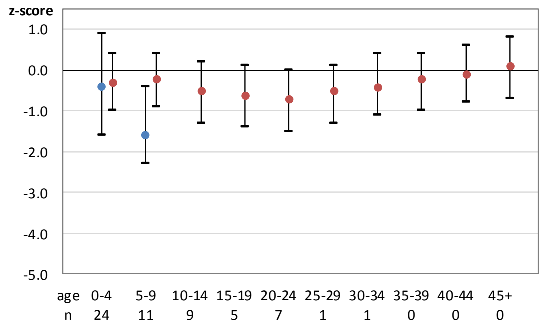
Quartiles of z-scores for weight: Italy



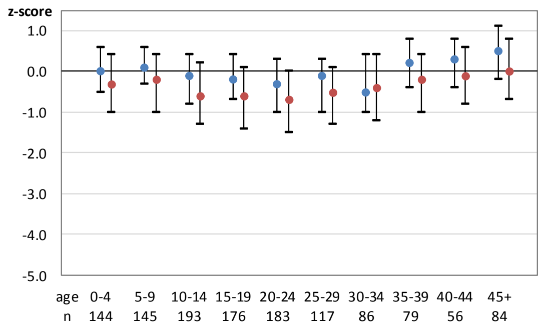
Quartiles of z-scores for weight: Rep of Macedonia



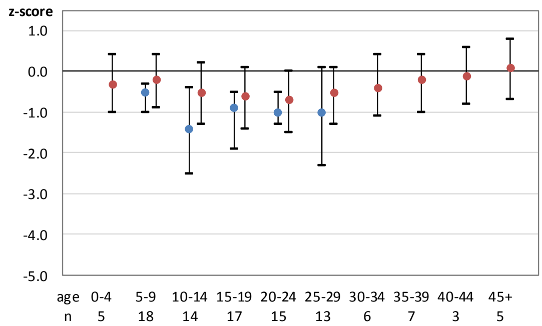
Quartiles of z-scores for weight: Rep of Moldova



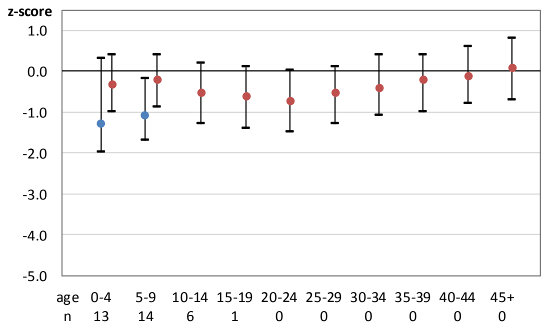
Quartiles of z-scores for weight: The Netherlands



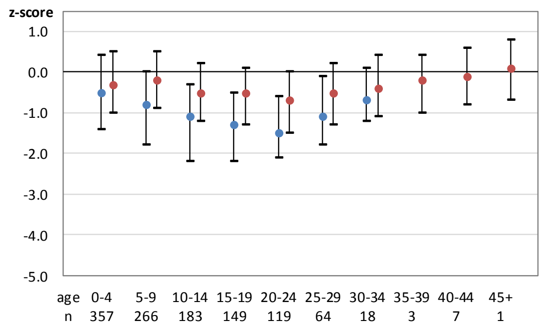
Quartiles of z-scores for weight: Portugal



Quartiles of z-scores for weight: Romania

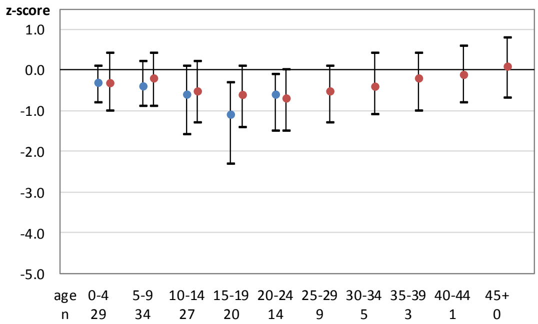


Quartiles of z-scores for weight: Russian Federation

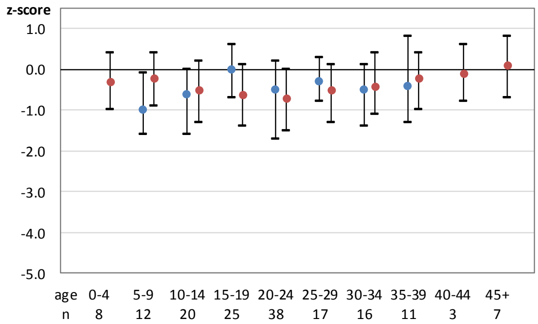


[figure 6.5 continued]

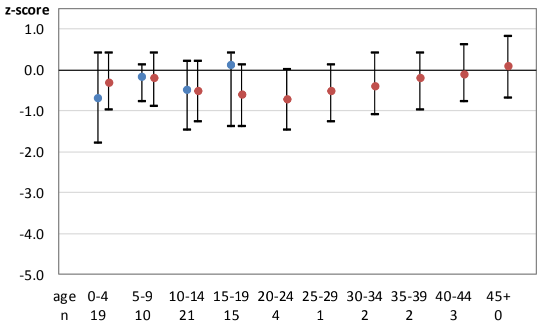
Quartiles of z-scores for weight: Serbia



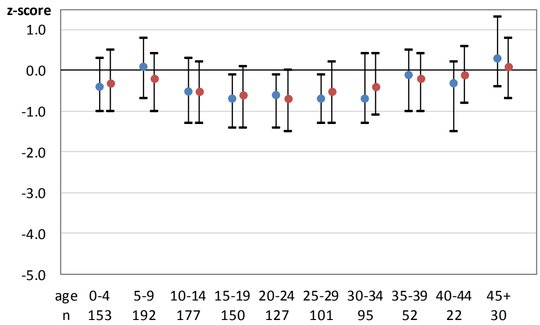
Quartiles of z-scores for weight: Slovak Republic



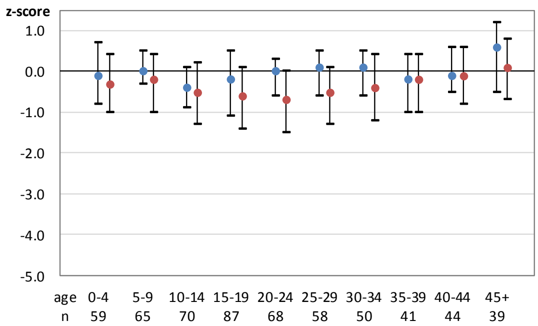
Quartiles of z-scores for weight: Slovenia



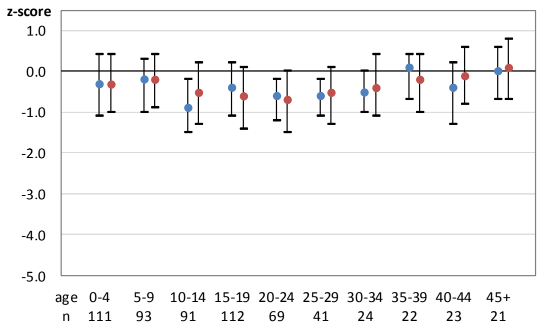
Quartiles of z-scores for weight: Spain



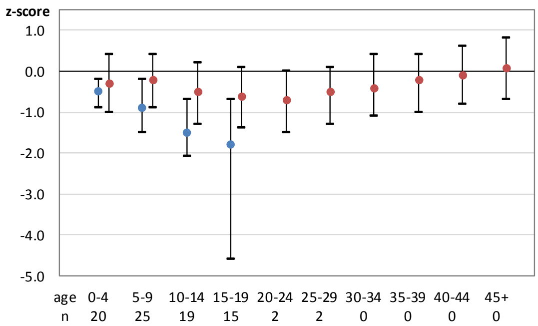
Quartiles of z-scores for weight: Sweden



Quartiles of z-scores for weight: Switzerland



Quartiles of z-scores for weight: Ukraine



Quartiles of z-scores for weight: United Kingdom

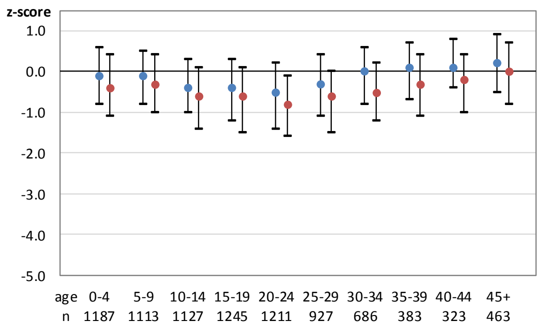


Table 6.8 Z-scores for BMI: descriptive statistics by country. All patients seen in 2012 aged 2-17 years.

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	307	0	-0.4	-3.9	-1.1	-0.4	0.4	2.2
Belgium	478	1	-0.2	-3.6	-0.8	-0.1	0.5	2.8
Czech Republic	289	0	-0.3	-5.5	-1.0	-0.3	0.4	2.0
Denmark	183	0	-0.4	-3.1	-1.0	-0.4	0.2	1.6
France	2778	15	-0.5	-6.7	-1.1	-0.4	0.2	2.6
Greece	48	0	-0.2	-4.2	-1.1	-0.1	0.5	2.5
Hungary	272	1	-1.0	-6.6	-1.8	-0.8	0.0	2.9
Ireland	449	10	-0.1	-3.0	-0.8	-0.1	0.6	4.5
Israel	220	1	-0.2	-3.3	-0.8	-0.1	0.5	2.4
Italy	1300	254	-0.1	-7.0	-0.8	-0.1	0.6	3.0
Latvia	<10	0	-1.8	-4.3	-2.2	-1.7	-1.2	0.6
Rep of Macedonia	66	0	-0.1	-2.4	-0.8	-0.2	0.3	2.6
Rep of Moldova	33	1	-0.8	-5.4	-1.7	-0.8	0.1	4.0
The Netherlands	539	0	-0.2	-3.0	-0.7	-0.2	0.3	2.6
Portugal	41	0	-0.8	-4.4	-1.5	-0.8	0.0	1.0
Romania	29	0	-0.7	-3.8	-1.8	-0.4	0.3	2.2
Russian Federation	726	6	-1.0	-9.1	-1.7	-0.8	0.0	3.7
Serbia	93	1	-0.4	-6.0	-1.2	-0.4	0.5	2.2
Slovak Republic	47	0	-0.6	-3.0	-1.4	-0.5	0.2	1.6
Slovenia	53	0	-0.6	-3.1	-1.2	-0.5	0.0	1.7
Spain	552	3	-0.1	-3.8	-0.7	0.0	0.7	3.2
Sweden	227	1	-0.1	-3.4	-0.5	-0.1	0.5	1.6
Switzerland	316	1	-0.4	-3.4	-1.0	-0.4	0.2	2.1
Ukraine	69	0	-1.1	-7.4	-1.6	-0.9	-0.2	0.9
United Kingdom	3794	31	0.0	-7.3	-0.6	0.0	0.7	6.8

Note: Lithuania has 0% coverage for children.

This table reports the median z-scores 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 2012 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	179	1	21.0	14.6	18.8	20.6	22.8	36.2
Belgium	484	1	21.6	14.4	19.5	21.1	23.3	34.6
Czech Republic	182	23	20.5	13.5	18.4	20.3	22.6	33.3
Denmark	251	0	21.8	14.3	19.5	21.5	23.3	36.9
France	2869	19	20.8	13.1	18.7	20.4	22.4	45.2
Greece	32	0	21.4	15.0	18.7	20.8	23.0	31.7
Hungary	195	4	19.9	14.3	17.5	19.7	22.3	25.9
Ireland	357	57	22.1	13.1	19.6	21.7	23.9	43.6
Israel	271	0	22.6	15.0	19.8	22.2	24.5	43.5
Italy	1950	278	21.9	14.7	19.7	21.5	23.7	45.4
Latvia	<10	0	17.7	16.0	16.0	17.7	19.5	19.5
Lithuania	13	0	18.5	12.0	17.7	19.0	20.8	22.2
Rep of Macedonia	18	0	20.6	17.3	19.5	20.6	21.5	24.5
Rep of Moldova	12	0	19.1	15.4	18.0	19.6	20.4	22.7
The Netherlands	665	0	21.8	14.9	19.8	21.5	23.5	38.4
Portugal	59	1	22.4	16.9	19.8	21.6	24.7	35.7
Russian Federation	278	14	19.5	12.3	17.6	19.2	21.2	34.6
Serbia	37	0	19.5	14.5	17.9	19.5	21.1	26.3
Slovak Republic	106	0	21.1	13.9	18.6	21.0	23.2	35.1
Slovenia	17	0	20.2	16.9	18.2	20.1	20.8	26.9
Spain	478	12	21.9	14.1	19.6	21.5	23.4	39.6
Sweden	340	6	22.2	16.1	19.9	21.7	24.1	35.9
Switzerland	241	3	21.1	14.9	19.6	21.0	22.4	36.6
Ukraine	<10	0	18.3	14.6	16.8	18.7	20.5	21.7
United Kingdom	4386	120	22.6	12.5	20.1	22.1	24.4	48.6

Note: Romania has 0% coverage for adults.

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.

Table 6.10 BMI: descriptive statistics by country. All male patients seen in 2012 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	91	1	21.6	14.9	19.1	21.3	23.5	36.2
Belgium	261	0	21.8	14.4	19.7	21.5	23.6	34.6
Czech Republic	96	13	20.8	13.7	18.7	20.6	23.2	33.3
Denmark	133	0	22.2	14.3	20.2	22.0	24.1	33.0
France	1509	8	20.9	13.1	18.9	20.6	22.7	40.5
Greece	13	0	22.2	17.0	19.0	22.2	24.2	31.7
Hungary	118	3	20.3	15.0	17.6	20.3	23.0	25.9
Ireland	208	30	22.4	16.4	20.0	22.1	24.3	31.5
Israel	155	0	22.9	15.0	20.1	22.5	24.7	43.5
Italy	1074	128	22.4	15.0	20.3	22.1	24.3	41.6
Latvia	<10	0	17.7	16.0	16.0	17.7	19.5	19.5
Lithuania	<10	0	19.2	12.0	18.0	20.2	21.6	21.9
Rep of Macedonia	<10	0	21.0	18.9	19.7	20.7	22.1	24.5
Rep of Moldova	<10	0	18.6	15.4	17.6	19.2	19.9	20.8
The Netherlands	370	0	21.9	15.1	20.1	21.7	23.7	31.3
Portugal	27	1	21.7	17.1	19.2	21.0	24.7	28.2
Russian Federation	167	5	19.6	12.3	17.7	19.3	21.2	34.6
Serbia	18	0	20.2	14.7	17.9	20.3	21.6	26.3
Slovak Republic	54	0	21.5	15.0	18.6	21.2	23.5	35.1
Slovenia	<10	0	21.2	16.9	19.4	20.6	23.0	26.9
Spain	244	5	22.3	14.1	20.3	22.0	23.8	39.6
Sweden	182	2	22.8	16.1	20.2	22.3	25.0	35.3
Switzerland	138	3	21.5	14.9	19.7	21.3	22.7	36.6
Ukraine	<10	0	18.0	14.6	15.8	18.0	19.9	21.7
United Kingdom	2419	66	22.9	13.4	20.6	22.6	25.0	43.9

Note: Romania has 0% coverage for adults.

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

Table 6.11 BMI: descriptive statistics by country. All female patients seen in 2012 aged 18 years or older.

