2011

# ECFS Patient Registry

## Annual Data Report

# ECFS Patient Registry

# Annual Data Report

# 2011 data

ecfs-pr@uzleuven.be

www.ecfs.eu/ecfspr

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# Preface

We are pleased to share with you the 2011 Annual Report from the European Cystic Fibrosis Society Patient Registry (ECFSPR). This report contains demographic and clinical data of 36,340 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.

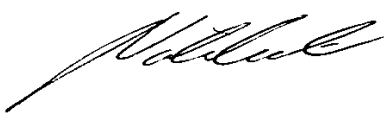
This 9th official report is published after the 2013 and 2014 reports. In the past two years we collected serial data from 2011 to 2014 with ECFSTracker, the ECFSPR data-collection software. We prioritised publication of the reports with the most recent data, hence the delay in production of the 2011 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 Italics: new participants since the report with 2010 data;
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 Pleger |
| | 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<br>Andreas Pleger<br>Maria Wagenhofer |
| | Medizinische Universität Innsbruck, Departement für Kinder- und Jugendheilkunde, CF Zentrum für Kinder, Jugendliche und Erwachsene, Innsbruck | Helmut Ellemunter<br>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<br>Alexander Ebner |
| | Universitätsklinik für Kinder- und Jugendheilkunde, Cystische Fibrose Ambulanz, Vienna | Sabine Renner<br>Brigitte Mersi |
| | *Wilhelminenspital, Abteilung für Kinder- und Jugendheilkunde mit Ambulanz, Vienna* | *Thomas Frischer*<br>*Ajibade Mogaji*<br>*Kerstin Tiringer* |
| | Klinikum Wels-Grieskirchen, Abteilung für Kinder- und Jugendheilkunde, Wels | Elisabeth Steiner<br>Vera Bauer<br>Beatrix Wintersteiger<br>Nadine Raffler |
| | *Klinikum Wels-Grieskirchen, Abteilung für Lungenkrankheiten, Wels* | *Helmut Feizelmeier* |
| Belgium | Belgian Cystic Fibrosis Registry | Muriel Thomas<br>Simeon Wanyama |
| Czech Republic | Cystic Fibrosis Registry of the Czech Republic | Pavel Drevinek<br>Alena Bilkova<br>Milan Macek<br>Marek Turnovec |
| Denmark | Cystic Fibrosis Registry of Denmark | Hanne Vebert Olesen<br>Tania Pressler |
| France | Registre Français de la Mucoviscidose | Lydie Lemonnier<br>Sophie Ravilly |
| Germany | Qualitätssicherung Mukoviszidose | Lutz Nährlich<br>Birgitt Wiese |
| Greece | 1 individual centre: | Elpis Hatziagorou |
| | Aristotle University of Thessaloniki, Hippokration General Hospital, Cystic Fibrosis Centre, Thessaloniki | John Tsanakas<br>Elpis Hatziagorou<br>Maria Fotoulaki<br>John Kioumis |

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

| Country | Centre/National Registry name | Contact |
|---|---|---|
| Slovakia | Cystic Fibrosis Registry of Slovakia | Hana Kayserova<br>Mariá Drugdova |
| Slovenia | 2 individual centres: | Uroš Krivec |
| | University Clinic of Pulmonary and Allergic Diseases, Golnik | Matjaž Fležar<br>Andraz Jakelj<br>Karmen Meško Meglič |
| | University Children`s Hospital, Pulmonary Department, Ljubljana | Uroš Krivec<br>Ana Kotnik Pirs<br>Barbara Salobir |
| 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 Maria Giron |
| | Hospital Niño Jesús, Sección de Neumologia Pediátrica/Unidad de Fibrosis Quística, Madrid | Jose R. Villa Asensi |
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| | *Hospital 12 de Octubre, Unidad de Fibrosis Quística, Madrid* | *Gloria Garcia Hernandez*<br>*Carmen Luna Paredes* |
| | Hospital Regional Universitario de Málaga, Unidad Fibrosis Quìstica Pediàtrica, Málaga | Francisco Javier Perez-Frias<br>Estela Perez-Ruiz<br>Pilar Caro-Aguilera |
| | Hospital Regionale Universitario de Málaga, Unidad Fibrosis Quística Adultos, Málaga | Casilda Olveira Fuster<br>Gabriel Maria Olveira Fuster<br>Nuria Porras Pèrez |
| | *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*<br>*Esther Quintana Gallego* |
| | Hospital Clinico Universitario de Valencia, Unidad de Fibrosis Quística Pediátrica, Valencia | Amparo Escribano Montaner<br>Silvia Castillo |
| | Hospital Universitario La Fe, Unidad de Trasplante Pulmonar y Fibrosis Quística, Valencia | Amparo Solé Jover<br>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<br>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*<br>*Sarosh Irani* |
| | Lindenhofspital Bern, Praxis für Pneumologie "Quartier Bleu", Bern | Reta Fischer<br>Carlo Mordasini |
| | Universitätsklinik für Kinderheilkunde, Zentrum für Cystische Fibrose und Pulmonologie, Inselspital, Bern | Carmen Casaulta<br>Philipp Latzin |
| | *Hôpital Cantonal Fribourg, Pädiatrie, Fribourg* | *Denise Herzog*<br>*Johannes Wildhaber* |
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**Alice Fox** and **Patrizia Iansa**, Italy, ECFSPR Service Desk;
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**Ulrike Pypops**, Belgium: CF Europe representative in the ECFSPR;
**Contributing country managers and national representatives** (the names are listed on page 6);
**Lutz Nährlich**, Germany, ECFSPR Director.

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# 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 only 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 the percentage of predicted from the raw data. Slightly different values are obtained if 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<br>(%) | 17242<br>(47.5) | 19093<br>(52.5) | 36340* |
| Age at follow-up (in years, patients alive on 31/12/2011) | mean<br>median | 19.1<br>17.3 | 19.9<br>18.5 | 19.6<br>17.9 |
| Patients ≥ 18 years ( patients alive on 31/12/2011) | % | 47.9 | 51.2 | 49.6 |
| Age at diagnosis** | mean (years)<br>median (months) | 4.2<br>4.9 | 3.9<br>4.9 | 4.0<br>4.9 |
| Patients with at least one F508del allele** | % | 82.5 | 82.4 | 82.4 |
| Patients living with lung transplant** | n<br>(%) | 699<br>(5.0) | 695<br>(4.5) | 1394<br>(4.7) |
| Patients living with liver transplant** | n<br>(%) | 54<br>(0.4) | 109<br>(0.7) | 163<br>(0.6) |
| Patients deceased in 2011*** | n<br>(%) | 180<br>(1.2) | 153<br>(0.9) | 333<br>(1.1) |
| Age at death (years)*** | mean<br>median | 27.2<br>25.0 | 27.9<br>26.0 | 27.6<br>26.0 |

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

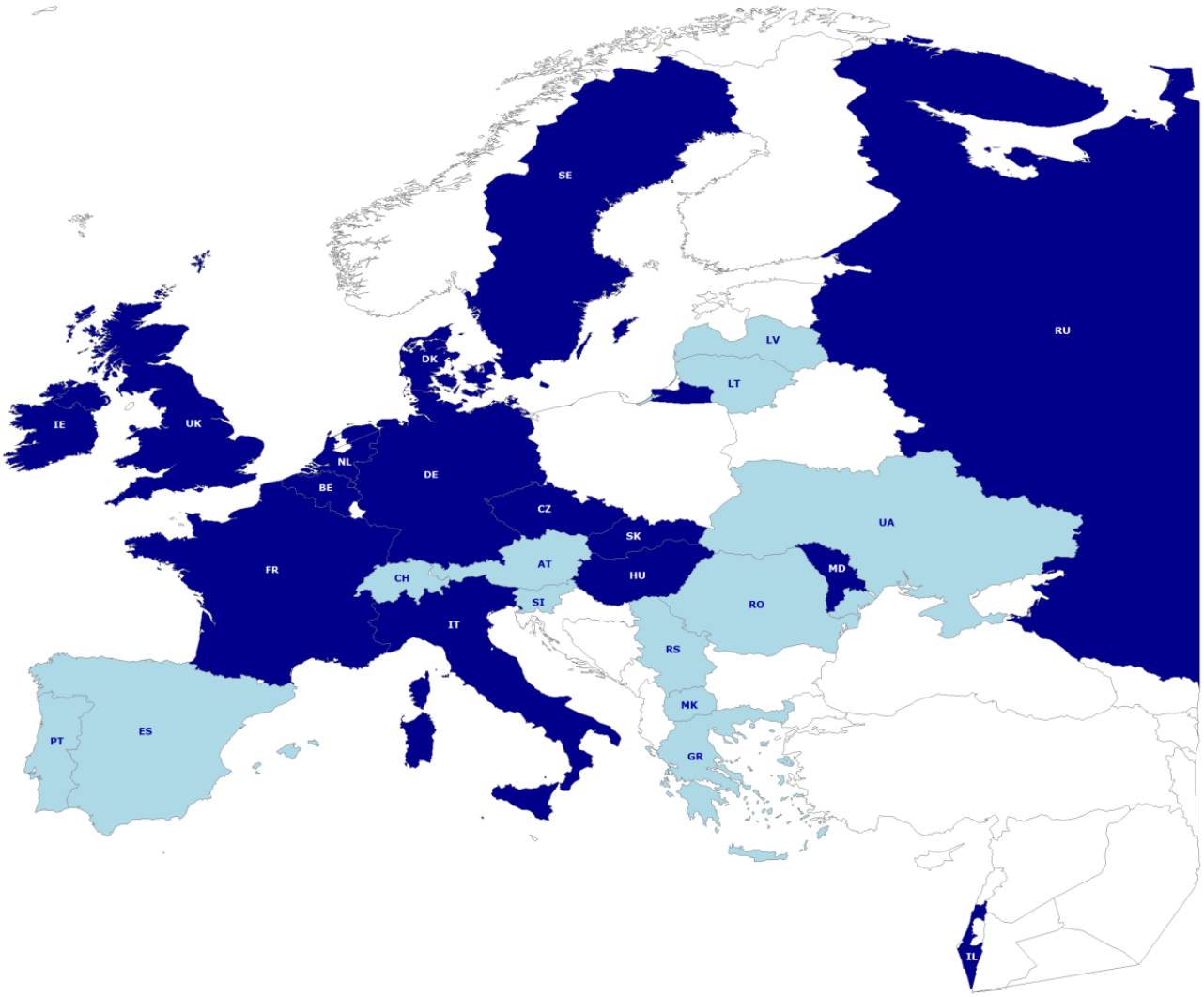
** Only patients seen during the year are presented; German 2010 data (N=5,003) is excluded. The total number of patients presented is 29,723.

*** Only patients seen during the year are presented; German 2010 data (N=5,003) is excluded. For the United Kingdom, all seen patients with confirmed diagnosis of CF are included (N=9,746). The total number of patients presented is 30,793.

# Data report

## 1. Demographics

***Figure 1.1 Map of countries that contributed to the ECFSPR in year 2011.***




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

### *Table 1.1 Number of patients in year 2011, by country.*

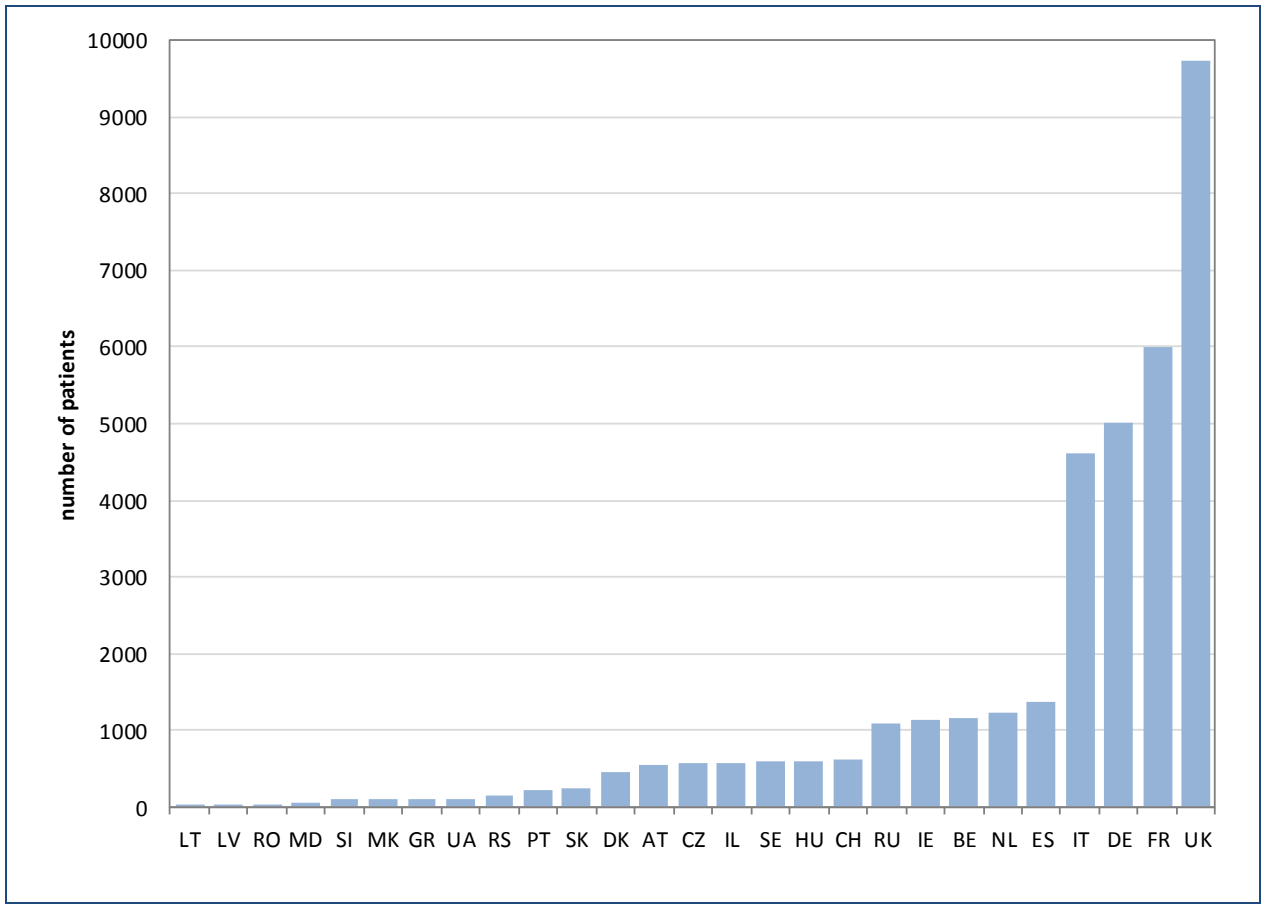
| Country | Patients registered, not lost to follow-up | Patients seen | Estimated coverage 2011 |
|---|---|---|---|
| **Austria** | 542 | 515 | 85% |
| **Belgium*** | 1150 | 1150 | >90% |
| **Czech Republic*** | 562 | 562 | 100% |
| **Denmark*** | 455 | 433 | 100% |
| **France*** | 6001 | 6001 | 90% |
| **Germany*** | 5003 | 5003 | 95%[1] |
| **Greece** | 109 | 101 | 20% |
| **Hungary*** | 593 | 593 | 90% |
| **Ireland*** | 1133 | 1042 | 93% |
| **Israel**** | 562 | 513 | 98% |
| **Italy*** | 4621 | 4621 | 93% |
| **Latvia** | 29 | 26 | >90% |
| **Lithuania** | 11 | 11 | 20%[2] |
| **Rep of Macedonia** | 88 | 87 | >90% |
| **Rep of Moldova*** | 56 | 56 | 68-76% |
| **The Netherlands*** | 1231 | 1231 | 98% |
| **Portugal** | 205 | 169 | >95% |
| **Romania** | 31 | 29 | 11%[3] |
| **Russian Federation*** | 1074 | 1074 | 62% |
| **Serbia** | 145 | 127 | >90% |
| **Slovak Republic**** | 234 | 177 | >90% |
| **Slovenia** | 87 | 75 | >95% |
| **Spain** | 1367 | 1179 | 40% |
| **Sweden*** | 582 | 582 | 95% |
| **Switzerland** | 614 | 588 | 74% |
| **Ukraine** | 109 | 105 | 13% |
| **United Kingdom*** | 9746 | 8676 | 99%[4] |
| **Total** | 36340 | 34726 | |

* Countries with an established national CF registry.
** These countries have a national registry, and use the direct data-entry function of ECFSTracker.
[1] Data are from 2010 and presented for demographic purposes. The 2011 data will be submitted in 2017.
[2] Coverage is 100% for adults and 0% for children.
[3] Coverage is 100% for children and 0% for adults.
[4] The total number for UK is three patients less than the 2011 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 2011” 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.

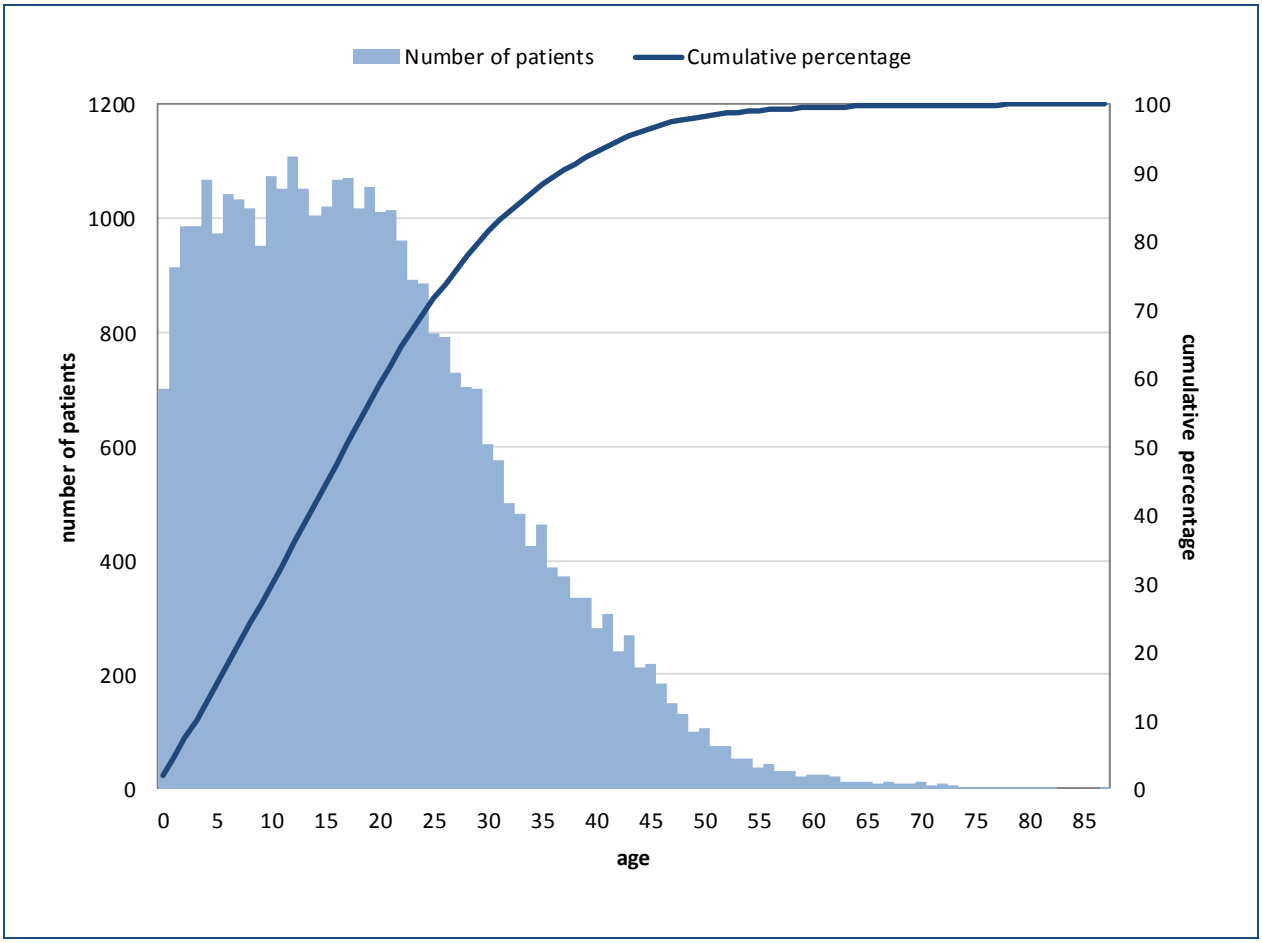
In all subsequent tables and graphs, the data referred to is for 2011, except for Germany, where the data referred to is for 2010. The German 2010 data is shown for demographic purposes and presented only in the demographic section.

***Figure 1.2 Number of patients registered in the ECFSPR in 2011, by country.***



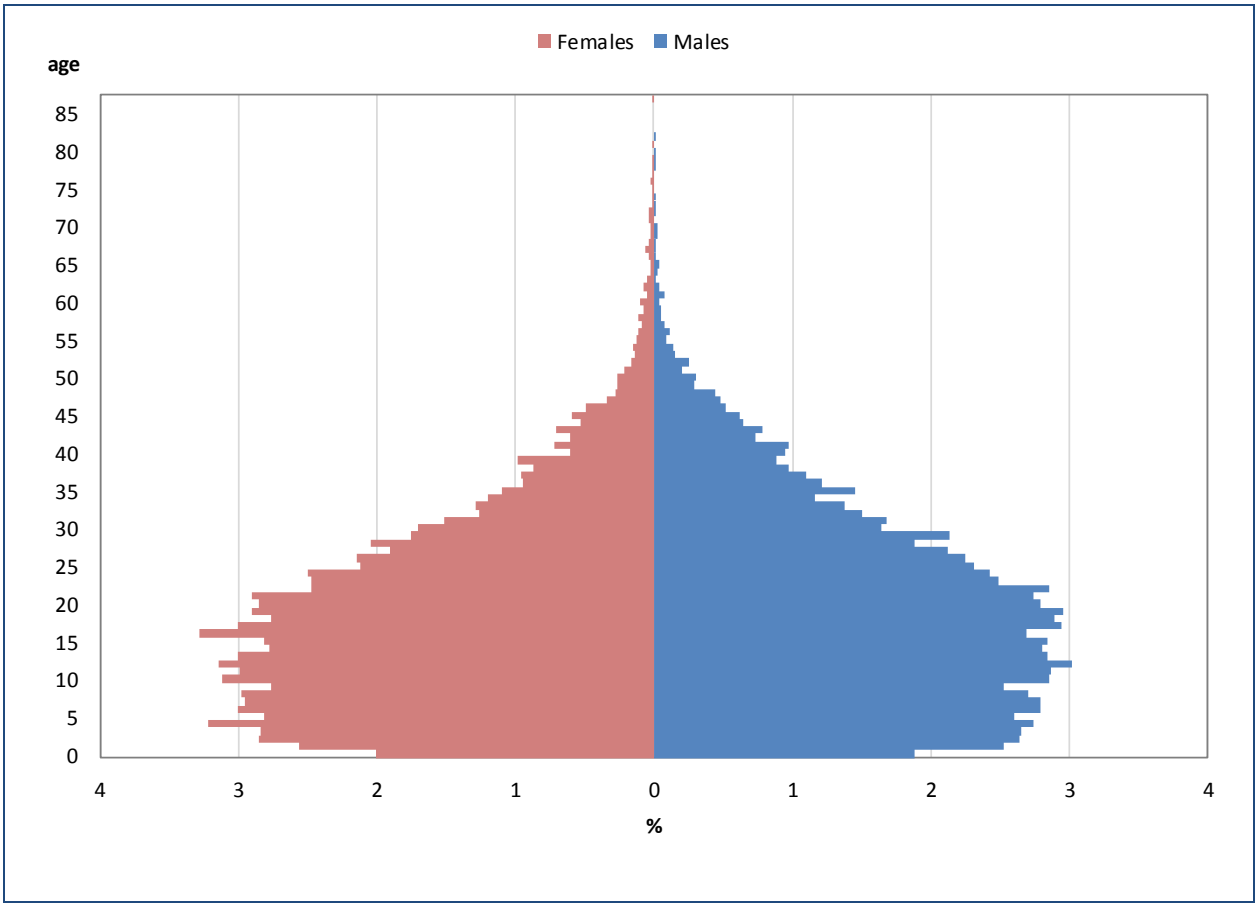

Each vertical bar shows the number of patients living in that country in 2011. Please refer to table 1.1 for the coverage in each country.

***Figure 1.3 Age at follow-up distribution. Patients alive on 31/12/2011.***




Each blue vertical bar represents the number of patients of that age alive in 2011. 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 17.9 years of age).

***Figure 1.4 Age at follow-up distribution by sex. Patients alive on 31/12/2011.***



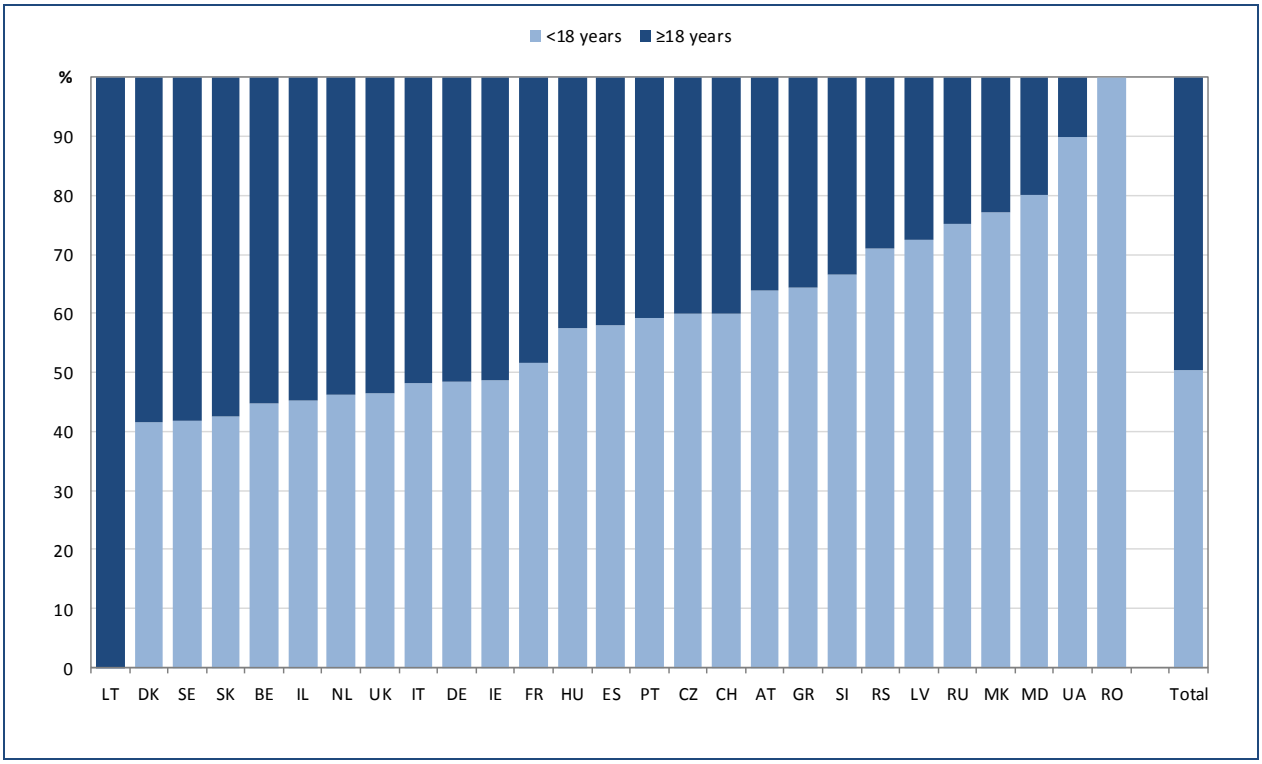

The pyramid shows the percentage of patients of different ages as horizontal bars. The right hand side of the pyramid (blue) shows, for males, how many patients (as a percentage) are a certain age, the left hand side (red) shows the same for females. The lower percentage of patients at the bottom of 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 and alive on 31/12/2011.***

| Country | Children (<18 years) number (%) | Adults (≥18 years) number (%) |
|---|---|---|
| **Austria** | 347 (64.02) | 195 (35.98) |
| **Belgium** | 510 (44.66) | 632 (55.34) |
| **Czech Republic** | 331 (59.96) | 221 (40.04) |
| **Denmark** | 186 (41.52) | 262 (58.48) |
| **France** | 3063 (51.61) | 2872 (48.39) |
| **Germany** | 2397 (48.34) | 2562 (51.66) |
| **Greece** | 69 (64.49) | 38 (35.51) |
| **Hungary** | 338 (57.48) | 250 (42.52) |
| **Ireland** | 538 (48.60) | 569 (51.40) |
| **Israel** | 250 (45.21) | 303 (54.79) |
| **Italy** | 2205 (48.11) | 2378 (51.89) |
| **Latvia** | 21 (72.41) | 8 (27.59) |
| **Lithuania** | 0 (0) | 11 (100) |
| **Rep of Macedonia** | 68 (77.27) | 20 (22.73) |
| **Rep of Moldova** | 44 (80.00) | 11 (20.00) |
| **The Netherlands** | 564 (46.23) | 656 (53.77) |
| **Portugal** | 121 (59.31) | 83 (40.69) |
| **Romania** | 31 (100) | 0 (0) |
| **Russian Federation** | 796 (75.17) | 263 (24.83) |
| **Serbia** | 103 (71.03) | 42 (28.97) |
| **Slovak Republic** | 99 (42.67) | 133 (57.33) |
| **Slovenia** | 58 (66.67) | 29 (33.33) |
| **Spain** | 789 (58.01) | 571 (41.99) |
| **Sweden** | 241 (41.77) | 336 (58.23) |
| **Switzerland** | 368 (60.03) | 245 (39.97) |
| **Ukraine** | 97 (89.81) | 11 (10.19) |
| **United Kingdom** | 4486 (46.59) | 5142 (53.41) |
| **Total** | 18120 (50.39) | 17843 (49.61) |

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 31/12/2011.***



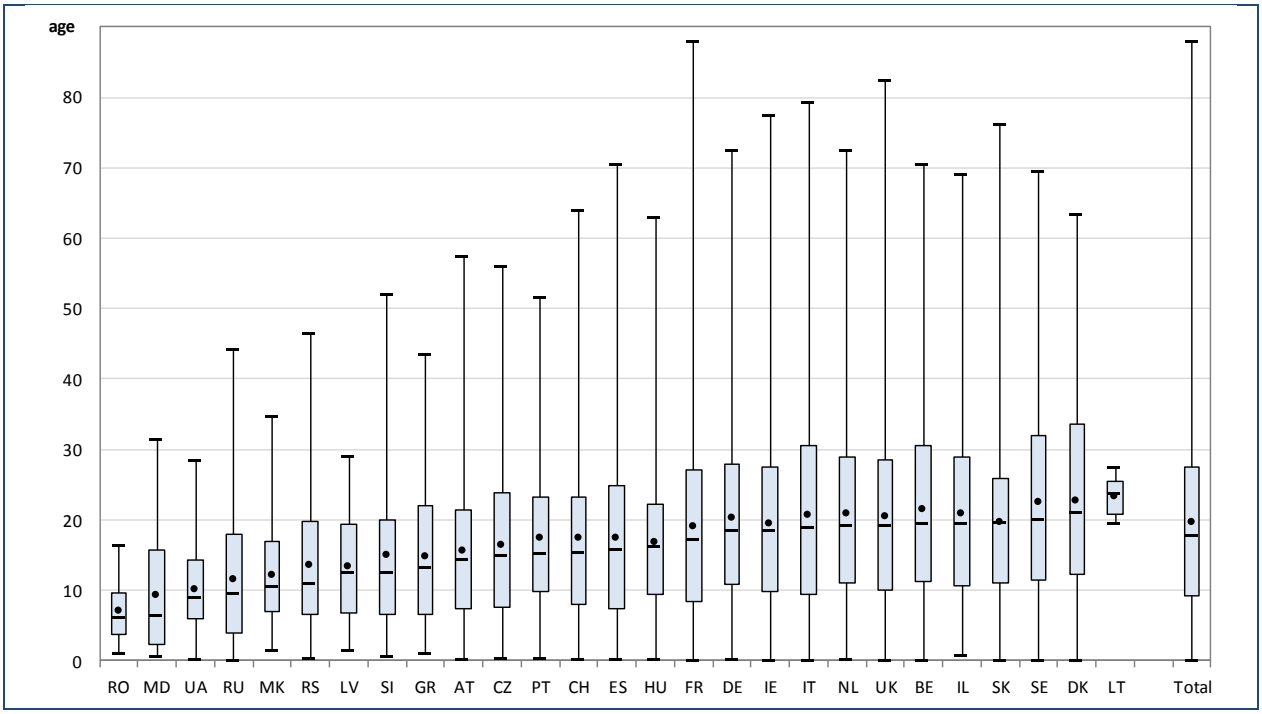

This graph shows the percentage of patients in each country who are adults (dark blue) or children (light blue). The percentage of adult patients varies considerably between the different countries, but this is partly an effect due to the way the patients are included: for some countries only a few individual 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 31/12/2011.***

| 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** | 542 | 15.7 | 0.2 | 7.4 | 14.5 | 21.4 |
| **Belgium** | 1142 | 21.6 | 0.0 | 11.2 | 19.5 | 30.5 |
| **Czech Republic** | 552 | 16.5 | 0.3 | 7.6 | 15.0 | 23.8 |
| **Denmark** | 448 | 22.8 | 0.0 | 12.3 | 21.2 | 33.5 |
| **France** | 5935 | 19.1 | 0.0 | 8.5 | 17.3 | 27.0 |
| **Germany** | 4959 | 20.2 | 0.1 | 10.8 | 18.5 | 28.0 |
| **Greece** | 107 | 14.9 | 1.0 | 6.5 | 13.2 | 22.0 |
| **Hungary** | 588 | 16.8 | 0.2 | 9.5 | 16.3 | 22.3 |
| **Ireland** | 1107 | 19.4 | 0.0 | 9.8 | 18.5 | 27.5 |
| **Israel** | 553 | 21.0 | 0.7 | 10.7 | 19.5 | 28.9 |
| **Italy** | 4583 | 20.8 | 0.0 | 9.5 | 18.8 | 30.5 |
| **Latvia** | 29 | 13.4 | 1.5 | 6.7 | 12.5 | 19.4 |
| **Lithuania** | 11 | 23.4 | 19.5 | 20.8 | 23.8 | 25.5 |
| **Rep of Macedonia** | 88 | 12.2 | 1.4 | 7.0 | 10.5 | 17.0 |
| **Rep of Moldova** | 55 | 9.4 | 0.6 | 2.4 | 6.5 | 15.7 |
| **The Netherlands** | 1220 | 21.0 | 0.1 | 11.0 | 19.2 | 28.9 |
| **Portugal** | 204 | 17.5 | 0.3 | 9.8 | 15.2 | 23.2 |
| **Romania** | 31 | 7.1 | 1.0 | 3.8 | 6.0 | 9.6 |
| **Russian Federation** | 1059 | 11.6 | 0.0 | 4.0 | 9.6 | 18.0 |
| **Serbia** | 145 | 13.6 | 0.3 | 6.5 | 10.9 | 19.7 |
| **Slovak Republic** | 232 | 19.6 | 0.0 | 11.1 | 19.6 | 25.8 |
| **Slovenia** | 87 | 15.1 | 0.5 | 6.6 | 12.5 | 20.0 |
| **Spain** | 1360 | 17.5 | 0.1 | 7.5 | 15.8 | 24.9 |
| **Sweden** | 577 | 22.5 | 0.0 | 11.4 | 20.0 | 31.9 |
| **Switzerland** | 613 | 17.4 | 0.1 | 8.0 | 15.5 | 23.2 |
| **Ukraine** | 108 | 10.1 | 0.2 | 5.9 | 9.0 | 14.4 |
| **United Kingdom** | 9628 | 20.5 | 0.0 | 10.1 | 19.2 | 28.5 |
| **Total** | 35963 | 19.6 | 0.0 | 9.3 | 17.9 | 27.5 |

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 2011 are included.

***Figure 1.6 Age at follow-up: box-plot, by country and overall. Patients alive on 31/12/2011.***




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.

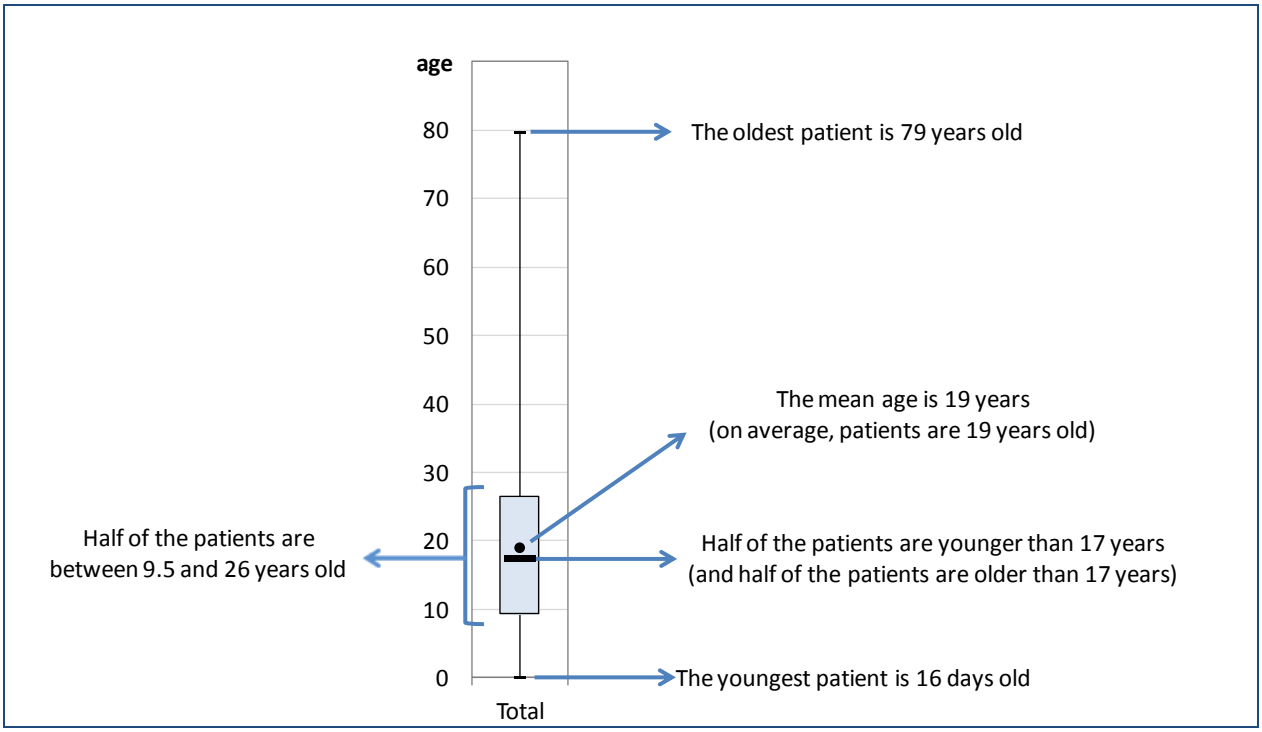
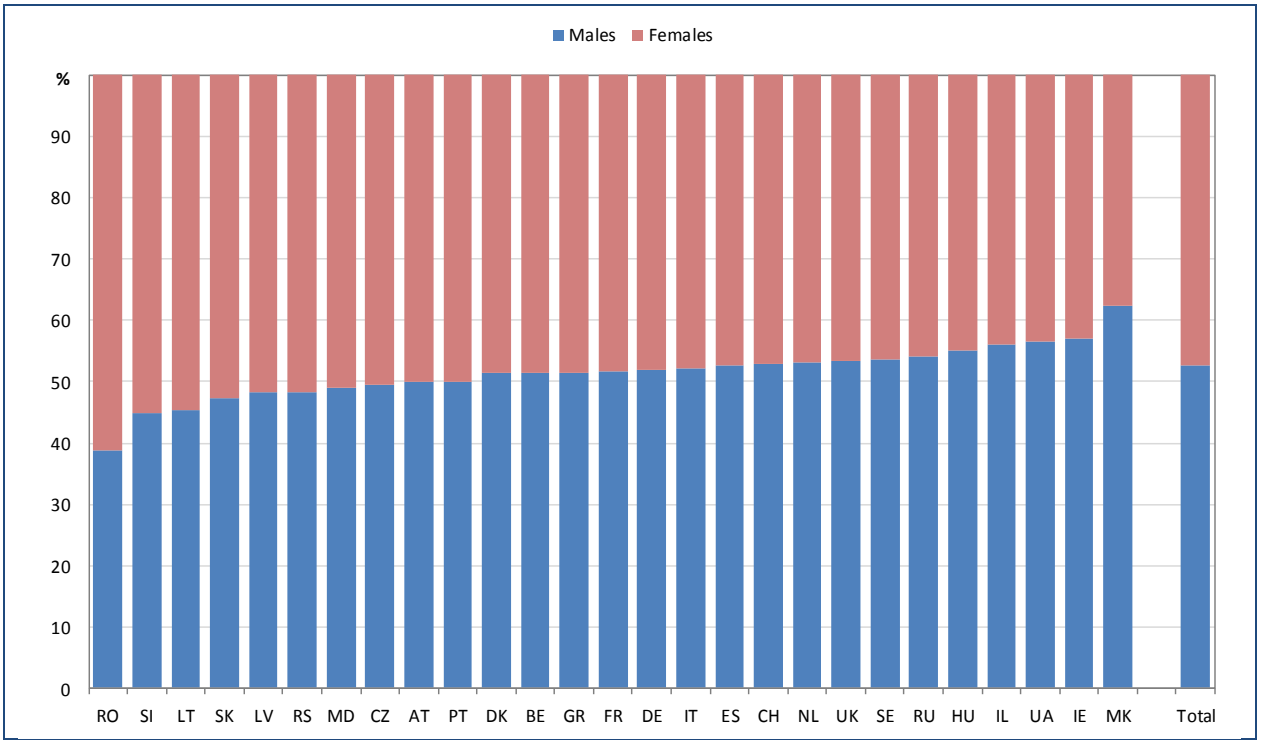
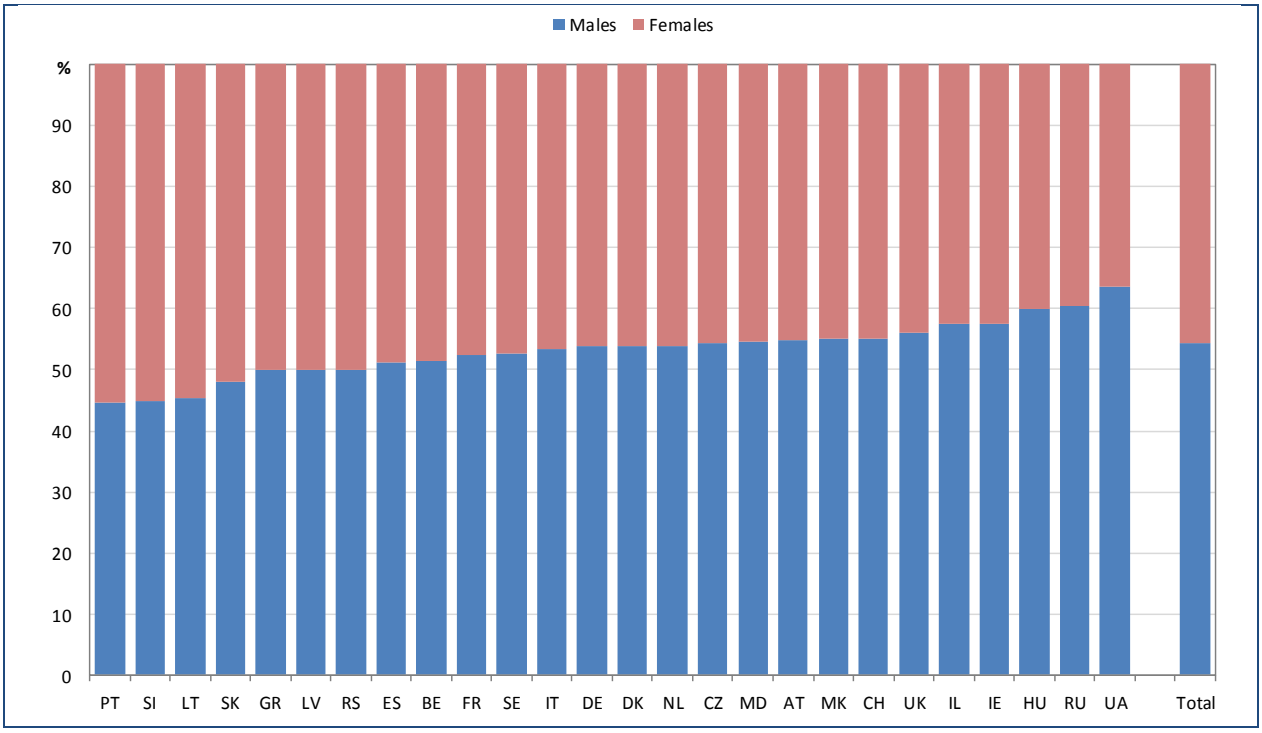


***Figure 1.7 Sex distribution, by country and overall. Patients alive on 31/12/2011.***




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 31/12/2011 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

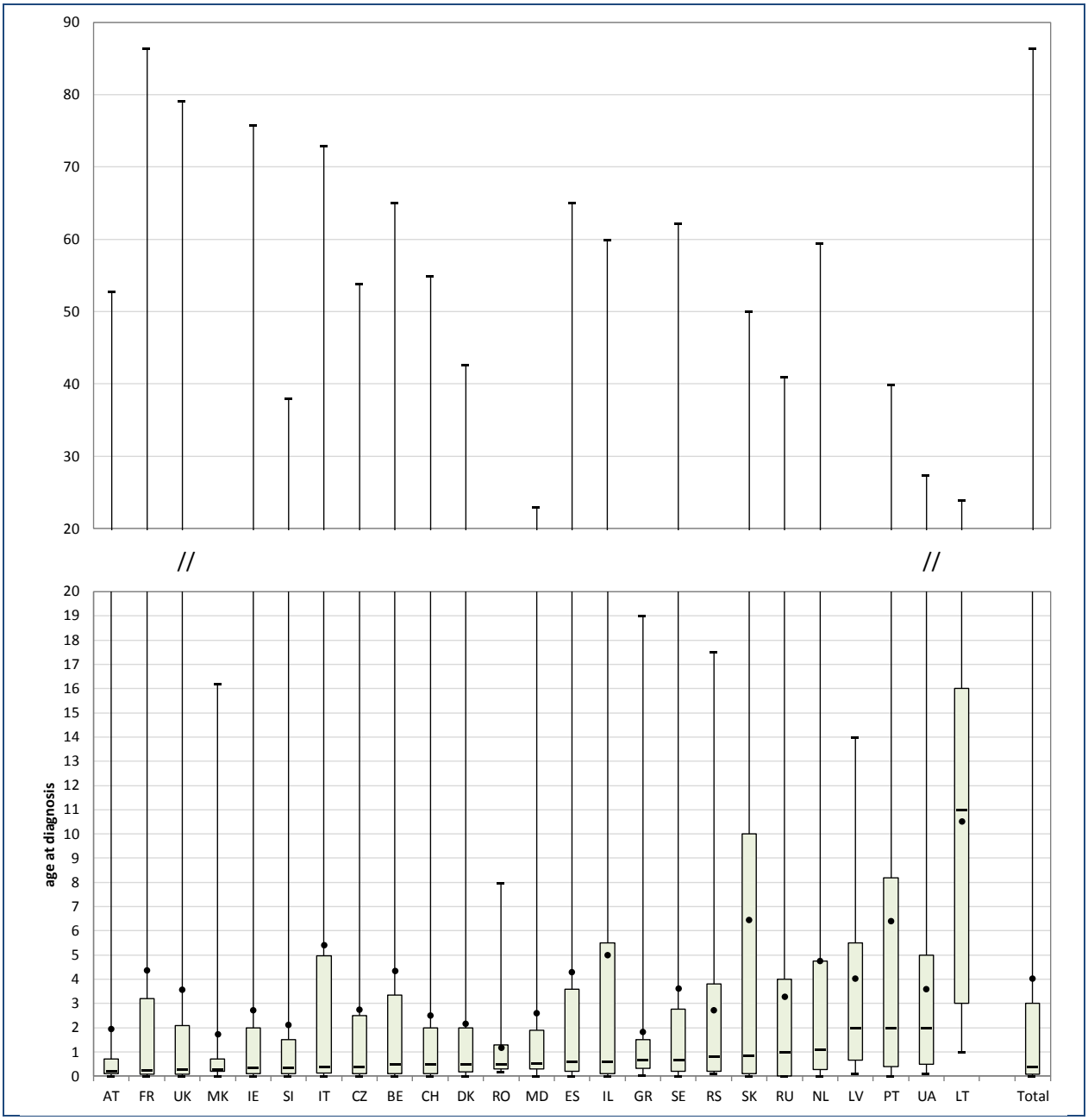
Hereafter, only patients who were seen during the year are presented and German 2010 data (N=5,003) is not included.

***Table 2.1 Age at diagnosis (in years): descriptive statistics, by country and overall. All patients seen in 2011.***

| 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** | 489 | 26 | 1.97 | 0.00 | 0.10 | 0.20 | 0.70 | 52.81 |
| **Belgium** | 1147 | 3 | 4.36 | 0.00 | 0.11 | 0.50 | 3.34 | 65.00 |
| **Czech Republic** | 562 | 0 | 2.77 | 0.00 | 0.10 | 0.40 | 2.50 | 53.90 |
| **Denmark** | 433 | 0 | 2.19 | 0.00 | 0.17 | 0.50 | 2.00 | 42.67 |
| **France** | 5519 | 482 | 4.38 | 0.00 | 0.08 | 0.25 | 3.21 | 86.44 |
| **Greece** | 97 | 4 | 1.85 | 0.04 | 0.33 | 0.67 | 1.50 | 19.00 |
| **Hungary** | 0 | 593 | - | - | - | - | - | - |
| **Ireland** | 1039 | 3 | 2.74 | 0.00 | 0.10 | 0.35 | 2.00 | 75.83 |
| **Israel** | 510 | 3 | 5.03 | 0.00 | 0.10 | 0.60 | 5.50 | 60.00 |
| **Italy** | 4494 | 127 | 5.43 | 0.00 | 0.12 | 0.39 | 4.96 | 72.97 |
| **Latvia** | 25 | 1 | 4.05 | 0.10 | 0.67 | 2.00 | 5.50 | 14.00 |
| **Lithuania** | 11 | 0 | 10.55 | 1.00 | 3.00 | 11.00 | 16.00 | 24.00 |
| **Rep of Macedonia** | 87 | 0 | 1.74 | 0.00 | 0.20 | 0.30 | 0.70 | 16.20 |
| **Rep of Moldova** | 56 | 0 | 2.63 | 0.00 | 0.30 | 0.55 | 1.90 | 23.00 |
| **The Netherlands** | 855 | 376 | 4.78 | 0.00 | 0.28 | 1.10 | 4.74 | 59.42 |
| **Portugal** | 161 | 8 | 6.43 | 0.00 | 0.40 | 2.00 | 8.20 | 40.00 |
| **Romania** | 29 | 0 | 1.20 | 0.20 | 0.30 | 0.50 | 1.30 | 8.00 |
| **Russian Federation** | 1069 | 5 | 3.29 | 0.00 | 0.00 | 1.00 | 4.00 | 41.00 |
| **Serbia** | 123 | 4 | 2.75 | 0.10 | 0.20 | 0.80 | 3.80 | 17.50 |
| **Slovak Republic** | 158 | 19 | 6.47 | 0.00 | 0.10 | 0.85 | 10.00 | 50.00 |
| **Slovenia** | 71 | 4 | 2.13 | 0.01 | 0.10 | 0.38 | 1.50 | 38.00 |
| **Spain** | 1137 | 42 | 4.31 | 0.00 | 0.20 | 0.60 | 3.60 | 65.00 |
| **Sweden** | 568 | 14 | 3.64 | 0.00 | 0.19 | 0.68 | 2.77 | 62.28 |
| **Switzerland** | 525 | 63 | 2.52 | 0.00 | 0.10 | 0.50 | 2.00 | 55.00 |
| **Ukraine** | 105 | 0 | 3.62 | 0.10 | 0.50 | 2.00 | 5.00 | 27.40 |
| **United Kingdom** | 8539 | 137 | 3.58 | 0.00 | 0.07 | 0.27 | 2.08 | 79.18 |
| **Total** | 27809 | 1914 | 4.05 | 0.00 | 0.09 | 0.39 | 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 2011.***




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.

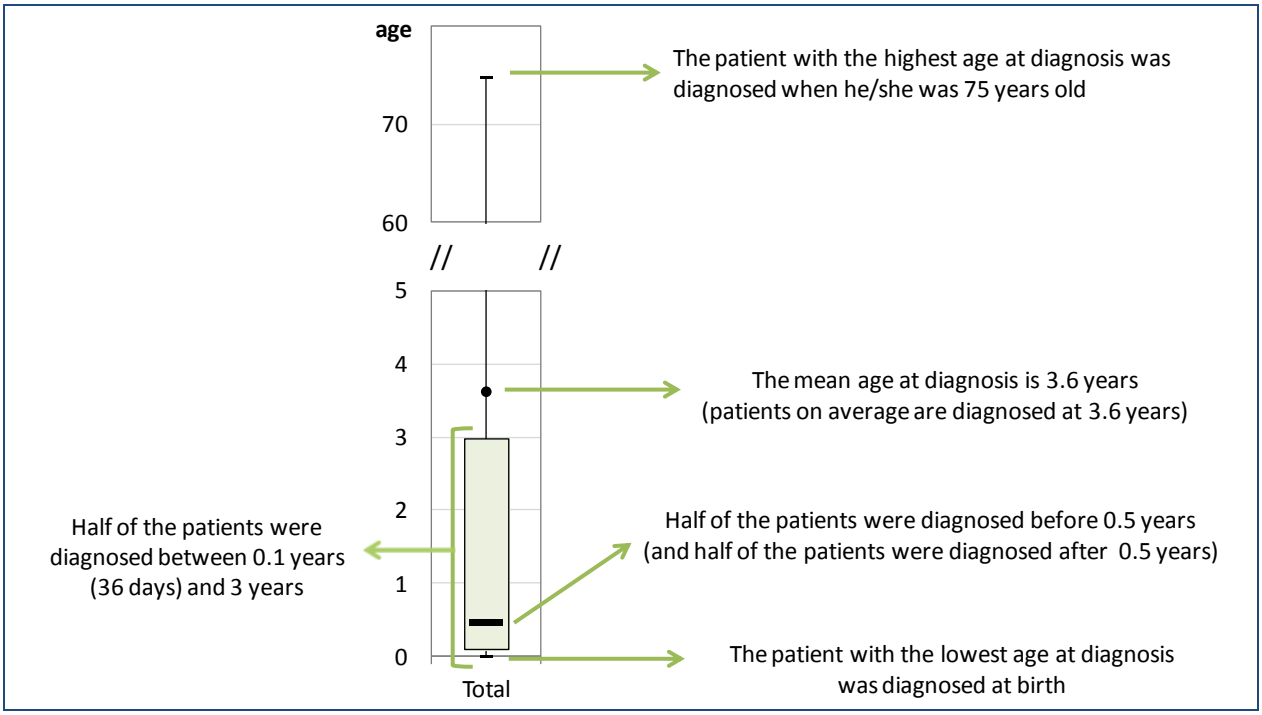
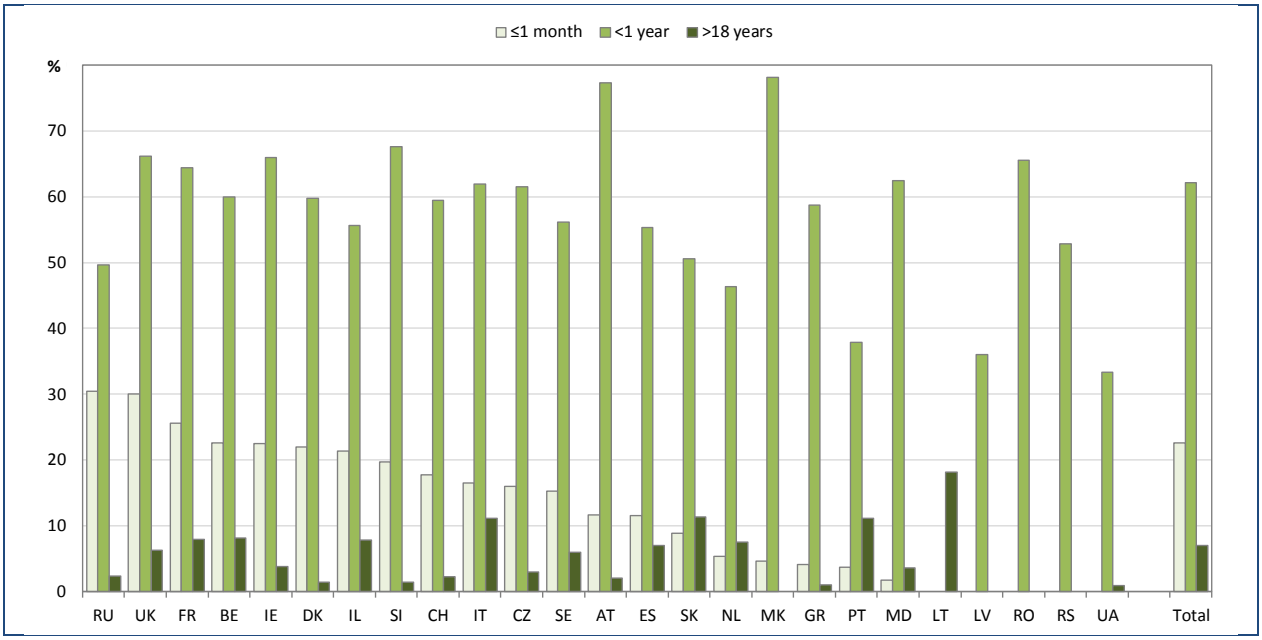

age
70
60
//
//
5
4
3
2
1
0
Total
The patient with the highest age at diagnosis was diagnosed when he/she was 75 years old
The mean age at diagnosis is 3.6 years (patients on average are diagnosed at 3.6 years)
Half of the patients were diagnosed before 0.5 years (and half of the patients were diagnosed 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 2011.***




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 subgroup for within 1 month are also part of the diagnoses in the subgroup 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 up to 100%.

***Figure 2.3 Proportion of patients who underwent neonatal screening, by country and overall. Patients 5 years old or younger seen in 2011.***

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 2011 who were screened at birth, (see country specific notes above). Dark green horizontal bars represent newborn screening "performed", light green bars "not performed".

This graph shows that in some countries there is no newborn screening and that in others, in the five years previous to 2011, almost all of the CF patients underwent newborn screening. In total, more than 60% of all children of 5 years old or younger registered in the ECFSPR in 2011 underwent newborn screening. 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.***

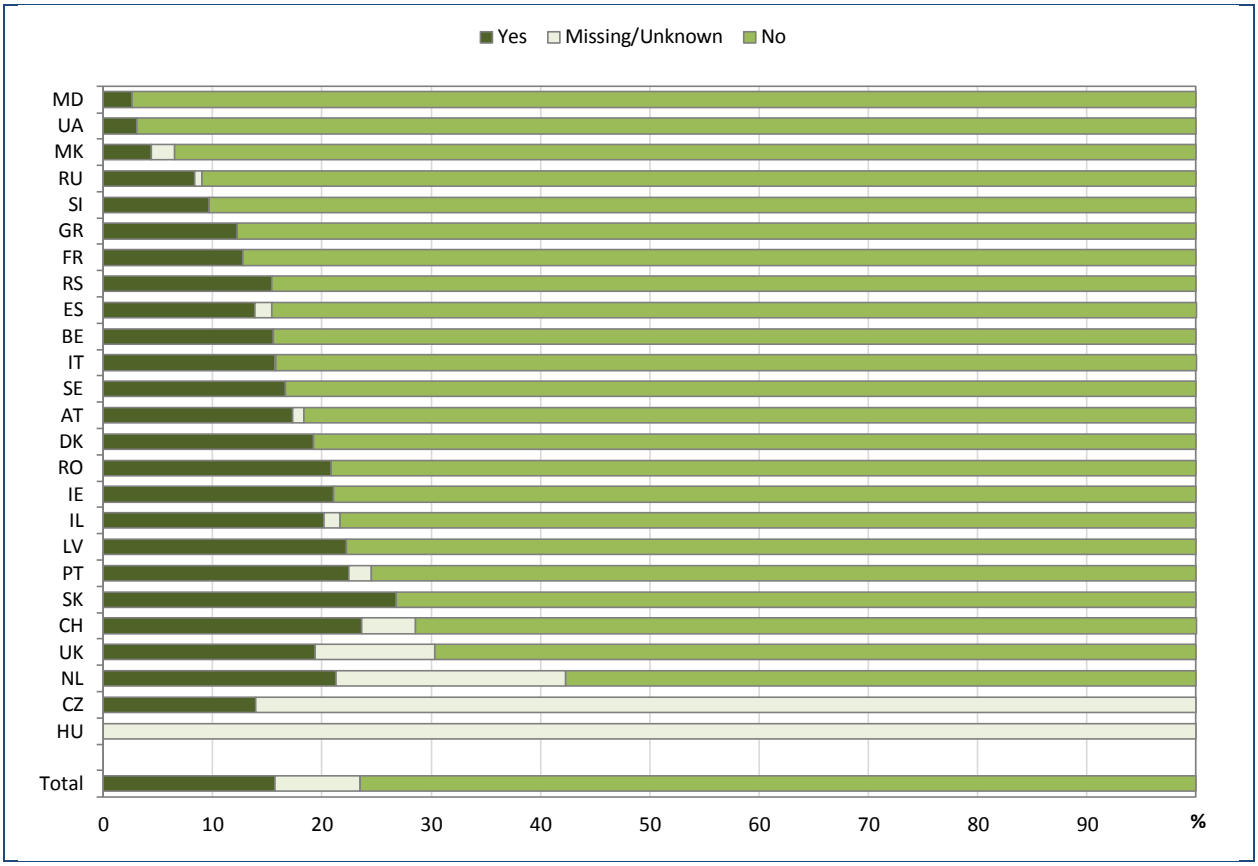
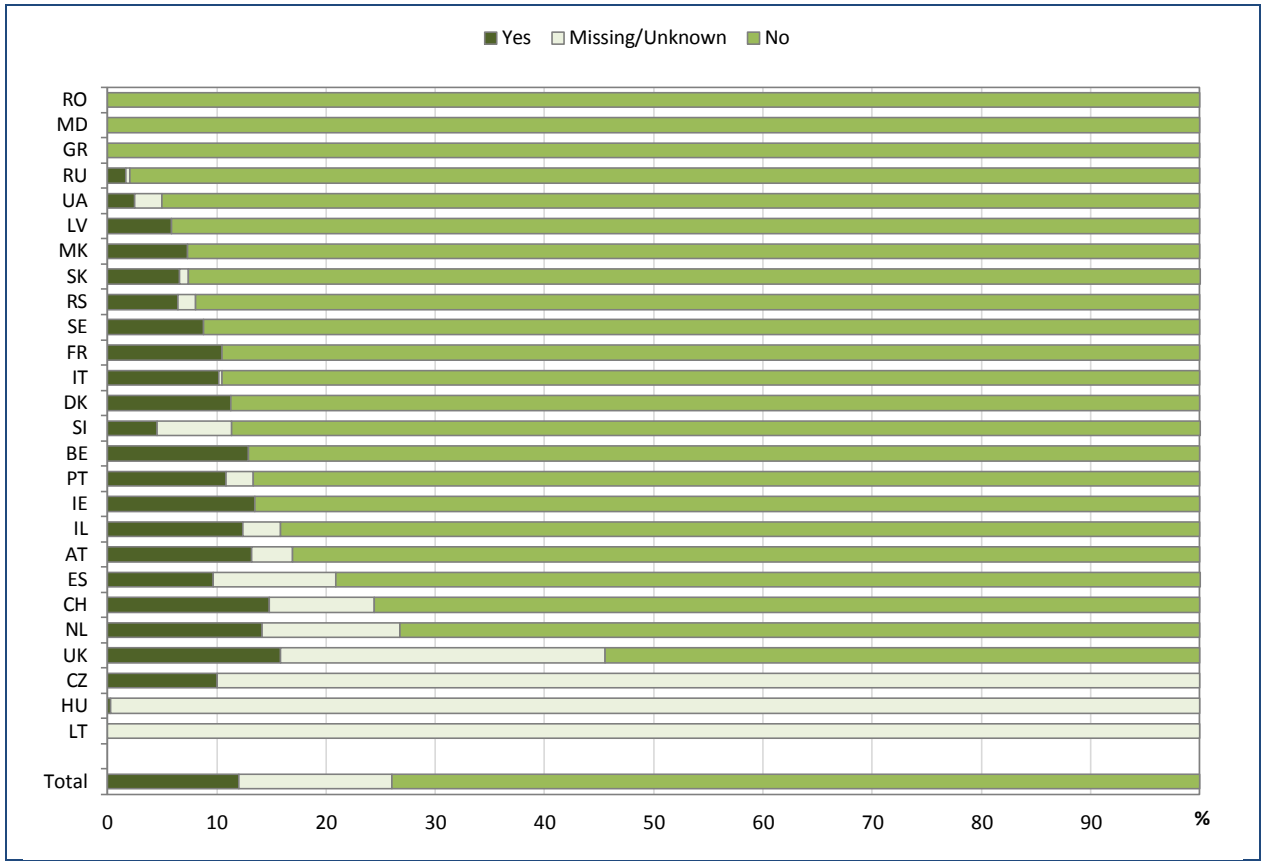


***Figure 2.5 Patients with meconium ileus, by country and overall. Patients aged 11 years or older.***




The 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 2011). 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 could 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.

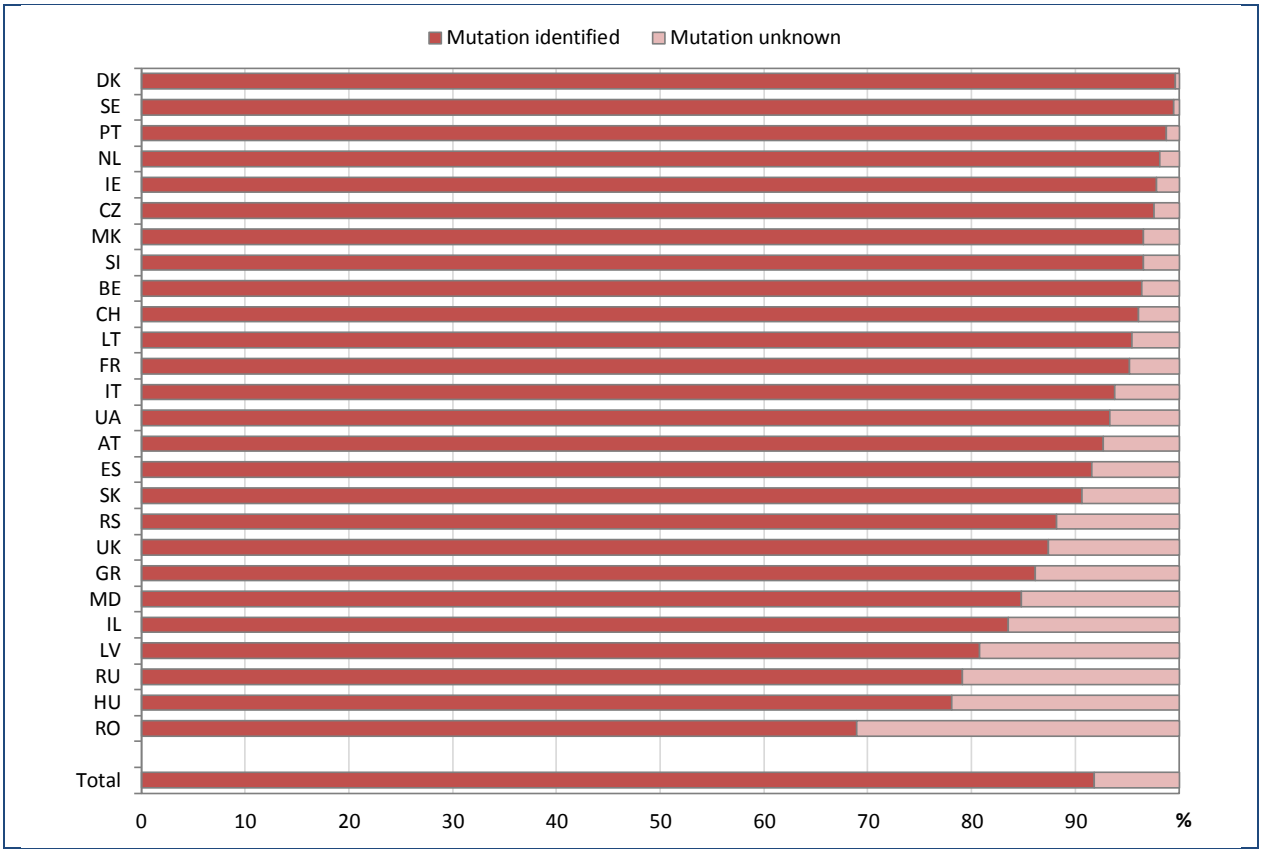
If DNA analysis to look for CFTR mutations had never been carried out, we asked the countries to report "not done" in the genotype field. If DNA analysis had been done, but only one or no mutations were found, we asked the countries to use "unknown" for the unidentified mutations. Please note that there 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 2011.*

| Country | N | Genotyping | | | Among genotyping done | |
|---|---|---|---|---|---|---|
| | | not done | done | unknown | two mutations identified | at least one mutation unknown |
| | | number (%) | number (%) | number (%) | number (%) | number (%) |
| **Austria** | 515 | 1 (0.19) | 514 (99.81) | 0 (0) | 458 (89.11) | 56 (10.89) |
| **Belgium** | 1150 | 0 (0) | 1150 (100) | 0 (0) | 1089 (94.70) | 61 (5.30) |
| **Czech Republic** | 562 | 0 (0) | 562 (100) | 0 (0) | 543 (96.62) | 19 (3.38) |
| **Denmark** | 433 | 0 (0) | 433 (100) | 0 (0) | 431 (99.54) | 2 (0.46) |
| **France** | 6001 | 0 (0) | 6001 (100) | 0 (0) | 5620 (93.65) | 381 (6.35) |
| **Greece** | 101 | 0 (0) | 101 (100) | 0 (0) | 77 (76.24) | 24 (23.76) |
| **Hungary** | 593 | 1 (0.17) | 592 (99.83) | 0 (0) | 407 (68.75) | 185 (31.25) |
| **Ireland** | 1042 | 10 (0.96) | 1032 (99.04) | 0 (0) | 996 (96.51) | 36 (3.49) |
| **Israel** | 513 | 3 (0.58) | 510 (99.42) | 0 (0) | 402 (78.82) | 108 (21.18) |
| **Italy** | 4621 | 36 (0.78) | 4585 (99.22) | 0 (0) | 4095 (89.31) | 490 (10.69) |
| **Latvia** | 26 | 0 (0) | 26 (100) | 0 (0) | 16 (61.54) | 10 (38.46) |
| **Lithuania** | 11 | 0 (0) | 11 (100) | 0 (0) | 10 (90.91) | 1 (9.09) |
| **Rep of Macedonia** | 87 | 0 (0) | 87 (100) | 0 (0) | 82 (94.25) | 5 (5.75) |
| **Rep of Moldova** | 56 | 0 (0) | 56 (100) | 0 (0) | 43 (76.79) | 13 (23.21) |
| **The Netherlands** | 1231 | 15 (1.22) | 1216 (98.78) | 0 (0) | 1179 (96.96) | 37 (3.04) |
| **Portugal** | 169 | 2 (1.18) | 167 (98.82) | 0 (0) | 163 (97.60) | 4 (2.40) |
| **Romania** | 29 | 0 (0) | 29 (100) | 0 (0) | 18 (62.07) | 11 (37.93) |
| **Russian Federation** | 1074 | 95 (8.85) | 979 (91.15) | 0 (0) | 670 (68.44) | 309 (31.56) |
| **Serbia** | 127 | 4 (3.15) | 123 (96.85) | 0 (0) | 98 (79.67) | 25 (20.33) |
| **Slovak Republic** | 177 | 0 (0) | 177 (100) | 0 (0) | 149 (84.18) | 28 (15.82) |
| **Slovenia** | 75 | 3 (4.00) | 72 (96.00) | 0 (0) | 68 (94.44) | 4 (5.56) |
| **Spain** | 1179 | 3 (0.25) | 1176 (99.75) | 0 (0) | 1011 (85.97) | 165 (14.03) |
| **Sweden** | 582 | 0 (0) | 582 (100) | 0 (0) | 577 (99.14) | 5 (0.86) |
| **Switzerland** | 588 | 7 (1.19) | 580 (98.64) | 1 (0.17) | 541 (93.28) | 39 (6.72) |
| **Ukraine** | 105 | 0 (0) | 105 (100) | 0 (0) | 92 (87.62) | 13 (12.38) |
| **United Kingdom** | 8676 | 384 (4.43) | 8292 (95.57) | 0 (0) | 6447 (77.75) | 1845 (22.25) |
| **Total** | 29723 | 564 (1.90) | 29158 (98.10) | 1 (0) | 25282 (86.71) | 3876 (13.29) |

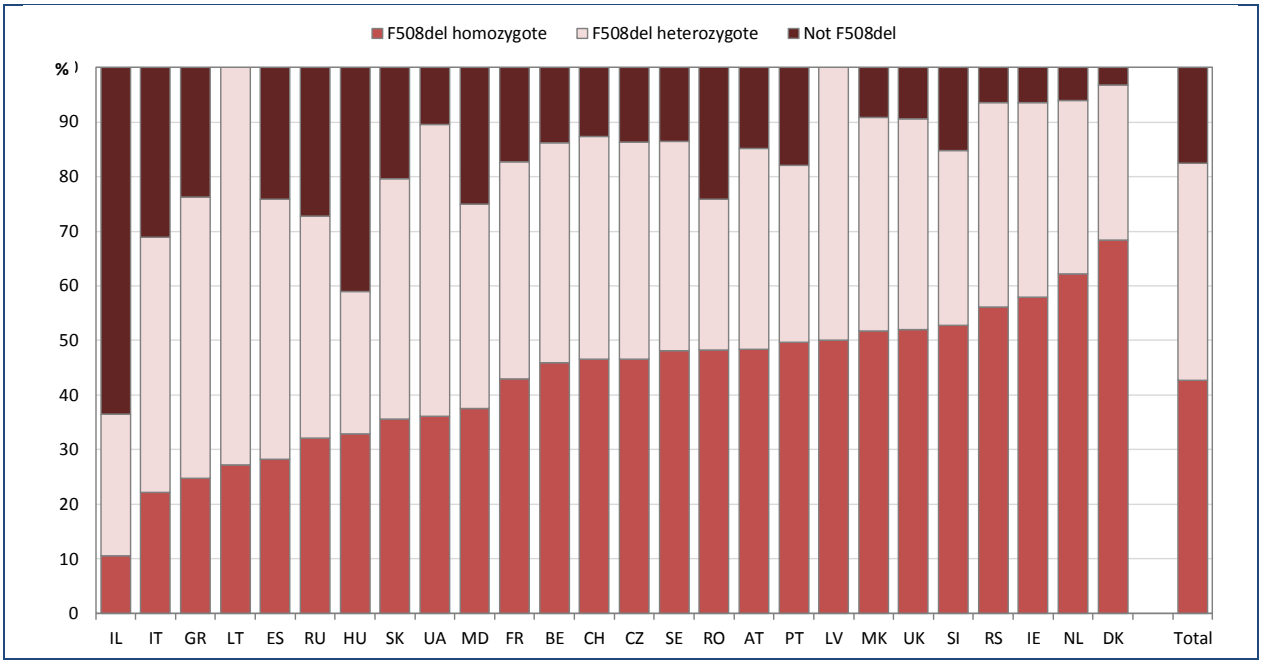
This table shows how many patients underwent DNA analysis to identify the CFTR mutations (column “genotyping done”) and, for those patients, how many patients had both mutations identified (column “two mutations identified”) and for how many one or both mutations remained unidentified (column “at least one mutation unknown”).