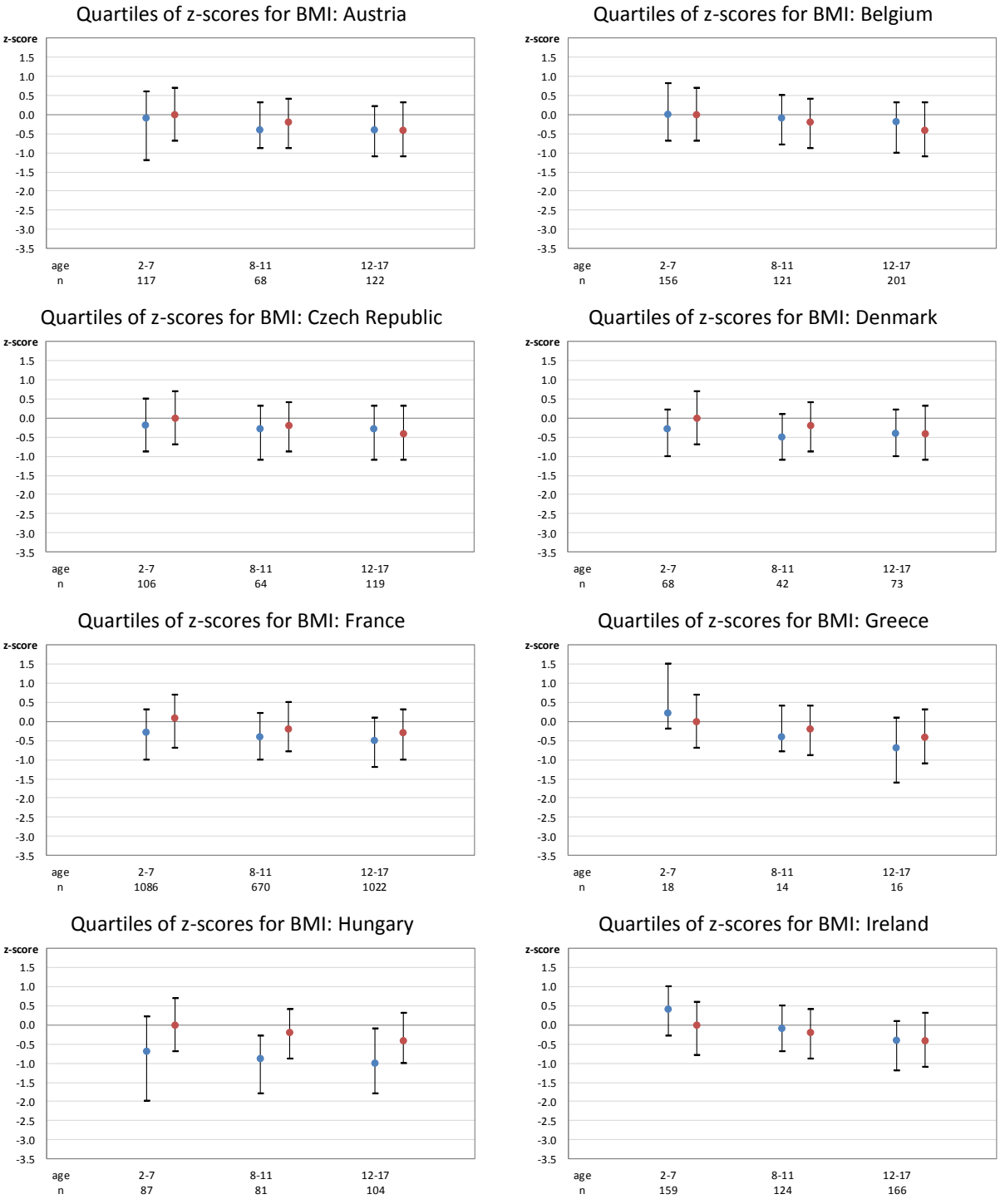
Country	N	N Miss	Mean	Min	25th pctl (25% of the patients are below this BMI)	Median (50% of the patients are below this BMI)	75th pctl (75% of the patients are below this BMI)	Max
Austria	88	0	20.4	14.6	18.6	20.0	21.8	30.5
Belgium	223	1	21.4	15.1	19.5	20.8	22.9	34.3
Czech Republic	86	10	20.1	13.5	18.3	20.0	21.8	26.9
Denmark	118	0	21.3	14.3	18.8	21.0	22.5	36.9
France	1360	11	20.7	13.8	18.5	20.1	22.1	45.2
Greece	19	0	20.9	15.0	18.7	20.4	22.6	27.0
Hungary	77	1	19.3	14.3	17.2	19.2	21.5	25.3
Ireland	149	27	21.8	13.1	19.2	21.1	23.4	43.6
Israel	116	0	22.1	16.0	19.4	21.2	23.8	36.7
Italy	876	150	21.3	14.7	19.2	20.7	22.8	45.4
Lithuania	<10	0	17.6	12.0	16.6	18.0	19.0	22.2
Rep of Macedonia	<10	0	20.3	17.3	19.2	20.4	21.5	22.9
Rep of Moldova	<10	0	19.8	15.4	19.9	20.1	20.8	22.7
The Netherlands	295	0	21.5	14.9	19.5	21.1	23.1	38.4
Portugal	32	0	22.9	16.9	20.3	22.3	24.4	35.7
Russian Federation	111	9	19.4	13.1	17.3	19.1	21.1	32.7
Serbia	19	0	18.7	14.5	17.4	18.5	20.3	22.5
Slovak Republic	52	0	20.7	13.9	18.6	20.8	22.7	26.7
Slovenia	<10	0	19.3	17.4	18.1	19.5	20.4	21.6
Spain	234	7	21.5	14.2	19.1	20.9	23.1	39.5
Sweden	158	4	21.5	16.4	19.3	21.0	22.5	35.9
Switzerland	103	0	20.7	15.2	19.5	20.2	21.9	27.5
Ukraine	<10	0	21.3	21.3	21.3	21.3	21.3	21.3
United Kingdom	1967	54	22.2	12.5	19.6	21.4	23.8	48.6

Note: Romania has 0% coverage for adults.
Latvia is excluded from the table, because there are no adult female patients.

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

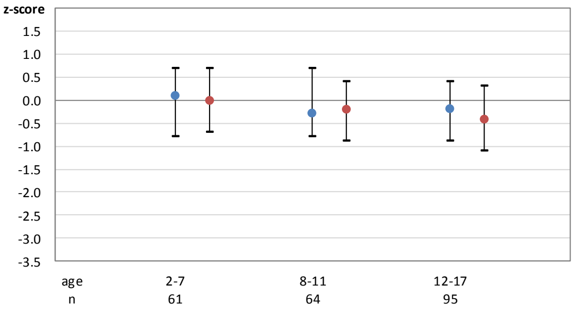
Figure 6.6 Quartiles of z-scores for BMI by age group and country. Patients aged 2-17 years in 2012.

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. 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 Lithuania from the graphs because none of the age groups in these countries had more than 10 patients.

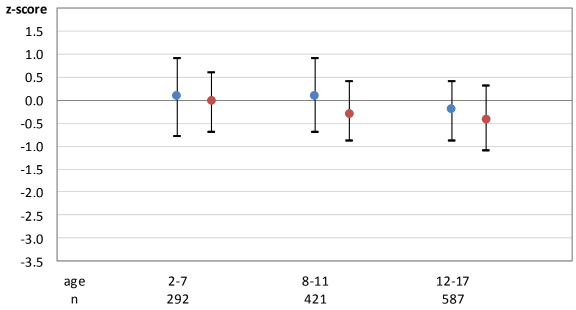


[figure 6.6 continued]

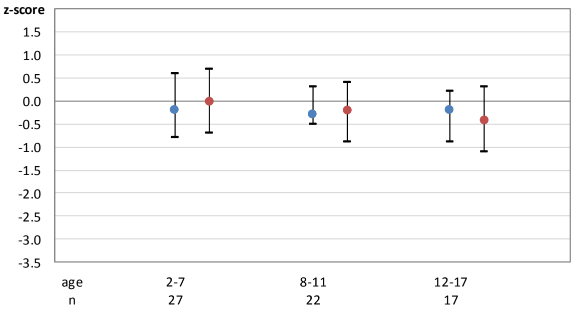
Quartiles of z-scores for BMI: Israel



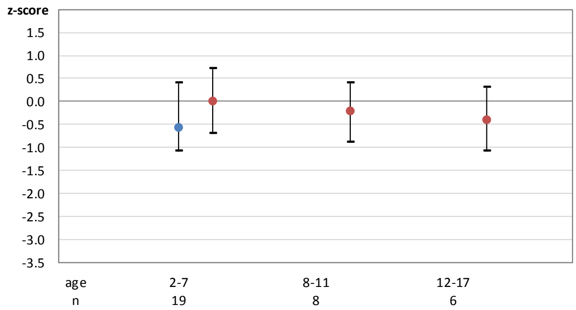
Quartiles of z-scores for BMI: Italy



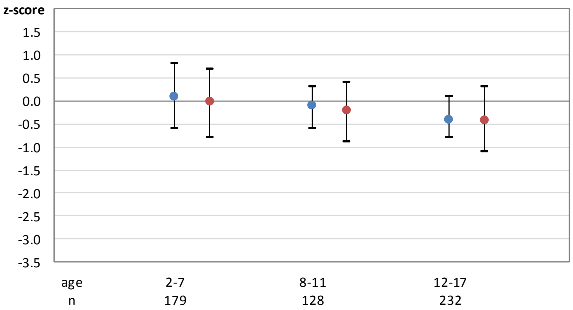
Quartiles of z-scores for BMI: Rep of Macedonia



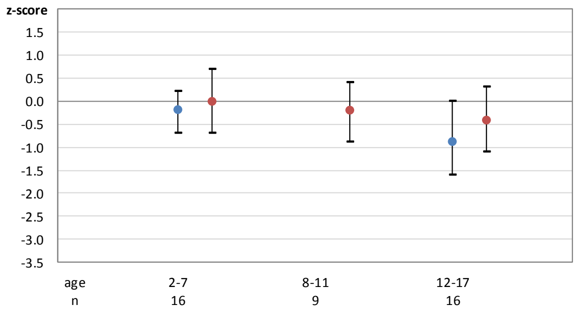
Quartiles of z-scores for BMI: Rep of Moldova



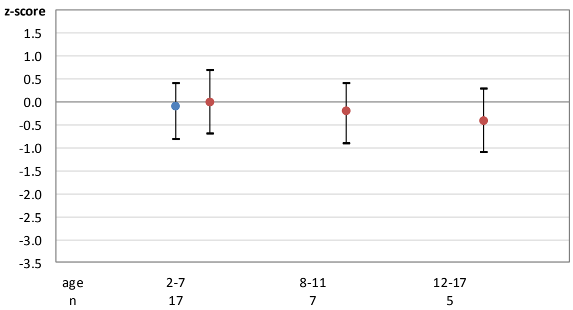
Quartiles of z-scores for BMI: The Netherlands



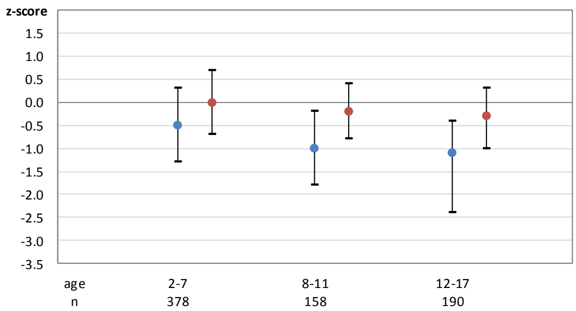
Quartiles of z-scores for BMI: Portugal



Quartiles of z-scores for BMI: Romania

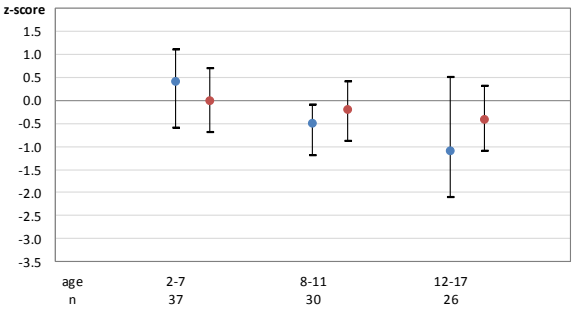


Quartiles of z-scores for BMI: Russian Federation

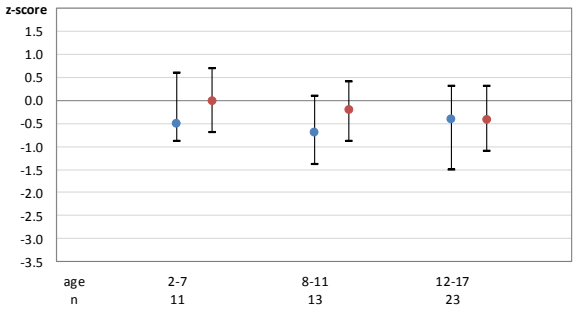


[figure 6.6 continued]

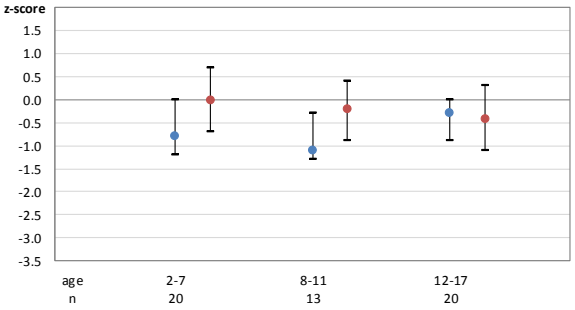
Quartiles of z-scores for BMI: Serbia



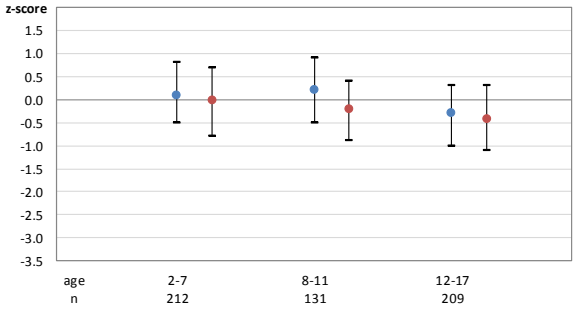
Quartiles of z-scores for BMI: Slovak Republic