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




This graph shows the percentage of mutations that 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 13.29% 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 2011.***



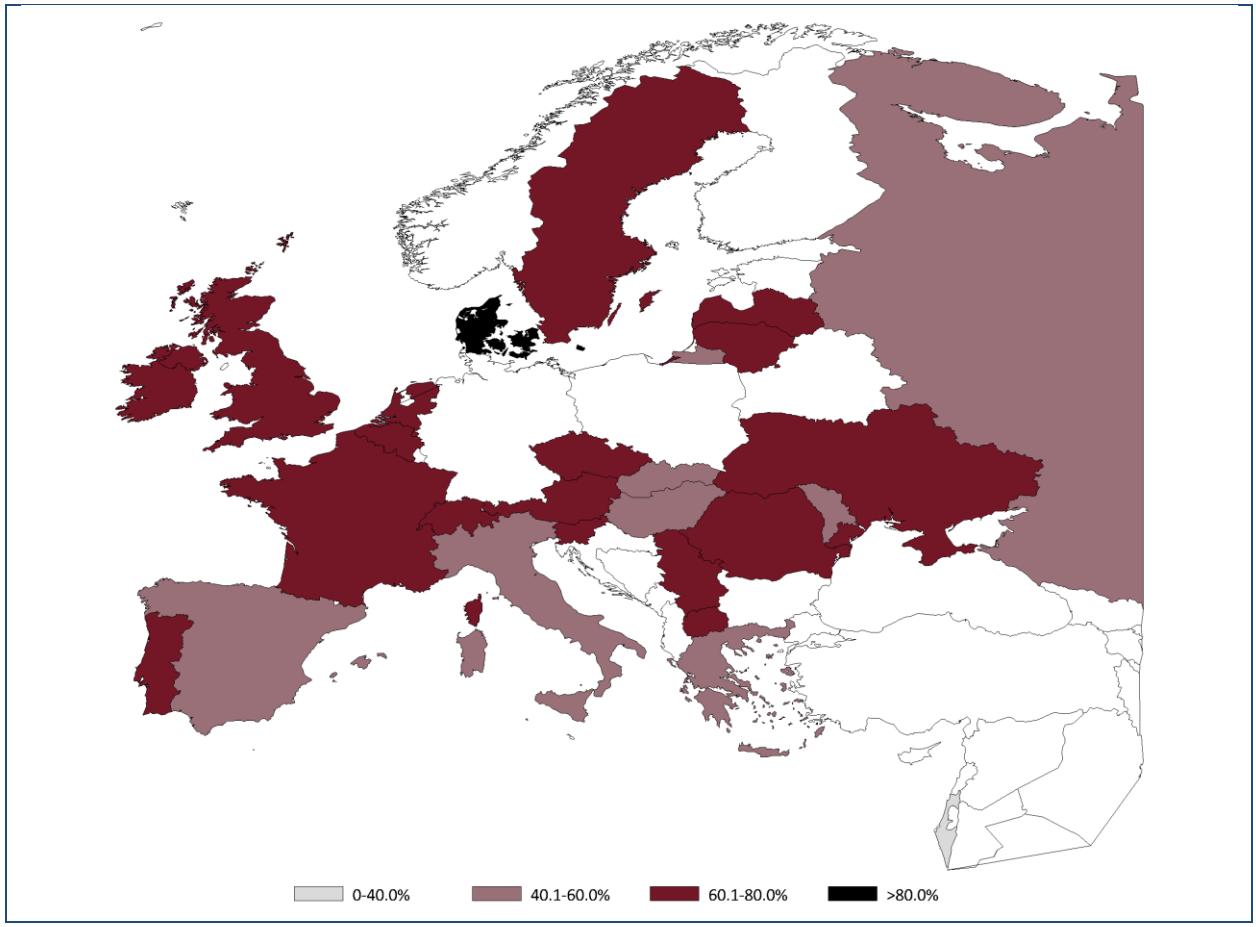

F508del is the name of the most commonly occurring CFTR mutation in the world. Patients who carry two F508del mutations are often described as having “classic CF”, but other combinations of mutations may cause the same degree of disease. We have grouped the patients in F508del homozygous (two F508del mutations), F508del heterozygous (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 13 most common mutations in the ECFSPR database.*

| Mutation name | Number of alleles | Percentage among tested | Country with highest allele frequency |
|---|---|---|---|
| **F508del** | 36486 | 62.57 | Denmark (82.56%) |
| **G542X** | 1618 | 2.77 | Greece (7.92%) |
| **N1303K** | 1240 | 2.13 | Italy (5.64%) |
| **G551D** | 805 | 1.38 | Ireland (7.51%) |
| **W1282X** | 657 | 1.13 | Israel (23.43%) |
| **R117H** | 616 | 1.06 | Ireland (2.62%) |
| **1717-1G->A** | 558 | 0.96 | Switzerland (2.76%) |
| **R553X** | 432 | 0.74 | Lithuania (9.09%) |
| **3849+10KbC->T** | 419 | 0.72 | Lithuania (13.64%) |
| **2789+5G->A** | 412 | 0.71 | Rep of Moldova (3.57%) |
| **2183AA->G** | 344 | 0.59 | Italy (2.17%) |
| **R1162X** | 337 | 0.58 | Slovenia (5.56%) |
| **621+1G->T** | 333 | 0.57 | Greece (8.91%) |

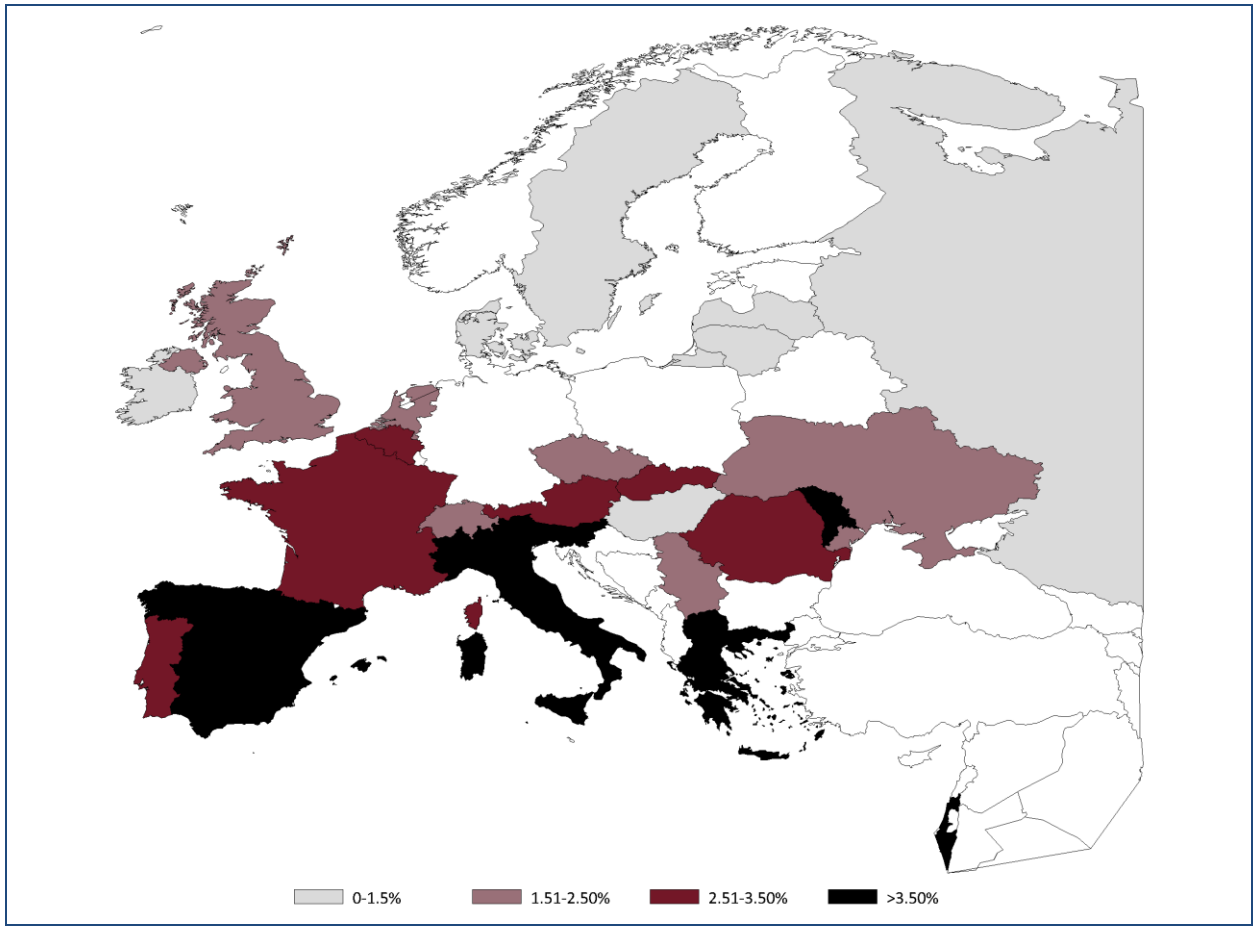
This table presents the allele frequency of the 13 most commonly occurring mutations found in the ECFSPR database. In the last column the country in which this particular mutation is most frequent is reported. F508del is by far the most frequent mutation. Additionally, since F508del is included in all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

***Figure 3.3 Geographical distribution of mutation F508del.***



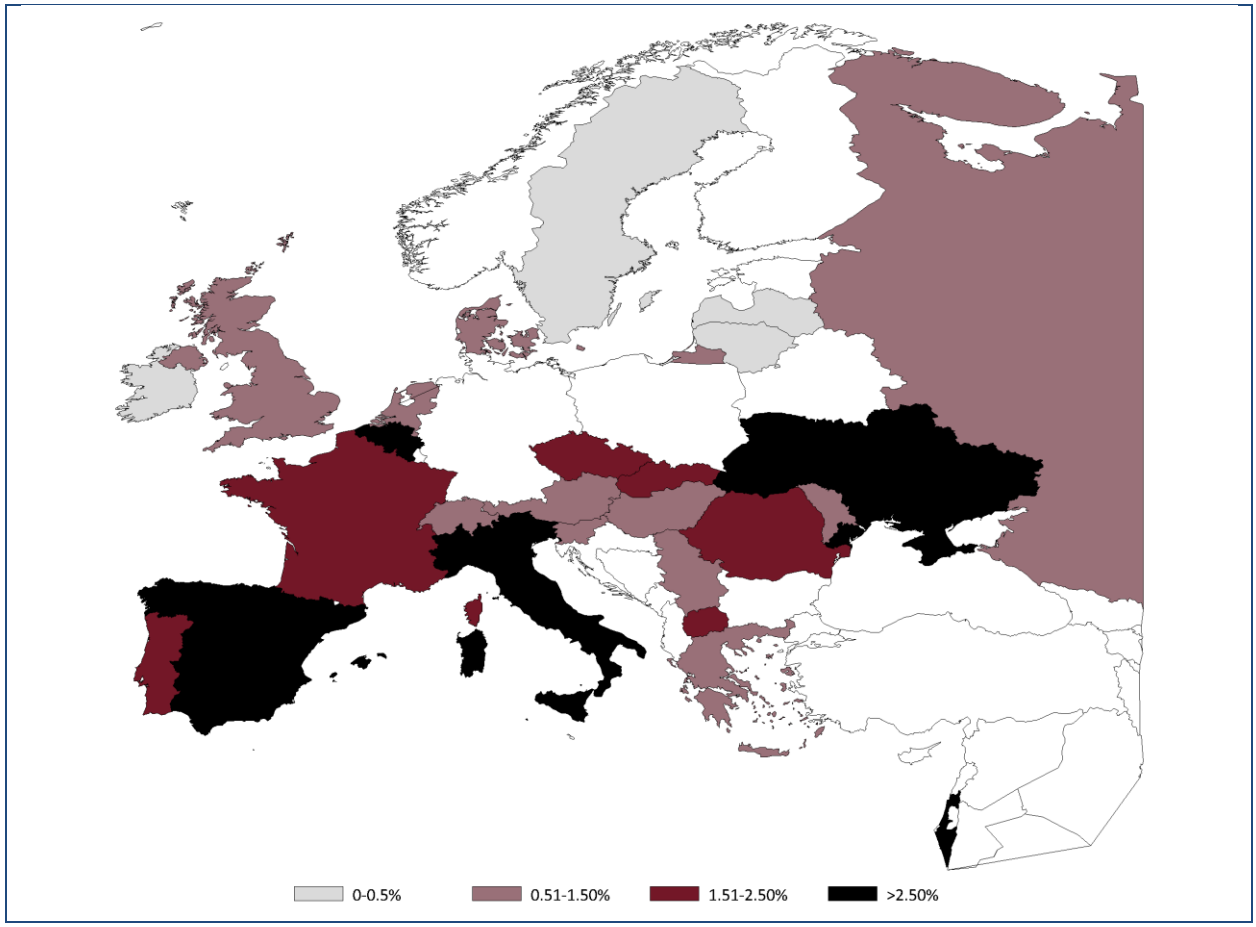

Although this mutation is the most common in all countries, the allele frequency still varies from 23.53% in Israel to 82.56% in Denmark.

***Figure 3.4 Geographical distribution of mutation G542X.***



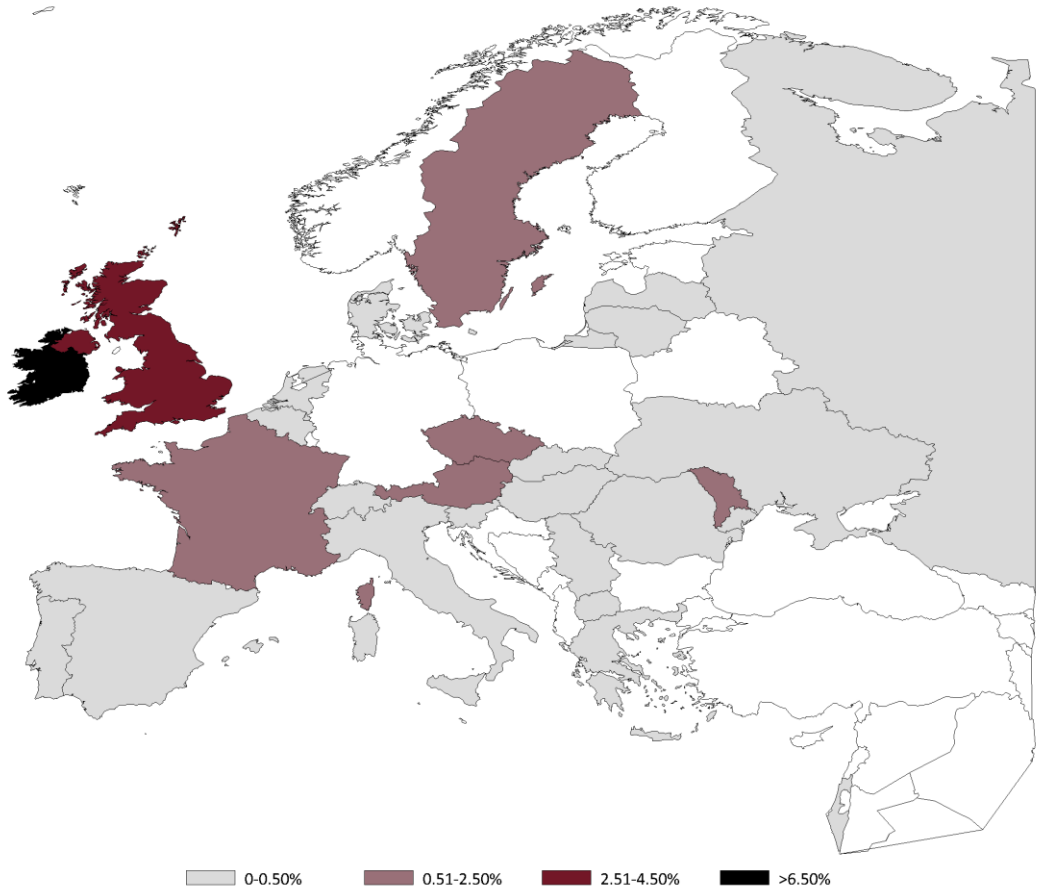

This mutation is most frequent in Southern Europe, with the highest allele frequency being in Greece (7.92%), whereas it is very rarely found in Scandinavia (0.81% in Denmark and 0.60% in Sweden), Latvia (0.0%) and Lithuania.

***Figure 3.5 Geographical distribution of mutation N1303K.***




This mutation is most frequent in Italy (5.64%) and other countries in Southern Europe and in Eastern Europe, but rare in Northern Europe.

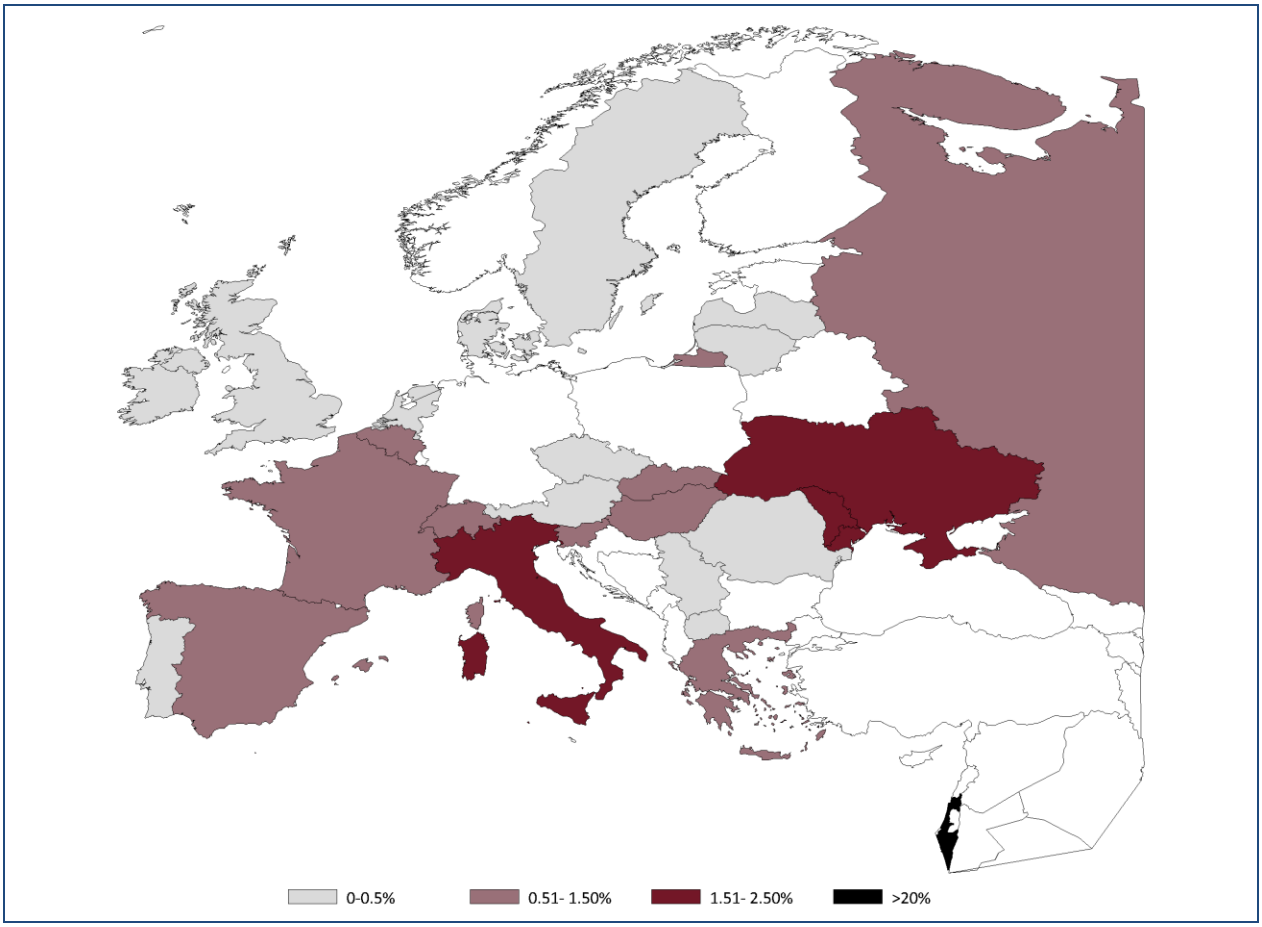
***Figure 3.6 Geographical distribution of mutation G551D.***




Note: Israel: G551D was not in the mutation panel for 2011, therefore the prevalence is unknown.

This mutation is most frequent in Ireland (7.51%), 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 (23.43%) 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

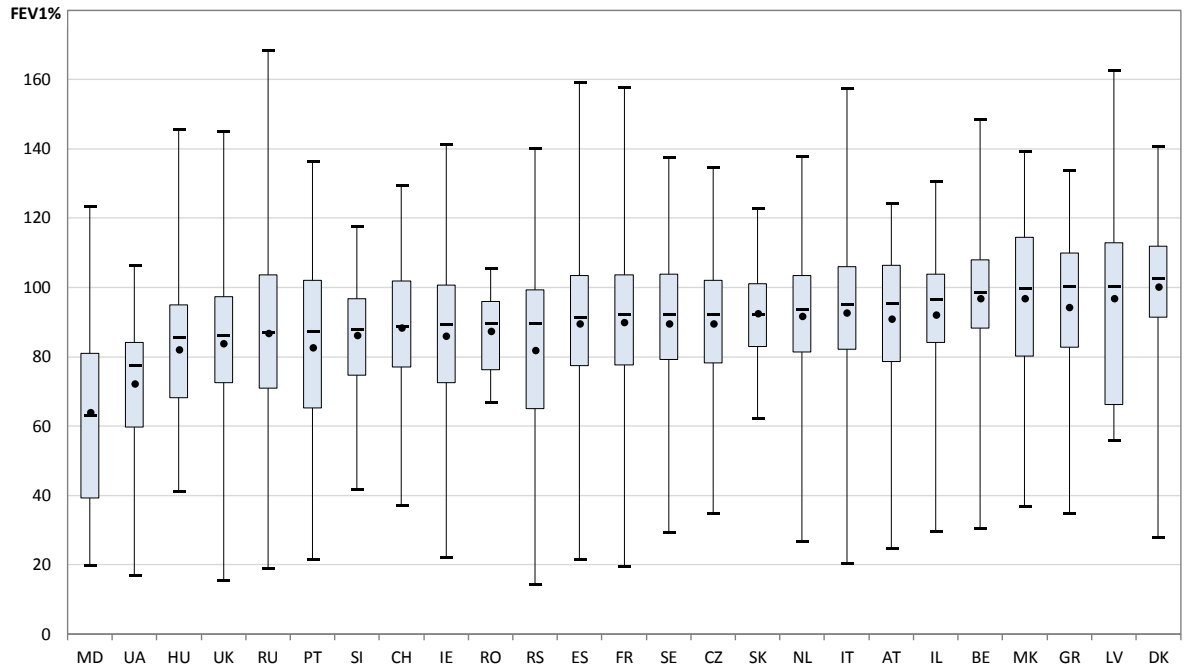
### *Table 4.1 $FEV_1$% of predicted: descriptive statistics, by country. Patients aged 6-17 years who have never had a lung transplant.*

| 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** | 225 | 5 | 90.9 | 24.6 | 78.6 | 95.2 | 106.3 | 124.2 |
| **Belgium** | 385 | 5 | 96.8 | 30.5 | 88.3 | 98.6 | 108.0 | 148.4 |
| **Czech Republic** | 194 | 16 | 89.5 | 34.7 | 78.3 | 92.4 | 102.1 | 134.6 |
| **Denmark** | 144 | 0 | 100.3 | 28.0 | 91.5 | 102.6 | 111.9 | 140.8 |
| **France** | 1887 | 146 | 89.9 | 19.6 | 77.6 | 92.1 | 103.6 | 157.6 |
| **Greece** | 44 | 0 | 94.3 | 34.8 | 82.8 | 100.2 | 109.9 | 133.6 |
| **Hungary** | 51 | 153 | 82.1 | 41.2 | 68.2 | 85.4 | 95.0 | 145.6 |
| **Ireland** | 297 | 53 | 86.1 | 22.0 | 72.5 | 89.4 | 100.6 | 141.3 |
| **Israel** | 179 | 1 | 92.1 | 29.6 | 84.1 | 96.5 | 103.9 | 130.5 |
| **Italy** | 1011 | 110 | 92.7 | 20.5 | 82.2 | 95.0 | 106.0 | 157.2 |
| **Latvia** | <10 | 0 | 96.9 | 56.0 | 66.2 | 100.2 | 112.9 | 162.5 |
| **Rep of Macedonia** | 49 | 0 | 96.9 | 36.8 | 80.3 | 99.6 | 114.4 | 139.1 |
| **Rep of Moldova** | 15 | 1 | 63.9 | 19.9 | 39.2 | 63.3 | 81.1 | 123.5 |
| **The Netherlands** | 393 | 6 | 91.8 | 26.7 | 81.4 | 93.5 | 103.4 | 137.7 |
| **Portugal** | 52 | 16 | 82.7 | 21.5 | 65.3 | 87.3 | 102.1 | 136.4 |
| **Romania** | 14 | 0 | 87.4 | 67.0 | 76.2 | 89.6 | 96.0 | 105.5 |
| **Russian Federation** | 247 | 151 | 86.9 | 18.9 | 71.0 | 87.0 | 103.7 | 168.3 |
| **Serbia** | 58 | 1 | 81.9 | 14.2 | 65.1 | 89.6 | 99.4 | 139.9 |
| **Slovak Republic** | 38 | 0 | 92.6 | 62.2 | 83.0 | 92.4 | 101.1 | 122.7 |
| **Slovenia** | 37 | 0 | 86.3 | 41.7 | 74.7 | 88.0 | 96.8 | 117.6 |
| **Spain** | 393 | 13 | 89.5 | 21.6 | 77.4 | 91.3 | 103.4 | 159.3 |
| **Sweden**[1] | 164 | 6 | 89.5 | 29.3 | 79.2 | 92.3 | 103.9 | 137.6 |
| **Switzerland** | 234 | 10 | 88.4 | 37.2 | 77.0 | 88.7 | 101.8 | 129.6 |
| **Ukraine** | 61 | 0 | 72.3 | 16.9 | 59.7 | 77.3 | 84.1 | 106.4 |
| **United Kingdom**[2] | 2585 | 190 | 83.8 | 15.6 | 72.6 | 86.1 | 97.3 | 144.9 |

[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 2011 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 2011 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.

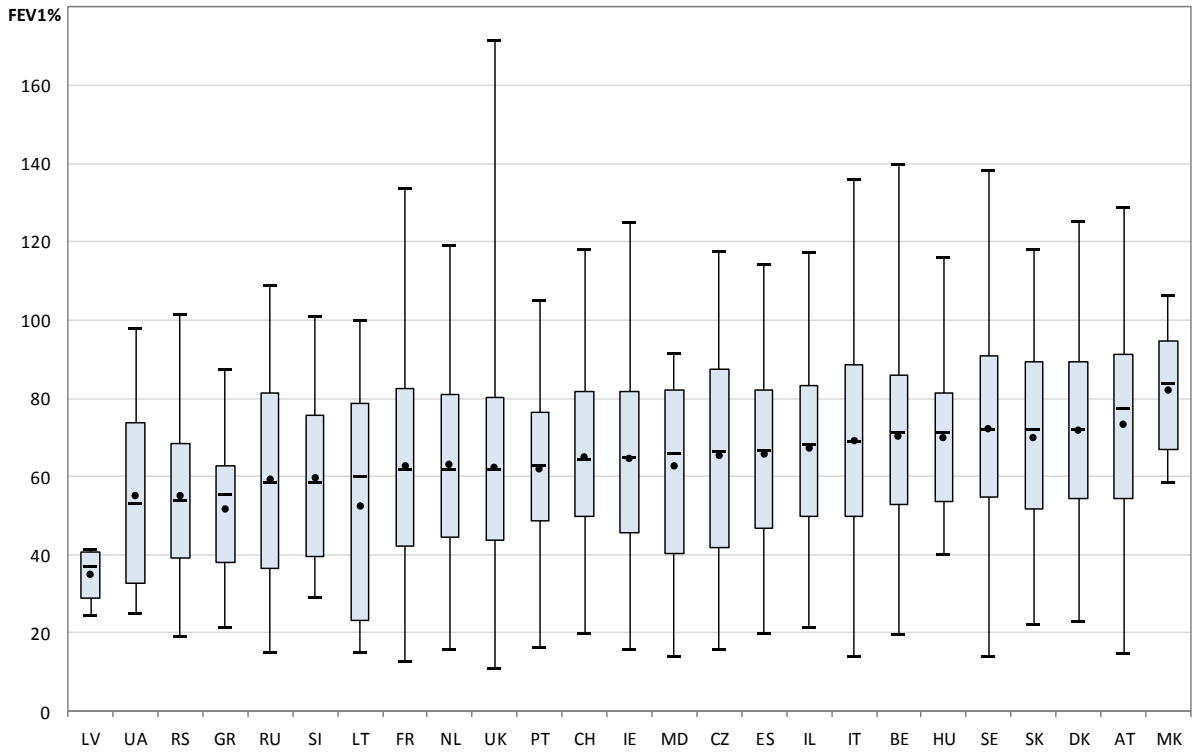
### *Table 4.2 $FEV_1$% of predicted: descriptive statistics, by country. Patients aged 18 years or older who have never had a lung transplant.*

| 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** | 153 | 1 | 73.2 | 14.6 | 54.2 | 77.4 | 91.3 | 128.6 |
| **Belgium** | 477 | 6 | 70.3 | 19.7 | 52.8 | 71.1 | 85.9 | 139.5 |
| **Czech Republic** | 101 | 72 | 65.1 | 15.7 | 42.0 | 66.2 | 87.6 | 117.6 |
| **Denmark** | 206 | 1 | 71.5 | 23.0 | 54.2 | 72.2 | 89.3 | 125.4 |
| **France** | 2260 | 51 | 62.7 | 12.7 | 42.4 | 61.9 | 82.3 | 133.5 |
| **Greece** | 30 | 0 | 51.6 | 21.4 | 38.1 | 55.3 | 62.7 | 87.3 |
| **Hungary** | 16 | 131 | 69.8 | 40.3 | 53.7 | 71.4 | 81.4 | 116.2 |
| **Ireland** | 284 | 106 | 64.6 | 15.7 | 45.6 | 64.9 | 81.7 | 124.7 |
| **Israel** | 247 | 1 | 67.0 | 21.7 | 50.0 | 68.3 | 83.3 | 117.4 |
| **Italy** | 1518 | 215 | 69.0 | 14.0 | 49.8 | 69.0 | 88.5 | 136.0 |
| **Latvia** | 4 | 0 | 34.9 | 24.5 | 29.1 | 37.1 | 40.7 | 41.1 |
| **Lithuania** | 11 | 0 | 52.1 | 15.0 | 23.2 | 59.8 | 78.6 | 99.9 |
| **Rep of Macedonia** | 16 | 0 | 81.8 | 58.5 | 67.1 | 83.9 | 94.6 | 106.4 |
| **Rep of Moldova** | 11 | 0 | 62.5 | 13.8 | 40.3 | 65.8 | 82.0 | 91.6 |
| **The Netherlands** | 578 | 15 | 62.8 | 15.9 | 44.5 | 61.9 | 81.1 | 119.2 |
| **Portugal** | 51 | 2 | 61.9 | 16.2 | 48.7 | 62.8 | 76.3 | 105.1 |
| **Russian Federation** | 163 | 33 | 59.2 | 15.1 | 36.6 | 58.3 | 81.3 | 109.0 |
| **Serbia** | 34 | 0 | 55.1 | 19.2 | 39.0 | 53.8 | 68.3 | 101.4 |
| **Slovak Republic** | 93 | 0 | 69.8 | 22.1 | 51.7 | 72.1 | 89.5 | 118.0 |
| **Slovenia** | 16 | 0 | 59.6 | 29.2 | 39.5 | 58.5 | 75.8 | 100.9 |
| **Spain** | 400 | 18 | 65.6 | 20.0 | 46.9 | 66.8 | 82.2 | 114.2 |
| **Sweden**[1] | 269 | 15 | 72.2 | 14.0 | 54.6 | 71.9 | 90.9 | 138.3 |
| **Switzerland** | 201 | 0 | 65.0 | 20.0 | 49.7 | 64.3 | 81.6 | 117.9 |
| **Ukraine** | 11 | 0 | 55.1 | 24.9 | 32.6 | 53.1 | 73.9 | 97.7 |
| **United Kingdom**[2] | 4069 | 114 | 62.3 | 10.8 | 43.7 | 61.9 | 80.3 | 171.6 |

[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 2011 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.

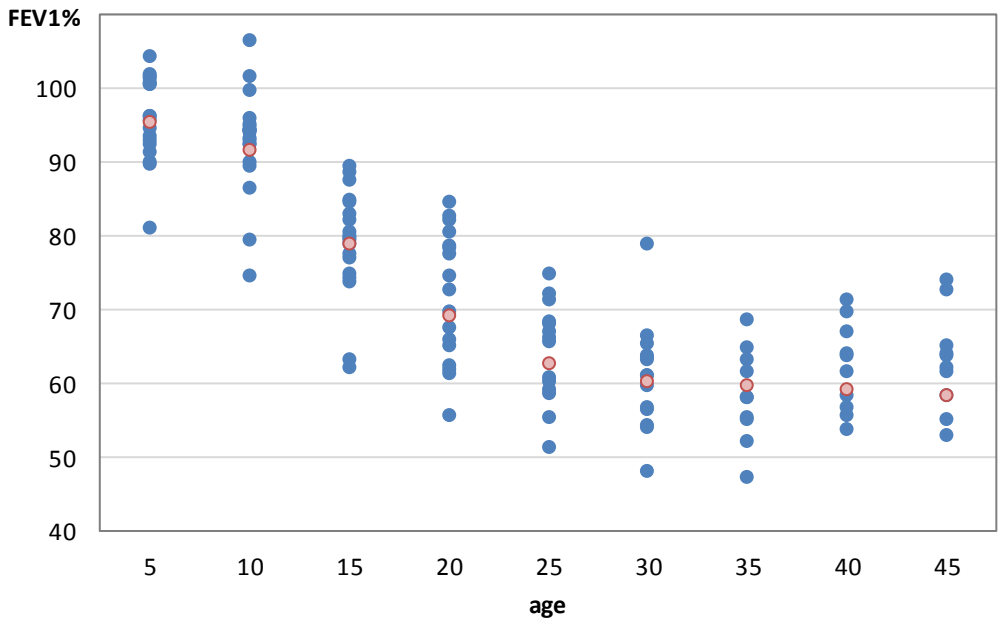
***Figure 4.2 $FEV_1$% of predicted: box-plot, by country and overall. Patients aged 18 years or older who have never had a lung transplant.***




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 2011 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 a % 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 30-34, 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.***

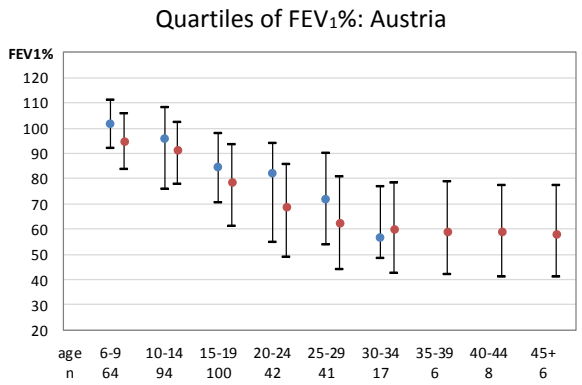
| Age at $FEV_1$ measurement | N | N Miss | Mean | Min | 25th pctl | Median | 75th pctl | Max |
|---|---|---|---|---|---|---|---|---|
| **6-9** | 2814 | 365 | 94.1 | 22.8 | 83.8 | 95.3 | 105.7 | 168.3 |
| **10-14** | 3726 | 326 | 89.4 | 16.9 | 77.6 | 91.6 | 102.5 | 163.5 |
| **15-19** | 3654 | 301 | 76.4 | 11.8 | 61.2 | 78.9 | 93.4 | 148.1 |
| **20-24** | 3198 | 237 | 67.7 | 12.0 | 49.2 | 69.2 | 85.9 | 130.3 |
| **25-29** | 2323 | 166 | 62.9 | 10.8 | 44.1 | 62.7 | 81.1 | 136.0 |
| **30-34** | 1562 | 115 | 61.3 | 14.0 | 42.7 | 60.1 | 78.1 | 139.5 |
| **35-39** | 1056 | 66 | 60.8 | 15.8 | 42.2 | 59.6 | 79.1 | 131.1 |
| **40-44** | 738 | 38 | 60.4 | 12.7 | 41.1 | 59.0 | 76.9 | 129.4 |
| **45+** | 914 | 50 | 60.8 | 13.0 | 41.0 | 58.2 | 77.7 | 171.6 |

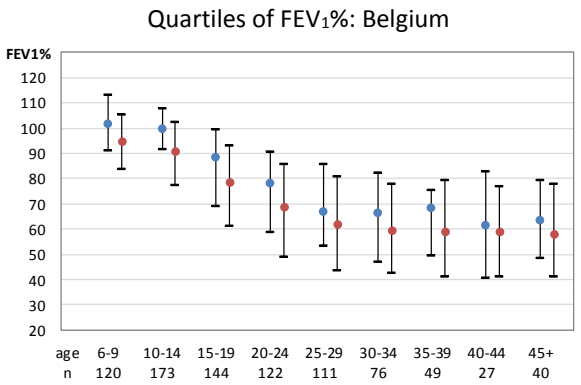
Note: Not every country reported the best $FEV_1$ value of the year (see tables 4.1 and 4.2).

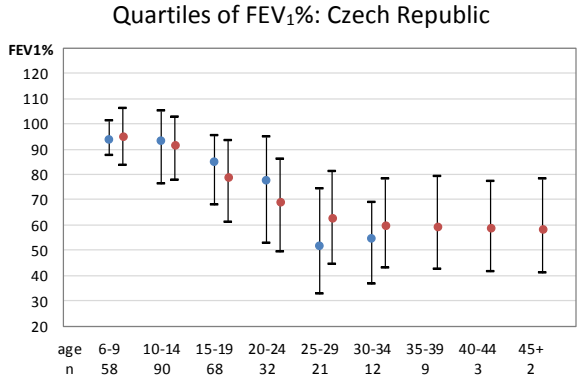
This table shows $FEV_1$% by age group for the total data set. The median values reported in this table are shown as red dots in fig 4.3.

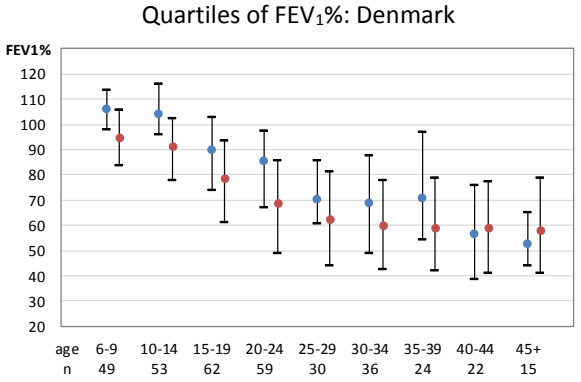
## *Figure 4.4 Quartiles of FEV$_1$% of predicted by age group and by country. Patients aged 6 years or older and who have never had a lung transplant.*

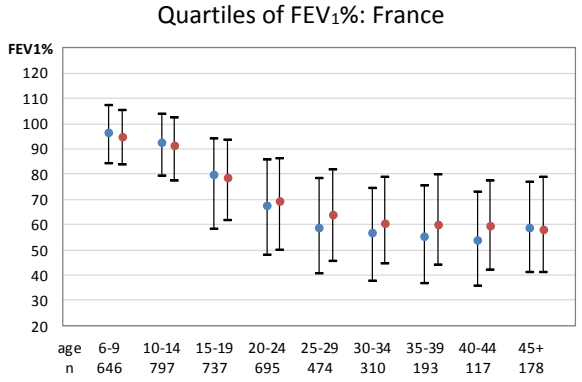
The figures below show, for each country, the FEV$_1$% in different age groups. The dot shows the median, and the whiskers show the 25$^{th}$ and 75$^{th}$ percentiles (the median, the 25$^{th}$ percentile and the 75$^{th}$ percentile are collectively named "quartiles"). In blue are the quartiles for 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, the Republic of Moldova and Romania from the graphs because none of the age groups had more than 10 patients.

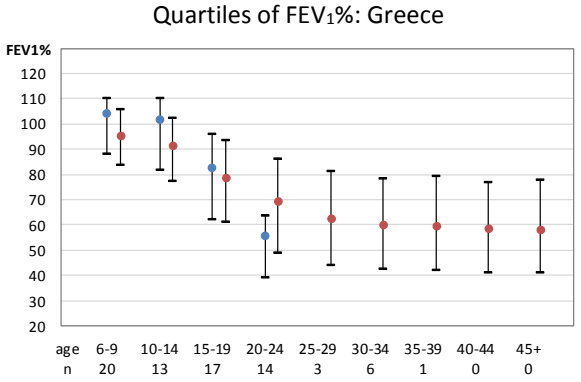


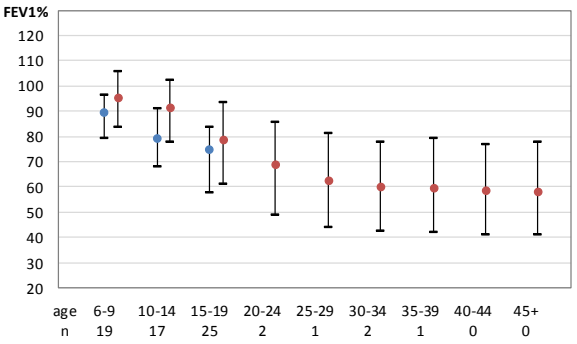



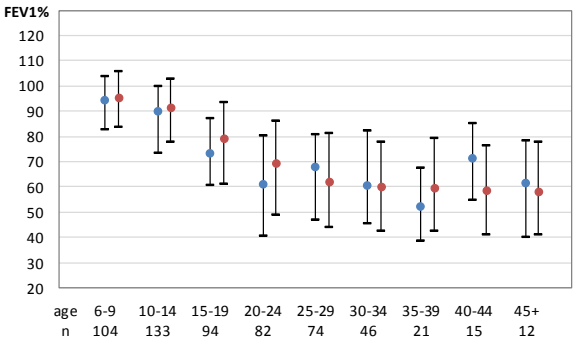



***[figure 4.4 continued]***

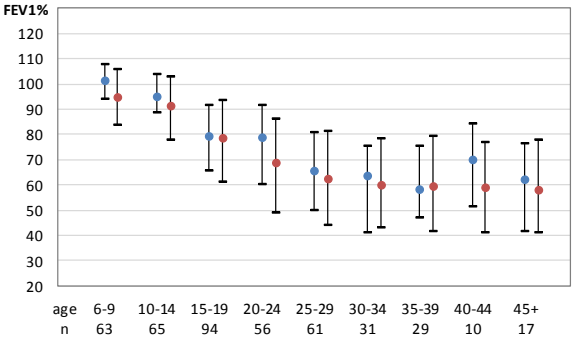
Quartiles of $FEV_1$%: Hungary



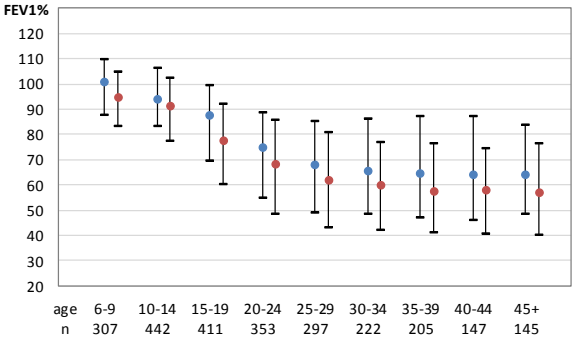

Quartiles of $FEV_1$%: Ireland



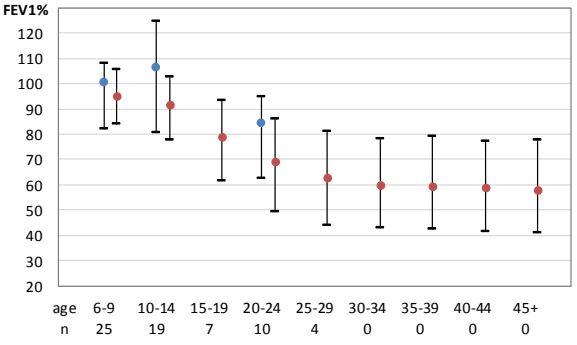

Quartiles of $FEV_1$%: Israel



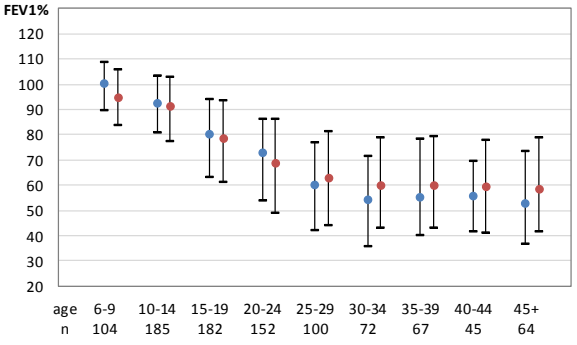

Quartiles of $FEV_1$%: Italy



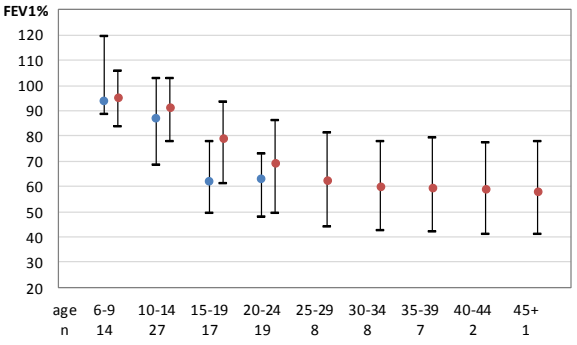

Quartiles of $FEV_1$%: Rep of Macedonia



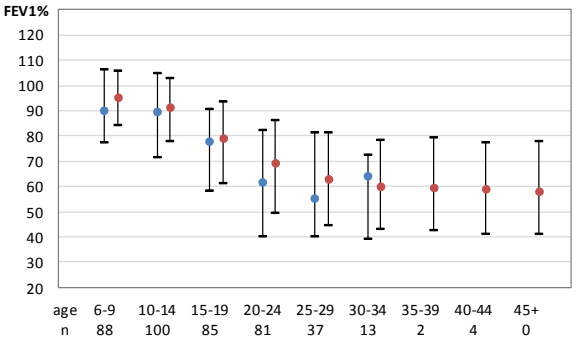

Quartiles of $FEV_1$%: The Netherlands




Quartiles of $FEV_1$%: Portugal

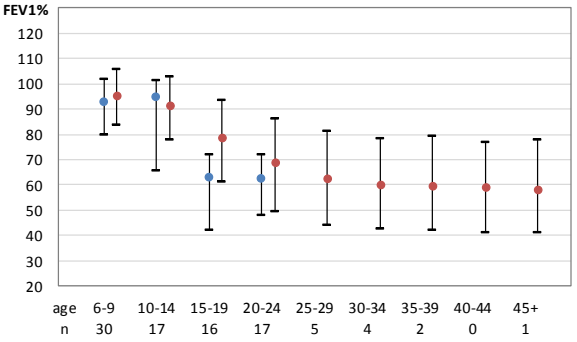



Quartiles of $FEV_1$%: Russian Federation

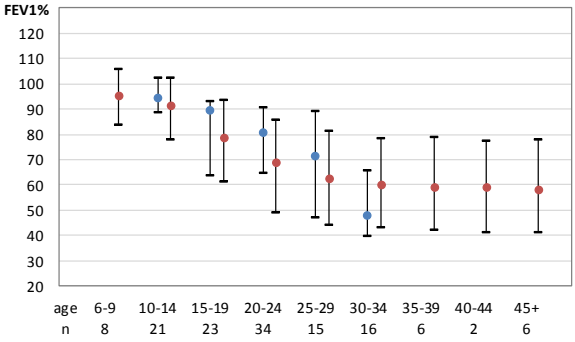


***[figure 4.4 continued]***

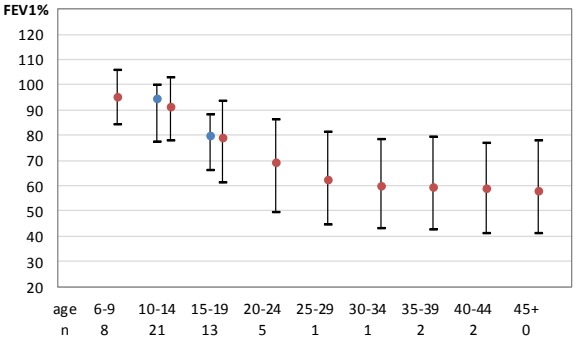
Quartiles of $FEV_1$%: Serbia



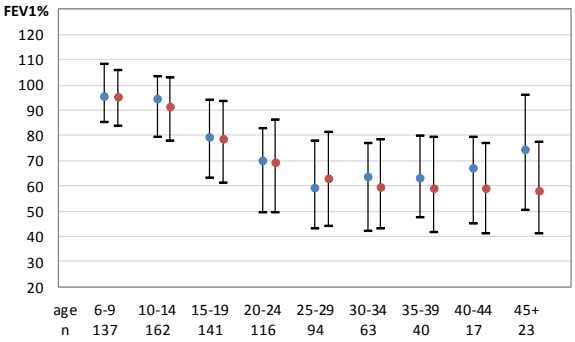

Quartiles of $FEV_1$%: Slovak Republic



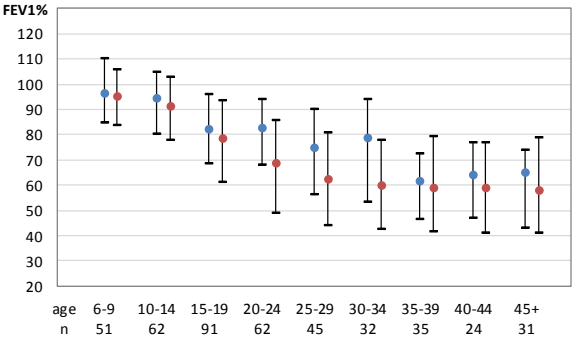

Quartiles of $FEV_1$%: Slovenia



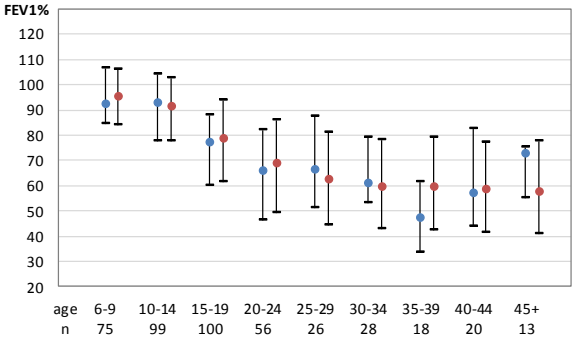

Quartiles of $FEV_1$%: Spain



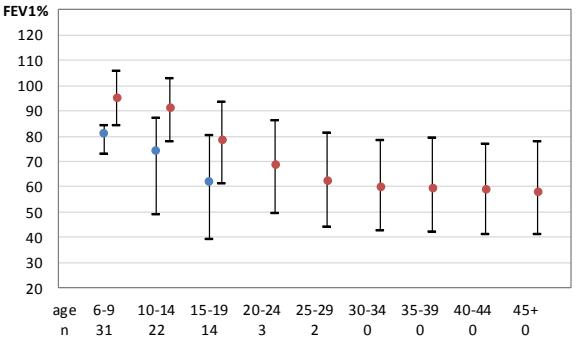

Quartiles of $FEV_1$%: Sweden[1]



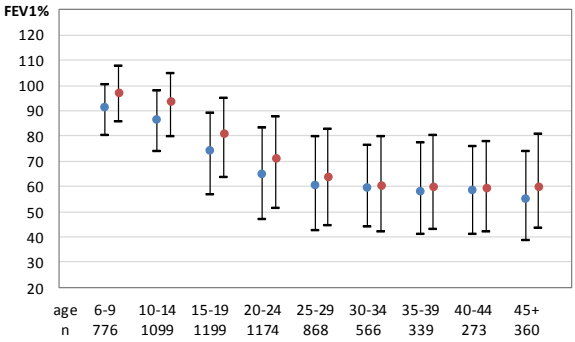

Quartiles of $FEV_1$%: Switzerland




Quartiles of $FEV_1$%: Ukraine



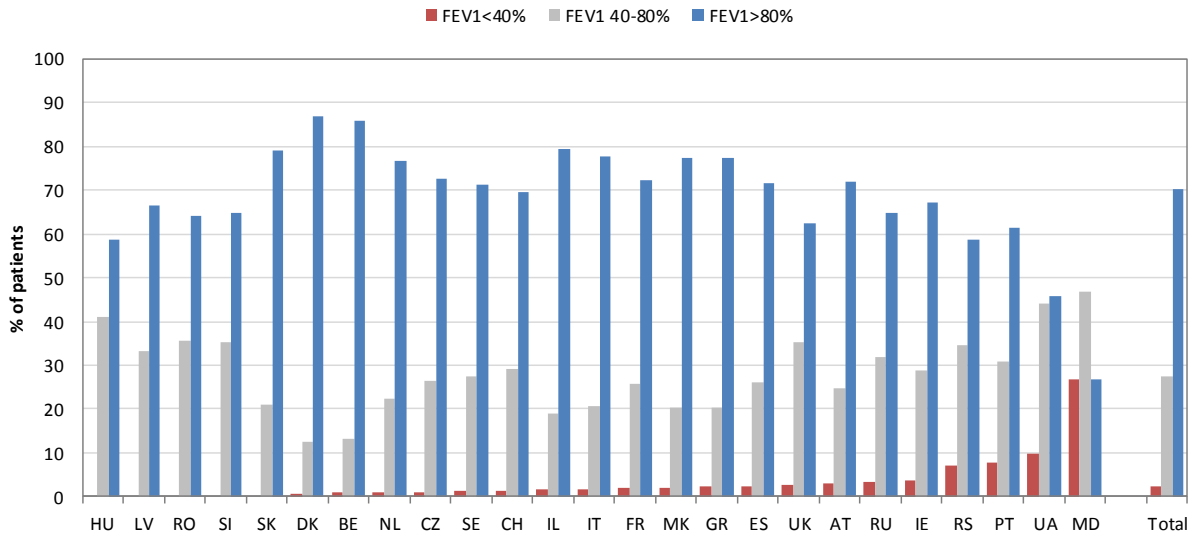

Quartiles of $FEV_1$%: United Kingdom[2]




[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 2011 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

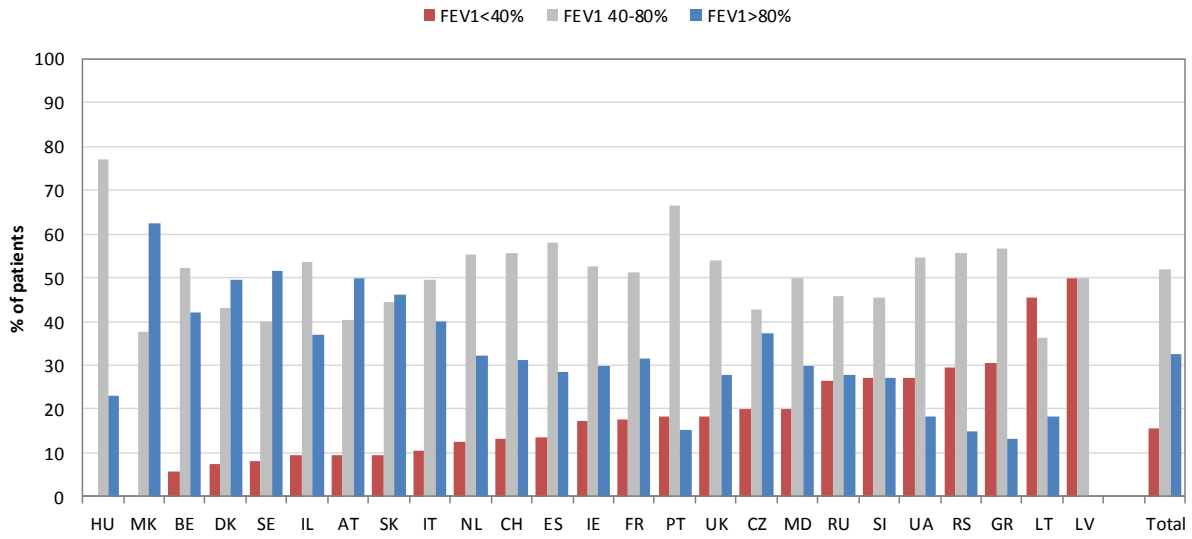
***Figure 4.5 $FEV_1$% of predicted according to severity group and age group, by country and overall. Patients aged 6-17 years who have never had a lung transplant.***




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 2011 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.
Note: Lithuania has 0% coverage for children.

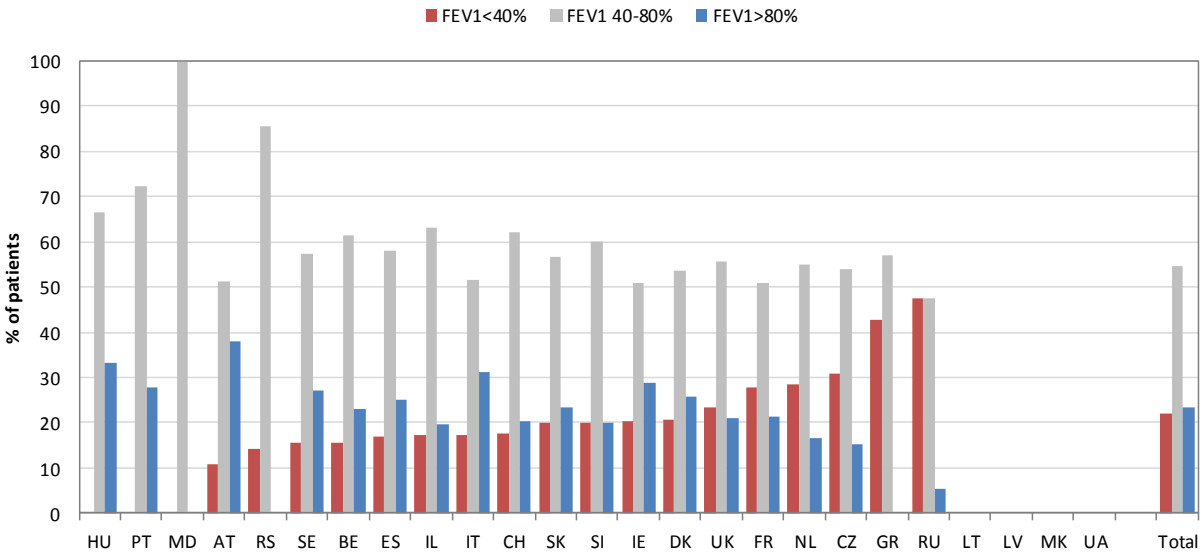
Figures 4.5, 4.6 and 4.7 show the $FEV_1$% by severity group, by country and overall. Patients with an $FEV_1$% higher than 80% are generally considered to have mild lung disease, patients with $FEV_1$% between 80% and 40% moderate lung disease, and patients with $FEV_1$ <40% severe lung disease. However, 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 dare of the patient's annual review. All analyses of $FEV_1$ in the UK 2011 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.
Note: Romania has 0% coverage for adults.

***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 2011 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.
Note: Romania has 0% coverage for adults.

# 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 2011, by country.*

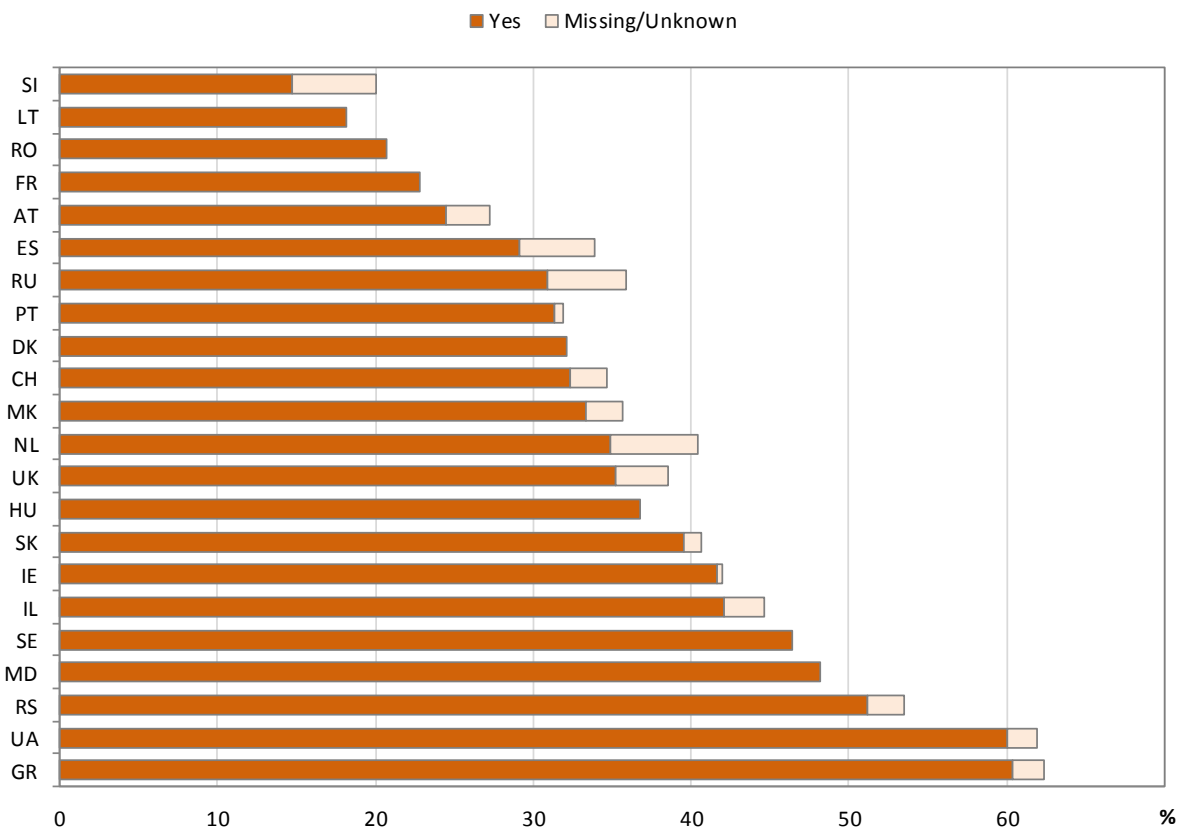
| Country | Chronic *Pseudomonas aeruginosa* number (%) | | | Chronic *Burkholderia cepacia complex species* number (%) | | | Chronic *Staphylococcus aureus* number (%) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Missing/ unknown | No | Yes | Missing/ unknown | No | Yes | Missing/ unknown | No | Yes |
| **Austria** | 14 (2.72) | 375 (72.82) | 126 (24.47) | 12 (2.33) | 487 (94.56) | 16 (3.11) | 10 (1.94) | 253 (49.13) | 252 (48.93) |
| **Belgium[1]** | 139 (12.09) | 715 (62.17) | 296 (25.74) | 137 (11.91) | 989 (86.00) | 24 (2.09) | 1150 (100) | - | - |
| **Czech Republic** | 221 (39.32) | 213 (37.90) | 128 (22.78) | 256 (45.55) | 253 (45.02) | 53 (9.43) | 213 (37.90) | 134 (23.84) | 215 (38.26) |
| **Denmark** | 0 (0) | 294 (67.90) | 139 (32.10) | 0 (0) | 404 (93.30) | 29 (6.70) | 433 (100) | - | - |
| **France** | 0 (0) | 4635 (77.24) | 1366 (22.76) | 0 (0) | 5930 (98.82) | 71 (1.18) | 6001 (100) | - | - |
| **Greece** | 2 (1.98) | 38 (37.62) | 61 (60.40) | 5 (4.95) | 96 (95.05) | 0 (0) | 2 (1.98) | 69 (68.32) | 30 (29.70) |
| **Hungary** | 0 (0) | 375 (63.24) | 218 (36.76) | 0 (0) | 572 (96.46) | 21 (3.54) | 593 (100) | - | - |
| **Ireland** | 4 (0.38) | 604 (57.97) | 434 (41.65) | 4 (0.38) | 1014 (97.31) | 24 (2.31) | 4 (0.38) | 573 (54.99) | 465 (44.63) |
| **Israel** | 13 (2.53) | 284 (55.36) | 216 (42.11) | 14 (2.73) | 496 (96.69) | 3 (0.58) | 14 (2.73) | 322 (62.77) | 177 (34.50) |
| **Italy** | 688 (14.89) | 2419 (52.35) | 1514 (32.76) | 688 (14.89) | 3790 (82.02) | 143 (3.09) | 688 (14.89) | 1878 (40.64) | 2055 (44.47) |
| **Latvia** | 8 (30.77) | 8 (30.77) | 10 (38.46) | 8 (30.77) | 18 (69.23) | 0 (0) | 8 (30.77) | 4 (15.38) | 14 (53.85) |
| **Lithuania** | 0 (0) | 9 (81.82) | 2 (18.18) | 0 (0) | 11 (100) | 0 (0) | 0 (0) | 6 (54.55) | 5 (45.45) |
| **Rep of Macedonia** | 2 (2.30) | 56 (64.37) | 29 (33.33) | 2 (2.30) | 84 (96.55) | 1 (1.15) | 2 (2.30) | 63 (72.41) | 22 (25.29) |
| **Rep of Moldova** | 0 (0) | 29 (51.79) | 27 (48.21) | 55 (98.21) | 1 (1.79) | 0 (0) | 0 (0) | 25 (44.64) | 31 (55.36) |
| **The Netherlands** | 68 (5.52) | 733 (59.55) | 430 (34.93) | 60 (4.87) | 1147 (93.18) | 24 (1.95) | 56 (4.55) | 734 (59.63) | 441 (35.82) |
| **Portugal** | 1 (0.59) | 115 (68.05) | 53 (31.36) | 2 (1.18) | 151 (89.35) | 16 (9.47) | 2 (1.18) | 112 (66.27) | 55 (32.54) |
| **Romania** | 0 (0) | 23 (79.31) | 6 (20.69) | 0 (0) | 29 (100) | 0 (0) | 0 (0) | 26 (89.66) | 3 (10.34) |
| **Russian Federation** | 53 (4.93) | 689 (64.15) | 332 (30.91) | 55 (5.12) | 951 (88.55) | 68 (6.33) | 53 (4.93) | 415 (38.64) | 606 (56.42) |
| **Serbia** | 3 (2.36) | 59 (46.46) | 65 (51.18) | 0 (0) | 105 (82.68) | 22 (17.32) | 0 (0) | 46 (36.22) | 81 (63.78) |
| **Slovak Republic** | 2 (1.13) | 105 (59.32) | 70 (39.55) | 2 (1.13) | 162 (91.53) | 13 (7.34) | 3 (1.69) | 120 (67.80) | 54 (30.51) |
| **Slovenia** | 4 (5.33) | 60 (80.00) | 11 (14.67) | 5 (6.67) | 70 (93.33) | 0 (0) | 6 (8.00) | 28 (37.33) | 41 (54.67) |
| **Spain** | 56 (4.75) | 779 (66.07) | 344 (29.18) | 57 (4.83) | 1086 (92.11) | 36 (3.05) | 60 (5.09) | 683 (57.93) | 436 (36.98) |
| **Sweden** | 0 (0) | 312 (53.61) | 270 (46.39) | 0 (0) | 566 (97.25) | 16 (2.75) | 582 (100) | - | - |
| **Switzerland** | 14 (2.38) | 384 (65.31) | 190 (32.31) | 15 (2.55) | 558 (94.90) | 15 (2.55) | 14 (2.38) | 283 (48.13) | 291 (49.49) |
| **Ukraine** | 2 (1.90) | 40 (38.10) | 63 (60.00) | 2 (1.90) | 102 (97.14) | 1 (0.95) | 2 (1.90) | 17 (16.19) | 86 (81.90) |
| **United Kingdom[2]** | 288 (3.32) | 5330 (61.43) | 3058 (35.25) | 301 (3.47) | 8061 (92.91) | 314 (3.62) | 320 (3.69) | 7044 (81.19) | 1312 (15.12) |

[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 2011, by country.*

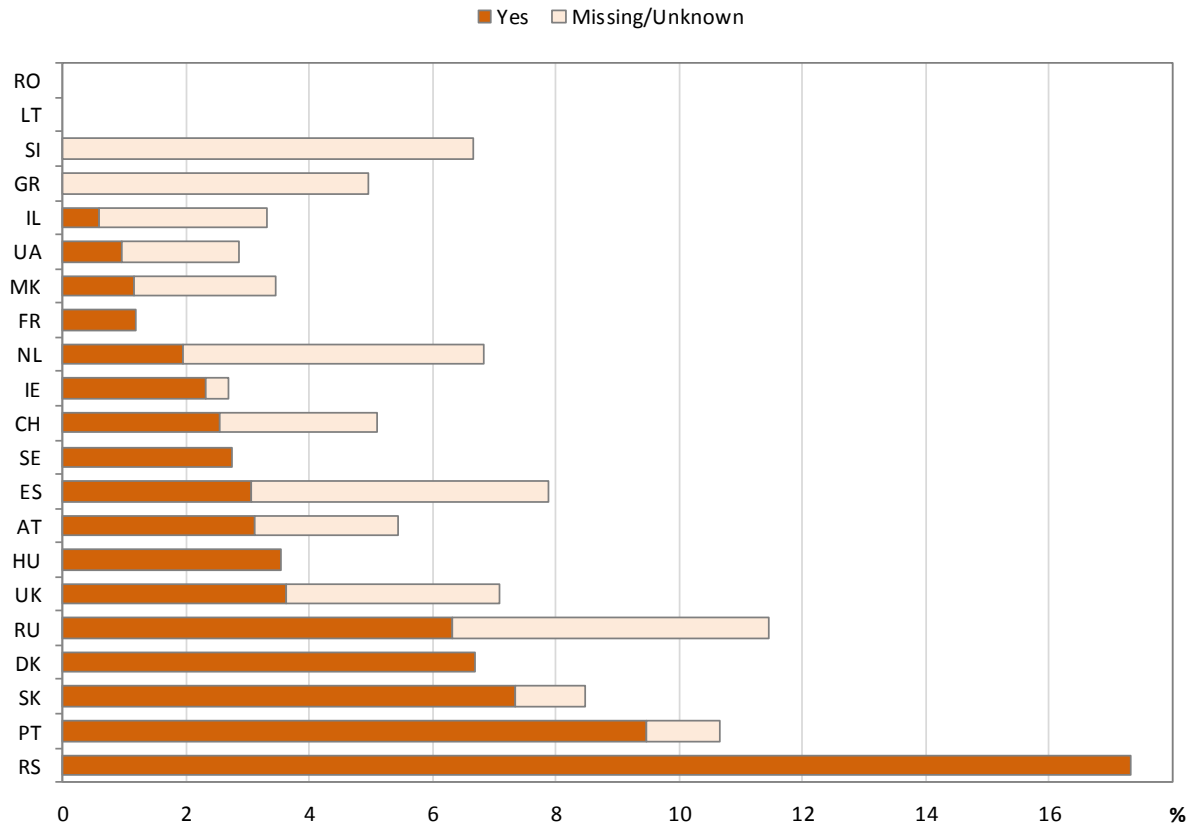



Note: Excluded from the graph are the countries for which the information on *Pseudomonas aeruginosa* was missing for more than 10% of the patients.

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 2011, by country.***

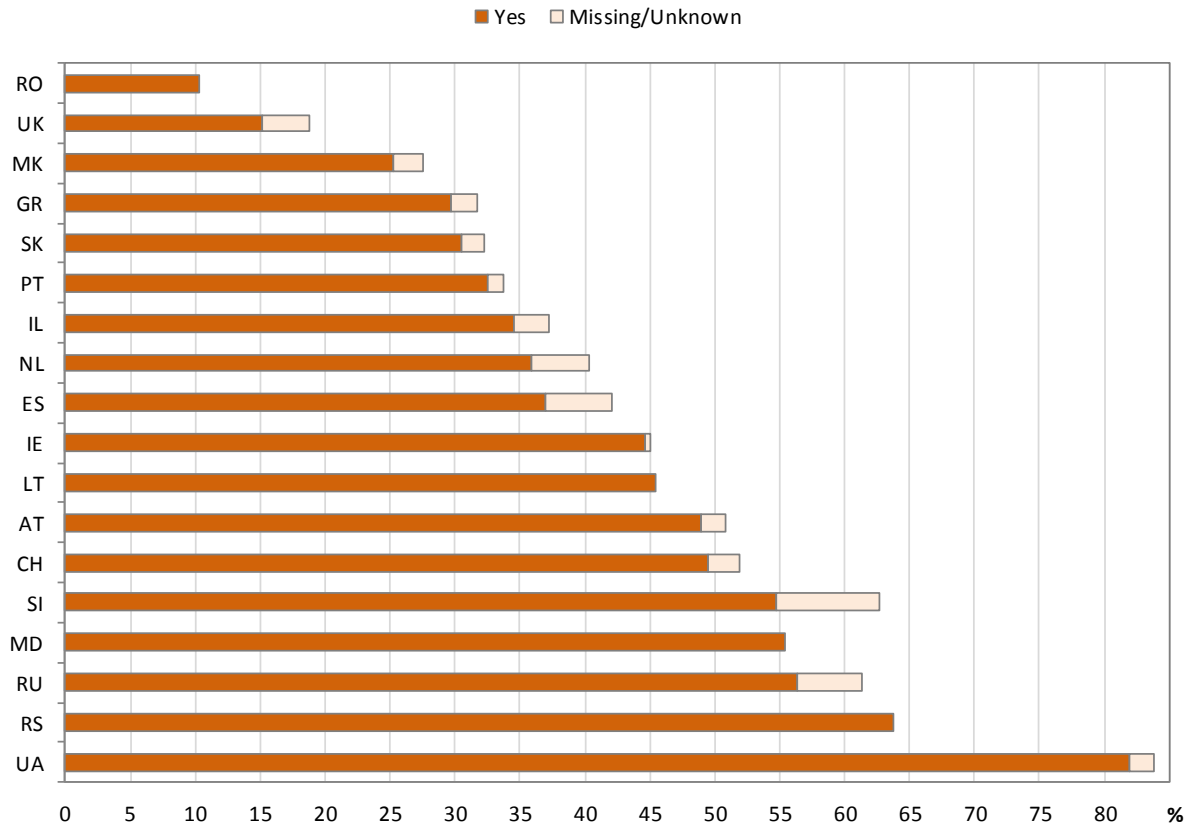



Note: Excluded from the graph are the countries for which the information on *Burkholderia cepacia complex species* was missing for more than 10% of the patients.