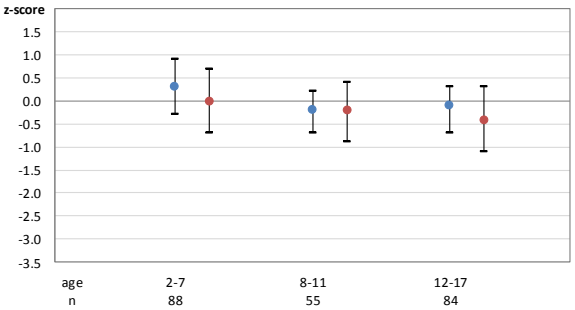
Quartiles of z-scores for BMI: Slovenia



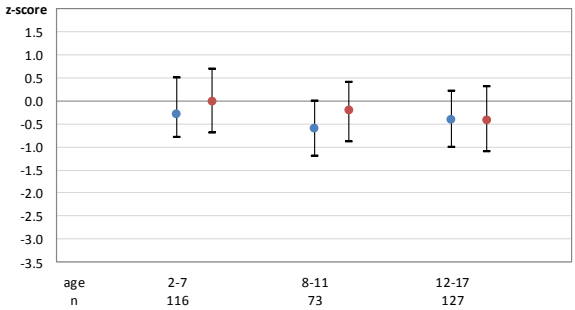
Quartiles of z-scores for BMI: Spain



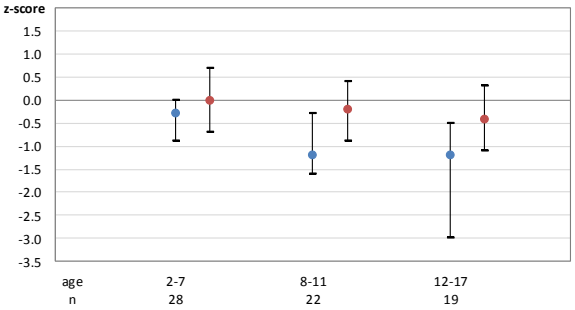
Quartiles of z-scores for BMI: Sweden



Quartiles of z-scores for BMI: Switzerland



Quartiles of z-scores for BMI: Ukraine



Quartiles of z-scores for BMI: United Kingdom

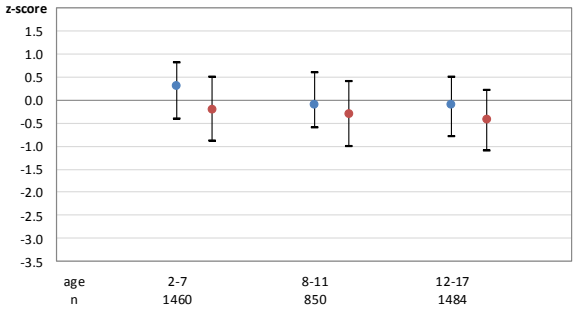
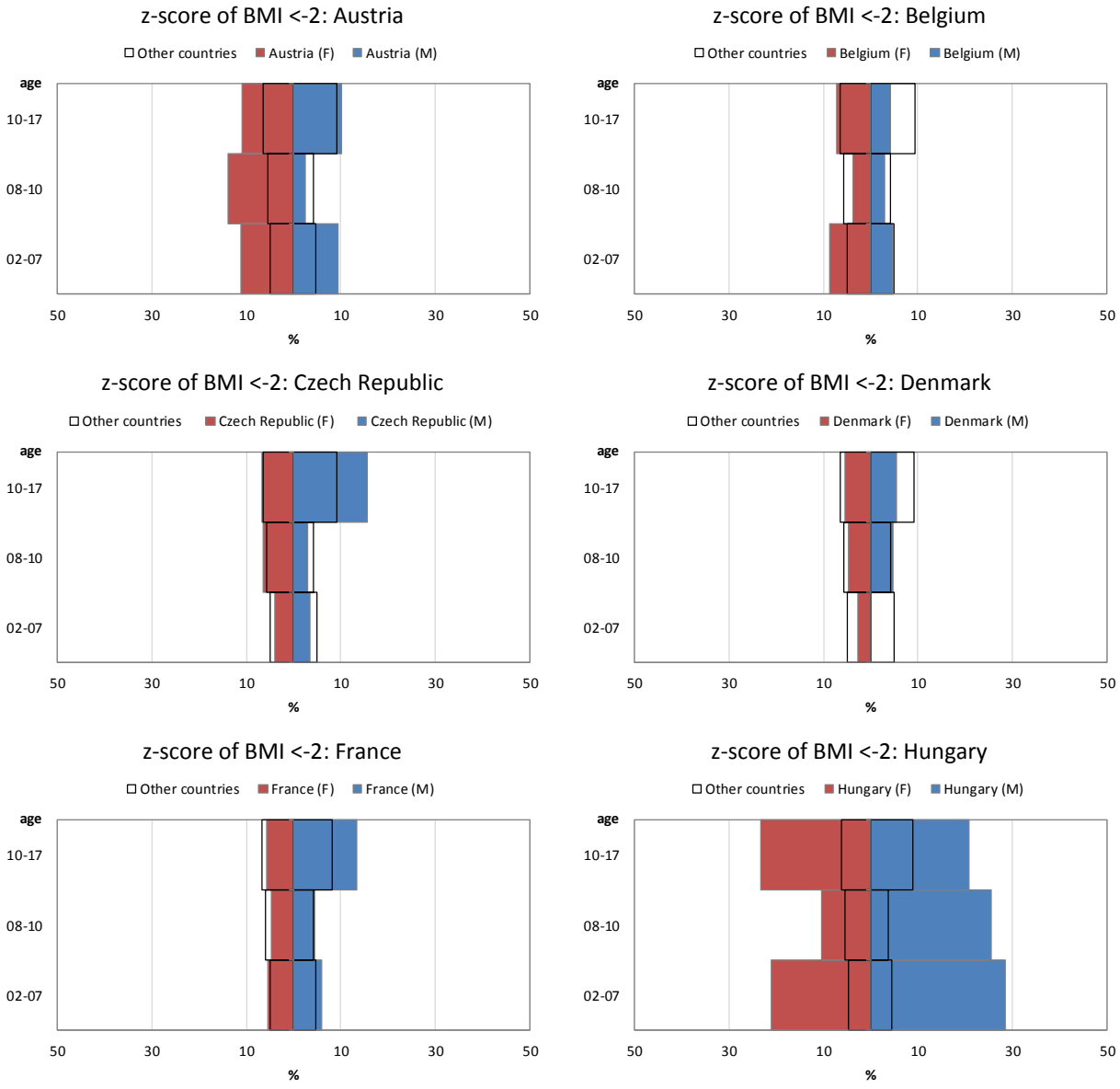
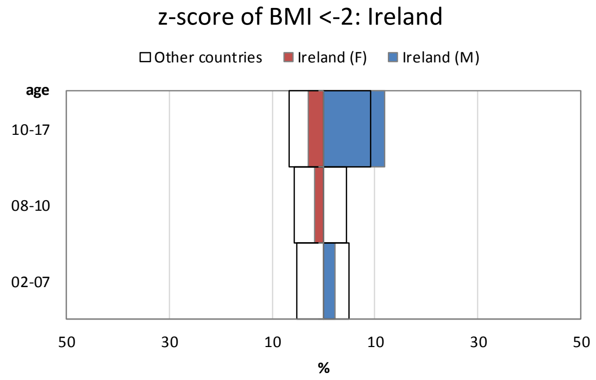


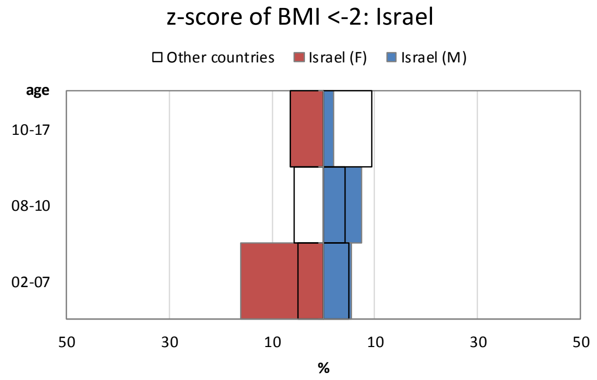
Figure 6.7 Proportion of child patients underweight (z-score of BMI <-2): age and sex pyramids, by country and overall. Patients aged 2-17 years in 2012.

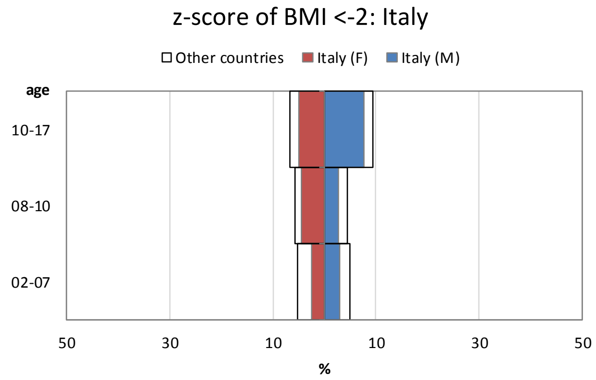
The coloured bars (red for females, blue for males) represent the percentage of underweight patients in the specified country, whereas the non-coloured bars represent the percentage of underweight patients in all the remaining countries (i.e. excluding that country). We excluded from the analyses those age groups where the number of patients was <10. We therefore excluded from the graphs Greece, Latvia, Lithuania, Republic of Moldova, Portugal, Romania, Slovak Republic and Slovenia because some of the age groups in these countries had less than 10 patients.

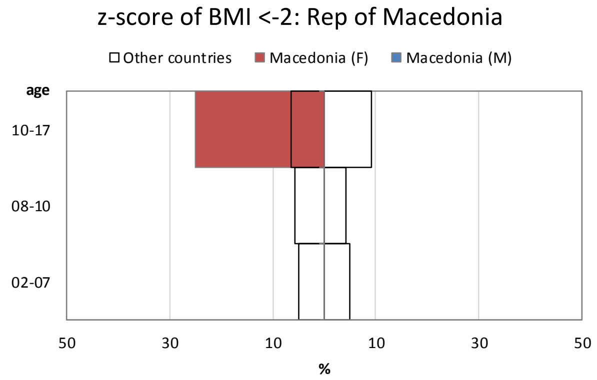


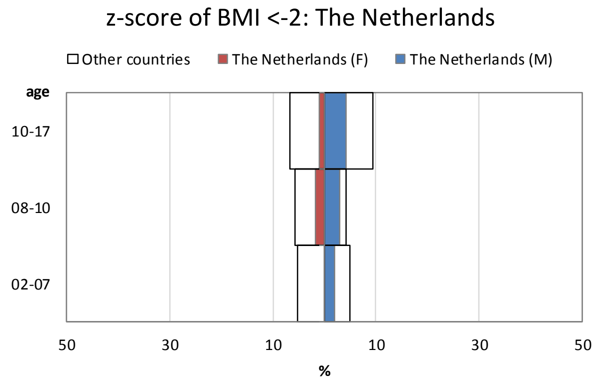
[figure 6.7 continued]

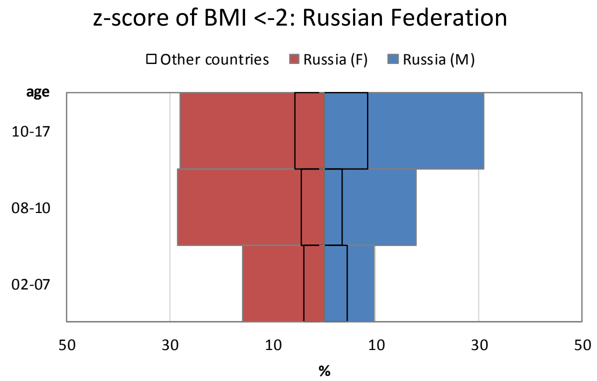


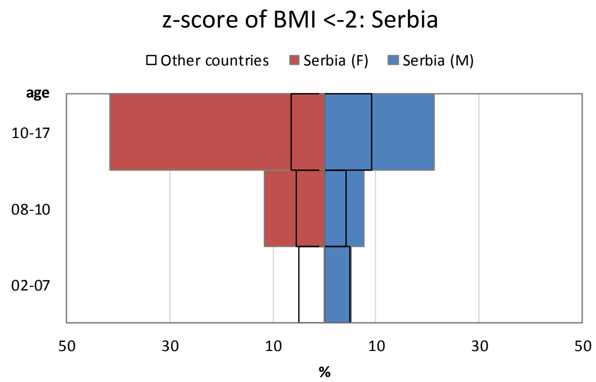


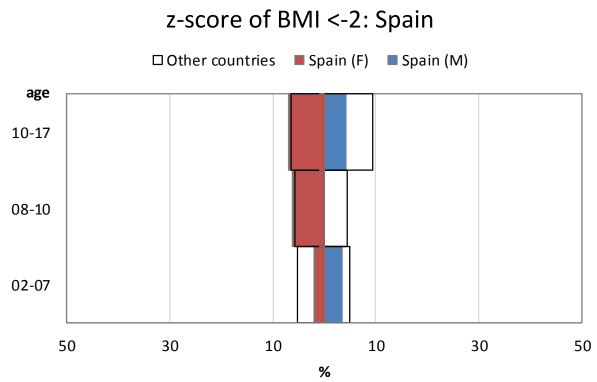




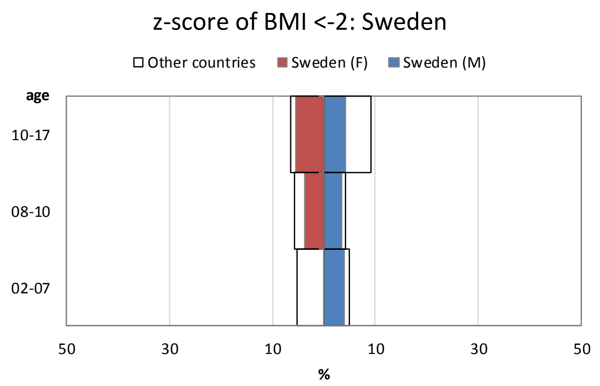


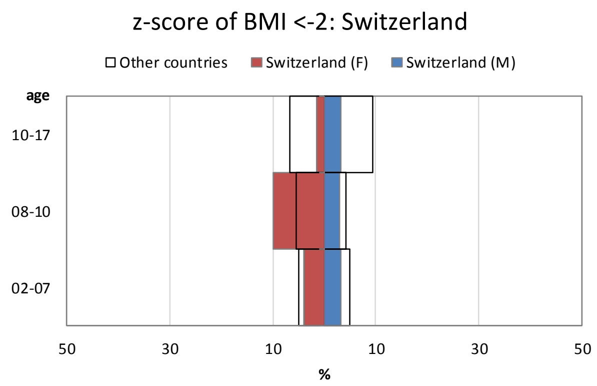


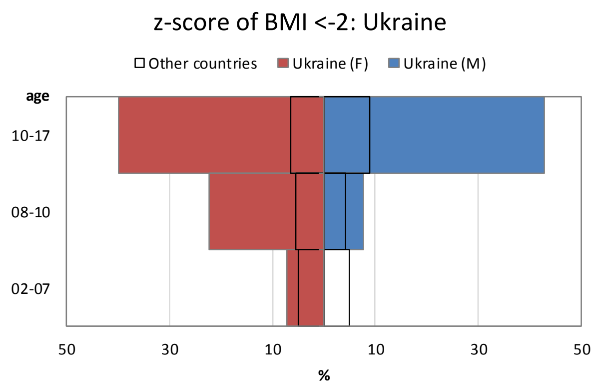




[figure 6.7 continued]







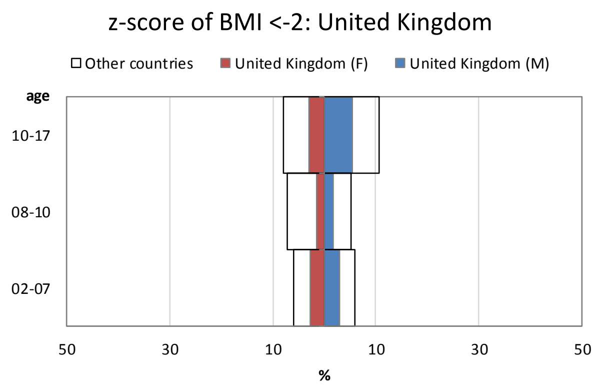
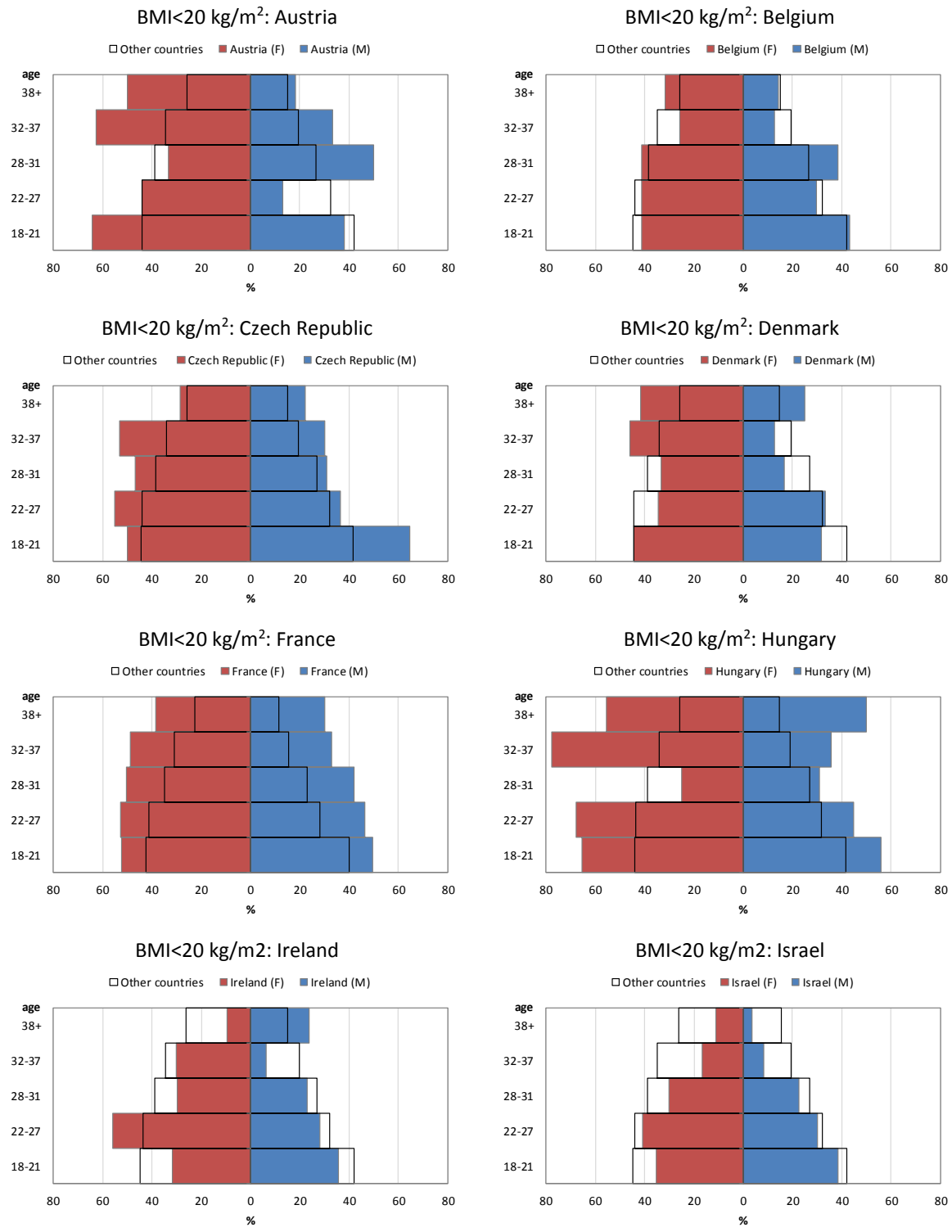
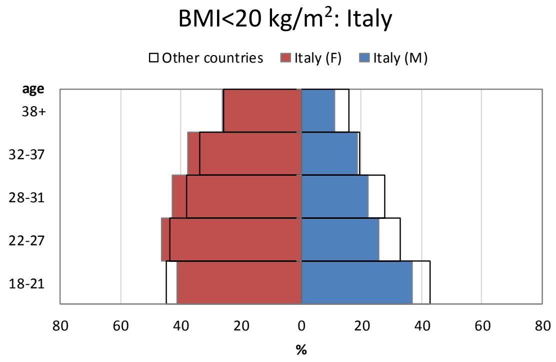