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 2011, by country.***




Note: Excluded from the graph are 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 2011, 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** | 10 (2.94) | 289 (85.00) | 41 (12.06) | 7 (2.06) | 329 (96.76) | 4 (1.18) | 5 (1.47) | 163 (47.94) | 172 (50.59) |
| **Belgium**[1] | 8 (1.57) | 452 (88.45) | 51 (9.98) | 8 (1.57) | 495 (96.87) | 8 (1.57) | 511 (100) | - | - |
| **Czech Republic** | 125 (37.76) | 154 (46.53) | 52 (15.71) | 138 (41.69) | 188 (56.80) | 5 (1.51) | 125 (37.76) | 101 (30.51) | 105 (31.72) |
| **Denmark** | 0 (0) | 169 (89.89) | 19 (10.11) | 0 (0) | 187 (99.47) | 1 (0.53) | 188 (100) | - | - |
| **France** | 0 (0) | 2834 (92.16) | 241 (7.84) | 0 (0) | 3053 (99.28) | 22 (0.72) | 3075 (100) | - | - |
| **Greece** | 0 (0) | 33 (48.53) | 35 (51.47) | 2 (2.94) | 66 (97.06) | 0 (0) | 1 (1.47) | 43 (63.24) | 24 (35.29) |
| **Hungary** | 0 (0) | 232 (68.24) | 108 (31.76) | 0 (0) | 333 (97.94) | 7 (2.06) | 340 (100) | - | - |
| **Ireland** | 2 (0.38) | 399 (75.57) | 127 (24.05) | 2 (0.38) | 519 (98.30) | 7 (1.33) | 2 (0.38) | 210 (39.77) | 316 (59.85) |
| **Israel** | 3 (1.27) | 185 (78.39) | 48 (20.34) | 4 (1.69) | 231 (97.88) | 1 (0.42) | 3 (1.27) | 131 (55.51) | 102 (43.22) |
| **Italy** | 420 (19.01) | 1401 (63.42) | 388 (17.56) | 420 (19.01) | 1775 (80.35) | 14 (0.63) | 420 (19.01) | 730 (33.05) | 1059 (47.94) |
| **Latvia** | 6 (33.33) | 6 (33.33) | 6 (33.33) | 6 (33.33) | 12 (66.67) | 0 (0 | 6 (33.33) | 3 (16.67) | 9 (50.00) |
| **Rep of Macedonia** | 1 (1.47) | 51 (75.00) | 16 (23.53) | 1 (1.47) | 66 (97.06) | 1 (1.47) ) | 1 (1.47) | 49 (72.06) | 18 (26.47) |
| **Rep of Moldova** | 0 (0) | 25 (55.56) | 20 (44.44) | 45 (100) | - | - | 0 (0) | 20 (44.44) | 25 (55.56) |
| **The Netherlands** | 3 (0.53) | 454 (80.35) | 108 (19.12) | 8 (1.42) | 551 (97.52) | 6 (1.06) | 3 (0.53) | 336 (59.47) | 226 (40.00) |
| **Portugal** | 1 (1.00) | 81 (81.00) | 18 (18.00) | 1 (1.00) | 89 (89.00) | 10 (10.00) | 1 (1.00) | 71 (71.00) | 28 (28.00) |
| **Romania** | 0 (0) | 23 (79.31) | 6 (20.69) | 0 (0) | 29 (100) | 0 (0) | 0 (0) | 26 (89.66) | 3 (10.34) |
| **Russian Federation** | 27 (3.36) | 563 (70.02) | 214 (26.62) | 28 (3.48) | 749 (93.16) | 27 (3.36) | 26 (3.23) | 301 (37.44) | 477 (59.33) |
| **Serbia** | 2 (2.20) | 51 (56.04) | 38 (41.76) | 0 (0) | 76 (83.52) | 15 (16.48) | 0 (0) | 33 (36.26) | 58 (63.74) |
| **Slovak Republic** | 0 (0) | 57 (80.28) | 14 (19.72) | 0 (0) | 71 (100) | 0 (0) | 0 (0) | 53 (74.65) | 18 (25.35) |
| **Slovenia** | 0 (0) | 50 (90.91) | 5 (9.09) | 1 (1.82) | 54 (98.18) | 0 (0) | 2 (3.64) | 23 (41.82) | 30 (54.55) |
| **Spain** | 15 (2.33) | 547 (85.07) | 81 (12.60) | 15 (2.33) | 619 (96.27) | 9 (1.40) | 16 (2.49) | 392 (60.96) | 235 (36.55) |

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

***[Table 5.2 continue].***

| 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 |
| **Sweden** | 0 (0) | 188 (78.01) | 53 (21.99) | 0 (0) | 239 (99.17) | 2 (0.83) | 241 (100) | - | - |
| **Switzerland** | 3 (0.84) | 298 (83.71) | 55 (15.45) | 3 (0.84) | 351 (98.60) | 2 (0.56) | 4 (1.12) | 165 (46.35) | 187 (52.53) |
| **Ukraine** | 2 (2.13) | 39 (41.49) | 53 (56.38) | 1 (1.06) | 92 (97.87) | 1 (1.06) | 2 (2.13) | 17 (18.09) | 75 (79.79) |
| **United Kingdom**[2] | 151 (3.65) | 3472 (83.86) | 517 (12.49) | 76 (1.84) | 3996 (96.52) | 68 (1.64) | 161 (3.89) | 3651 (88.19) | 328 (7.92) |

[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.

This table 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 2011, 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 (2.29) | 86 (49.14) | 85 (48.57) | 5 (2.86) | 158 (90.29) | 12 (6.86) | 5 (2.86) | 90 (51.43) | 80 (45.71) |
| **Belgium**[1] | 131 (20.50) | 263 (41.16) | 245 (38.34) | 129 (20.19) | 494 (77.31) | 16 (2.50) | 639 (100) | - | - |
| **Czech Republic** | 96 (41.56) | 59 (25.54) | 76 (32.90) | 118 (51.08) | 65 (28.14) | 48 (20.78) | 88 (38.10) | 33 (14.29) | 110 (47.62) |
| **Denmark** | 0 (0) | 125 (51.02) | 120 (48.98) | 0 (0) | 217 (88.57) | 28 (11.43) | 245 (100) | - | - |
| **France** | 0 (0) | 1801 (61.55) | 1125 (38.45) | 0 (0) | 2877 (98.33) | 49 (1.67) | 2926 (100) | - | - |
| **Greece** | 2 (6.06) | 5 (15.15) | 26 (78.79) | 3 (9.09) | 30 (90.91) | 0 (0) | 1 (3.03) | 26 (78.79) | 6 (18.18) |
| **Hungary** | 0 (0) | 142 (56.57) | 109 (43.43) | 0 (0) | 237 (94.42) | 14 (5.58) | 251 (100) | - | - |
| **Ireland** | 2 (0.39) | 205 (39.88) | 307 (59.73) | 2 (0.39) | 495 (96.30) | 17 (3.31) | 2 (0.39) | 363 (70.62) | 149 (28.99) |
| **Israel** | 10 (3.61) | 99 (35.74) | 168 (60.65) | 10 (3.61) | 265 (95.67) | 2 (0.72) | 11 (3.97) | 191 (68.95) | 75 (27.08) |
| **Italy** | 268 (11.12) | 1018 (42.22) | 1125 (46.66) | 268 (11.12) | 2014 (83.53) | 129 (5.35) | 268 (11.12) | 1147 (47.57) | 996 (41.31) |
| **Latvia** | 2 (25.00) | 2 (25.00) | 4 (50.00) | 2 (25.00) | 6 (75.00) | 0 (0) | 2 (25.00) | 1 (12.50) | 5 (62.50) |
| **Lithuania** | 0 (0) | 9 (81.82) | 2 (18.18) | 0 (0) | 11 (100) | 0 (0) | 0 (0) | 6 (54.55) | 5 (45.45) |
| **Rep of Macedonia** | 1 (5.26) | 5 (26.32) | 13 (68.42) | 1 (5.26) | 18 (94.74) | 0 (0) | 1 (5.26) | 14 (73.68) | 4 (21.05) |
| **Rep of Moldova** | 0 (0) | 4 (36.36) | 7 (63.64) | 10 (90.91) | 1 (9.09) | 0 (0) | 0 (0) | 5 (45.45) | 6 (54.55) |
| **The Netherlands** | 65 (9.76) | 279 (41.89) | 322 (48.35) | 52 (7.81) | 596 (89.49) | 18 (2.70) | 53 (7.96) | 398 (59.76) | 215 (32.28) |
| **Portugal** | 0 (0) | 34 (49.28) | 35 (50.72) | 1 (1.45) | 62 (89.86) | 6 (8.70) | 1 (1.45) | 41 (59.42) | 27 (39.13) |
| **Russian Federation** | 26 (9.63) | 126 (46.67) | 118 (43.70) | 27 (10.00) | 202 (74.81) | 41 (15.19) | 27 (10.00) | 114 (42.22) | 129 (47.78) |
| **Serbia** | 1 (2.78) | 8 (22.22) | 27 (75.00) | 0 (0) | 29 (80.56) | 7 (19.44) | 0 (0) | 13 (36.11) | 23 (63.89) |
| **Slovak Republic** | 2 (1.89) | 48 (45.28) | 56 (52.83) | 2 (1.89) | 91 (85.85) | 13 (12.26) | 3 (2.83) | 67 (63.21) | 36 (33.96) |
| **Slovenia** | 4 (20.00) | 10 (50.00) | 6 (30.00) | 4 (20.00) | 16 (80.00) | 0 (0) | 4 (20.00) | 5 (25.00) | 11 (55.00) |
| **Spain** | 41 (7.66) | 232 (43.36) | 262 (48.97) | 42 (7.85) | 466 (87.10) | 27 (5.05) | 44 (8.22) | 291 (54.39) | 200 (37.38) |
| **Sweden** | 0 (0) | 124 (36.36) | 217 (63.64) | 0 (0) | 327 (95.89) | 14 (4.11) | 341 (100) | - | - |
| **Switzerland** | 11 (4.74) | 86 (37.07) | 135 (58.19) | 12 (5.17) | 207 (89.22) | 13 (5.60) | 10 (4.31) | 118 (50.86) | 104 (44.83) |
| **Ukraine** | 0 (0) | 1 (9.09) | 10 (90.91) | 1 (9.09) | 10 (90.91) | 0 (0) | 0 (0) | 0 (0) | 11 (100) |
| **United Kingdom**[2] | 137 (3.02) | 1858 (40.96) | 2541 (56.02) | 225 (4.96) | 4065 (89.62) | 246 (5.42) | 159 (3.51) | 3393 (74.80) | 984 (21.69) |

[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: for Romania coverage is 0% for adults.

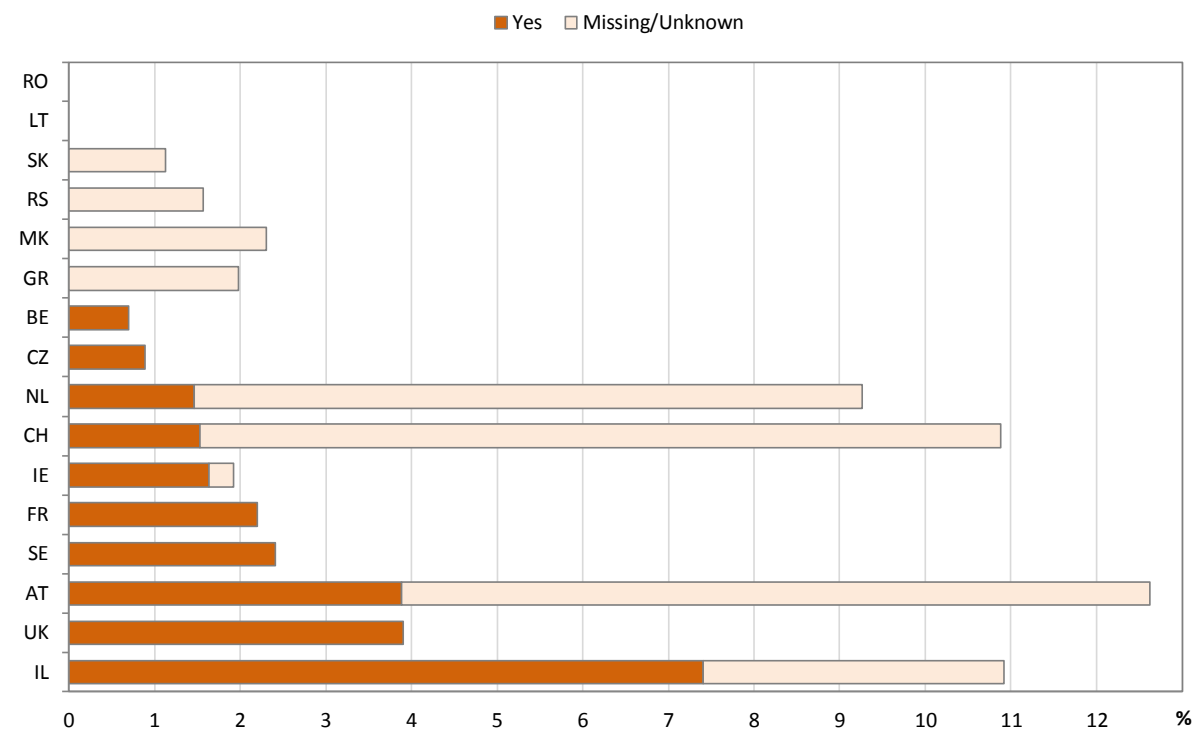
Table 5.3 shows, separately by country, the frequency of chronic *Pseudomonas aeruginosa*, chronic *Burkholderia cepacia complex species* and chronic *Staphylococcus aureus* in adults. The number of missing values is also included. The identification rate of *Burkholderia cepacia complex species* in 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 2011, 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** | 45 (8.74) | 450 (87.38) | 20 (3.88) | 16 (3.11) | 447 (86.80) | 52 (10.10) |
| **Belgium** | 0 (0) | 1142 (99.30) | 8 (0.70) | 0 (0) | 1055 (91.74) | 95 (8.26) |
| **Czech Republic** | 0 (0) | 557 (99.11) | 5 (0.89) | 274 (48.75) | 246 (43.77) | 42 (7.47) |
| **Denmark** | 433 (100) | - | - | 433 (100) | - | - |
| **France** | 0 (0) | 5869 (97.80) | 132 (2.20) | 0 (0) | 5418 (90.28) | 583 (9.72) |
| **Greece** | 2 (1.98) | 99 (98.02) | 0 (0) | 1 (0.99) | 96 (95.05) | 4 (3.96) |
| **Hungary** | 593 (100) | - | - | 593 (100) | - | - |
| **Ireland** | 3 (0.29) | 1022 (98.08) | 17 (1.63) | 3 (0.29) | 947 (90.88) | 92 (8.83) |
| **Israel** | 18 (3.51) | 457 (89.08) | 38 (7.41) | 19 (3.70) | 476 (92.79) | 18 (3.51) |
| **Italy** | 688 (14.89) | 3906 (84.53) | 27 (0.58) | 688 (14.89) | 3761 (81.39) | 172 (3.72) |
| **Latvia** | 8 (30.77) | 18 (69.23) | 0 (0) | 8 (30.77) | 16 (61.54) | 2 (7.69) |
| **Lithuania** | 0 (0) | 11 (100) | 0 (0) | 0 (0) | 9 (81.82) | 2 (18.18) |
| **Rep of Macedonia** | 2 (2.30) | 85 (97.70) | 0 (0) | 2 (2.30) | 85 (97.70) | 0 (0) |
| **Rep of Moldova** | 56 (100) | - | - | 55 (98.21) | 1 (1.79) | 0 (0) |
| **The Netherlands** | 96 (7.80) | 1117 (90.74) | 18 (1.46) | 56 (4.55) | 1076 (87.41) | 99 (8.04) |
| **Portugal** | 19 (11.24) | 150 (88.76) | 0 (0) | 1 (0.59) | 156 (92.31) | 12 (7.10) |
| **Romania** | 0 (0) | 29 (100) | 0 (0) | 27 (93.10) | 1 (3.45) | 1 (3.45) |
| **Russian Federation** | 614 (57.17) | 453 (42.18) | 7 (0.65) | 77 (7.17) | 958 (89.20) | 39 (3.63) |
| **Serbia** | 2 (1.57) | 125 (98.43) | 0 (0) | 0 (0) | 116 (91.34) | 11 (8.66) |
| **Slovak Republic** | 2 (1.13) | 175 (98.87) | 0 (0) | 3 (1.69) | 163 (92.09) | 11 (6.21) |
| **Slovenia** | 10 (13.33) | 65 (86.67) | 0 (0) | 16 (21.33) | 49 (65.33) | 10 (13.33) |
| **Spain** | 272 (23.07) | 878 (74.47) | 29 (2.46) | 55 (4.66) | 1071 (90.84) | 53 (4.50) |
| **Sweden** | 0 (0) | 568 (97.59) | 14 (2.41) | 0 (0) | 541 (92.96) | 41 (7.04) |
| **Switzerland** | 55 (9.35) | 524 (89.12) | 9 (1.53) | 36 (6.12) | 470 (79.93) | 82 (13.95) |
| **Ukraine** | 105 (100) | - | - | 2 (1.90) | 102 (97.14) | 1 (0.95) |
| **United Kingdom** | 0 (0) | 8338 (96.10) | 338 (3.90) | 301 (3.47) | 8084 (93.18) | 291 (3.35) |

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.

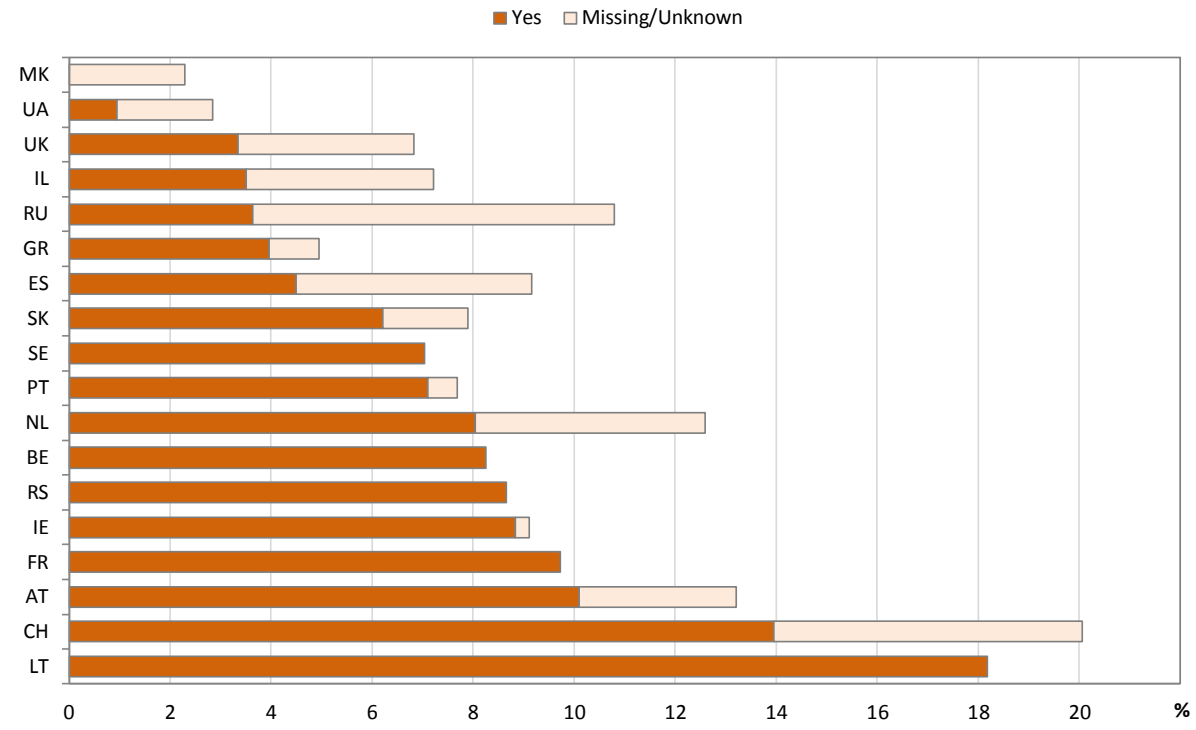
***Figure 5.4 Prevalence of non-tuberculous mycobacteria in all patients seen in 2011, by country.***




Note: Excluded from the graph are 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 2011, by country.***




Note: Excluded from the graph are 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 2011, 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** | 33 (9.71) | 296 (87.06) | 11 (3.24) | 10 (2.94) | 299 (87.94) | 31 (9.12) |
| **Belgium** | 0 (0) | 510 (99.80) | 1 (0.20) | 0 (0) | 476 (93.15) | 35 (6.85) |
| **Czech Republic** | 0 (0) | 331 (100) | 0 (0) | 139 (41.99) | 157 (47.43) | 35 (10.57) |
| **Denmark** | 188 (100) | - | - | 188 (100) | - | - |
| **France** | 0 (0) | 3036 (98.73) | 39 (1.27) | 0 (0) | 2748 (89.37) | 327 (10.63) |
| **Greece** | 1 (1.47) | 67 (98.53) | 0 (0) | 0 (0) | 65 (95.59) | 3 (4.41) |
| **Hungary** | 340 (100) | - | - | 340 (100) | - | - |
| **Ireland** | 1 (0.19) | 520 (98.48) | 7 (1.33) | 1 (0.19) | 466 (88.26) | 61 (11.55) |
| **Israel** | 5 (2.12) | 219 (92.80) | 12 (5.08) | 7 (2.97) | 221 (93.64) | 8 (3.39) |
| **Italy** | 420 (19.01) | 1779 (80.53) | 10 (0.45) | 420 (19.01) | 1694 (76.69) | 95 (4.30) |
| **Latvia** | 6 (33.33) | 12 (66.67) | 0 (0) | 6 (33.33) | 10 (55.56) | 2 (11.11) |
| **Rep of Macedonia** | 1 (1.47) | 67 (98.53) | 0 (0) | 1 (1.47) | 67 (98.53) | 0 (0) |
| **Rep of Moldova** | 45 (100) | - | - | 45 (100) | - | - |
| **The Netherlands** | 16 (2.83) | 546 (96.64) | 3 (0.53) | 3 (0.53) | 510 (90.27) | 52 (9.20) |
| **Portugal** | 11 (11.00) | 89 (89.00) | 0 (0) | 1 (1.00) | 93 (93.00) | 6 (6.00) |
| **Romania** | 0 (0) | 29 (100) | 0 (0) | 27 (93.10) | 1 (3.45) | 1 (3.45) |
| **Russian Federation** | 428 (53.23) | 373 (46.39) | 3 (0.37) | 37 (4.60) | 739 (91.92) | 28 (3.48) |
| **Serbia** | 2 (2.20) | 89 (97.80) | 0 (0) | 0 (0) | 81 (89.01) | 10 (10.99) |
| **Slovak Republic** | 0 (0) | 71 (100) | 0 (0 | 1 (1.41) | 64 (90.14) | 6 (8.45) |
| **Slovenia** | 0 (0) | 55 (100) | 0 (0) ) | 1 (1.82) | 46 (83.64) | 8 (14.55) |
| **Spain** | 160 (24.88) | 477 (74.18) | 6 (0.93) | 14 (2.18) | 606 (94.25) | 23 (3.58) |
| **Sweden** | 0 (0) | 236 (97.93) | 5 (2.07) | 0 (0) | 231 (95.85) | 10 (4.15) |
| **Switzerland** | 34 (9.55) | 319 (89.61) | 3 (0.84) | 24 (6.74) | 279 (78.37) | 53 (14.89) |
| **Ukraine** | 94 (100) | - | - | 1 (1.06) | 92 (97.87) | 1 (1.06) |
| **United Kingdom** | 0 (0) | 4033 (97.42) | 107 (2.58) | 76 (1.84) | 3938 (95.12) | 126 (3.04) |

Note: for Lithuania coverage is 0% for children.

## *Table 5.6 Prevalence of non-tuberculous mycobacteria and Stenotrophomonas maltophilia infection in adults seen in 2011, 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** | 12 (6.86) | 154 (88.00) | 9 (5.14) | 6 (3.43) | 148 (84.57) | 21 (12.00) |
| **Belgium** | 0 (0) | 632 (98.90) | 7 (1.10) | 0 (0) | 579 (90.61) | 60 (9.39) |
| **Czech Republic** | 0 (0) | 226 (97.84) | 5 (2.16) | 135 (58.44) | 89 (38.53) | 7 (3.03) |
| **Denmark** | 245 (100) | - | - | 245 (100) | - | - |
| **France** | 0 (0) | 2833 (96.82) | 93 (3.18) | 0 (0) | 2670 (91.25) | 256 (8.75) |
| **Greece** | 1 (3.03) | 32 (96.97) | 0 (0) | 1 (3.03) | 31 (93.94) | 1 (3.03) |
| **Hungary** | 251 (100) | - | - | 251 (100) | - | - |
| **Ireland** | 2 (0.39) | 502 (97.67) | 10 (1.95) | 2 (0.39) | 481 (93.58) | 31 (6.03) |
| **Israel** | 13 (4.69) | 238 (85.92) | 26 (9.39) | 12 (4.33) | 255 (92.06) | 10 (3.61) |
| **Italy** | 268 (11.12) | 2126 (88.18) | 17 (0.71) | 268 (11.12) | 2066 (85.69) | 77 (3.19) |
| **Latvia** | 2 (25.00) | 6 (75.00) | 0 (0) | 2 (25.00) | 6 (75.00) | 0 (0) |
| **Lithuania** | 0 (0) | 11 (100) | 0 (0) | 0 (0) | 9 (81.82) | 2 (18.18) |
| **Rep of Macedonia** | 1 (5.26) | 18 (94.74) | 0 (0) | 1 (5.26) | 18 (94.74) | 0 (0) |
| **Rep of Moldova** | 11 (100) | - | - | 10 (90.91) | 1 (9.09) | 0 (0) |
| **The Netherlands** | 80 (12.01) | 571 (85.74) | 15 (2.25) | 53 (7.96) | 566 (84.98) | 47 (7.06) |
| **Portugal** | 8 (11.59) | 61 (88.41) | 0 (0) | 0 (0) | 63 (91.30) | 6 (8.70) |
| **Russian Federation** | 186 (68.89) | 80 (29.63) | 4 (1.48) | 40 (14.81) | 219 (81.11) | 11 (4.07) |
| **Serbia** | 0 (0) | 36 (100) | 0 (0) | 0 (0) | 35 (97.22) | 1 (2.78) |
| **Slovak Republic** | 2 (1.89) | 104 (98.11) | 0 (0) | 2 (1.88) | 99 (93.40) | 5 (4.72) |
| **Slovenia** | 10 (50.00) | 10 (50.00) | 0 (0) | 15 (75.00) | 3 (15.00) | 2 (10.00) |
| **Spain** | 112 (20.93) | 400 (74.77) | 23 (4.30) | 41 (7.66) | 465 (86.92) | 29 (5.42) |
| **Sweden** | 0 (0) | 332 (97.36) | 9 (2.64) | 0 (0) | 310 (90.91) | 31 (9.09) |
| **Switzerland** | 21 (9.05) | 205 (88.36) | 6 (2.59) | 12 (5.17) | 191 (82.33) | 29 (12.50) |
| **Ukraine** | 11 (100) | - | - | 1 (9.09) | 10 (90.91) | 0 (0) |
| **United Kingdom** | 0 (0) | 4305 (94.91) | 231 (5.09) | 225 (4.96) | 4146 (91.4) | 165 (3.64) |

Note: for Romania coverage is 0% 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.

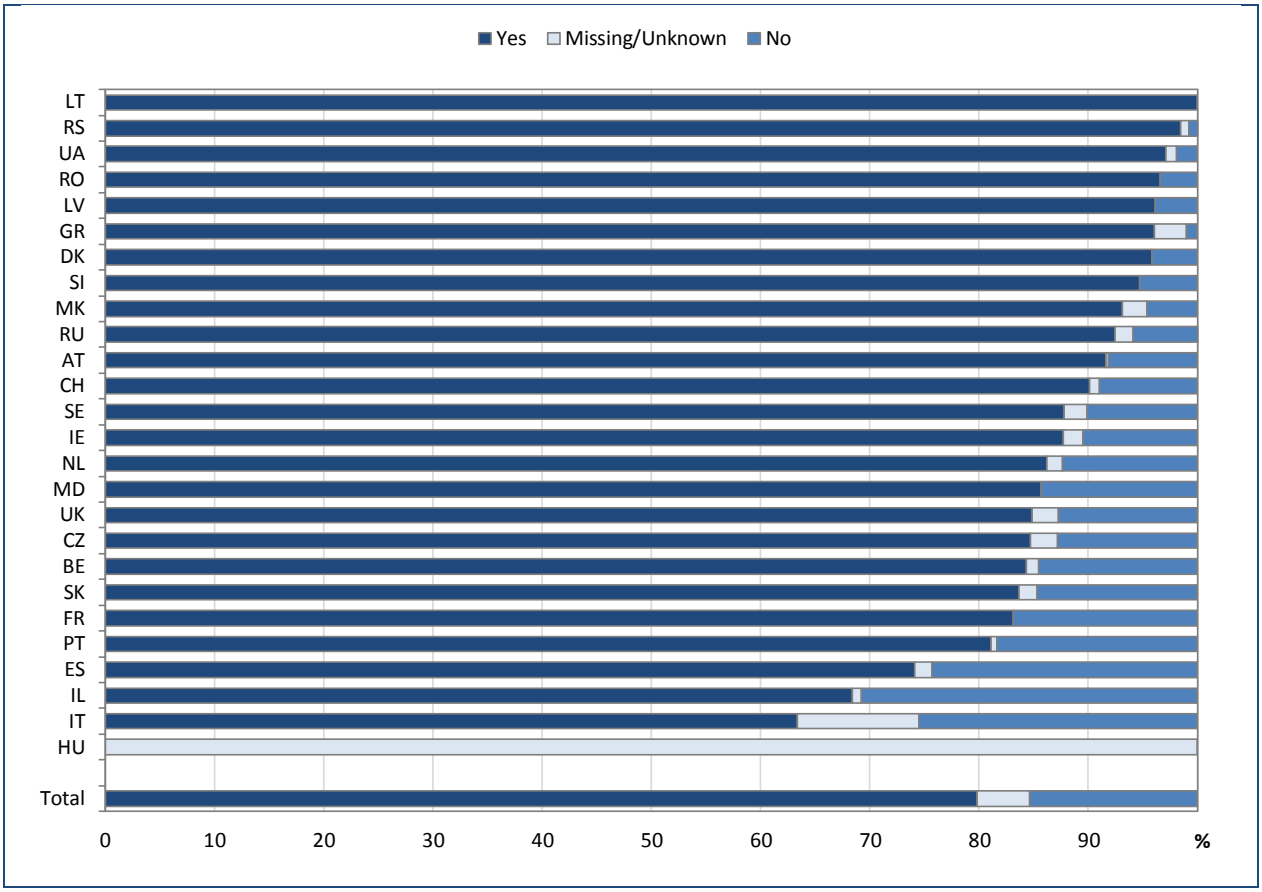
We collected weight and height measured on the date the best FEV1 value was recorded and, for patients that did not perform spirometry, the last measurements of the year were considered; from these raw values we calculated body mass index (BMI). A patient with a low weight is not necessarily underweight 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 13 (2014), S23–S42.

***Figure 6.1 Use of pancreatic enzymes in 2011 for all patients, by country and overall.***




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 2011.***

| Country | Number of patients | Height | | Weight | |
|---|---|---|---|---|---|
| | | N | N miss | N | N miss |
| **Austria** | 515 | 497 | 18 | 498 | 17 |
| **Belgium**[1] | 1150 | 1007 | 143 | 1007 | 143 |
| **Czech Republic** | 562 | 484 | 78 | 484 | 78 |
| **Denmark** | 433 | 425 | 8 | 425 | 8 |
| **France** | 6001 | 5772 | 229 | 5781 | 220 |
| **Greece** | 101 | 80 | 21 | 80 | 21 |
| **Hungary** | 593 | 440 | 153 | 425 | 168 |
| **Ireland** | 1042 | 875 | 167 | 886 | 156 |
| **Israel** | 513 | 466 | 47 | 466 | 47 |
| **Italy** | 4621 | 3373 | 1248 | 3384 | 1237 |
| **Latvia** | 26 | 13 | 13 | 13 | 13 |
| **Lithuania** | 11 | 11 | 0 | 11 | 0 |
| **Rep of Macedonia** | 87 | 83 | 4 | 83 | 4 |
| **Rep of Moldova** | 56 | 56 | 0 | 56 | 0 |
| **The Netherlands** | 1231 | 1199 | 32 | 1200 | 31 |
| **Portugal** | 169 | 142 | 27 | 142 | 27 |
| **Romania** | 29 | 21 | 8 | 21 | 8 |
| **Russian Federation** | 1074 | 951 | 123 | 957 | 117 |
| **Serbia** | 127 | 122 | 5 | 123 | 4 |
| **Slovak Republic** | 177 | 148 | 29 | 148 | 29 |
| **Slovenia** | 75 | 73 | 2 | 73 | 2 |
| **Spain** | 1179 | 1053 | 126 | 1057 | 122 |
| **Sweden** | 582 | 575 | 7 | 574 | 8 |
| **Switzerland** | 588 | 571 | 17 | 571 | 17 |
| **Ukraine** | 105 | 81 | 24 | 81 | 24 |
| **United Kingdom** | 8676 | 8563 | 113 | 8558 | 118 |

[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** | 334 | -0.2 | -4.6 | -0.8 | -0.1 | 0.5 | 2.7 |
| **Belgium** | 524 | -0.3 | -4.3 | -1.1 | -0.3 | 0.5 | 3.6 |
| **Czech Republic** | 316 | 0.0 | -9.6 | -0.8 | 0.0 | 0.8 | 4.2 |
| **Denmark** | 189 | 0.0 | -3.1 | -0.5 | 0.0 | 0.6 | 2.6 |
| **France** | 3013 | -0.5 | -5.6 | -1.2 | -0.4 | 0.2 | 5.5 |
| **Greece** | 50 | -0.4 | -3.5 | -1.2 | -0.5 | 0.6 | 1.7 |
| **Hungary** | 270 | -0.1 | -7.7 | -0.9 | 0.0 | 0.8 | 5.1 |
| **Ireland** | 494 | -0.8 | -6.6 | -1.5 | -0.7 | -0.1 | 2.8 |
| **Israel** | 211 | -0.6 | -3.2 | -1.3 | -0.7 | 0.0 | 4.8 |
| **Italy** | 1431 | -0.4 | -4.8 | -1.0 | -0.4 | 0.3 | 3.0 |
| **Latvia** | <10 | -0.4 | -2.3 | -1.0 | 0.2 | 0.4 | 1.1 |
| **Rep of Macedonia** | 67 | -0.7 | -4.6 | -1.6 | -0.8 | -0.2 | 2.3 |
| **Rep of Moldova** | 45 | -0.9 | -9.3 | -2.0 | -1.3 | 0.4 | 4.2 |
| **The Netherlands** | 580 | 0.2 | -2.9 | -0.5 | 0.2 | 0.8 | 3.3 |
| **Portugal** | 85 | -0.7 | -3.9 | -1.4 | -0.8 | 0.0 | 1.6 |
| **Romania** | 21 | -0.5 | -2.2 | -1.5 | -0.4 | 0.6 | 1.7 |
| **Russian Federation** | 759 | -0.2 | -6.7 | -1.2 | -0.2 | 0.7 | 9.0 |
| **Serbia** | 88 | -0.4 | -3.8 | -1.1 | -0.3 | 0.3 | 2.9 |
| **Slovak Republic** | 51 | 0.3 | -1.7 | -0.5 | 0.3 | 0.8 | 3.0 |
| **Slovenia** | 57 | -0.4 | -3.1 | -1.4 | -0.6 | 0.6 | 2.5 |
| **Spain** | 582 | -0.4 | -4.2 | -1.1 | -0.4 | 0.3 | 5.2 |
| **Sweden** | 247 | -0.1 | -4.3 | -0.7 | -0.1 | 0.4 | 2.9 |
| **Switzerland** | 355 | -0.3 | -3.3 | -1.0 | -0.3 | 0.4 | 2.2 |
| **Ukraine** | 70 | -0.8 | -5.6 | -1.5 | -0.7 | -0.1 | 2.9 |
| **United Kingdom** | 4153 | -0.3 | -4.3 | -1.0 | -0.4 | 0.4 | 8.4 |

Note: for Lithuania coverage is 0% 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).