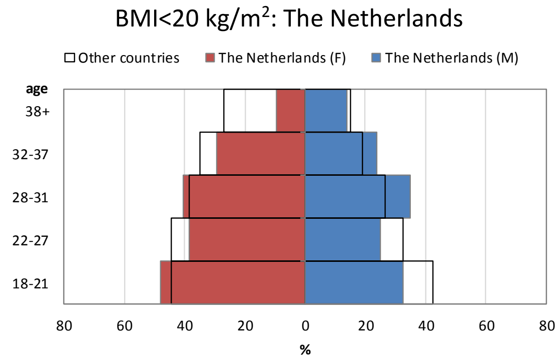
Figure 6.8 Proportion of adult patients with BMI <20: age and sex pyramids, by country and overall. Patients aged 18 years or older in 2012.

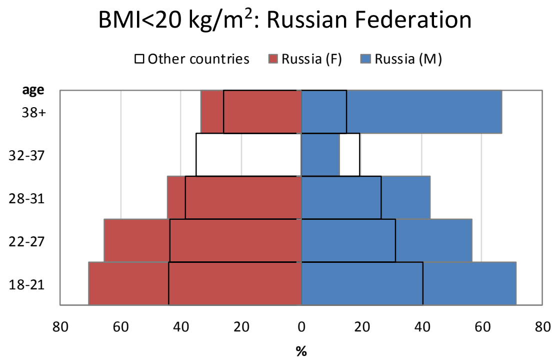
The coloured bars (red for females, blue for males) represent the percentage of underweight patients in the specified country, whereas the non-coloured bars represent the percentage of underweight patients in all the remaining countries (i.e. excluding that country). We excluded from the analyses those age groups where the number of patients was <10. We therefore excluded from the graphs Greece, Latvia, Lithuania, Republic of Moldova, Republic of Macedonia, Portugal, Romania, Serbia, Slovak Republic, Slovenia and Ukraine because some of the age groups in these countries had less than 10 patients.

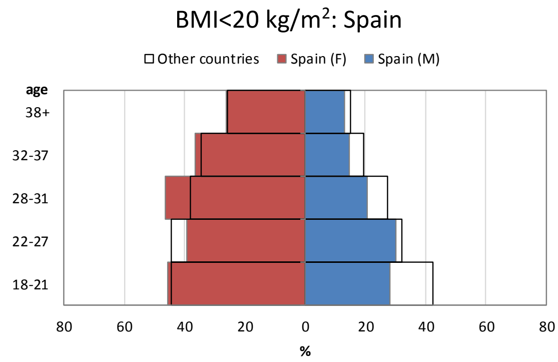


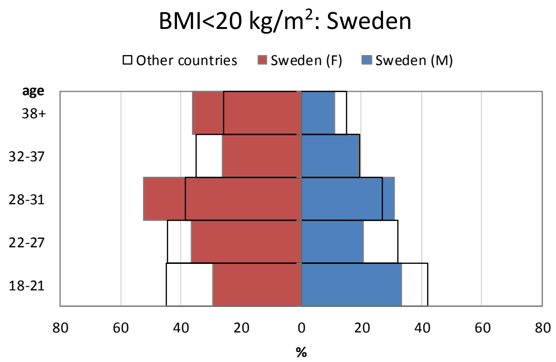
[figure 6.8 continued]

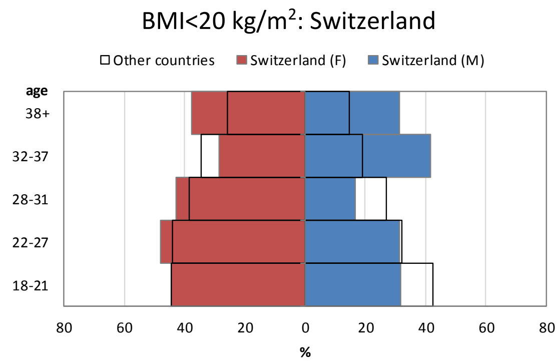


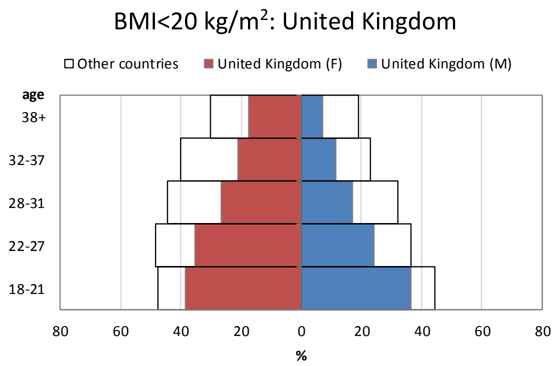












7. Complications and therapy

The information in this section should not be considered complete, either because national registries do not collect data about one or more complications since 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 was missing. For a full list of complications and definitions please see Appendix 2 on page 119.

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), 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.

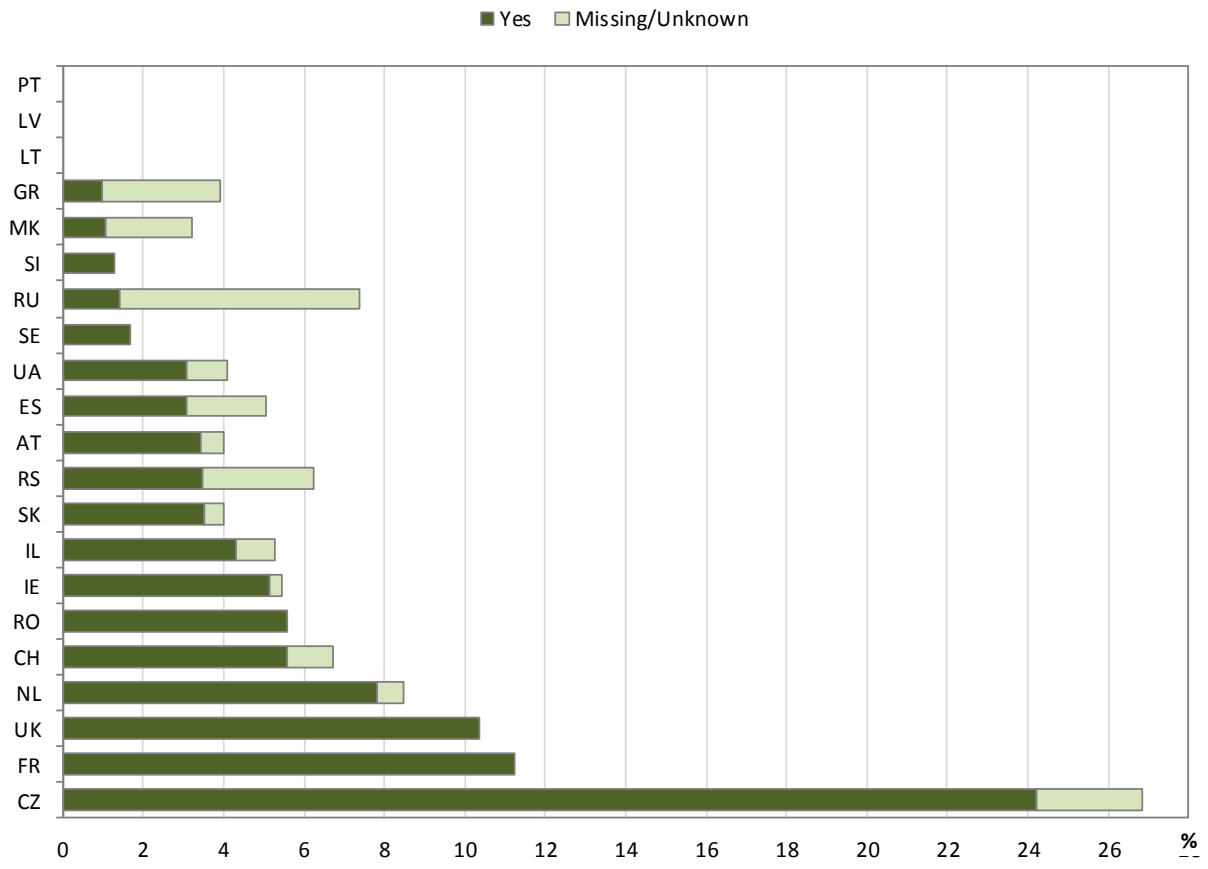
Table 7.1 Prevalence of allergic bronchopulmonary aspergillosis (all patients seen in 2012) and CFRD treated with insulin in 2012 (patients aged 18 years or older), by country.

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	3 (0.58)	502 (95.98)	18 (3.44)	1 (0.51)	153 (78.46)	41 (21.03)
Belgium[1]	136 (11.80)	977 (84.73)	40 (3.47)	130 (20.25)	426 (66.35)	86 (13.40)
Czech Republic	15 (2.63)	417 (73.16)	138 (24.21)	9 (3.73)	156 (64.73)	76 (31.54)
Denmark	449 (100)	-	-	0 (0)	160 (60.61)	104 (39.39)
France[2]	0 (0)	5466 (88.76)	692 (11.24)	0 (0)	2366 (77.45)	689 (22.55)
Greece	3 (2.94)	98 (96.08)	1 (0.98)	2 (5.41)	32 (86.48)	3 (8.11)
Hungary	65 (12.36)	458 (87.07)	3 (0.57)	9 (3.80)	180 (75.95)	48 (20.25)
Ireland	3 (0.28)	1008 (94.56)	55 (5.16)	3 (0.58)	376 (72.17)	142 (27.25)
Israel	5 (0.94)	505 (94.75)	23 (4.31)	4 (1.39)	198 (68.99)	85 (29.62)
Italy	1695 (36.16)	2847 (60.73)	146 (3.11)	315 (12.82)	1631 (66.35)	512 (20.83)
Latvia	0 (0)	33 (100)	0 (0)	0 (0)	5 (62.50)	3 (37.50)
Lithuania	0 (0)	13 (100)	0 (0)	0 (0)	12 (92.31)	1 (7.69)
Rep of Macedonia	2 (2.15)	90 (96.77)	1 (1.08)	2 (9.52)	14 (66.67)	5 (23.81)
Rep of Moldova	56 (94.92)	3 (5.08)	0 (0)	0 (0)	12 (92.31)	1 (7.69)
The Netherlands	8 (0.63)	1169 (91.54)	100 (7.83)	6 (0.86)	448 (64.55)	240 (34.59)
Portugal	0 (0)	119 (100)	0 (0)	1 (1.43)	62 (88.57)	7 (10.00)
Romania	0 (0)	34 (94.44)	2 (5.56)	-	-	-
Russian Federation	76 (5.97)	1180 (92.62)	18 (1.41)	30 (8.36)	297 (82.73)	32 (8.91)
Serbia	4 (2.78)	135 (93.75)	5 (3.47)	0 (0)	34 (79.07)	9 (20.93)
Slovak Republic	1 (0.50)	192 (96.00)	7 (3.50)	2 (1.80)	99 (89.19)	10 (9.01)
Slovenia	0 (0)	77 (98.72)	1 (1.28)	0 (0)	18 (90.00)	2 (10.00)
Spain	24 (1.99)	1144 (94.94)	37 (3.07)	15 (2.79)	372 (69.14)	151 (28.07)
Sweden	0 (0)	580 (98.31)	10 (1.69)	0 (0)	262 (73.60)	94 (26.40)
Switzerland	7 (1.12)	584 (93.29)	35 (5.59)	3 (1.14)	206 (78.03)	55 (20.83)
Ukraine	1 (1.02)	94 (95.92)	3 (3.06)	0 (0)	8 (88.89)	1 (11.11)
United Kingdom	0 (0)	7880 (89.66)	909 (10.34)	5 (0.11)	3230 (69.52)	1411 (30.37)

[1] Belgium: most of the patients that have missing values are transplanted patients.
[2] France: ABPA was collected as: Aspergillosis (ABPA and other) if treated.

Table 7.1 shows the frequency of allergic bronchopulmonary aspergillosis (see Appendix 2, page 119, for ABPA definitions) and CF-related diabetes (CFRD) – defined here as treated daily with insulin – by country. For CFRD only patients 18 years or older are included.

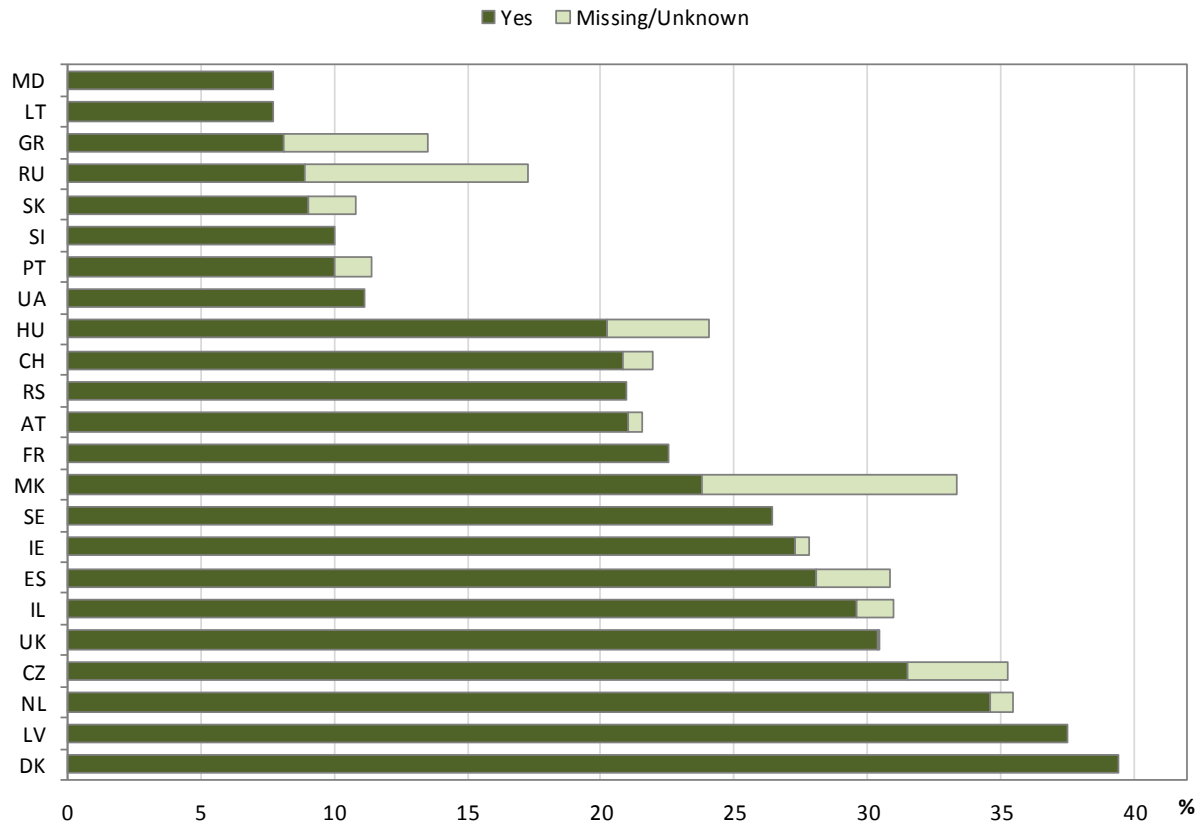
Figure 7.1 Prevalence of allergic bronchopulmonary aspergillosis in all patients seen in 2012, by country.