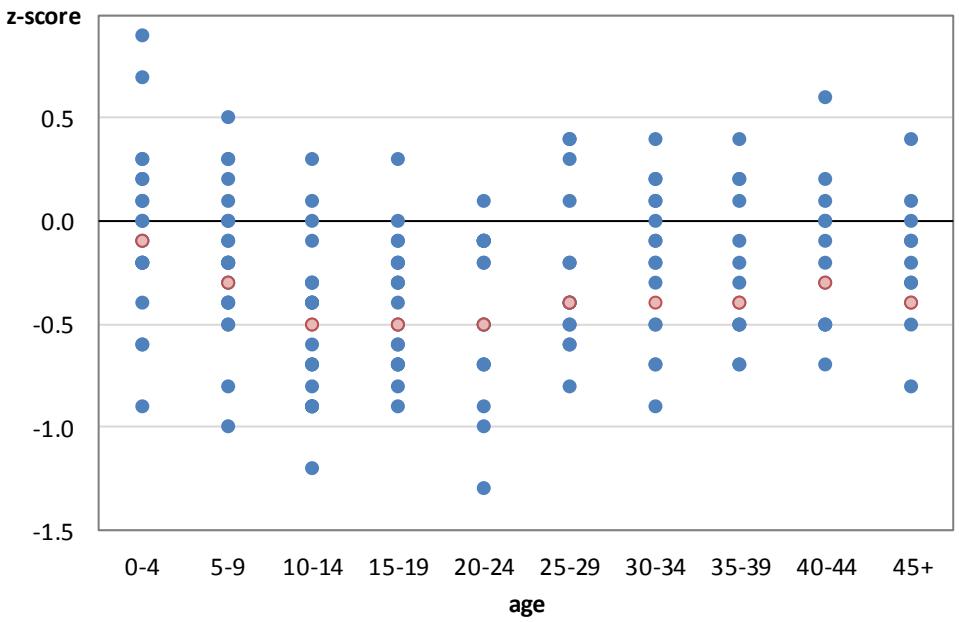
***Table 6.3 Z-scores for height: descriptive statistics by country. Patients aged 18 years or older.***

| 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** | 163 | -0.2 | -2.7 | -0.8 | -0.2 | 0.3 | 2.6 |
| **Belgium** | 483 | -0.3 | -3.9 | -1.1 | -0.2 | 0.4 | 2.6 |
| **Czech Republic** | 168 | -0.1 | -2.5 | -0.7 | -0.1 | 0.4 | 3.1 |
| **Denmark** | 236 | 0.1 | -2.7 | -0.7 | 0.0 | 0.7 | 3.2 |
| **France** | 2759 | -0.6 | -5.1 | -1.2 | -0.5 | 0.1 | 3.6 |
| **Greece** | 30 | -0.4 | -2.1 | -1.4 | -0.3 | 0.2 | 2.0 |
| **Hungary** | 170 | -0.3 | -3.3 | -1.0 | -0.3 | 0.3 | 2.6 |
| **Ireland** | 381 | -0.4 | -5.1 | -1.0 | -0.4 | 0.3 | 4.6 |
| **Israel** | 255 | -0.7 | -4.7 | -1.4 | -0.7 | -0.1 | 2.3 |
| **Italy** | 1942 | -0.6 | -4.5 | -1.3 | -0.7 | 0.1 | 2.6 |
| **Latvia** | <10 | -0.1 | -0.8 | -0.7 | -0.3 | 0.5 | 0.9 |
| **Lithuania** | 11 | 0.8 | -0.5 | -0.1 | 0.9 | 1.5 | 2.1 |
| **Rep of Macedonia** | 16 | -0.8 | -2.7 | -1.5 | -1.0 | -0.4 | 2.6 |
| **Rep of Moldova** | 11 | -0.4 | -3.2 | -1.3 | -0.5 | 1.0 | 2.0 |
| **The Netherlands** | 619 | 0.2 | -4.0 | -0.4 | 0.3 | 0.9 | 3.8 |
| **Portugal** | 57 | -0.8 | -3.2 | -1.4 | -0.9 | -0.2 | 1.3 |
| **Russian Federation** | 192 | -0.2 | -4.4 | -1.0 | -0.3 | 0.6 | 3.1 |
| **Serbia** | 34 | 0.1 | -2.1 | -0.5 | 0.0 | 0.7 | 2.1 |
| **Slovak Republic** | 97 | 0.0 | -4.1 | -0.5 | 0.0 | 0.7 | 2.4 |
| **Slovenia** | 16 | -0.1 | -2.8 | -0.5 | 0.2 | 0.6 | 1.3 |
| **Spain** | 471 | -0.7 | -3.8 | -1.4 | -0.6 | -0.1 | 2.3 |
| **Sweden** | 328 | 0.1 | -2.9 | -0.5 | 0.2 | 0.7 | 3.3 |
| **Switzerland** | 216 | -0.3 | -3.7 | -1.0 | -0.3 | 0.3 | 2.4 |
| **Ukraine** | 11 | -0.4 | -1.7 | -1.2 | -0.4 | 0.3 | 0.7 |
| **United Kingdom** | 4410 | -0.4 | -4.8 | -1.1 | -0.4 | 0.3 | 4.8 |

Note: for Romania coverage is 0% 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 2011.***




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

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

***Table 6.4 Z-scores for height: descriptive statistics by age group. All patients seen in 2011.***

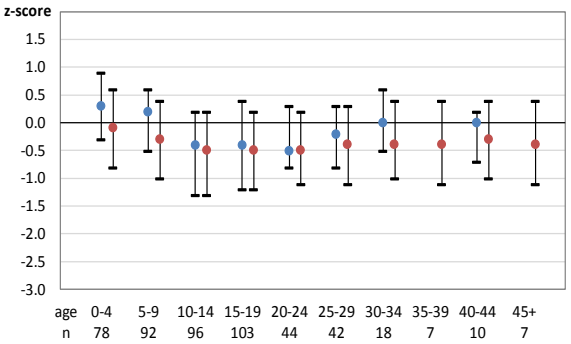
| Age at height measurement | N | Mean | Min | 25th pctl | Median | 75th pctl | Max |
|---|---|---|---|---|---|---|---|
| **0-4** | 3400 | -0.1 | -9.6 | -0.8 | -0.1 | 0.6 | 9.0 |
| **5-9** | 4036 | -0.3 | -9.3 | -1.0 | -0.3 | 0.4 | 5.5 |
| **10-14** | 4112 | -0.5 | -5.6 | -1.3 | -0.5 | 0.2 | 3.2 |
| **15-19** | 4032 | -0.5 | -7.7 | -1.2 | -0.5 | 0.2 | 3.8 |
| **20-24** | 3578 | -0.5 | -4.2 | -1.1 | -0.5 | 0.2 | 3.1 |
| **25-29** | 2697 | -0.4 | -4.8 | -1.1 | -0.4 | 0.3 | 4.8 |
| **30-34** | 1913 | -0.3 | -5.1 | -1.0 | -0.4 | 0.4 | 4.6 |
| **35-39** | 1314 | -0.3 | -3.3 | -1.1 | -0.4 | 0.4 | 3.3 |
| **40-44** | 928 | -0.3 | -5.1 | -1.0 | -0.3 | 0.4 | 2.9 |
| **45+** | 1071 | -0.3 | -4.4 | -1.1 | -0.4 | 0.4 | 3.3 |

This table reports the median z-score for height and other descriptive statistics by age group for all the patients seen in 2011. The median values reported in this table are shown as red dots in fig 6.2.

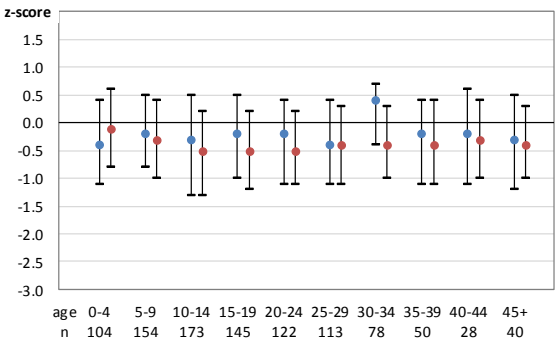
## *Figure 6.3 Quartiles of z-scores for height by age group and by country. All patients seen in 2011.*

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, Lithuania and Romania from the graphs, because in none of the age groups in these countries there were more than 10 patients.

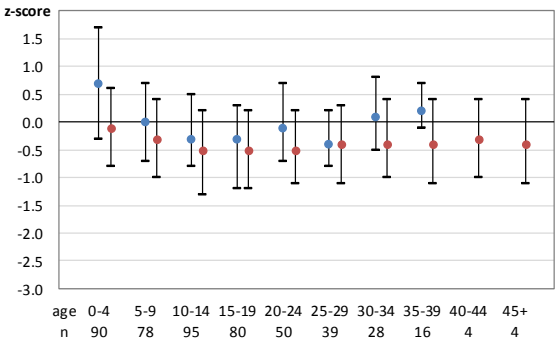
Quartiles of z-scores for height: Austria



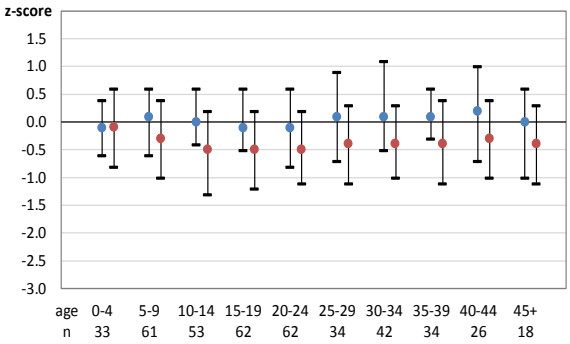

Quartiles of z-scores for height: Belgium



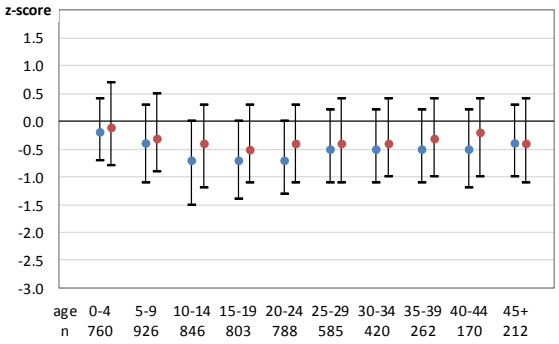

Quartiles of z-scores for height: Czech Republic



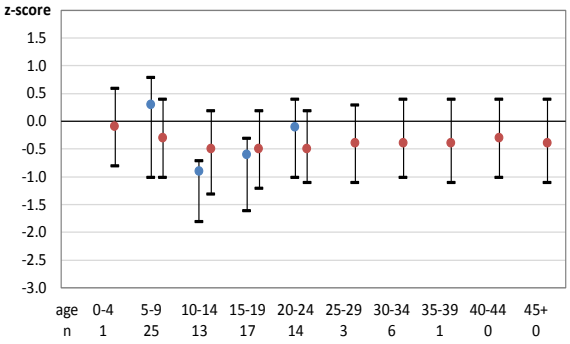

Quartiles of z-scores for height: Denmark




Quartiles of z-scores for height: France

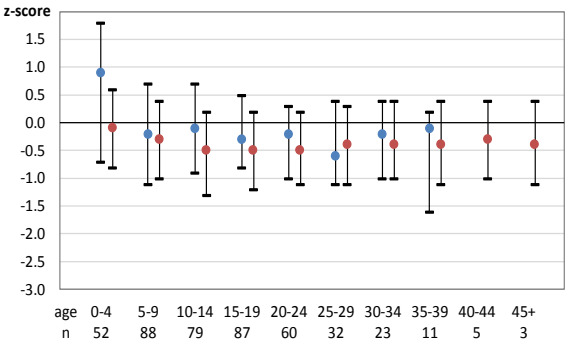



Quartiles of z-scores for height: Greece

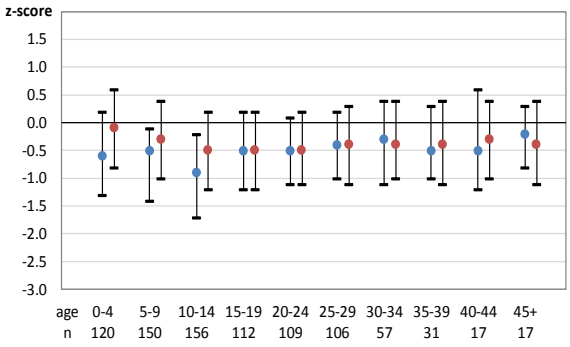


***[figure 6.3 continued]***

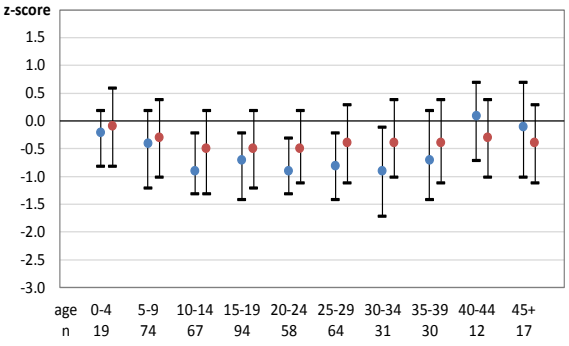
Quartiles of z-scores for height: Hungary



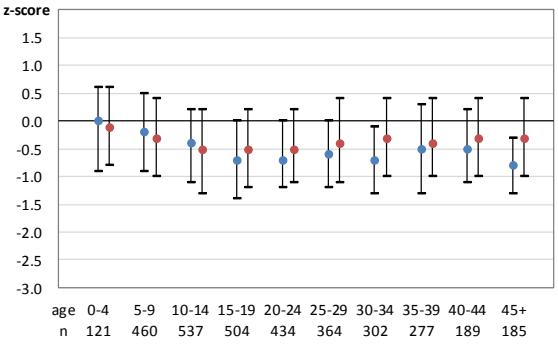

Quartiles of z-scores for height: Ireland



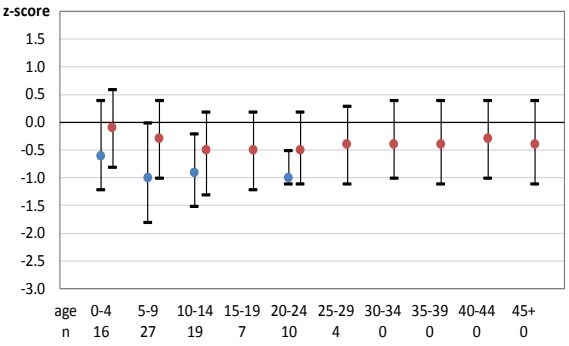

Quartiles of z-scores for height: Israel



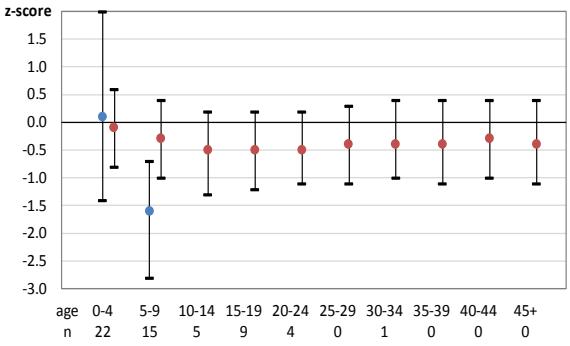

Quartiles of z-scores for height: Italy



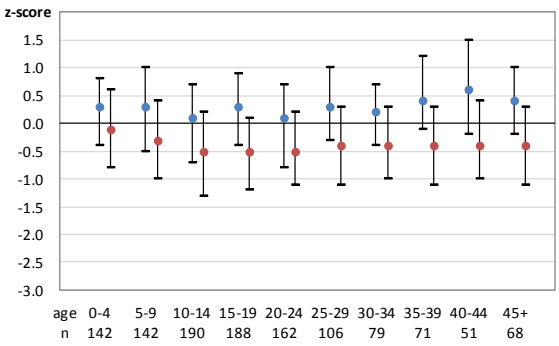

Quartiles of z-scores for height: Rep of Macedonia



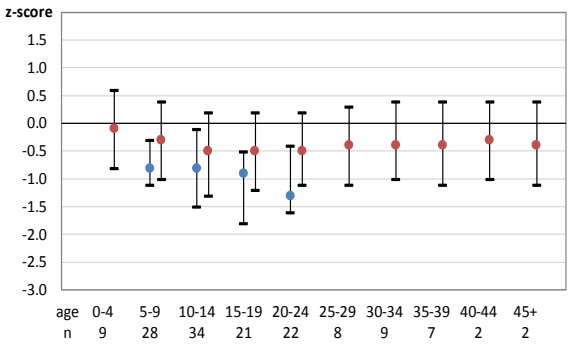

Quartiles of z-scores for height: Rep of Moldova




Quartiles of z-scores for height: The Netherlands

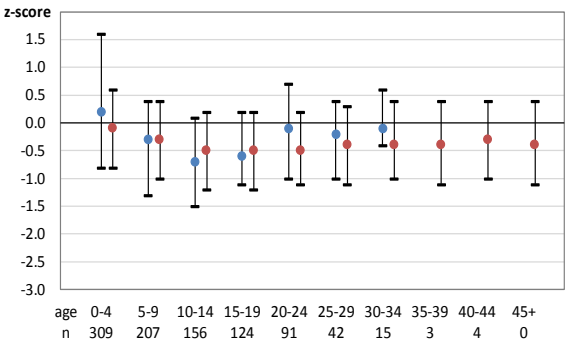



Quartiles of z-scores for height: Portugal

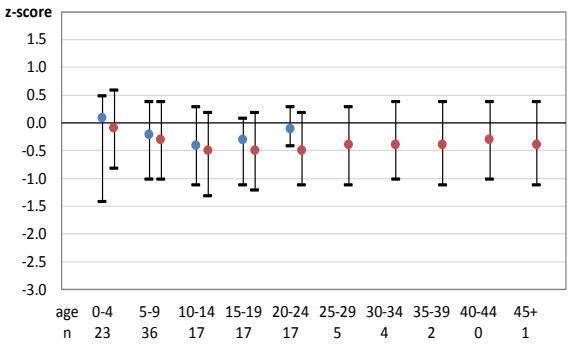


***[figure 6.3 continued]***

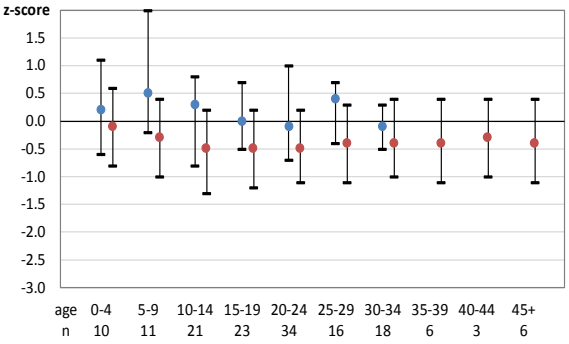
Quartiles of z-scores for height: Russian Federation



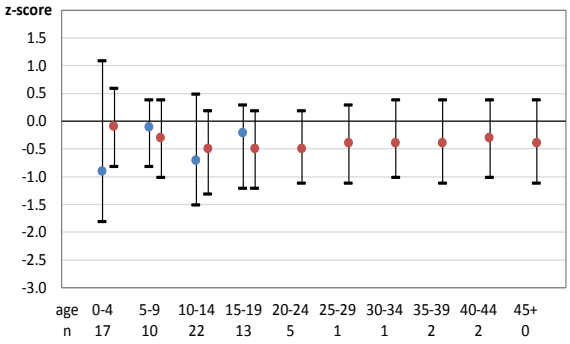

Quartiles of z-scores for height: Serbia




Quartiles of z-scores for height: Slovak Republic

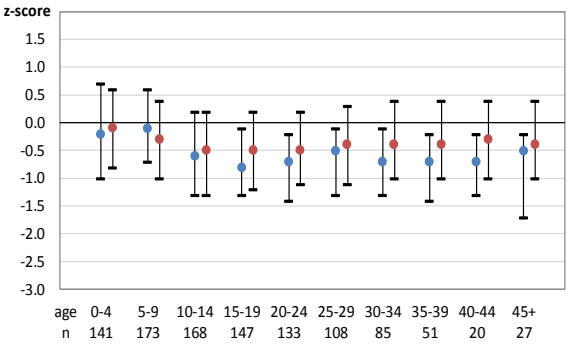



Quartiles of z-scores for height: Slovenia

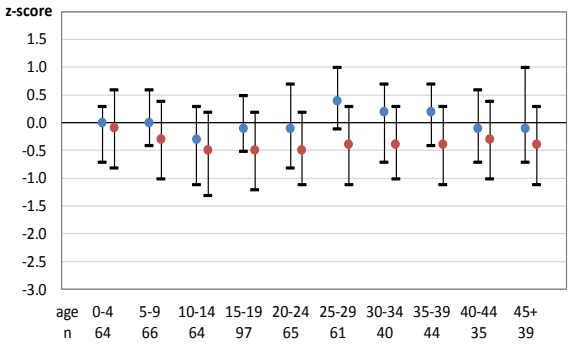


***[figure 6.3 continued]***

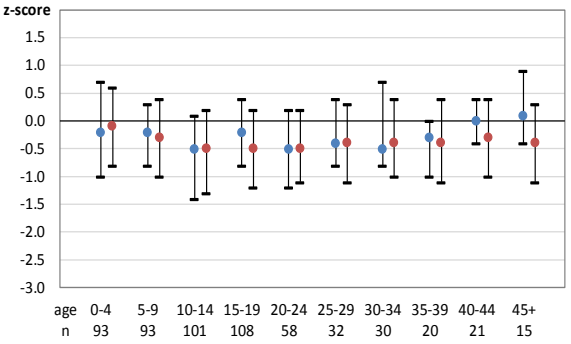
Quartiles of z-scores for height: Spain



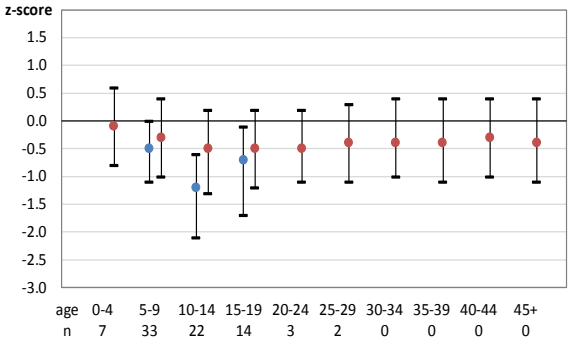

Quartiles of z-scores for height: Sweden



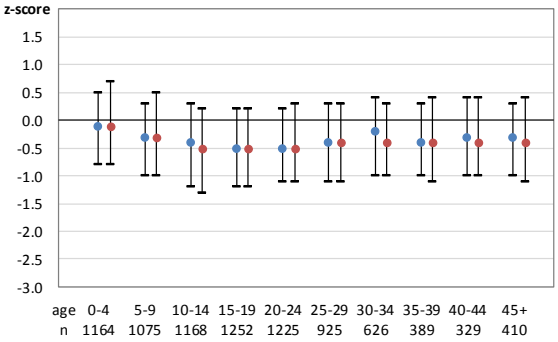

Quartiles of z-scores for height: Switzerland




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** | 335 | -0.4 | -6.8 | -1.1 | -0.3 | 0.4 | 2.1 |
| **Belgium** | 524 | -0.4 | -4.6 | -1.1 | -0.3 | 0.4 | 2.6 |
| **Czech Republic** | 316 | -0.4 | -6.1 | -1.0 | -0.3 | 0.5 | 3.1 |
| **Denmark** | 189 | -0.3 | -3.1 | -0.7 | -0.3 | 0.2 | 1.7 |
| **France** | 3021 | -0.7 | -7.9 | -1.3 | -0.6 | 0.1 | 3.7 |
| **Greece** | 50 | -0.3 | -4.3 | -1.1 | -0.4 | 0.7 | 2.2 |
| **Hungary** | 269 | -0.6 | -9.6 | -1.4 | -0.5 | 0.4 | 4.5 |
| **Ireland** | 501 | -0.6 | -9.9 | -1.3 | -0.5 | 0.2 | 2.7 |
| **Israel** | 211 | -0.5 | -3.9 | -1.3 | -0.5 | 0.2 | 2.4 |
| **Italy** | 1438 | -0.3 | -6.0 | -1.0 | -0.3 | 0.5 | 2.9 |
| **Latvia** | <10 | -1.6 | -5.7 | -2.7 | -1.5 | 0.0 | 0.2 |
| **Rep of Macedonia** | 67 | -0.5 | -4.3 | -1.3 | -0.5 | 0.3 | 2.5 |
| **Rep of Moldova** | 45 | -1.2 | -8.5 | -2.5 | -1.3 | 0.5 | 4.7 |
| **The Netherlands** | 581 | 0.0 | -3.7 | -0.5 | 0.0 | 0.6 | 3.1 |
| **Portugal** | 85 | -1.0 | -8.1 | -1.4 | -0.7 | -0.1 | 1.5 |
| **Romania** | 21 | -0.6 | -2.8 | -1.2 | -0.8 | 0.0 | 2.1 |
| **Russian Federation** | 765 | -0.7 | -7.5 | -1.7 | -0.7 | 0.2 | 5.1 |
| **Serbia** | 89 | -0.8 | -6.2 | -1.6 | -0.7 | 0.1 | 2.6 |
| **Slovak Republic** | 51 | -0.2 | -2.7 | -0.9 | -0.1 | 0.5 | 2.3 |
| **Slovenia** | 57 | -0.7 | -4.8 | -1.5 | -0.5 | 0.2 | 1.6 |
| **Spain** | 584 | -0.3 | -4.5 | -1.1 | -0.3 | 0.5 | 4.0 |
| **Sweden** | 247 | -0.2 | -4.1 | -0.8 | -0.1 | 0.5 | 2.3 |
| **Switzerland** | 356 | -0.6 | -3.2 | -1.3 | -0.4 | 0.1 | 2.4 |
| **Ukraine** | 70 | -1.5 | -6.8 | -2.2 | -1.2 | -0.4 | 1.2 |
| **United Kingdom** | 4197 | -0.3 | -8.7 | -0.9 | -0.2 | 0.5 | 9.0 |

Note: for Lithuania coverage is 0% for children.

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

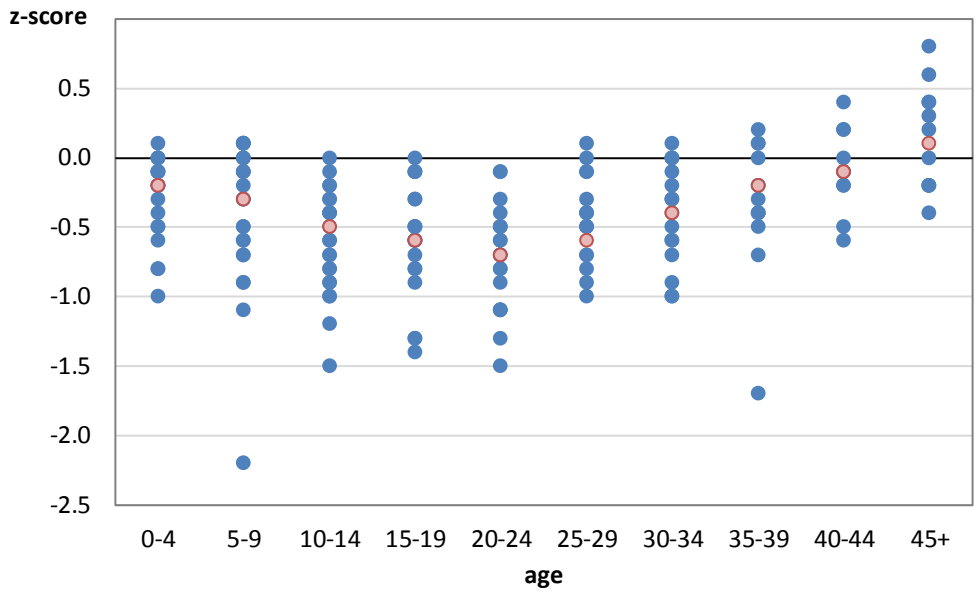
### *Table 6.6 Z-scores for weight: descriptive statistics by country. Patients aged 18 years or older.*

| 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** | 163 | -0.7 | -6.1 | -1.3 | -0.5 | 0.1 | 1.8 |
| **Belgium** | 483 | -0.6 | -6.4 | -1.2 | -0.5 | 0.3 | 2.7 |
| **Czech Republic** | 168 | -0.7 | -3.9 | -1.5 | -0.5 | 0.2 | 1.3 |
| **Denmark** | 236 | -0.4 | -5.8 | -1.1 | -0.3 | 0.4 | 2.3 |
| **France** | 2760 | -1.0 | -7.7 | -1.7 | -0.9 | -0.1 | 2.6 |
| **Greece** | 30 | -0.8 | -3.3 | -1.3 | -0.8 | -0.1 | 1.4 |
| **Hungary** | 156 | -1.0 | -5.4 | -1.9 | -0.9 | -0.1 | 1.3 |
| **Ireland** | 385 | -0.4 | -4.1 | -1.1 | -0.3 | 0.4 | 2.2 |
| **Israel** | 255 | -0.5 | -4.2 | -1.3 | -0.6 | 0.3 | 2.9 |
| **Italy** | 1946 | -0.6 | -5.8 | -1.3 | -0.6 | 0.1 | 3.2 |
| **Latvia** | <10 | -1.9 | -2.3 | -2.2 | -1.9 | -1.6 | -1.5 |
| **Lithuania** | 11 | -1.4 | -5.2 | -2.8 | -0.7 | -0.1 | 0.3 |
| **Rep of Macedonia** | 16 | -1.1 | -2.5 | -1.7 | -1.1 | -0.5 | 0.9 |
| **Rep of Moldova** | 11 | -1.6 | -4.6 | -3.3 | -0.5 | -0.3 | 0.4 |
| **The Netherlands** | 619 | -0.2 | -4.4 | -0.8 | -0.1 | 0.5 | 2.3 |
| **Portugal** | 57 | -0.8 | -3.9 | -1.7 | -0.6 | 0.0 | 2.3 |
| **Russian Federation** | 192 | -1.3 | -8.6 | -2.0 | -1.2 | -0.3 | 2.4 |
| **Serbia** | 34 | -1.1 | -5.2 | -1.5 | -0.8 | -0.3 | 1.2 |
| **Slovak Republic** | 97 | -0.5 | -3.6 | -1.3 | -0.2 | 0.2 | 2.5 |
| **Slovenia** | 16 | -0.8 | -3.0 | -1.6 | -0.3 | 0.1 | 0.4 |
| **Spain** | 473 | -0.7 | -5.2 | -1.3 | -0.6 | 0.1 | 2.1 |
| **Sweden** | 327 | -0.2 | -3.6 | -0.7 | -0.1 | 0.5 | 2.5 |
| **Switzerland** | 215 | -0.6 | -6.8 | -1.2 | -0.4 | 0.1 | 2.2 |
| **Ukraine** | 11 | -1.4 | -4.0 | -1.9 | -1.2 | -0.7 | -0.4 |
| **United Kingdom** | 4361 | -0.3 | -9.0 | -1.0 | -0.2 | 0.4 | 2.8 |

Note: for Romania coverage is 0% for adults.

This table reports the median z-scores for weight (the value that separates the highest and lowest half of the patients), the mean z-scores 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 2011.***




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 20-24 years before they increase in the older age groups. Again, the patients in the oldest age groups are patients that survived, and may therefore represent the patients with less disease severity. There is considerable variability between countries.

***Table 6.7 Z-scores for weight: descriptive statistics by age group. All patients seen in 2011.***

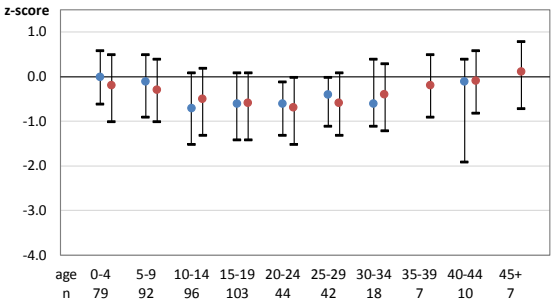
| Age at weight measurement | N | Mean | Min | 25th pctl | Median | 75th pctl | Max |
|---|---|---|---|---|---|---|---|
| **0-4** | 3465 | -0.3 | -9.9 | -1.0 | -0.2 | 0.5 | 9.0 |
| **5-9** | 4038 | -0.3 | -9.6 | -1.0 | -0.3 | 0.4 | 3.2 |
| **10-14** | 4118 | -0.6 | -6.8 | -1.3 | -0.5 | 0.2 | 2.9 |
| **15-19** | 4029 | -0.7 | -9.0 | -1.4 | -0.6 | 0.1 | 2.9 |
| **20-24** | 3561 | -0.8 | -7.7 | -1.5 | -0.7 | 0.0 | 2.8 |
| **25-29** | 2685 | -0.6 | -7.2 | -1.3 | -0.6 | 0.1 | 3.2 |
| **30-34** | 1908 | -0.5 | -6.5 | -1.2 | -0.4 | 0.3 | 2.5 |
| **35-39** | 1306 | -0.3 | -6.3 | -0.9 | -0.2 | 0.5 | 3.1 |
| **40-44** | 926 | -0.1 | -5.4 | -0.8 | -0.1 | 0.6 | 2.8 |
| **45+** | 1068 | 0.0 | -5.5 | -0.7 | 0.1 | 0.8 | 2.9 |

This table reports the median z-score for weight and other descriptive statistics by age group for all the patients seen in 2011. The median values reported in this table are shown as red dots in fig 6.4.