Note: We excluded from the graph the countries where the information on allergic bronchopulmonary aspergillosis (ABPA) 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 bronchopulmonary aspergillosis by country. For the definition of ABPA see Appendix 2, page 119. 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 2012 aged 18 years or older.



Note: We excluded from the graph the countries where the information on CFRD was missing for more than 10% of the patients.
Note: Romania has 0% coverage for adults.

This graph shows the prevalence of CF-related diabetes (CFRD) by country. CFRD is recorded differently among the 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 whom this information was missing. Only patients aged 18 years or older were included in this graph.

Table 7.2 Prevalence of pneumothorax, haemoptysis and malignancy in all patients seen in 2012, 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	5 (0.96)	518 (99.04)	0 (0)	9 (1.72)	505 (96.56)	9 (1.72)	2 (0.38)	521 (99.62)	0 (0)
Belgium[1]	136 (11.80)	1014 (87.94)	3 (0.26)	136 (11.80)	1011 (87.68)	6 (0.52)	136 (11.80)	1014 (87.94)	3 (0.26)
Czech Republic	23 (4.04)	542 (95.08)	5 (0.88)	24 (4.21)	533 (93.51)	13 (2.28)	15 (2.63)	555 (97.37)	0 (0)
Denmark	0 (0)	449 (100)	0 (0)	449 (100)	-	-	0 (0)	449 (100)	0 (0)
France[2]	0 (0)	6097 (99.01)	61 (0.99)	0 (0)	5874 (95.39)	284 (4.61)	0 (0)	6124 (99.45)	34 (0.55)
Greece	5 (4.90)	97 (95.10)	0 (0)	3 (2.94)	99 (97.06)	0 (0)	4 (3.92)	98 (96.08)	0 (0)
Hungary	11 (2.09)	503 (95.63)	12 (2.28)	69 (13.12)	452 (85.93)	5 (0.95)	69 (13.12)	454 (86.31)	3 (0.57)
Ireland	3 (0.28)	1052 (98.69)	11 (1.03)	3 (0.28)	1063 (99.72)	0 (0)	3 (0.28)	1060 (99.44)	<5 (0.28)
Israel	5 (0.94)	527 (98.87)	1 (0.19)	5 (0.94)	517 (97.00)	11 (2.06)	8 (1.50)	525 (98.50)	0 (0)
Italy	945 (20.16)	3730 (79.56)	13 (0.28)	947 (20.20)	3684 (78.58)	57 (1.22)	945 (20.16)	3730 (79.56)	13 (0.28)
Latvia	1 (3.03)	32 (96.97)	0 (0)	0 (0)	33 (100)	0 (0)	0 (0)	33 (100)	0 (0)
Lithuania	0 (0)	13 (100)	0 (0)	1 (7.69)	11 (84.62)	1 (7.69)	0 (0)	13 (100)	0 (0)
Rep of Macedonia	2 (2.15)	91 (97.85)	0 (0)	2 (2.15)	90 (96.77)	1 (1.08)	2 (2.15)	91 (97.85)	0 (0)
Rep of Moldova	0 (0)	59 (100)	0 (0)	0 (0)	52 (88.14)	7 (11.86)	0 (0)	59 (100)	0 (0)
The Netherlands[3]	12 (0.94)	1259 (98.59)	6 (0.47)	10 (0.78)	1215 (95.15)	52 (4.07)	12 (0.94)	1259 (98.59)	6 (0.47)
Portugal	0 (0)	119 (100)	0 (0)	0 (0)	110 (92.44)	9 (7.56)	1 (0.84)	118 (99.16)	0 (0)
Romania	0 (0)	36 (100)	0 (0)	0 (0)	35 (97.22)	1 (2.78)	0 (0)	36 (100)	0 (0)
Russian Federation	53 (4.16)	1208 (94.82)	13 (1.02)	61 (4.79)	1188 (93.25)	25 (1.96)	48 (3.77)	1222 (95.92)	4 (0.31)
Serbia	4 (2.78)	138 (95.83)	2 (1.39)	0 (0)	141 (97.92)	3 (2.08)	0 (0)	144 (100)	0 (0)
Slovak Republic	1 (0.50)	199 (99.50)	0 (0)	3 (1.50)	184 (92.00)	13 (6.50)	2 (1.00)	197 (98.50)	1 (0.50)
Slovenia	0 (0)	78 (100)	0 (0)	0 (0)	78 (100)	0 (0)	0 (0)	78 (100)	0 (0)
Spain	28 (2.32)	1173 (97.35)	4 (0.33)	37 (3.07)	1098 (91.12)	70 (5.81)	29 (2.41)	1166 (96.76)	10 (0.83)
Sweden	0 (0)	589 (99.83)	1 (0.17)	0 (0)	590 (100)	0 (09	0 (0)	588 (99.66)	2 (0.34)
Switzerland	6 (0.96)	620 (99.04)	0 (0)	12 (1.92)	600 (95.85)	14 (2.24)	9 (1.44)	616 (98.40)	1 (0.16)
Ukraine	1 (1.02)	97 (98.98)	0 (0)	1 (1.02)	96 (97.96)	1 (1.02)	2 (2.04)	96 (97.96)	0 (0)
United Kingdom	0 (0)	8750 (99.56)	39 (0.44)	0 (0)	8713 (99.14)	76 (0.86)	0 (0)	8768 (99.76)	21 (0.24)

[1] Belgium: most of the patients that have missing values are transplanted patients.
[2] France: pneumothorax only; haemoptysis, no quantification.
[3] The Netherlands: malignancy diagnosed this year/before.

Table 7.2 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 2012, 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 portal hypertension/ hypersplenism	Cirrhosis no portal hypertension/ hypersplenism	Cirrhosis, portal hypertension unknown				
Austria	6 (1.15)	283 (54.11)	19 (3.63)	16 (3.06)	2 (0.38)	197 (37.67)	4 (0.76)	268 (51.25)	251 (47.99)
Belgium[1]	136 (11.80)	981 (85.08)	36 (3.12)	0 (0)	0 (0)	0 (0)	142 (12.32)	755 (65.48)	256 (22.20)
Czech Republic	185 (32.45)	244 (42.81)	7 (1.23)	5 (0.88)	0 (0)	129 (22.63)	15 (2.63)	314 (55.09)	241 (42.28)
Denmark[2]	0 (0)	422 (93.99)	0 (0)	0 (0)	27 (6.01)	0 (0)	0 (0)	352 (78.40)	97 (21.60)
France[3]	0 (0)	5892 (95.68)	0 (0)	0 (0)	266 (4.32)	0 (0)	0 (0)	4372 (71.00)	1786 (29.00)
Greece	3 (2.94)	54 (52.95)	38 (37.25)	0 (0)	0 (0)	7 (6.86)	2 (1.96)	48 (47.06)	52 (50.98)
Hungary	76 (14.45)	302 (57.41)	13 (2.47)	11 (2.09)	17 (3.24)	107 (20.34)	83 (15.78)	283 (53.80)	160 (30.42)
Ireland	3 (0.28)	948 (88.93)	27 (2.53)	0 (0)	0 (0)	88 (8.26)	17 (1.59)	897 (84.15)	152 (14.26)
Israel	6 (1.13)	433 (81.23)	4 (0.75)	5 (0.94)	0 (0)	85 (15.95)	6 (1.13)	439 (82.36)	88 (16.51)
Italy	945 (20.16)	2851 (60.81)	45 (0.96)	21 (0.45)	8 (0.17)	818 (17.45)	551 (11.75)	2838 (60.54)	1299 (27.71)
Latvia	0 (0)	12 (36.36)	1 (3.03)	0 (0)	0 (0)	20 (60.61)	0 (0)	13 (39.39)	20 (60.61)
Lithuania	0 (0)	13 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	13 (100)	0 (0)
Rep of Macedonia	2 (2.15)	46 (49.46)	2 (2.15)	17 (18.28)	0 (0)	26 (27.96)	2 (2.15)	46 (49.46)	45 (48.39)
Rep of Moldova	0 (0)	58 (98.31)	1 (1.69)	0 (0)	0 (0)	0 (0)	0 (0)	18 (30.51)	41 (69.49)
The Netherlands	29 (2.27)	1055 (82.62)	53 (4.15)	16 (1.25)	117 (9.16)	7 (0.55)	7 (0.55)	904 (70.79)	366 (28.66)
Portugal	1 (0.84)	110 (92.44)	0 (0)	0 (0)	0 (0)	8 (6.72)	0 (0)	85 (71.43)	34 (28.57)
Romania	0 (0)	32 (88.89)	0 (0)	0 (0)	0 (0)	4 (11.11)	0 (0)	34 (94.44)	2 (5.56)

[1] Belgium: collects only cirrhosis with portal hypertension yes or no. No liver disease therefore means no cirrhosis with portal hypertension. For Belgium most of the patients that have missing values are transplanted patients.

[2] Denmark: collects data only as cirrhosis yes or no.

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

[table 7.3 continued]

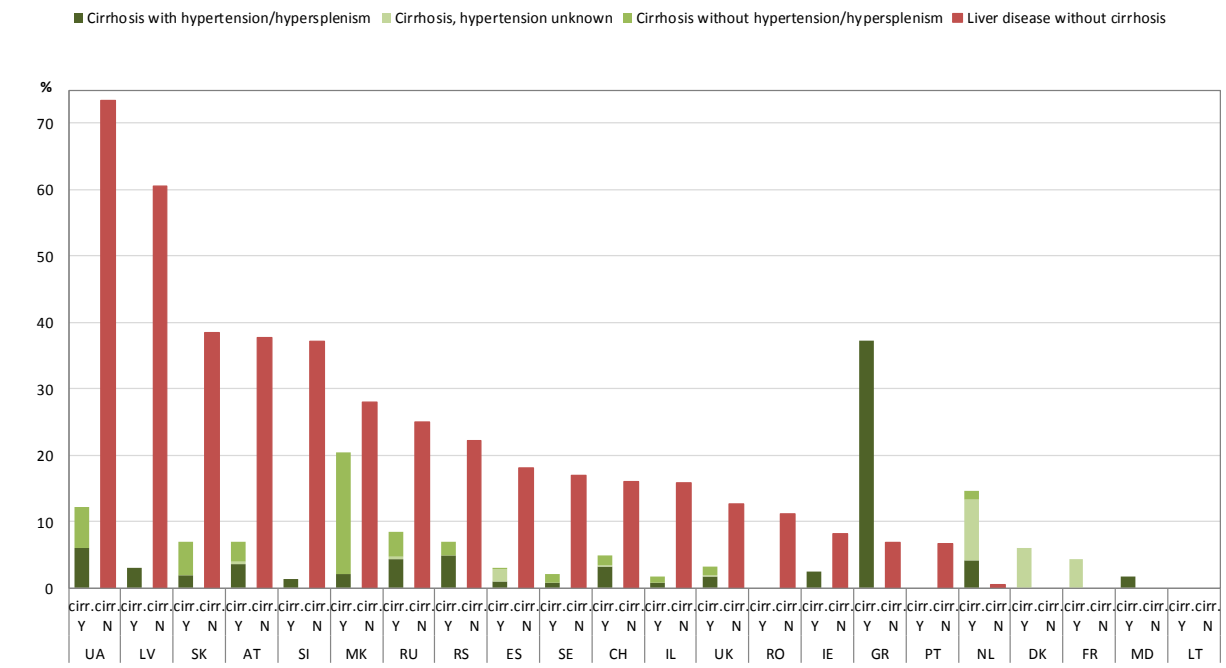
Country	Liver disease this year number (%)						Ursodeoxycholic acid this year number (%)		
	Missing/ unknown	No liver disease	Cirrhosis			Liver disease without cirrhosis	Missing/ unknown	No	Yes
			Cirrhosis with portal hypertension/ hypersplenism	Cirrhosis no portal hypertension/ hypersplenism	Cirrhosis, portal hypertension unknown				
Russian Federation	47 (3.69)	801 (62.87)	56 (4.40)	47 (3.69)	5 (0.39)	318 (24.96)	27 (2.12)	92 (7.22)	1155 (90.66)
Serbia[4]	0 (0)	102 (70.83)	7 (4.86)	3 (2.08)	0 (0)	32 (22.23)	1 (0.69)	103 (71.53)	40 (27.78)
Slovak Republic	2 (1.00)	107 (53.50)	4 (2.00)	10 (5.00)	0 (0)	77 (38.50)	1 (0.50)	92 (46.00)	107 (53.50)
Slovenia	0 (0)	48 (61.54)	1 (1.28)	0 (0)	0 (0)	29 (37.18)	0 (0)	35 (44.87)	43 (55.13)
Spain	28 (2.32)	924 (76.68)	13 (1.08)	2 (0.17)	21 (1.74)	217 (18.01)	23 (1.91)	888 (73.69)	294 (24.40)
Sweden[5]	0 (0)	478 (81.01)	5 (0.85)	7 (1.19)	0 (0)	100 (16.95)	20 (3.39)	436 (73.90)	134 (22.71)
Switzerland	31 (4.95)	463 (73.97)	20 (3.19)	10 (1.60)	1 (0.16)	101 (16.13)	3 (0.48)	459 (73.32)	164 (26.20)
Ukraine	1 (1.02)	13 (13.27)	6 (6.12)	6 (6.12)	0 (0)	72 (73.47)	2 (2.04)	3 (3.06)	93 (94.90)
United Kingdom	0 (0)	7390 (84.08)	158 (1.80)	118 (1.34)	6 (0.07)	1117 (12.71)	229 (2.61)	6745 (76.74)	1815 (20.65)

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

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

This table shows the frequency and severity of liver disease according to the ECFSPR definitions (see Appendix 2, page 119) and use of ursodeoxycholic acid, a commonly used treatment for CF liver disease. 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 2012, by country.