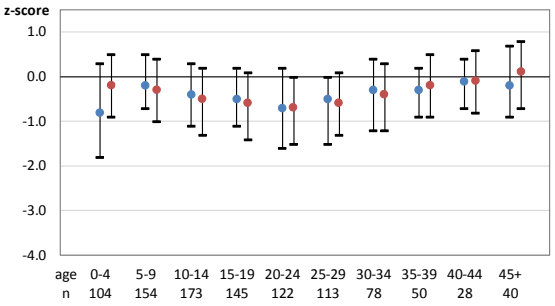
## *Figure 6.5 Quartiles of z-scores for weight by age group and by country. All patients seen in 2011.*

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

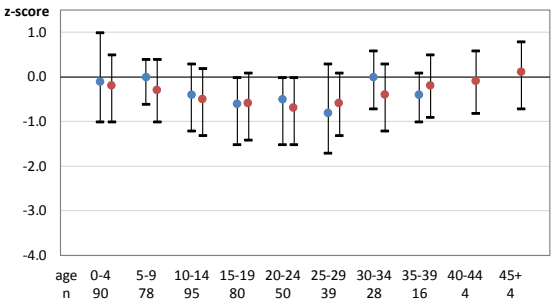
Quartiles of z-scores for weight: Austria



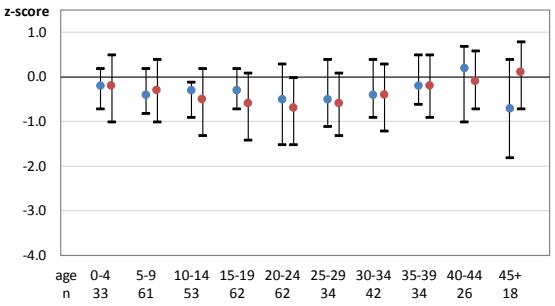

Quartiles of z-scores for weight: Belgium



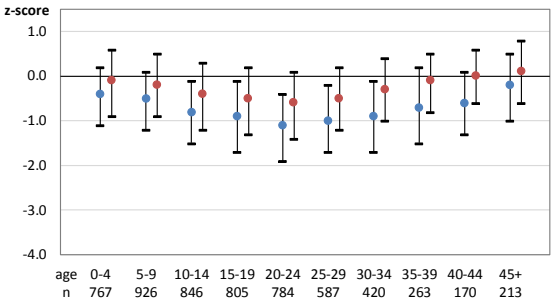

Quartiles of z-scores for weight: Czech Republic



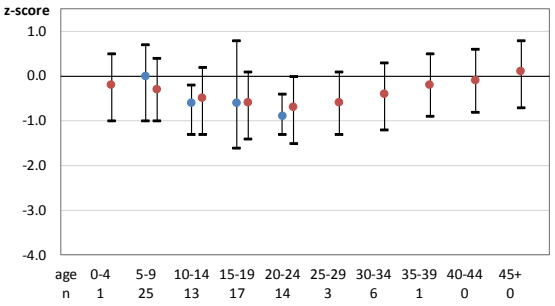

Quartiles of z-scores for weight: Denmark




Quartiles of z-scores for weight: France

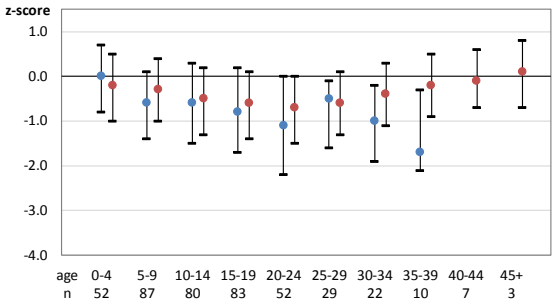



Quartiles of z-scores for weight: Greece

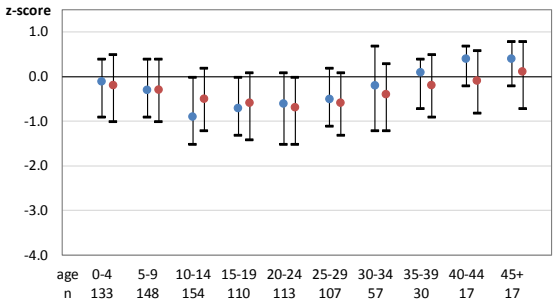


***[figure 6.5 continued]***

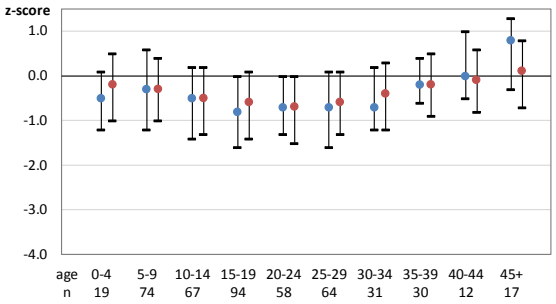
Quartiles of z-scores for weight: Hungary



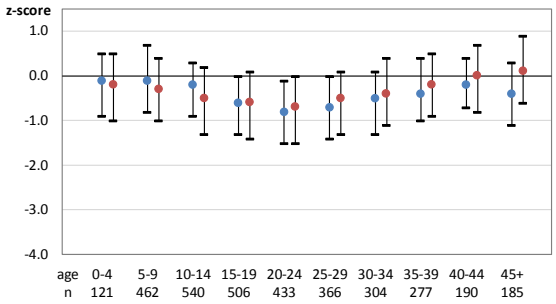

Quartiles of z-scores for weight: Ireland



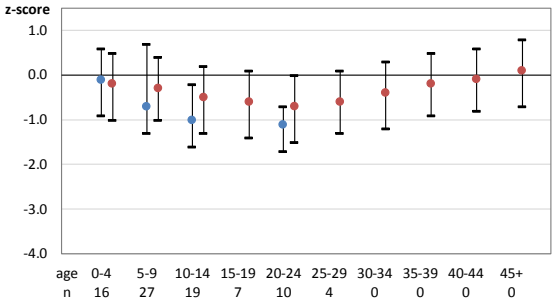

Quartiles of z-scores for weight: Israel



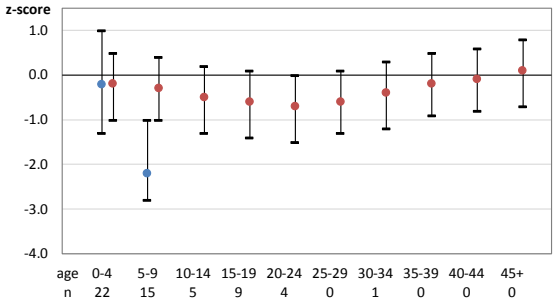

Quartiles of z-scores for weight: Italy



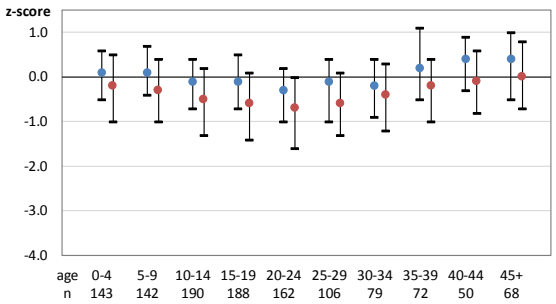

Quartiles of z-scores for weight: Rep of Macedonia



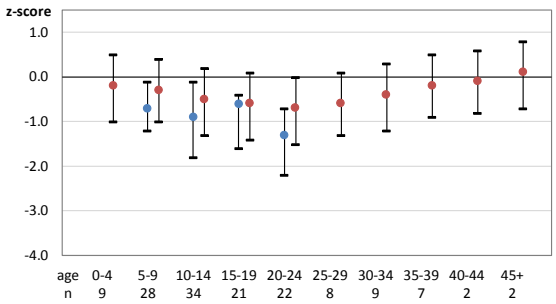

Quartiles of z-scores for weight: Rep of Moldova




Quartiles of z-scores for weight: The Netherlands

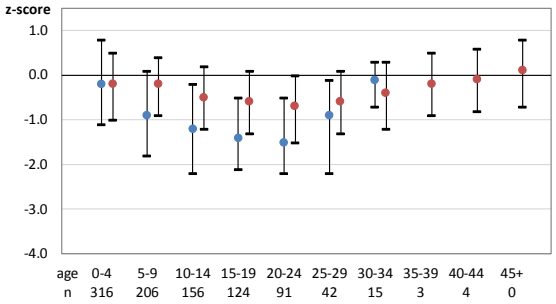



Quartiles of z-scores for weight: Portugal

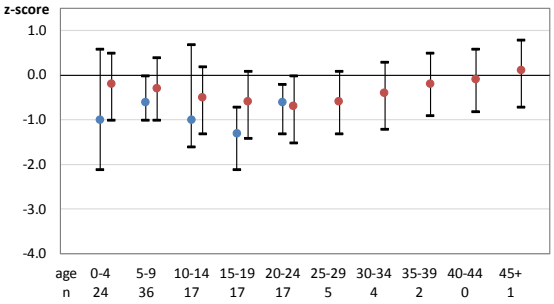


***[figure 6.5 continued]***

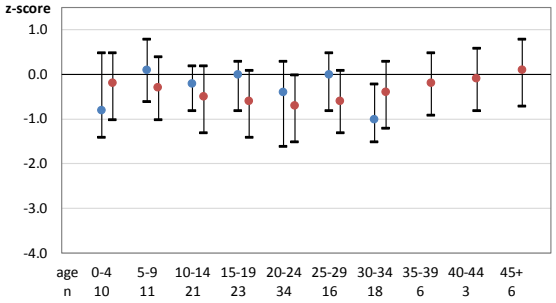
Quartiles of z-scores for weight: Russian Federation



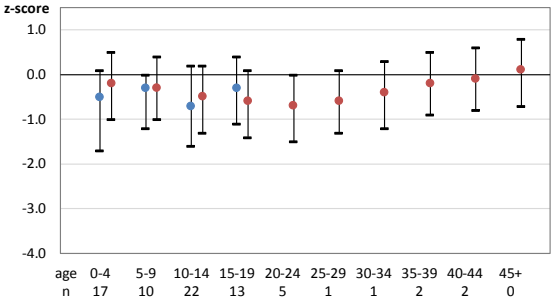

Quartiles of z-scores for weight: Serbia



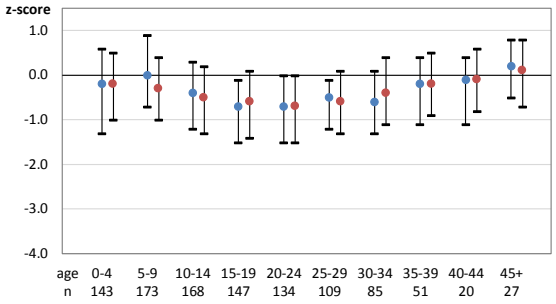

Quartiles of z-scores for weight: Slovak Republic



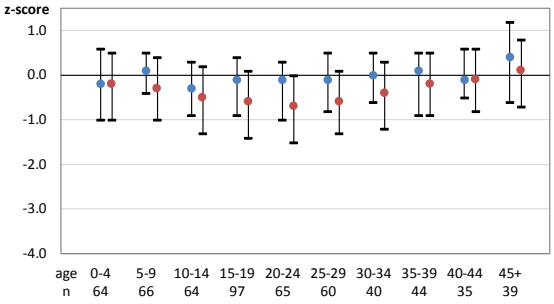

Quartiles of z-scores for weight: Slovenia



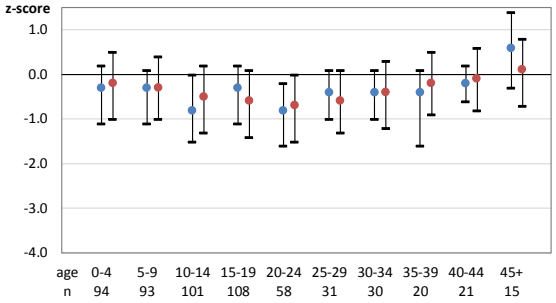

Quartiles of z-scores for weight: Spain



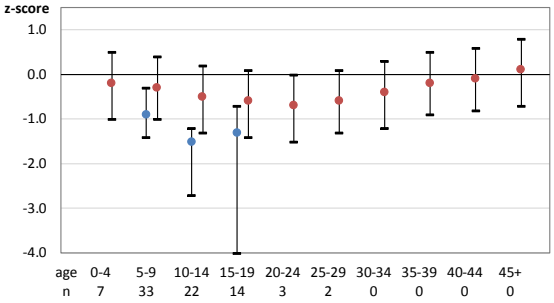

Quartiles of z-scores for weight: Sweden




Quartiles of z-scores for weight: Switzerland




Quartiles of z-scores for weight: Ukraine




Quartiles of z-scores for weight: United Kingdom

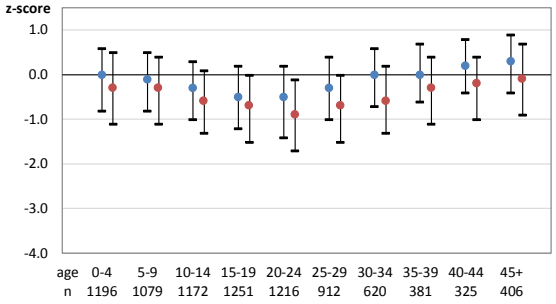


***Table 6.8 Z-scores for BMI: descriptive statistics by country. All patients seen in 2011 aged 2-17 years.***

| 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** | 306 | 0 | -0.4 | -4.0 | -1.0 | -0.3 | 0.3 | 2.3 |
| **Belgium** | 484 | 0 | -0.2 | -3.4 | -0.9 | -0.2 | 0.5 | 3.2 |
| **Czech Republic** | 268 | 3 | -0.4 | -5.2 | -1.1 | -0.3 | 0.4 | 1.7 |
| **Denmark** | 182 | 0 | -0.4 | -3.0 | -0.9 | -0.3 | 0.1 | 1.3 |
| **France** | 2751 | 5 | -0.5 | -6.1 | -1.1 | -0.4 | 0.2 | 3.3 |
| **Greece** | 50 | 0 | -0.1 | -2.6 | -0.8 | -0.3 | 0.7 | 2.4 |
| **Hungary** | 256 | 3 | -0.9 | -4.6 | -1.6 | -0.7 | 0.0 | 3.2 |
| **Ireland** | 444 | 8 | -0.1 | -3.9 | -0.8 | -0.1 | 0.6 | 3.2 |
| **Israel** | 208 | 0 | -0.3 | -3.7 | -0.9 | -0.2 | 0.6 | 2.4 |
| **Italy** | 1380 | 141 | -0.1 | -6.9 | -0.8 | -0.1 | 0.6 | 3.1 |
| **Latvia** | <10 | 0 | -1.8 | -4.4 | -2.5 | -1.2 | -0.6 | 0.0 |
| **Rep of Macedonia** | 64 | 0 | 0.1 | -2.7 | -0.6 | 0.0 | 0.5 | 2.4 |
| **Rep of Moldova** | 29 | 0 | -1.2 | -5.0 | -2.2 | -1.4 | 0.0 | 2.9 |
| **The Netherlands** | 533 | 1 | -0.1 | -3.7 | -0.6 | -0.1 | 0.4 | 3.2 |
| **Portugal** | 83 | 0 | -0.7 | -5.1 | -1.5 | -0.5 | 0.4 | 1.5 |
| **Romania** | 21 | 0 | -0.5 | -2.8 | -1.3 | -0.7 | 0.2 | 1.9 |
| **Russian Federation** | 615 | 6 | -1.0 | -9.8 | -1.9 | -0.8 | 0.0 | 2.3 |
| **Serbia** | 76 | 0 | -0.6 | -6.2 | -1.6 | -0.6 | 0.5 | 2.5 |
| **Slovak Republic** | 47 | 0 | -0.5 | -3.6 | -1.2 | -0.5 | 0.3 | 1.9 |
| **Slovenia** | 50 | 0 | -0.5 | -4.0 | -1.2 | -0.5 | 0.2 | 1.9 |
| **Spain** | 536 | 1 | -0.1 | -3.6 | -0.8 | -0.1 | 0.6 | 2.9 |
| **Sweden** | 226 | 2 | -0.1 | -2.6 | -0.6 | 0.0 | 0.5 | 2.1 |
| **Switzerland** | 317 | 0 | -0.5 | -4.0 | -1.1 | -0.4 | 0.2 | 2.2 |
| **Ukraine** | 67 | 0 | -1.4 | -7.5 | -1.5 | -1.1 | -0.5 | 1.1 |
| **United Kingdom** | 3714 | 42 | 0.0 | -9.6 | -0.6 | 0.0 | 0.7 | 2.8 |

Note: For Lithuania coverage is 0% for children.

This table reports the median z-scores for BMI, the mean z-scores 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 2011 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** | 163 | 0 | 20.9 | 12.5 | 19.1 | 20.6 | 22.5 | 32.1 |
| **Belgium** | 483 | 0 | 21.4 | 14.0 | 19.3 | 20.9 | 23.1 | 36.3 |
| **Czech Republic** | 168 | 19 | 20.7 | 15.1 | 18.7 | 20.2 | 22.6 | 29.1 |
| **Denmark** | 236 | 0 | 21.5 | 14.3 | 19.4 | 21.0 | 22.9 | 39.3 |
| **France** | 2750 | 25 | 20.7 | 12.8 | 18.6 | 20.2 | 22.2 | 42.8 |
| **Greece** | 30 | 0 | 20.8 | 15.3 | 18.5 | 20.7 | 22.7 | 29.8 |
| **Hungary** | 152 | 23 | 20.1 | 13.6 | 17.6 | 20.0 | 22.0 | 27.0 |
| **Ireland** | 377 | 29 | 22.1 | 12.3 | 19.6 | 21.8 | 24.2 | 33.4 |
| **Israel** | 255 | 0 | 22.3 | 15.8 | 20.0 | 21.7 | 23.9 | 39.9 |
| **Italy** | 1939 | 254 | 21.7 | 12.7 | 19.6 | 21.4 | 23.4 | 41.9 |
| **Latvia** | <10 | 0 | 17.2 | 16.4 | 16.4 | 16.7 | 17.9 | 18.8 |
| **Lithuania** | 11 | 0 | 17.7 | 12.1 | 16.0 | 17.9 | 20.2 | 22.2 |
| **Rep of Macedonia** | 16 | 0 | 20.5 | 18.0 | 19.6 | 20.6 | 21.2 | 23.5 |
| **Rep of Moldova** | 11 | 0 | 18.8 | 14.6 | 16.9 | 19.3 | 20.7 | 21.1 |
| **The Netherlands** | 617 | 5 | 21.8 | 14.5 | 19.9 | 21.6 | 23.4 | 38.8 |
| **Portugal** | 57 | 0 | 21.6 | 15.6 | 19.6 | 21.1 | 23.2 | 36.0 |
| **Russian Federation** | 192 | 4 | 19.4 | 12.1 | 17.3 | 19.1 | 21.2 | 34.9 |
| **Serbia** | 34 | 0 | 19.3 | 14.5 | 17.2 | 19.4 | 21.6 | 24.5 |
| **Slovak Republic** | 97 | 0 | 21.1 | 14.6 | 18.9 | 20.9 | 23.0 | 34.4 |
| **Slovenia** | 16 | 0 | 20.1 | 16.9 | 18.6 | 20.5 | 21.5 | 23.6 |
| **Spain** | 471 | 17 | 21.8 | 14.1 | 19.7 | 21.5 | 23.2 | 39.1 |
| **Sweden** | 327 | 4 | 22.0 | 14.4 | 19.7 | 21.6 | 23.8 | 34.5 |
| **Switzerland** | 215 | 1 | 21.3 | 14.7 | 19.5 | 21.0 | 22.9 | 35.6 |
| **Ukraine** | 11 | 0 | 18.9 | 15.2 | 16.5 | 19.0 | 20.2 | 22.1 |
| **United Kingdom** | 4349 | 77 | 22.6 | 12.7 | 20.1 | 22.1 | 24.5 | 48.6 |

Note: For Romania coverage is 0% 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 2011 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** | 87 | 0 | 21.2 | 14.2 | 19.2 | 21.3 | 22.8 | 32.1 |
| **Belgium** | 252 | 0 | 21.7 | 14.0 | 19.5 | 21.3 | 23.8 | 36.3 |
| **Czech Republic** | 85 | 12 | 21.0 | 15.4 | 18.7 | 20.5 | 23.2 | 29.1 |
| **Denmark** | 124 | 0 | 21.9 | 14.4 | 19.9 | 21.5 | 24.1 | 34.7 |
| **France** | 1454 | 8 | 20.8 | 12.8 | 18.6 | 20.4 | 22.5 | 41.5 |
| **Greece** | 14 | 0 | 20.8 | 17.3 | 18.0 | 20.1 | 22.7 | 29.8 |
| **Hungary** | 91 | 18 | 20.5 | 15.5 | 18.0 | 20.6 | 22.9 | 26.9 |
| **Ireland** | 213 | 17 | 22.5 | 14.7 | 20.0 | 22.3 | 24.9 | 32.6 |
| **Israel** | 145 | 0 | 22.6 | 15.8 | 20.1 | 21.8 | 24.5 | 39.9 |
| **Italy** | 1040 | 122 | 22.3 | 12.7 | 20.2 | 22.0 | 24.0 | 41.9 |
| **Latvia** | <10 | 0 | 18.8 | 18.8 | 18.8 | 18.8 | 18.8 | 18.8 |
| **Lithuania** | <10 | 0 | 18.0 | 12.1 | 17.9 | 18.0 | 20.2 | 21.6 |
| **Rep of Macedonia** | <10 | 0 | 20.4 | 18.4 | 19.6 | 20.2 | 20.9 | 23.5 |
| **Rep of Moldova** | <10 | 0 | 18.5 | 15.9 | 16.9 | 18.7 | 19.9 | 20.7 |
| **The Netherlands** | 330 | 4 | 22.0 | 15.6 | 20.3 | 21.9 | 23.6 | 31.6 |
| **Portugal** | 26 | 0 | 21.1 | 15.6 | 18.7 | 21.3 | 23.2 | 25.8 |
| **Russian Federation** | 114 | 3 | 19.4 | 12.1 | 17.2 | 18.9 | 21.4 | 34.9 |
| **Serbia** | 17 | 0 | 19.3 | 14.5 | 16.7 | 19.8 | 21.7 | 24.5 |
| **Slovak Republic** | 43 | 0 | 21.6 | 15.7 | 18.9 | 21.4 | 23.7 | 34.4 |
| **Slovenia** | <10 | 0 | 20.6 | 16.9 | 20.3 | 20.8 | 21.5 | 23.6 |
| **Spain** | 241 | 7 | 22.1 | 14.1 | 20.4 | 22.1 | 23.5 | 35.3 |
| **Sweden** | 171 | 2 | 22.6 | 14.4 | 20.5 | 22.3 | 24.5 | 34.5 |
| **Switzerland** | 121 | 1 | 21.5 | 14.7 | 19.6 | 21.3 | 23.3 | 35.6 |
| **Ukraine** | <10 | 0 | 18.8 | 15.2 | 16.5 | 19.2 | 20.2 | 22.1 |
| **United Kingdom** | 2420 | 48 | 22.8 | 12.7 | 20.4 | 22.6 | 24.9 | 40.5 |

Note: For Romania coverage is 0% 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 2011 aged 18 years or older.*

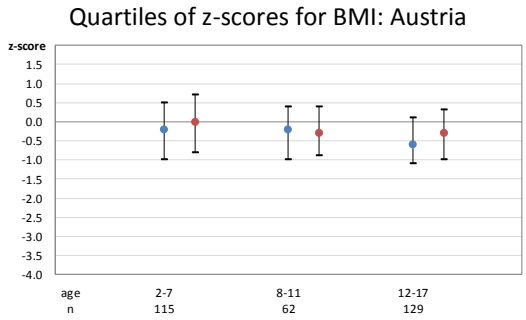
| Country | N | N Miss | Mean | Min | 25th pctl (25% of the patients are below this BMI) | Median (50% of the patients are below this BMI) | 75th pctl (75% of the patients are below this BMI) | Max |
|---|---|---|---|---|---|---|---|---|
| **Austria** | 76 | 0 | 20.6 | 12.5 | 19.1 | 20.4 | 21.7 | 31.2 |
| **Belgium** | 231 | 0 | 21.0 | 15.6 | 19.1 | 20.5 | 22.2 | 32.0 |
| **Czech Republic** | 83 | 7 | 20.3 | 15.1 | 18.7 | 19.8 | 21.6 | 28.1 |
| **Denmark** | 112 | 0 | 21.0 | 14.3 | 18.6 | 20.5 | 22.0 | 39.3 |
| **France** | 1296 | 17 | 20.5 | 13.1 | 18.4 | 20.0 | 21.8 | 42.8 |
| **Greece** | 16 | 0 | 20.8 | 15.3 | 18.9 | 21.0 | 22.4 | 26.7 |
| **Hungary** | 61 | 5 | 19.4 | 13.6 | 17.3 | 19.5 | 21.5 | 27.0 |
| **Ireland** | 164 | 12 | 21.6 | 12.3 | 19.4 | 21.2 | 23.5 | 33.4 |
| **Israel** | 110 | 0 | 21.8 | 16.4 | 19.7 | 21.2 | 23.8 | 33.3 |
| **Italy** | 899 | 132 | 21.1 | 14.2 | 19.1 | 20.5 | 22.4 | 38.5 |
| **Latvia** | <10 | 0 | 16.6 | 16.4 | 16.4 | 16.5 | 17.0 | 17.0 |
| **Lithuania** | <10 | 0 | 17.5 | 12.1 | 16.0 | 17.8 | 19.0 | 22.2 |
| **Rep of Macedonia** | <10 | 0 | 20.5 | 18.0 | 19.3 | 21.1 | 21.6 | 22.1 |
| **Rep of Moldova** | <10 | 0 | 19.3 | 14.6 | 19.3 | 20.3 | 21.1 | 21.1 |
| **The Netherlands** | 287 | 1 | 21.5 | 14.5 | 19.4 | 21.0 | 23.0 | 38.8 |
| **Portugal** | 31 | 0 | 22.1 | 16.2 | 19.7 | 21.1 | 23.7 | 36.0 |
| **Russian Federation** | 78 | 1 | 19.5 | 13.7 | 17.3 | 19.1 | 21.1 | 33.9 |
| **Serbia** | 17 | 0 | 19.3 | 15.3 | 18.0 | 19.0 | 20.4 | 23.4 |
| **Slovak Republic** | 54 | 0 | 20.7 | 14.6 | 19.0 | 20.9 | 22.6 | 26.4 |
| **Slovenia** | <10 | 0 | 19.8 | 17.4 | 18.5 | 19.7 | 21.5 | 21.6 |
| **Spain** | 230 | 10 | 21.5 | 14.2 | 19.4 | 20.9 | 22.9 | 39.1 |
| **Sweden** | 156 | 2 | 21.3 | 15.5 | 19.5 | 21.1 | 23.0 | 33.0 |
| **Switzerland** | 94 | 0 | 21.1 | 15.8 | 19.2 | 20.7 | 22.3 | 34.7 |
| **Ukraine** | <10 | 0 | 18.9 | 16.5 | 17.7 | 18.9 | 20.2 | 21.3 |
| **United Kingdom** | 1929 | 29 | 22.2 | 13.2 | 19.7 | 21.5 | 23.8 | 48.6 |

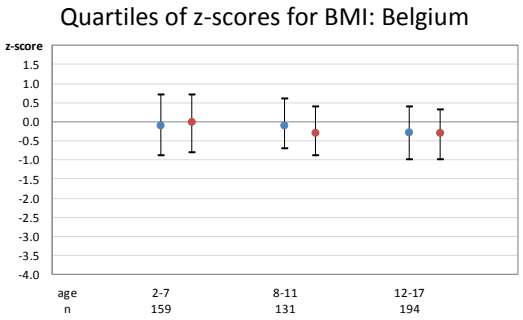
Note: For Romania coverage is 0% for adults.

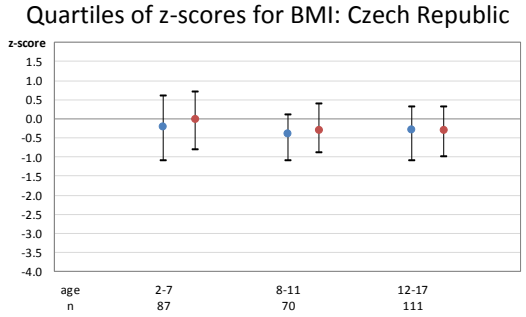
This table reports the median BMI (expressed as absolute values, not as z-scores), the mean BMI, and other descriptive statistics, for female patients aged 18 years or older, by country.

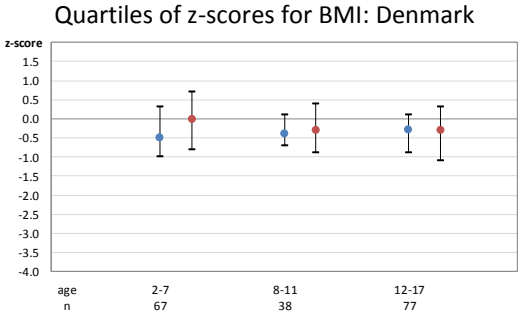
## *Figure 6.6 Quartiles of z-scores for BMI by age group and country. Patients aged 2-17 years in 2011.*

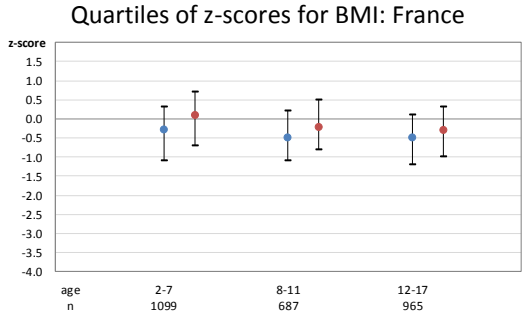
The figures below show the z-scores for weight by country. The dot is the median, and the whiskers show the 25th and 75th percentiles. In blue are the quartiles for the country, in red are the pooled quartiles computed on all other countries (i.e. excluding that country). We did not compute quartiles 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.

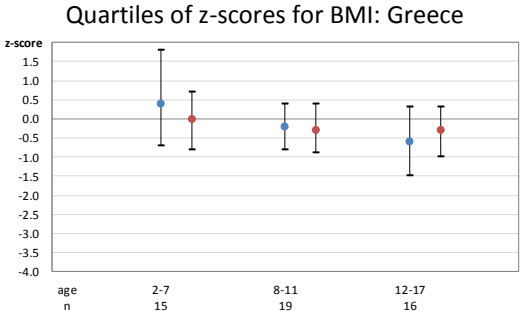


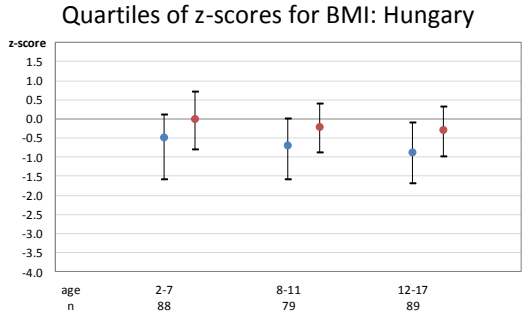



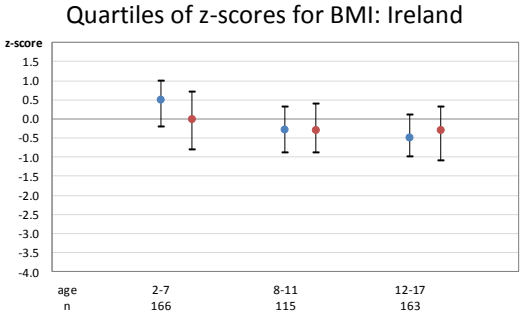



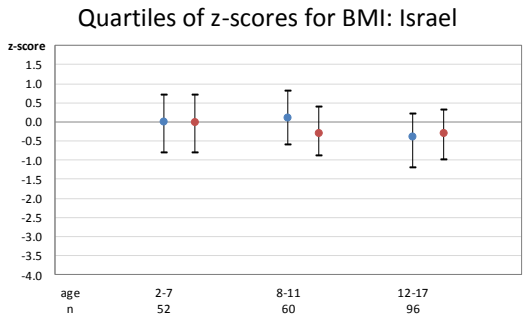



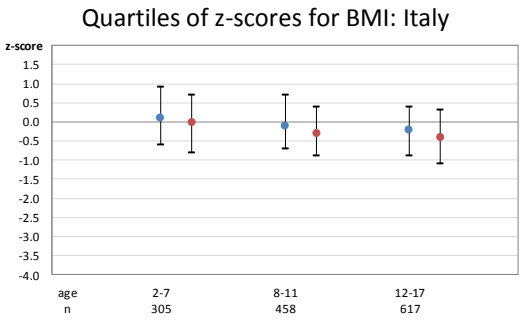



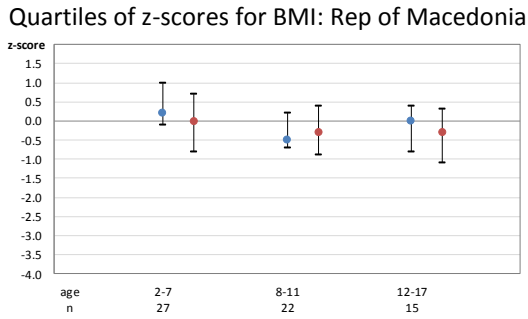



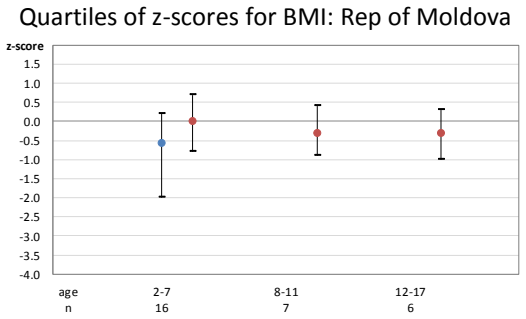



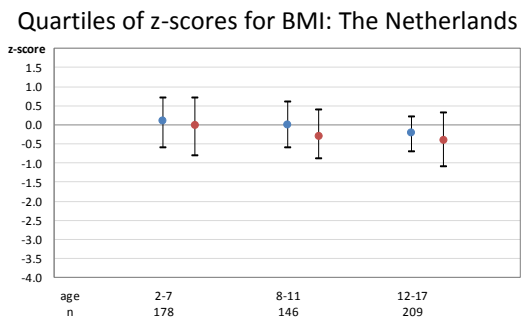
***[figure 6.6 continued]***

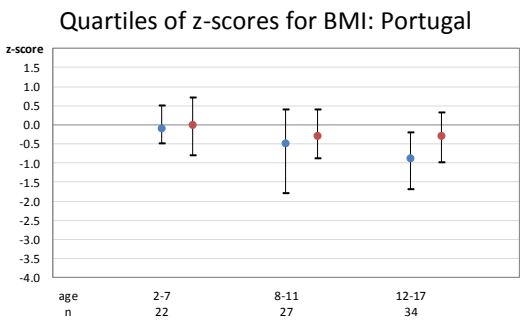


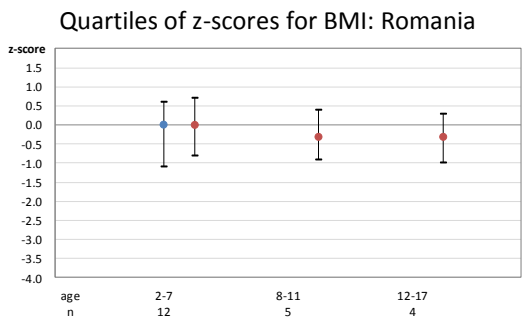



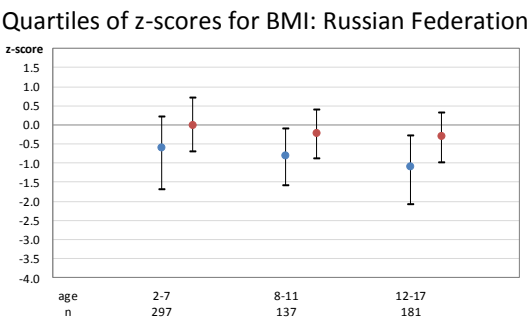



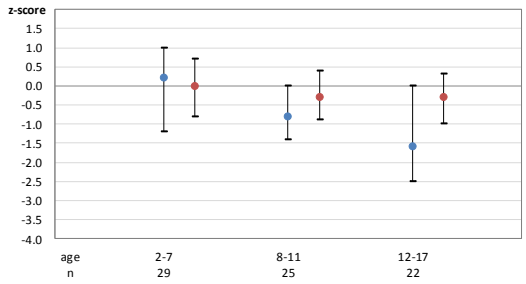



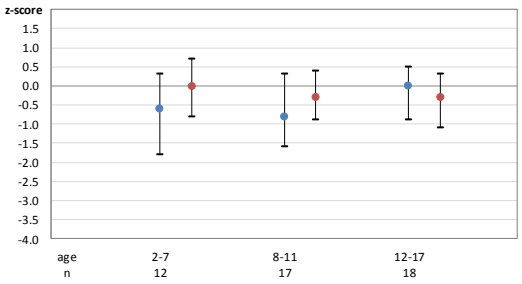



***[figure 6.6 continued]***

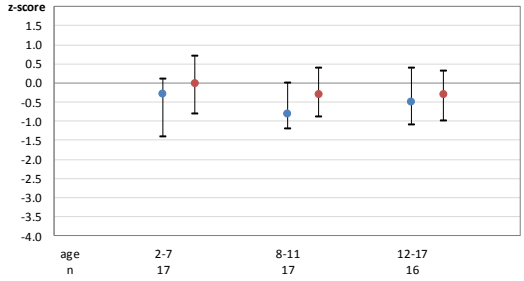
Quartiles of z-scores for BMI: Serbia



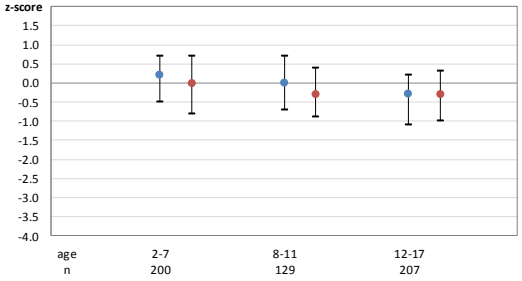

Quartiles of z-scores for BMI: Slovak Republic



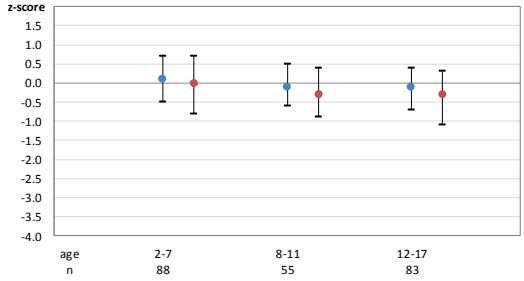

Quartiles of z-scores for BMI: Slovenia



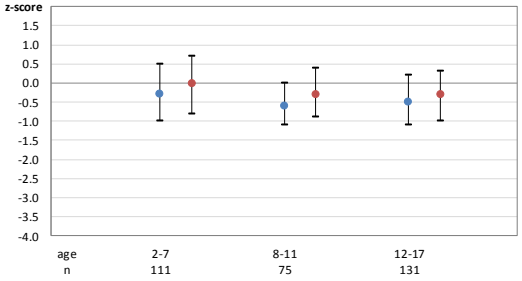

Quartiles of z-scores for BMI: Spain



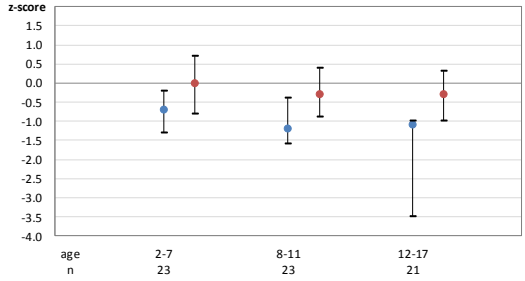

Quartiles of z-scores for BMI: Sweden



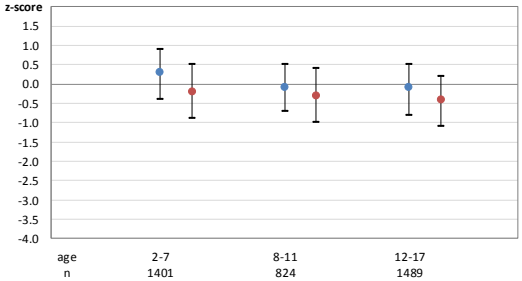

Quartiles of z-scores for BMI: Switzerland




Quartiles of z-scores for BMI: Ukraine

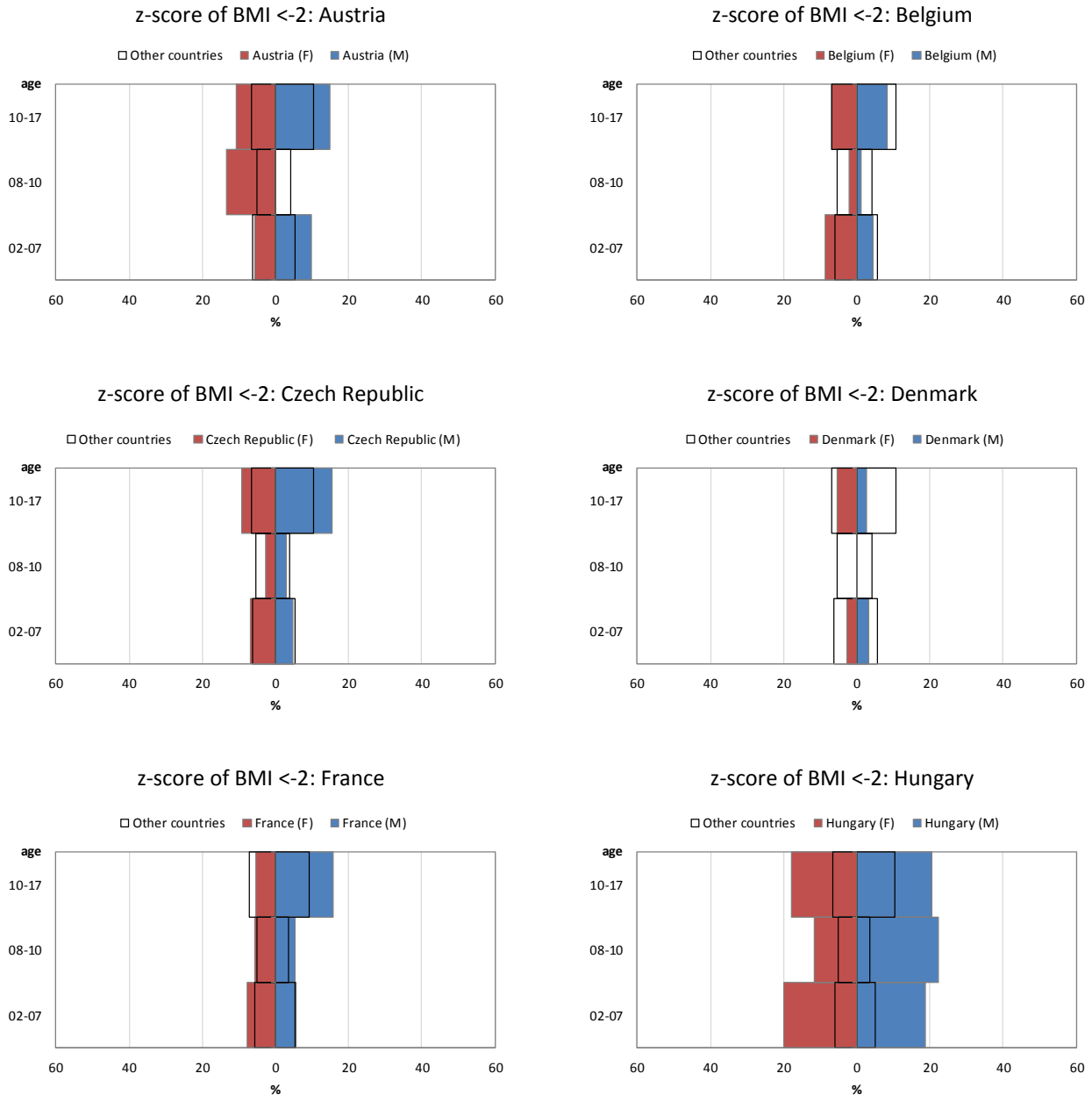



Quartiles of z-scores for BMI: United Kingdom

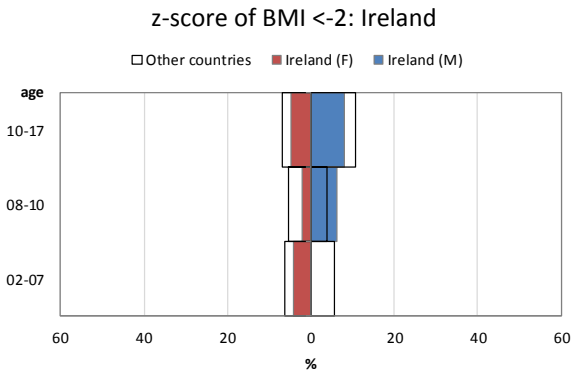


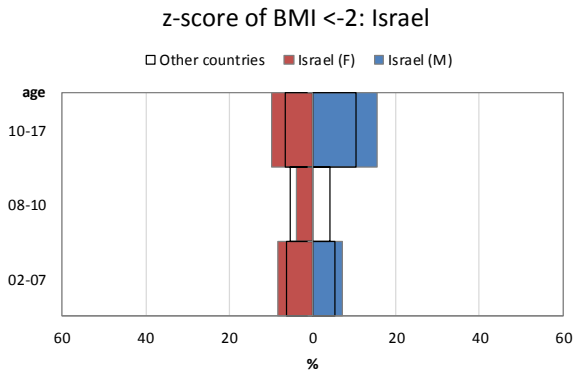
## *Figure 6.7 Proportion of child patients underweight (z-score of BMI<-2): age and sex pyramids, by country and overall. Patients aged 2-17 years in 2011.*