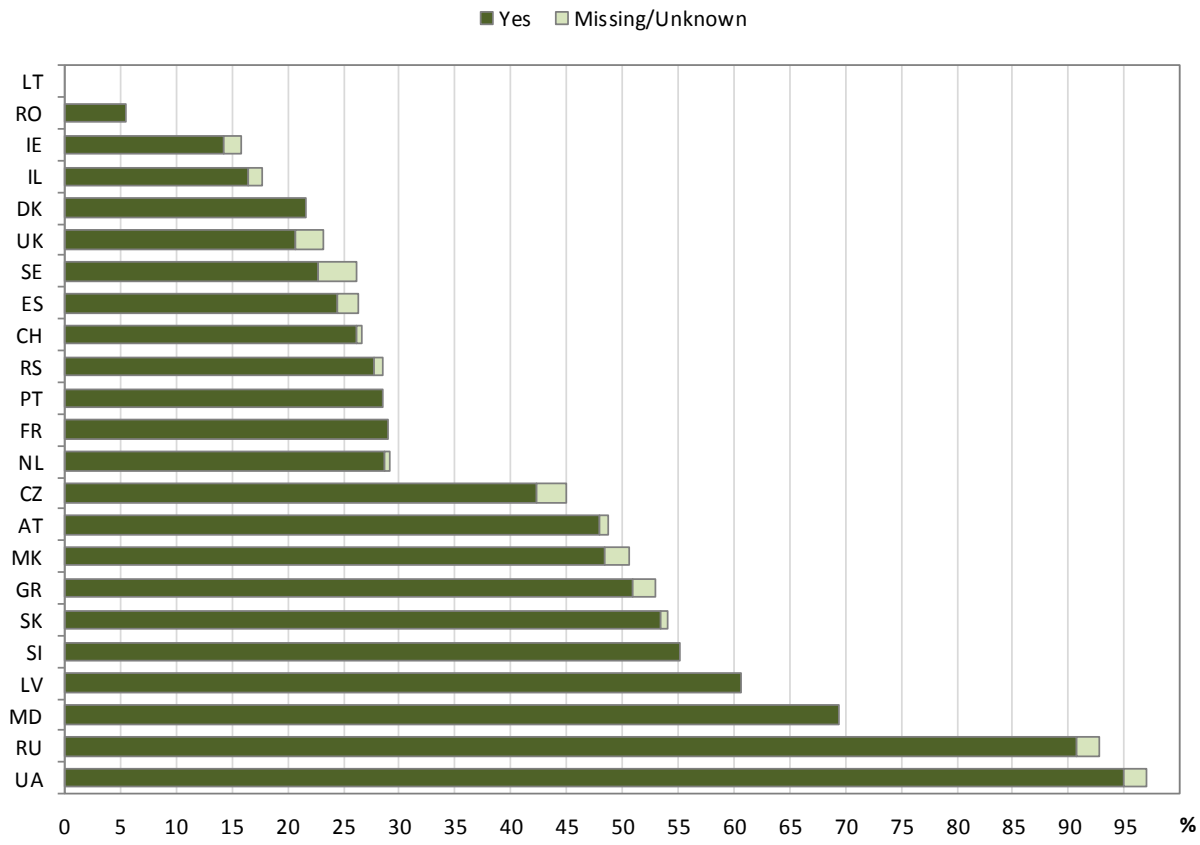


Note: We excluded from the graph the countries where the information on liver disease was missing for more than 10% of the patients.

Note: Belgium: collects only cirrhosis with portal hypertension yes or no. No liver disease therefore means no cirrhosis with portal hypertension.
France: collects cirrhosis/liver disease yes or no – these have been pooled under cirrhosis, portal hypertension unknown.
Serbia: cirrhosis without portal hypertension/hypersplenism means the presence of CF-related disease with normal liver function.
Sweden: has only collected cirrhosis with portal hypertension yes or no this year. The rest have been set to No liver disease due to local software issues. The prevalence of use of ursodeoxycholic acid could be used as an indicator of the total incidence of liver disease in 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 2012, by country.



Note: We excluded from the graph the countries where 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 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 whom this information is missing.

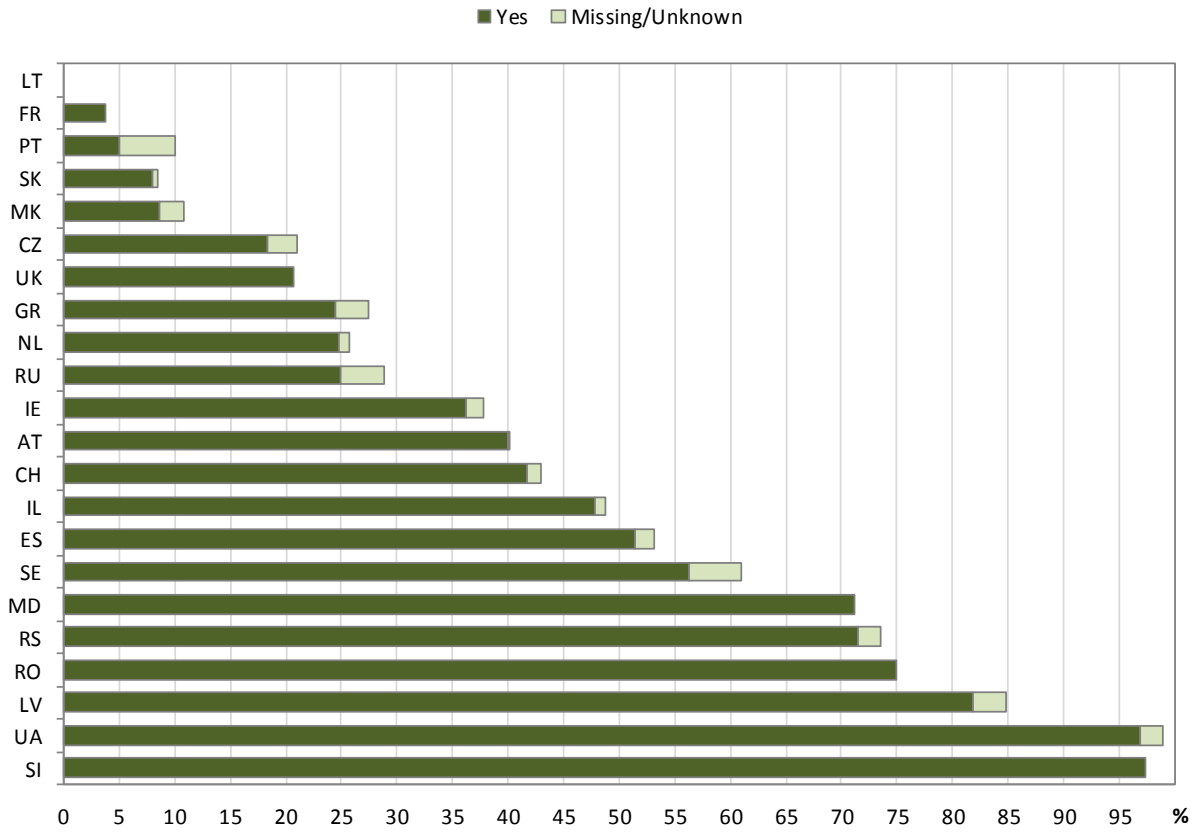
Table 7.4 Use of hypertonic saline, rhDNase and bronchodilators in all patients seen in 2012, by country.

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	1 (0.19)	313 (59.85)	209 (39.96)	8 (1.53)	242 (46.27)	273 (52.20)	2 (0.38)	69 (13.19)	452 (86.43)
Belgium[1]	136 (11.80)	442 (38.33)	575 (49.87)	136 (11.80)	288 (24.98)	729 (63.22)	136 (11.80)	241 (20.90)	776 (67.30)
Czech Republic	15 (2.63)	450 (78.95)	105 (18.42)	15 (2.63)	217 (38.07)	338 (59.30)	15 (2.63)	288 (50.53)	267 (46.84)
Denmark	449 (100)	-	-	0 (0)	104 (23.16)	345 (76.84)	449 (100)	-	-
France	0 (0)	5922 (96.17)	236 (3.83)	0 (0)	3314 (53.82)	2844 (46.18)	0 (0)	3054 (49.59)	3104 (50.41)
Greece	3 (2.94)	74 (72.55)	25 (24.51)	4 (3.92)	55 (53.92)	43 (42.16)	2 (1.96)	83 (81.37)	17 (16.67)
Hungary	54 (10.27)	203 (38.59)	269 (51.14)	68 (12.93)	167 (31.75)	291 (55.32)	55 (10.45)	251 (47.72)	220 (41.83)
Ireland	17 (1.59)	663 (62.20)	386 (36.21)	17 (1.59)	621 (58.26)	428 (40.15)	17 (1.59)	413 (38.75)	636 (59.66)
Israel	5 (0.94)	273 (51.22)	255 (47.84)	4 (0.75)	226 (42.40)	303 (56.85)	29 (5.44)	213 (39.96)	291 (54.60)
Italy	1274 (27.18)	2292 (48.89)	1122 (23.93)	551 (11.75)	2905 (61.97)	1232 (26.28)	1274 (27.18)	956 (20.39)	2458 (52.43)
Latvia	1 (3.03)	5 (15.15)	27 (81.82)	0 (0)	10 (30.30)	23 (69.70)	0 (0)	4 (12.12)	29 (87.88)
Lithuania	0 (0)	13 (100)	0 (0)	0 (0)	1 (7.69)	12 (92.31)	0 (0)	1 (7.69)	12 (92.31)
Rep of Macedonia	2 (2.15)	83 (89.25)	8 (8.60)	2 (2.15)	43 (46.24)	48 (51.61)	2 (2.15)	3 (3.23)	88 (94.62)
Rep of Moldova	0 (0)	17 (28.81)	42 (71.19)	0 (0)	59 (100)	0 (0)	0 (0)	19 (32.20)	40 (67.80)
The Netherlands	12 (0.94)	949 (74.31)	316 (24.75)	7 (0.55)	434 (33.98)	836 (65.47)	9 (0.70)	657 (51.45)	611 (47.85)
Portugal	6 (5.04)	107 (89.92)	6 (5.04)	0 (0)	34 (28.57)	85 (71.43)	0 (0)	40 (33.61)	79 (66.39)
Romania	0 0	9 25	27 75	0 0	12 33.33	24 66.67	0 0	4 11.11	32 88.89
Russian Federation	49 (3.85)	907 (71.19)	318 (24.96)	26 (2.04)	73 (5.73)	1175 (92.23)	56 (4.40)	416 (32.65)	802 (62.95)
Serbia	3 (2.08)	38 (26.39)	103 (71.53)	0 (0)	78 (54.17)	66 (45.83)	3 (2.08)	3 (2.08)	138 (95.84)
Slovak Republic	1 (0.50)	183 (91.50)	16 (8.00)	2 (1.00)	80 (40.00)	118 (59.00)	1 (0.50)	89 (44.50)	110 (55.00)
Slovenia	0 (0)	2 (2.56)	76 (97.44)	0 (0)	46 (58.97)	32 (41.03)	1 (1.28)	68 (87.18)	9 (11.54)
Spain	22 (1.83)	564 (46.80)	619 (51.37)	23 (1.91)	936 (77.68)	246 (20.41)	23 (1.91)	363 (30.12)	819 (67.97)
Sweden	28 (4.75)	230 (38.98)	332 (56.27)	24 (4.07)	457 (77.46)	109 (18.47)	24 (4.07)	62 (10.51)	504 (85.42)
Switzerland	8 (1.28)	357 (57.03)	261 (41.69)	6 (0.96)	375 (59.90)	245 (39.14)	3 (0.48)	84 (13.42)	539 (86.10)
Ukraine	2 (2.04)	1 (1.02)	95 (96.94)	1 (1.02)	97 (98.98)	0 (0)	2 (2.04)	30 (30.61)	66 (67.35)
United Kingdom[2]	0 (0)	6974 (79.35)	1815 (20.65)	0 (0)	4504 (51.25)	4285 (48.75)	0 (0)	4290 (48.81)	4499 (51.19)

[1] Belgium: most of the patients that have missing values are transplanted patients.
[2] United Kingdom: the duration of use of inhaled hypertonic saline and of bronchodilators is not specified.

Table 7.4 shows the use of three different inhaled medications: hypertonic saline, rhDNase (Pulmozyme®) and bronchodilators (see page 13 for abbreviations). All of these medications are widely used, but still with marked differences among the countries.

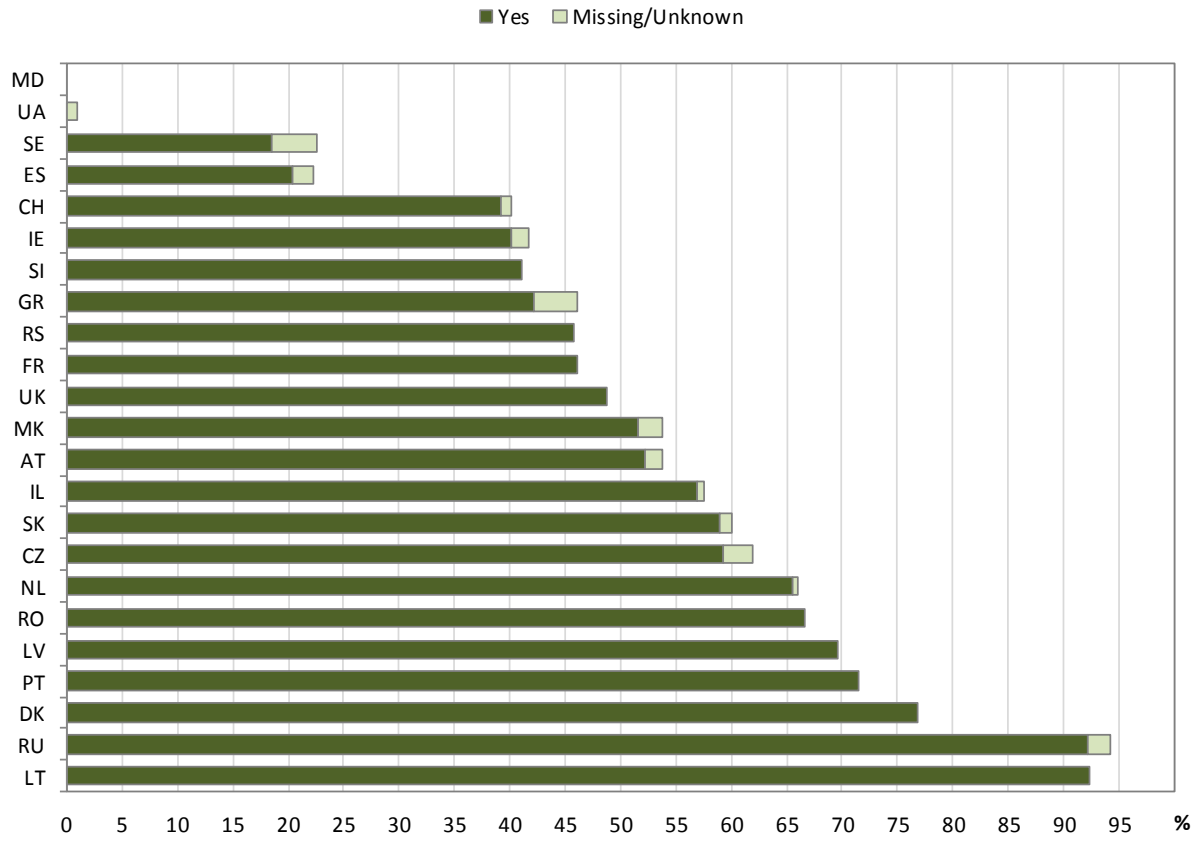
Figure 7.5 Use of inhaled hypertonic saline in all patients seen in 2012, by country.



Note: We excluded from the graph the countries where 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 whom this information is missing.

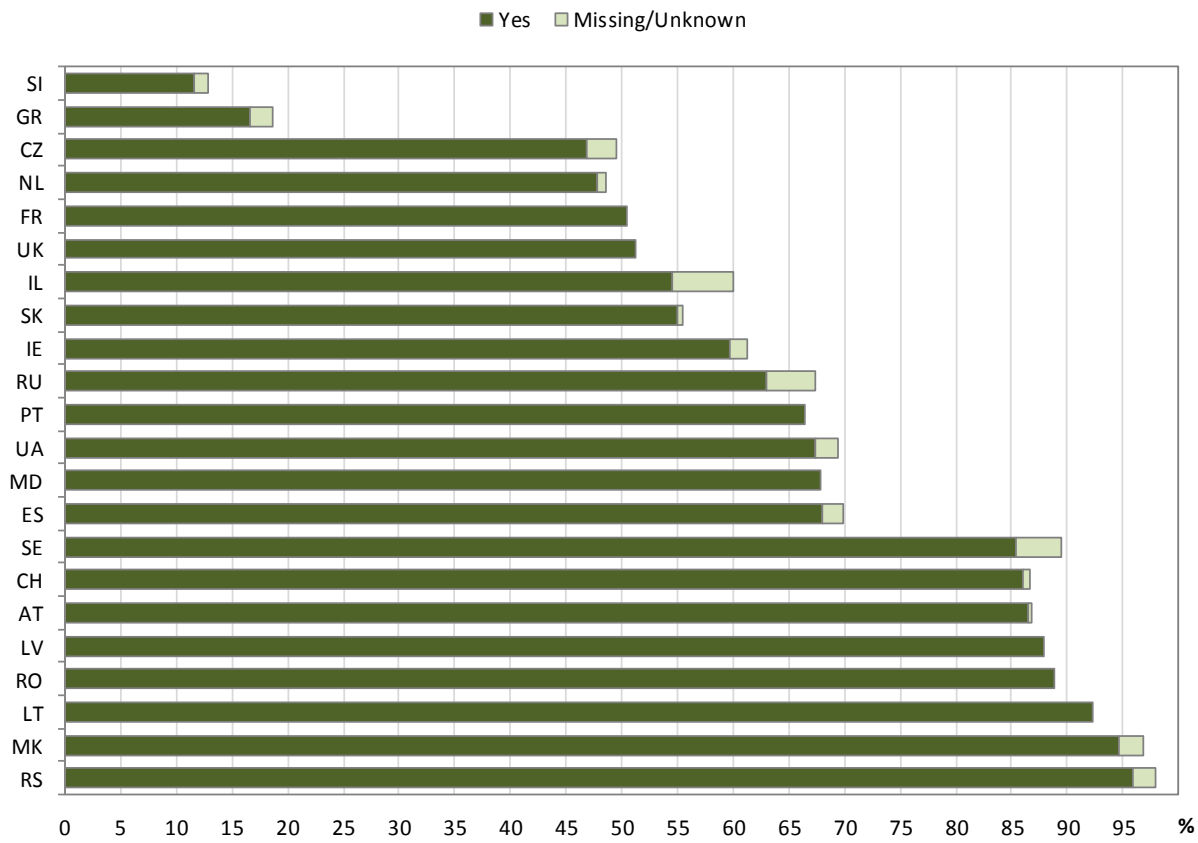
Figure 7.6 Use of rhDNase in all patients seen in 2012, by country.



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

This graph shows the use of inhaled rhDNase (marketed as Pulmozyme®) for more than 3 months during the 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 whom this information is missing.

Figure 7.7 Use of bronchodilators in all patients seen in 2012, by country.



Note: We excluded from the graph the countries where 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 whom this information is missing.

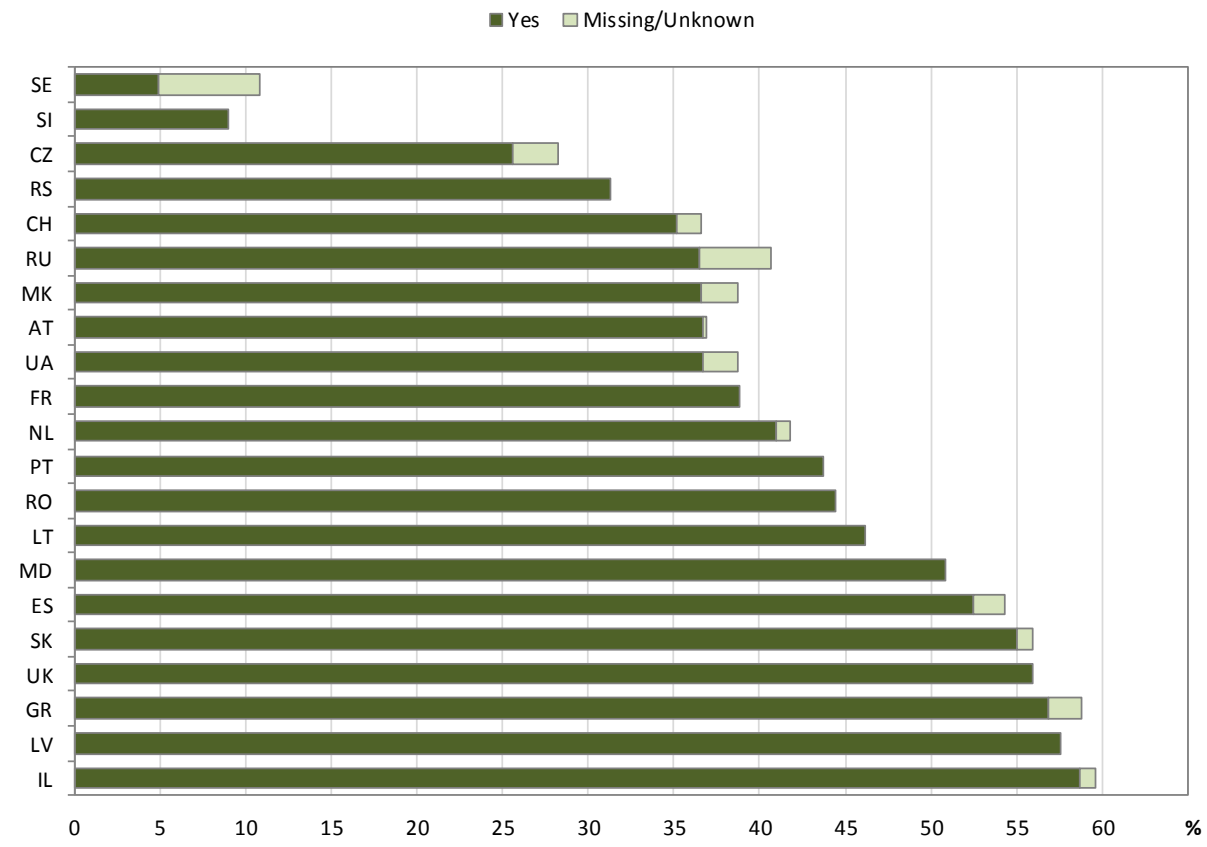
Table 7.5 Use of inhaled antibiotics, macrolides and oxygen in all patients seen in 2012, by country.

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	1 (0.19)	330 (63.10)	192 (36.71)	2 (0.38)	495 (94.65)	26 (4.97)	1 (0.19)	447 (85.47)	75 (14.34)
Belgium[1]	136 (11.80)	460 (39.90)	557 (48.30)	143 (12.40)	989 (85.78)	21 (1.82)	136 (11.80)	543 (47.09)	474 (41.11)
Czech Republic	15 (2.63)	409 (71.76)	146 (25.61)	15 (2.63)	535 (93.86)	20 (3.51)	15 (2.63)	464 (81.41)	91 (15.96)
Denmark	449 (100)	-	-	449 (100)	-	-	449 (100)	-	-
France[2]	0 (0)	3767 (61.17)	2391 (38.83)	0 (0)	5835 (94.75)	323 (5.25)	0 (0)	3510 (57.00)	2648 (43.00)
Greece	2 (1.96)	42 (41.18)	58 (56.86)	2 (1.96)	99 (97.06)	1 (0.98)	2 (1.96)	87 (85.29)	13 (12.75)
Hungary	66 (12.55)	250 (47.53)	210 (39.92)	86 (16.35)	398 (75.67)	42 (7.98)	77 (14.64)	345 (65.59)	104 (19.77)
Ireland	126 (11.82)	486 (45.59)	454 (42.59)	17 (1.59)	1021 (95.78)	28 (2.63)	29 (2.72)	629 (59.01)	408 (38.27)
Israel	5 (0.94)	215 (40.34)	313 (58.72)	8 (1.50)	510 (95.69)	15 (2.81)	5 (0.94)	258 (48.40)	270 (50.66)
Italy	550 (11.73)	2757 (58.81)	1381 (29.46)	551 (11.75)	3952 (84.30)	185 (3.95)	551 (11.75)	2758 (58.83)	1379 (29.42)
Latvia	0 (0)	14 (42.42)	19 (57.58)	0 (0)	30 (90.91)	3 (9.09)	0 (0)	22 (66.67)	11 (33.33)
Lithuania	0 (0)	7 (53.85)	6 (46.15)	0 (0)	11 (84.62)	2 (15.38)	0 (0)	11 (84.62)	2 (15.38)
Rep of Macedonia	2 (2.15)	57 (61.29)	34 (36.56)	2 (2.15)	90 (96.77)	1 (1.08)	2 (2.15)	72 (77.42)	19 (20.43)
Rep of Moldova	0 (0)	29 (49.15)	30 (50.85)	0 (0)	57 (96.61)	2 (3.39)	0 (0)	31 (52.54)	28 (47.46)
The Netherlands	10 (0.78)	744 (58.26)	523 (40.96)	11 (0.86)	1207 (94.52)	59 (4.62)	11 (0.86)	673 (52.70)	593 (46.44)
Portugal	0 (0)	67 (56.30)	52 (43.70)	0 (0)	107 (89.92)	12 (10.08)	0 (0)	80 (67.23)	39 (32.77)
Romania	0 (0)	20 (55.56)	16 (44.44)	0 (0)	36 (100)	0 (0)	0 (0)	33 (91.67)	3 (8.33)
Russian Federation	53 (4.16)	756 (59.34)	465 (36.50)	48 (3.77)	1141 (89.56)	85 (6.67)	81 (6.36)	789 (61.93)	404 (31.71)
Serbia	0 (0)	99 (68.75)	45 (31.25)	1 (0.69)	132 (91.67)	11 (7.64)	1 (0.69)	125 (86.81)	18 (12.50)
Slovak Republic	2 (1.00)	88 (44.00)	110 (55.00)	2 (1.00)	194 (97.00)	4 (2.00)	1 (0.50)	107 (53.50)	92 (46.00)
Slovenia	0 (0)	71 (91.03)	7 (8.97)	1 (1.28)	75 (96.16)	2 (2.56)	0 (0)	72 (92.31)	6 (7.69)
Spain	22 (1.83)	551 (45.73)	632 (52.45)	23 (1.91)	1149 (95.35)	33 (2.74)	21 (1.74)	725 (60.17)	459 (38.09)
Sweden	35 (5.93)	526 (89.15)	29 (4.92)	25 (4.24)	553 (93.73)	12 (2.03)	28 (4.75)	363 (61.53)	199 (33.73)
Switzerland	9 (1.44)	397 (63.42)	220 (35.14)	5 (0.80)	599 (95.69)	22 (3.51)	4 (0.64)	435 (69.49)	187 (29.87)
Ukraine	2 (2.04)	60 (61.23)	36 (36.73)	1 (1.02)	96 (97.96)	1 (1.02)	3 (3.06)	3 (3.06)	92 (93.88)
United Kingdom[3]	0 (0)	3874 (44.08)	4915 (55.92)	167 (1.90)	7998 (91.00)	624 (7.10)	0 (0)	5238 (59.60)	3551 (40.40)

[1] Belgium: most of the patients that have missing values are transplanted patients.
[2] France: collects only use of azithromycin.
[3] 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).

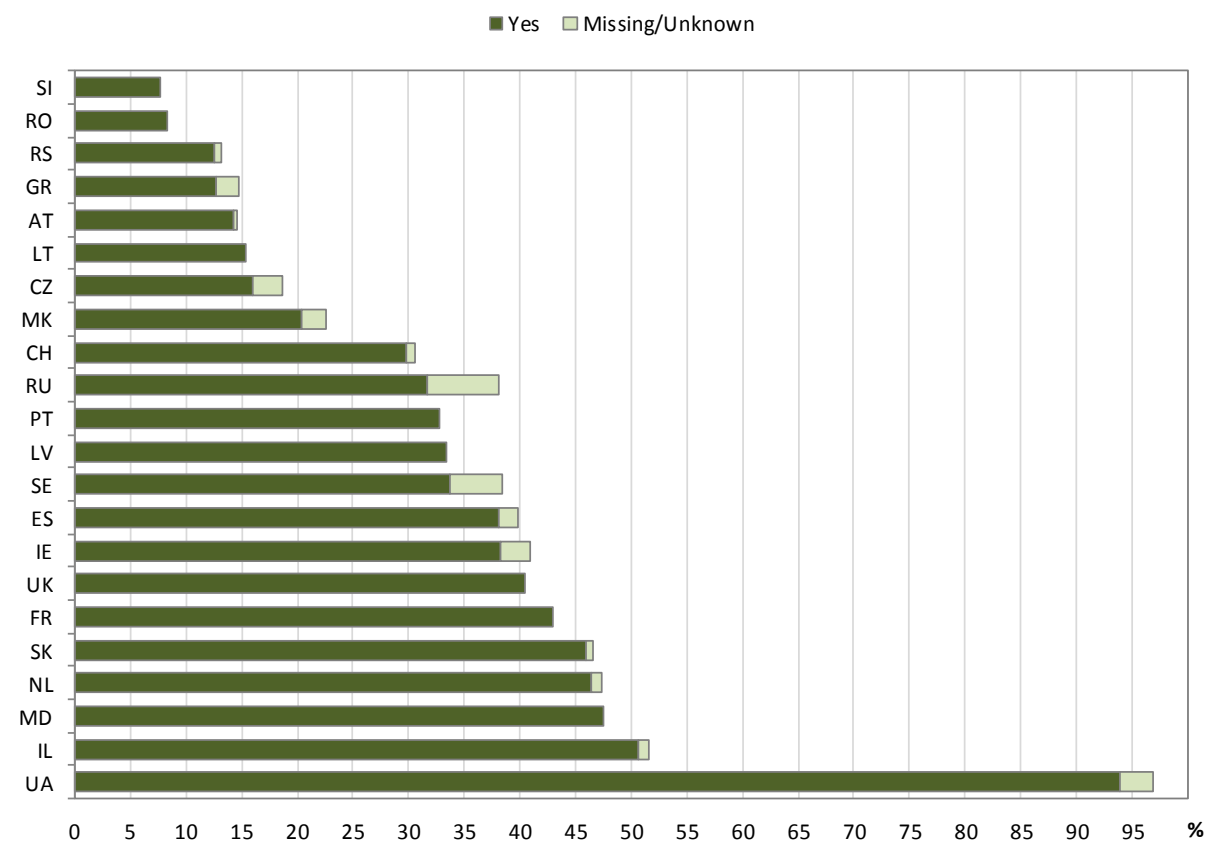
Figure 7.8 Use of inhaled antibiotics in all patients seen in 2012, by country.



Note: We excluded from the graph the countries where 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 5 to 60%. 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 whom this information is missing.

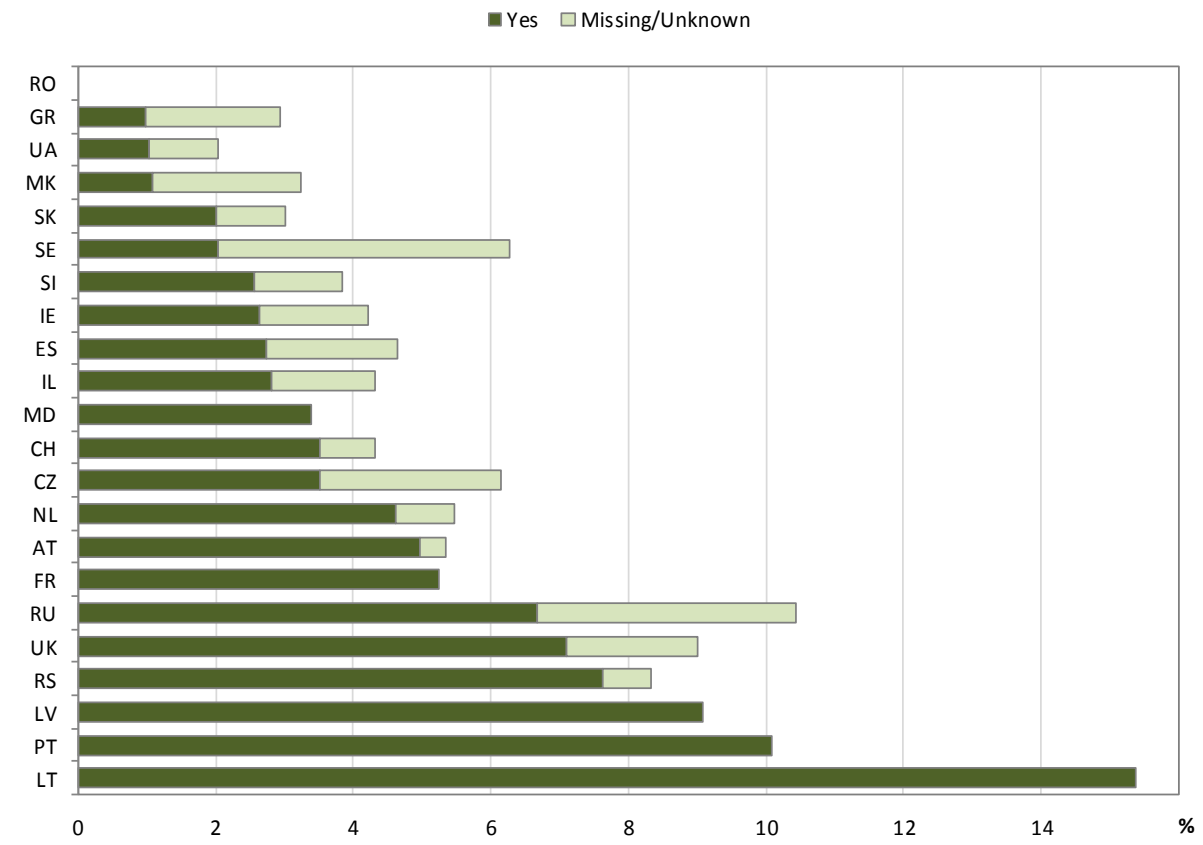
Figure 7.9 Use of macrolides in all patients seen in 2012, by country.



Note: We excluded from the graph the countries where the information on use of macrolides was missing for more than 10% of the patients.
Note France: collects only the use of azithromycin.
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 whom this information is missing.

Figure 7.10 Use of oxygen in all patients seen in 2012, by country.



Note: We excluded from the graph the countries where 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 whom 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 transplanted patients are no longer registered in the CF centres' database and the CF national registry, 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 2012 with transplanted lungs, by age and sex.

Age	Males	Females	Total	Transplants performed during the survey year
5-9	0	1	1	1
10-14	11	8	19	8
15-19	32	53	85	23
20-24	83	101	184	47
25-29	113	158	271	55
30-34	155	147	302	28
35-39	144	115	259	17
40-44	114	88	202	17
45+	108	75	183	16
Total	760	746	1506	212

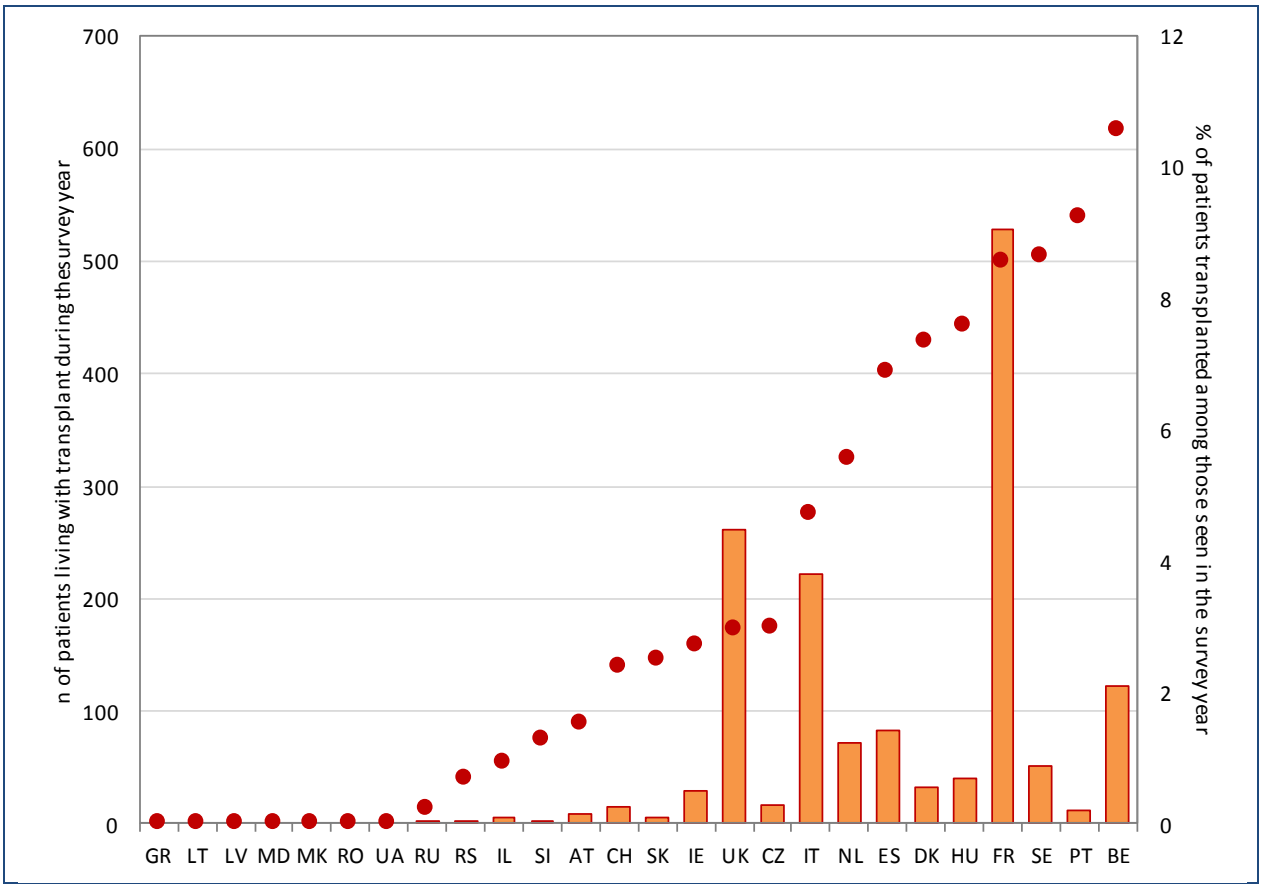
This table shows the number of patients alive in 2012 who have had a lung transplant at some time in their life, by age group, as well as the number of patients transplanted during 2012.

Table 8.2 Number of patients living in 2012 with transplanted liver, by age and sex.

Age	Males	Females	Total	Transplants performed during the survey year
0-4	2	0	2	1
5-9	2	2	4	1
10-14	5	1	6	1
15-19	14	8	22	3
20-24	16	14	30	5
25-29	24	13	37	3
30-34	23	8	31	0
35-39	12	5	17	0
40-44	6	3	9	1
45+	3	1	4	0
Total	107	55	162	15

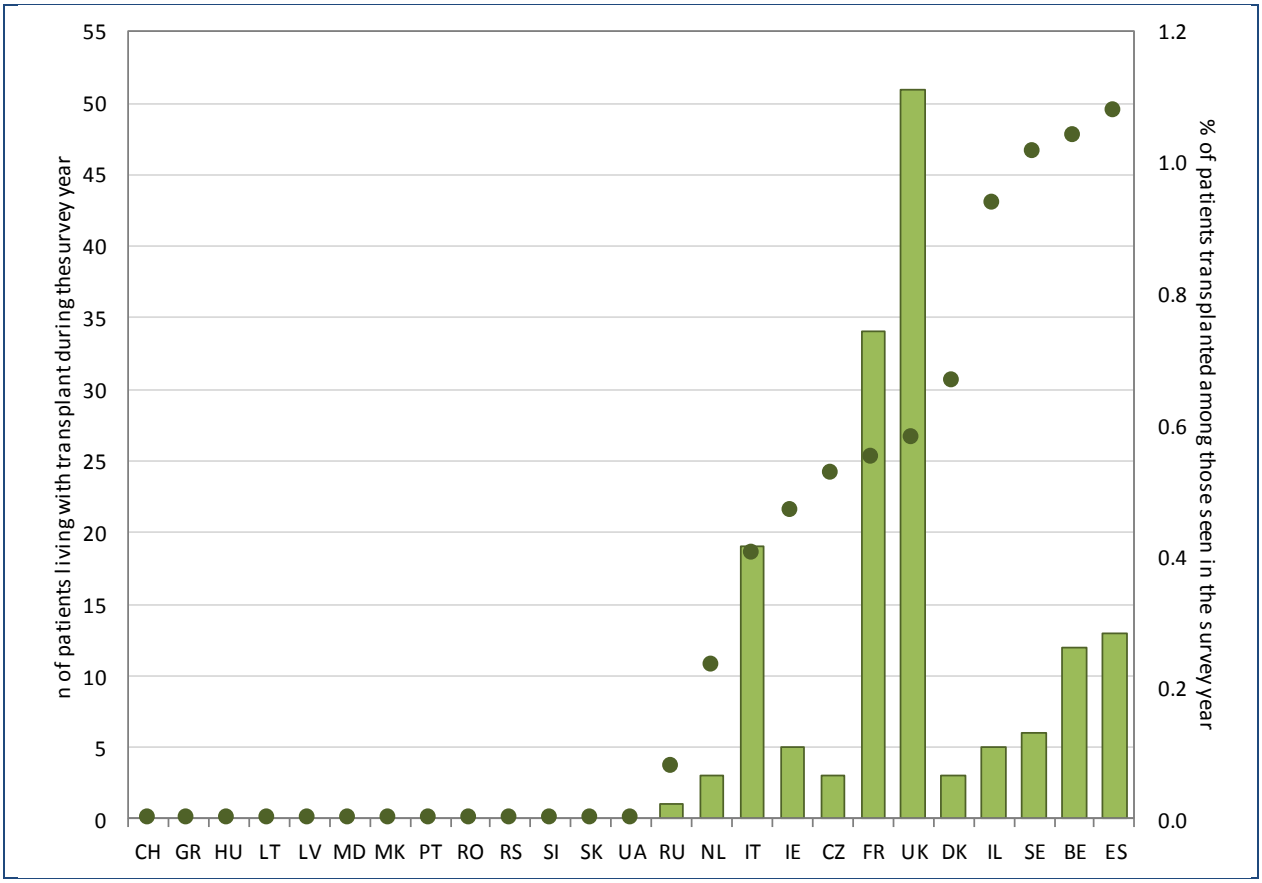
This table shows the number of patients alive in 2012 who have had a liver transplant at some time in their life, by age group, as well as the number of patients transplanted during 2012.

Figure 8.1 Number of patients living in 2012 with transplanted lungs, by country.



This graph shows the number of patients alive in 2012 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 2012 among the patients that were seen in 2012.

Figure 8.2 Number of patients living in 2012 with transplanted liver, by country.



This graph shows the number of patients alive in 2012 who have had a liver transplant (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 2012 among the patients that were seen in 2012.

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 2012, by age and sex.

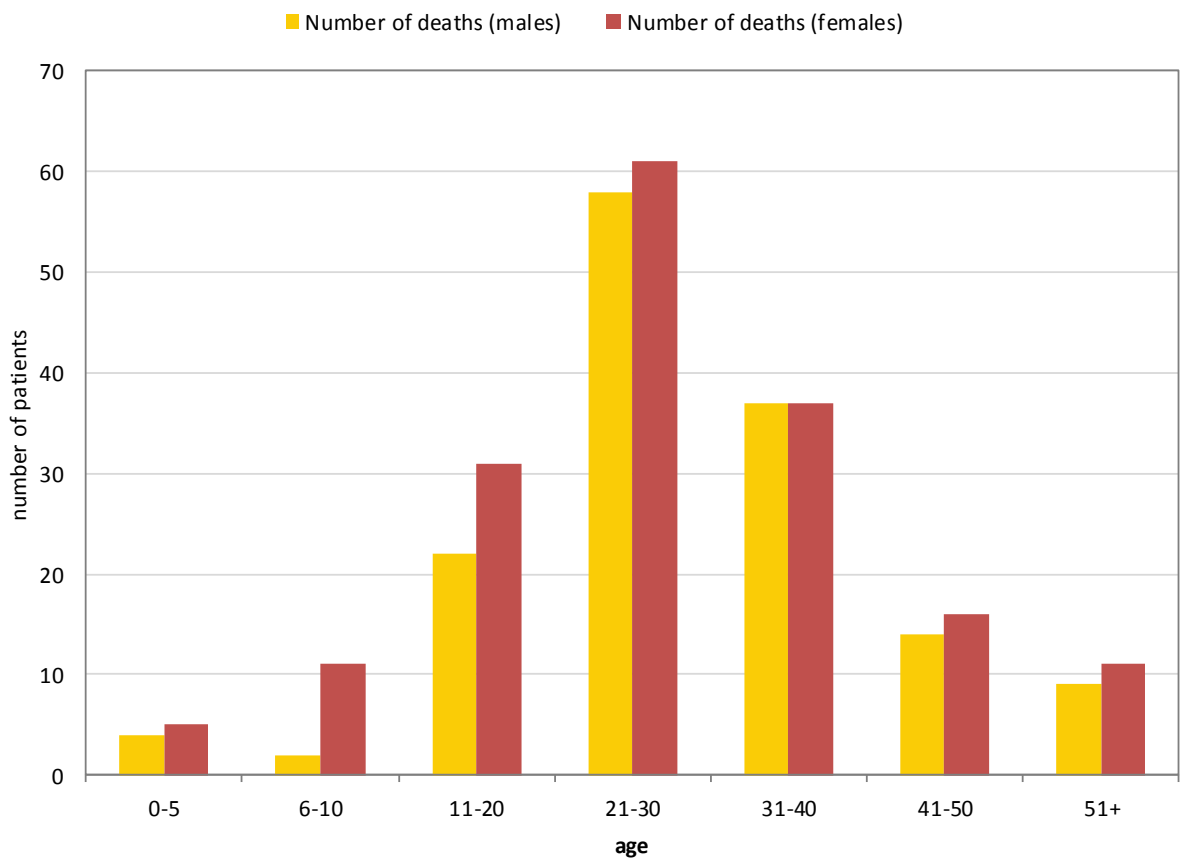
Age at death	Number of male patients	% of deaths in this age group of all male deaths	Number of female patients	% of deaths in this age group of all female deaths	Total	% Total
0-5	4	2.74	5	2.91	9	2.83
6-10	2	1.37	11	6.40	13	4.09
11-20	22	15.07	31	18.02	53	16.67
21-30	58	39.73	61	35.46	119	37.42
31-40	37	25.34	37	21.51	74	23.27
41-50	14	9.59	16	9.30	30	9.43
51+	9	6.16	11	6.40	20	6.29
Total	146	100	172	100	318	100

Note: Only patients seen during the year are presented and German 2010 data (N=5,003) is not considered. For the United Kingdom, all patients with confirmed diagnosis of CF were included (N=10,073). The total number of patients presented is 31,686.

Note: For 20 patients (10 male and 10 female) date at death, and thereby age at death, is unknown.

This table shows the number of deaths in 2012 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 2012, by sex.



Note: Only patients seen during the year are presented and German 2010 data (N=5,003) is not considered. For the United Kingdom, all patients with confirmed diagnosis of CF were included (N=10,073). The total number of patients presented is 31,686.

Note: For 20 patients (10 male and 10 female) date at death, and thereby age at death, was unknown.

This graph shows the distribution of age at death of patients who died in 2012, separately by males (yellow) and females (red).

Table 9.2 Cause of death distribution of deaths in 2012.

Cause of death	Number of deaths	Percentage of all deaths
Respiratory disease	226	66.86
Transplantation related	41	12.13
Non-CF related	18	5.32
Liver-GI related	5	1.48
Suicide	1	0.30
Trauma	2	0.59
Unknown	45	13.32
Total	338	100

Note: United Kingdom collects cause of death “respiratory disease” as “cardio/respiratory”.

This table shows cause 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 has been actively used for research. Data applications are handled in accordance with the ECFSPR guidelines, which are published on the website www.ecfs.eu/projects/efcs-patient-registry/guidelines.

Several of the research projects have resulted in publications, others are in the pipeline. For an overview of the published articles we refer you to the webpage www.ecfs.eu/projects/ecfs-patient-registry/articles.

An overview of the approved applications for data for which there is no publication, can be found on the webpage www.ecfs.eu/projects/ecfs-patient-registry/overview-data-applications.

Partners and Contributors

Appendix 1: Technical notes

Patient inclusion criteria

The ECFSPR registers patients diagnosed with CF in accordance with 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 data was anonymous, we collected only year and month of birth and the day of birth was set to the 15th of the month (for Belgium, which only supplies year of birth for adults, month of birth was set to 7).

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[1]. 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 FEV_1 predicted values

We computed percent of predicted values for FEV_1 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.

[1] For details on the target population, please see 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 bronchopulmonary 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 in 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 met:
    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 following options:
    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: (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 infection in 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 BRONCHOPULMONARY 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.