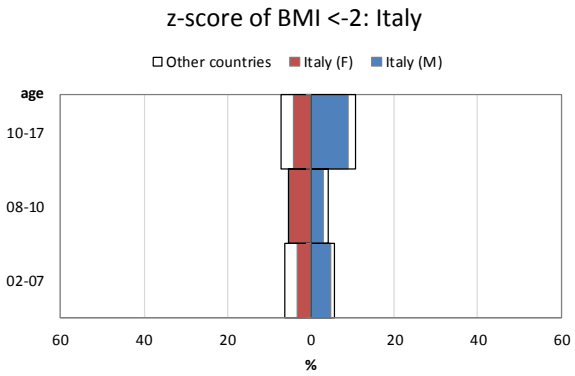
The coloured bars (red for females, blue for males) represent the percentage of underweight patients in the specified country, whereas the non-coloured bars represent the percentage of underweight patients in all the remaining countries (i.e. excluding that country). We excluded from the analyses those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

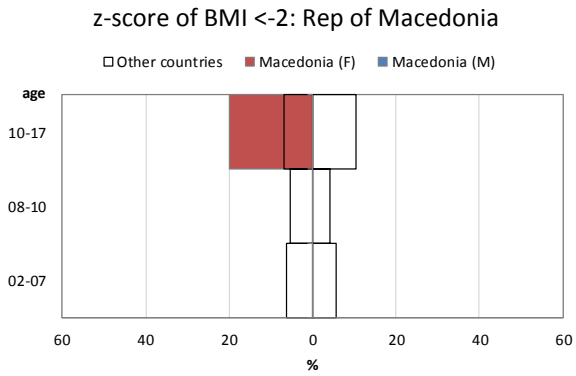


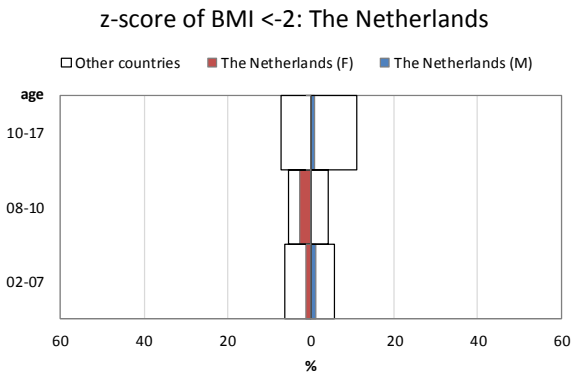
***[figure 6.7 continued]***

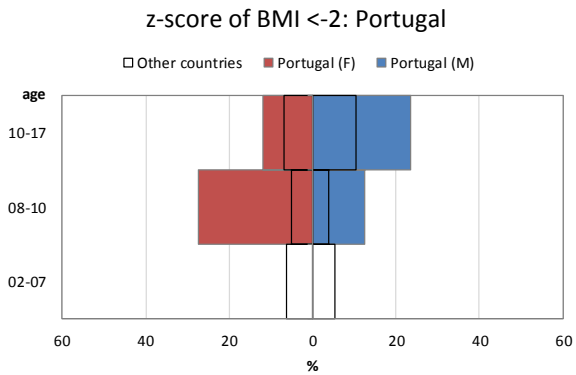


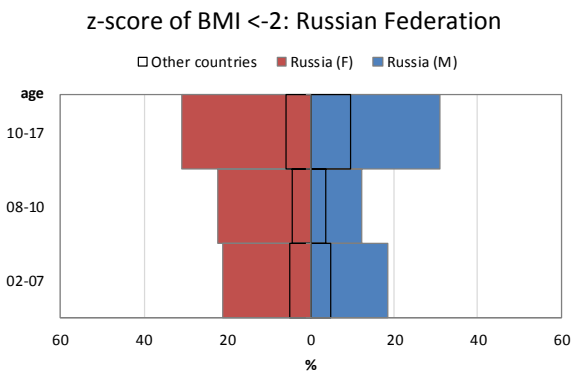



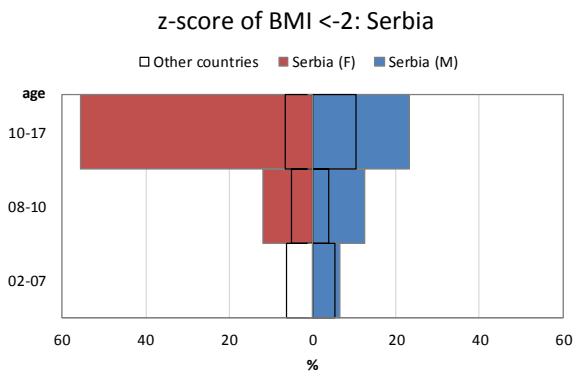



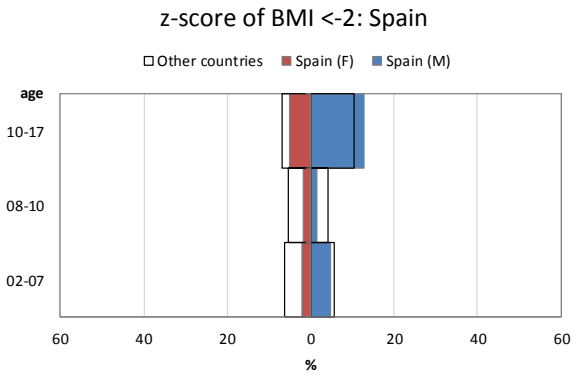



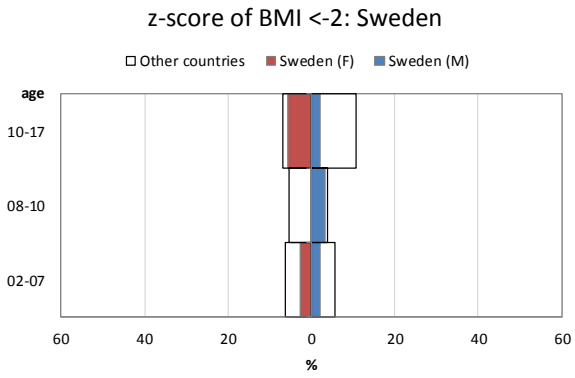



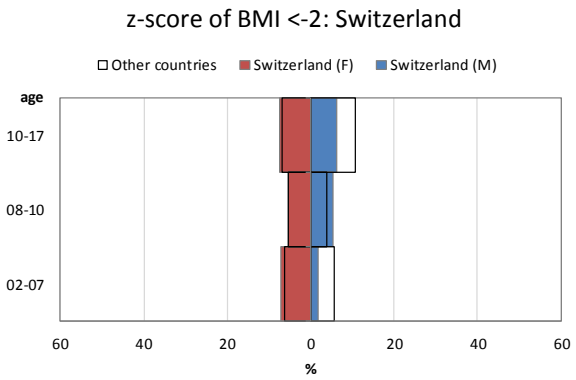



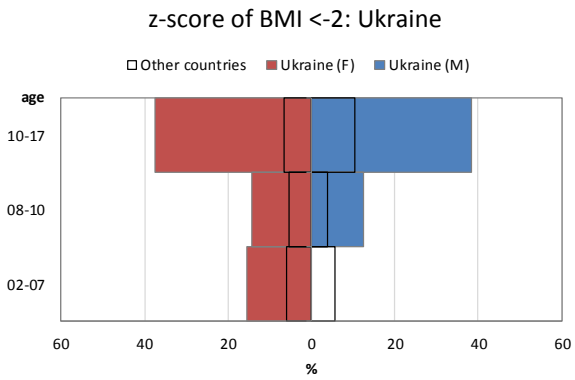



***[figure 6.7 continued]***



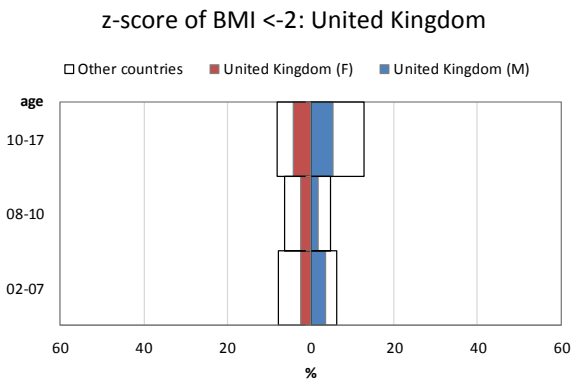
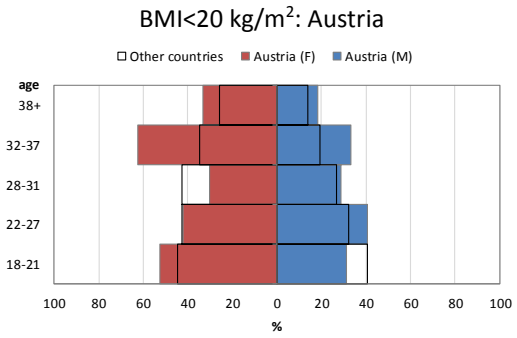
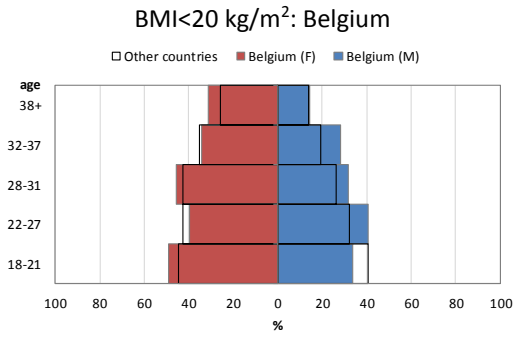
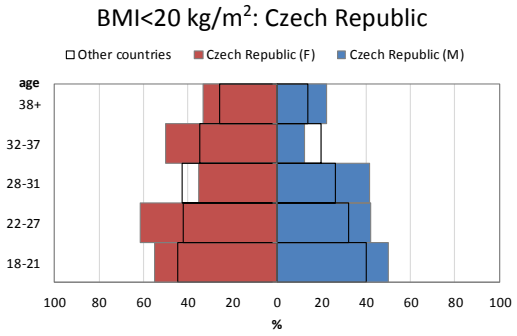



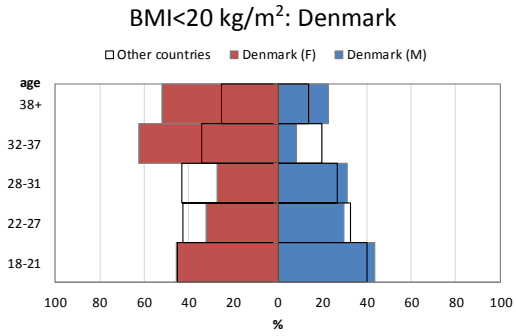
***Figure 6.8 Proportion of adult patients with BMI<20: age and sex pyramids, by country and overall. Patients aged 18 years or older in 2011.***

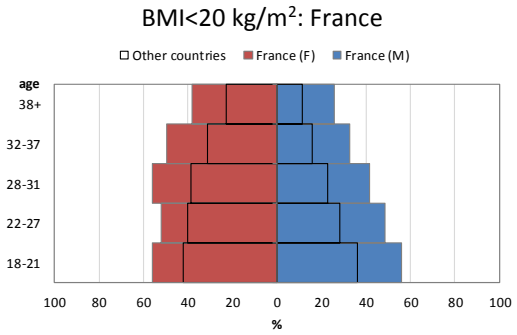
The coloured bars (red for females, blue for males) represent the percentage of underweight patients in the specified country, whereas the non-coloured bars represent the percentage of underweight patients in all the remaining countries (i.e. excluding that country). We excluded from the analyses those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

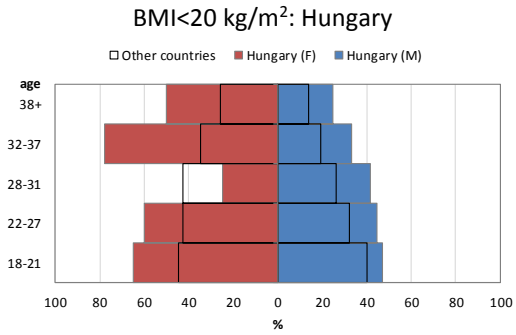


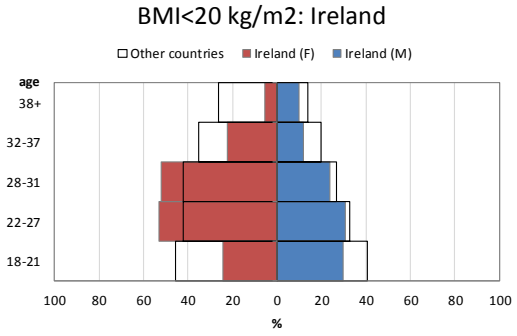



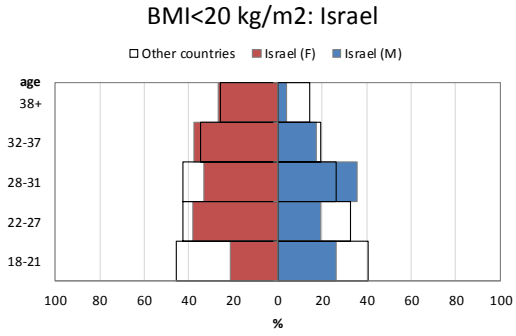



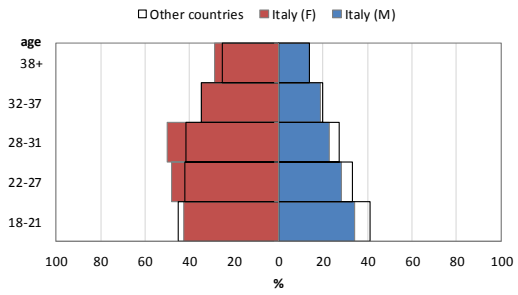



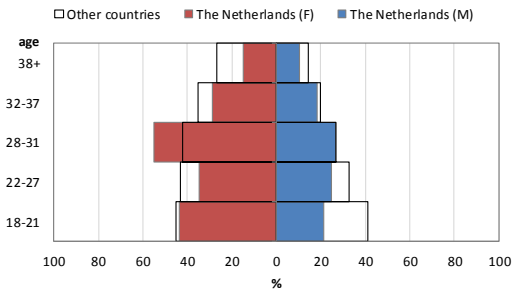



***[figure 6.8 continued]***

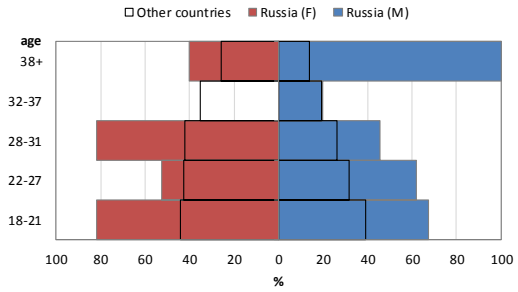
BMI<20 kg/m$^2$: Italy



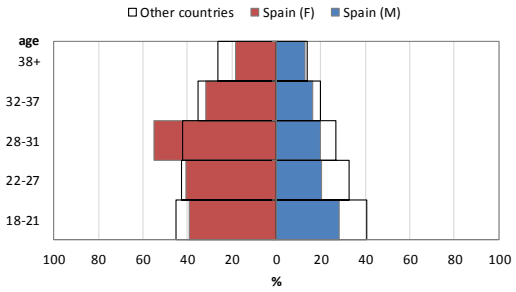

BMI<20 kg/m$^2$: The Netherlands



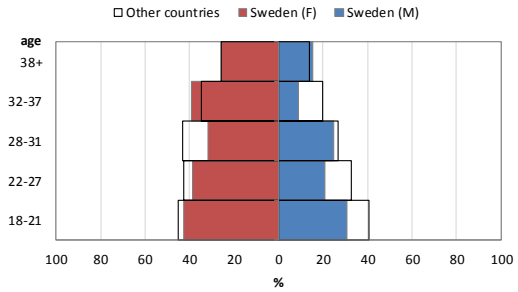

BMI<20 kg/m$^2$: Russian Federation



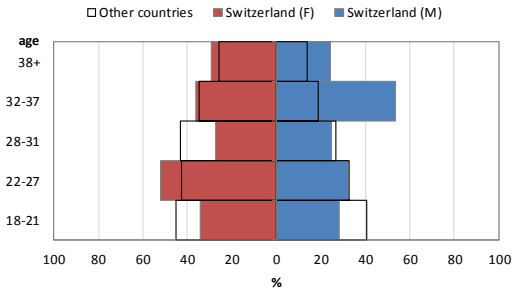

BMI<20 kg/m$^2$: Spain



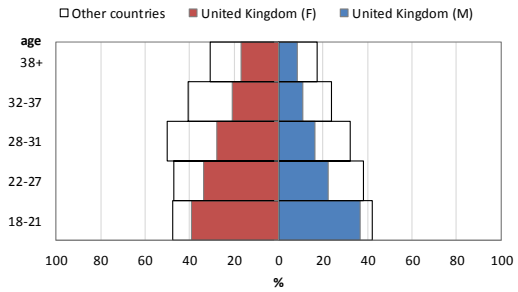

BMI<20 kg/m$^2$: Sweden




BMI<20 kg/m$^2$: Switzerland




BMI<20 kg/m$^2$: United Kingdom



# 7. Complications and therapy

The information in this section should not be considered complete, either because national registries do not collect data about 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.

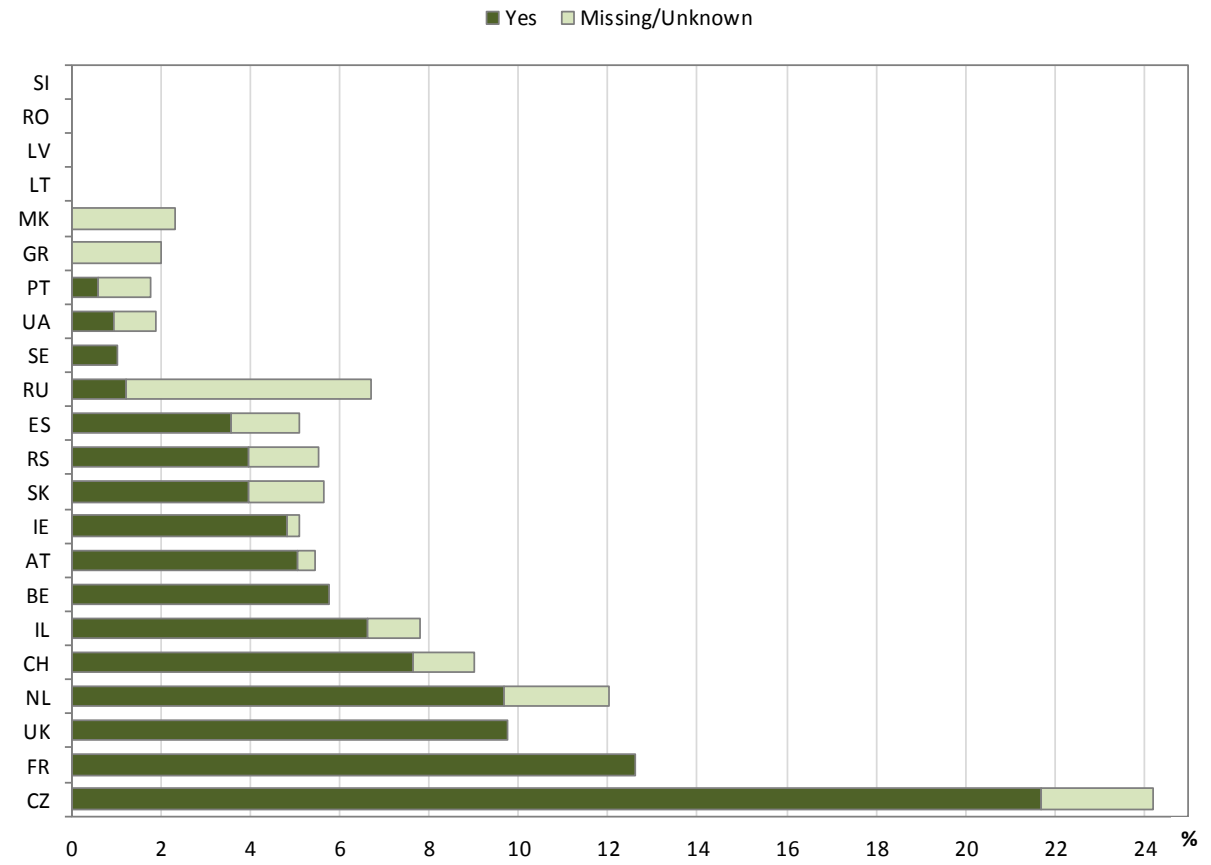
## *Table 7.1 Prevalence of allergic bronchopulmonary aspergillosis (all patients seen in 2011) and CFRD treated with insulin in 2011 (patients aged 18 years or older), by country.*

| 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** | 2 (0.39) | 487 (94.56) | 26 (5.05) | 0 (0) | 141 (80.57) | 34 (19.43) |
| **Belgium** | 0 (0) | 1084 (94.26) | 66 (5.74) | 67 (10.49) | 428 (66.97) | 144 (22.54) |
| **Czech Republic** | 14 (2.49) | 426 (75.80) | 122 (21.71) | 12 (5.20) | 145 (62.77) | 74 (32.03) |
| **Denmark** | 433 (100) | 0 (0) | 0 (0) | 0 (0) | 148 (60.41) | 97 (39.59) |
| **France**[1] | 0 (0) | 5244 (87.39) | 757 (12.61) | 0 (0) | 2284 (78.06) | 642 (21.94) |
| **Greece** | 2 (1.98) | 99 (98.02) | 0 (0) | 2 (6.06) | 26 (78.79) | 5 (15.15) |
| **Hungary** | 593 (100) | 0 (0) | 0 (0) | 251 (100) | 0 (0) | 0 (0) |
| **Ireland** | 3 (0.29) | 989 (94.91) | 50 (4.80) | 2 (0.39) | 366 (71.21) | 146 (28.40) |
| **Israel** | 6 (1.17) | 473 (92.20) | 34 (6.63) | 4 (1.44) | 203 (73.29) | 70 (25.27) |
| **Italy** | 1196 (25.88) | 3272 (70.81) | 153 (3.31) | 156 (6.47) | 1708 (70.84) | 547 (22.69) |
| **Latvia** | 0 (0) | 26 (100) | 0 (0) | 0 (0) | 5 (62.50) | 3 (37.50) |
| **Lithuania** | 0 (0) | 11 (100) | 0 (0) | 0 (0) | 11 (100) | 0 (0) |
| **Rep of Macedonia** | 2 (2.30) | 85 (97.70) | 0 (0) | 1 (5.26) | 14 (73.69) | 4 (21.05) |
| **Rep of Moldova** | 55 (98.21) | 1 (1.79) | 0 (0) | 0 (0) | 11 (100) | 0 (0) |
| **The Netherlands** | 29 (2.35) | 1083 (87.98) | 119 (9.67) | 13 (1.95) | 443 (66.52) | 210 (31.53) |
| **Portugal** | 2 (1.18) | 166 (98.22) | 1 (0.60) | 0 (0) | 58 (84.06) | 11 (15.94) |
| **Romania** | 0 (0) | 29 (100) | 0 (0) | - | - | - |
| **Russian Federation** | 59 (5.49) | 1002 (93.3) | 13 (1.21) | 18 (6.67) | 228 (84.44) | 24 (8.89) |
| **Serbia** | 2 (1.57) | 119 (94.49) | 5 (3.94) | 1 (2.77) | 29 (80.56) | 6 (16.67) |
| **Slovak Republic** | 3 (1.70) | 167 (94.35) | 7 (3.95) | 2 (1.89) | 91 (85.85) | 13 (12.26) |
| **Slovenia** | 0 (0) | 75 (100) | 0 (0) | 0 (0) | 18 (90.00) | 2 (10.00) |
| **Spain** | 18 (1.53) | 1119 (94.91) | 42 (3.56) | 13 (2.43) | 383 (71.59) | 139 (25.98) |
| **Sweden** | 0 (0) | 576 (98.97) | 6 (1.03) | 0 (0) | 248 (72.73) | 93 (27.27) |
| **Switzerland** | 8 (1.36) | 535 (90.99) | 45 (7.65) | 3 (1.29) | 175 (75.43) | 54 (23.28) |
| **Ukraine** | 1 (0.95) | 103 (98.10) | 1 (0.95) | 0 (0) | 11 (100) | 0 (0) |
| **United Kingdom** | 0 (0) | 7829 (90.24) | 847 (9.76) | 37 (0.81) | 3122 (68.83) | 1377 (30.36) |

[1] 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.

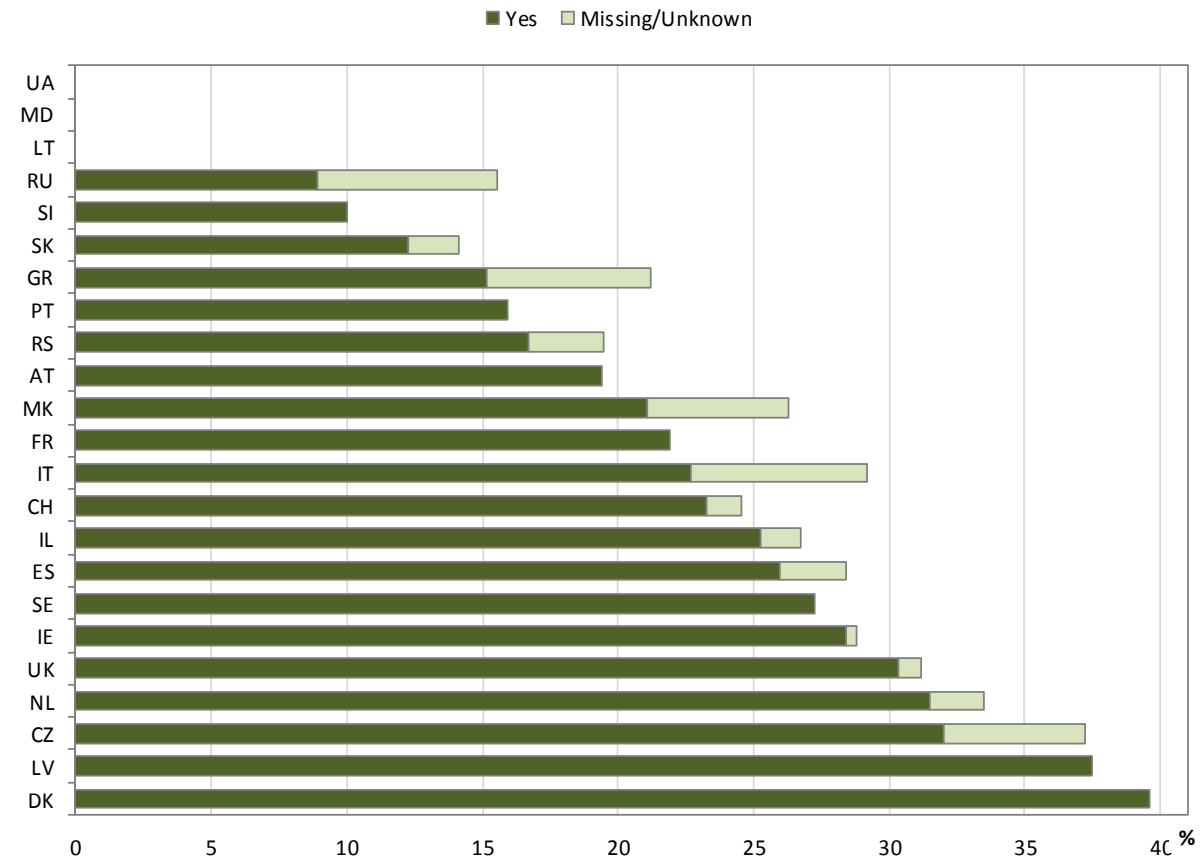
### *Figure 7.1 Prevalence of allergic bronchopulmonary aspergillosis in all patients seen in 2011, by country.*




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 2011 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.

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 2011, 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** | 3 (0.58) | 512 (99.42) | 0 (0) | 2 (0.38) | 507 (98.45) | 6 (1.17) | 4 (0.78) | 511 (99.22) | 0 (0) |
| **Belgium** | 0 (0) | 1148 (99.83) | 2 (0.17) | 0 (0) | 1139 (99.04) | 11 (0.96) | 0 (0) | 1144 (99.48) | 6 (0.52) |
| **Czech Republic** | 21 (3.74) | 533 (94.84) | 8 (1.42) | 21 (3.74) | 531 (94.48) | 10 (1.78) | 14 (2.49) | 548 (97.51) | 0 (0) |
| **Denmark** | 0 (0) | 432 (99.77) | 1 (0.23) | 433 (100) | 0 (0) | 0 (0) | 0 (0) | 432 (99.77) | 1 (0.23) |
| **France**[1] | 0 (0) | 5946 (99.08) | 55 (0.92) | 0 (0) | 5699 (94.97) | 302 (5.03) | 0 (0) | 5984 (99.72) | 17 (0.28) |
| **Greece** | 3 (2.97) | 98 (97.03) | 0 (0) | 4 (3.96) | 96 (95.05) | 1 (0.99) | 3 (2.97) | 98 (97.03) | 0 (0) |
| **Hungary** | 0 (0) | 540 (91.06) | 53 (8.94) | 593 (100) | 0 (0) | 0 (0) | 593 (100) | 0 (0) | 0 (0) |
| **Ireland** | 3 (0.29) | 1030 (98.85) | 9 (0.86) | 3 (0.29) | 1037 (99.52) | 2 (0.19) | 3 (0.28) | 1038 (99.62) | 1 (0.10) |
| **Israel** | 8 (1.56) | 503 (98.05) | 2 (0.39) | 5 (0.97) | 499 (97.27) | 9 (1.76) | 4 (0.78) | 508 (99.03) | 1 (0.19) |
| **Italy** | 458 (9.91) | 4143 (89.66) | 20 (0.43) | 465 (10.07) | 4086 (88.42) | 70 (1.51) | 459 (9.93) | 4149 (89.79) | 13 (0.28) |
| **Latvia** | 0 (0) | 26 (100) | 0 (0) | 0 (0) | 26 (100) | 0 (0) | 0 (0) | 26 (100) | 0 (0) |
| **Lithuania** | 0 (0) | 11 (100) | 0 (0) | 0 (0) | 10 (90.91) | 1 (9.09) | 0 (0) | 11 (100) | 0 (0) |
| **Rep of Macedonia** | 2 (2.30) | 85 (97.70) | 0 (0) | 2 (2.30) | 85 (97.70) | 0 (0) | 2 (2.30) | 85 (97.70) | 0 (0) |
| **Rep of Moldova** | 0 (0) | 56 (100) | 0 (0) | 0 (0) | 52 (92.86) | 4 (7.14) | 0 (0) | 56 (100) | 0 (0) |
| **The Netherlands**[2] | 160 (13.00) | 1064 (86.43) | 7 (0.57) | 32 (2.60) | 1143 (92.85) | 56 (4.55) | 35 (2.84) | 1192 (96.83) | 4 (0.33) |
| **Portugal** | 3 (1.78) | 165 (97.63) | 1 (0.59) | 3 (1.78) | 155 (91.72) | 11 (6.52) | 3 (1.78) | 166 (98.22) | 0 (0) |
| **Romania** | 0 (0) | 29 (100) | 0 (0) | 0 (0) | 28 (96.55) | 1 (3.45) | 0 (0) | 29 (100) | 0 (0) |
| **Russian Federation** | 36 (3.35) | 1023 (95.25) | 15 (1.40) | 39 (3.63) | 1009 (93.95) | 26 (2.42) | 33 (3.07) | 1037 (96.56) | 4 (0.37) |
| **Serbia** | 5 (3.94) | 122 (96.06) | 0 (0) | 2 (1.57) | 123 (96.86) | 2 (1.57) | 1 (0.79) | 126 (99.21) | 0 (0) |
| **Slovak Republic** | 3 (1.69) | 174 (98.31) | 0 (0) | 3 (1.69) | 161 (90.96) | 13 (7.35) | 2 (1.13) | 174 (98.31) | 1 (0.56) |
| **Slovenia** | 1 (1.33) | 74 (98.67) | 0 (0) | 0 (0) | 75 (100) | 0 (0) | 0 (0) | 75 (100) | 0 (0) |
| **Spain** | 20 (1.70) | 1157 (98.13) | 2 (0.17) | 24 (2.03) | 1093 (92.71) | 62 (5.26) | 21 (1.78) | 1154 (97.88) | 4 (0.34) |
| **Sweden** | 0 (0) | 579 (99.48) | 3 (0.52) | 0 (0) | 582 (100) | 0 (0) | 0 (0) | 581 (99.83) | 1 (0.17) |
| **Switzerland** | 7 (1.19) | 581 (98.81) | 0 (0) | 7 (1.19) | 562 (95.58) | 19 (3.23) | 8 (1.36) | 578 (98.30) | 2 (0.34) |
| **Ukraine** | 1 (0.95) | 104 (99.05) | 0 (0) | 0 (0) | 102 (97.14) | 3 (2.86) | 1 (0.95) | 104 (99.05) | 0 (0) |
| **United Kingdom** | 0 (0) | 8633 (99.50) | 43 (0.50) | 0 (0) | 8585 (98.95) | 91 (1.05) | 0 (0) | 8659 (99.80) | 17 (0.20) |

[1] France: pneumothorax only; haemoptysis, no quantification.
[2] 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 2011, 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** | 4 (0.78) | 284 (55.15) | 22 (4.27) | 21 (4.08) | 1 (0.19) | 183 (35.53) | 3 (0.58) | 260 (50.49) | 252 (48.93) |
| **Belgium**[1] | 0 (0) | 1116 (97.04) | 34 (2.96) | 0 (0) | 0 (0) | 0 (0) | 15 (1.30) | 845 (73.48) | 290 (25.22) |
| **Czech Republic** | 191 (33.99) | 236 (41.99) | 6 (1.07) | 3 (0.53) | 0 (0) | 126 (22.42) | 14 (2.49) | 313 (55.69) | 235 (41.81) |
| **Denmark**[2] | 407 (94.00) | 0 (0) | 0 (0) | 0 (0) | 26 (6.00) | 0 (0) | 0 (0) | 335 (77.37) | 98 (22.63) |
| **France**[3] | 0 (0) | 5756 (95.92) | 0 (0) | 0 (0) | 245 (4.08) | 0 (0) | 0 (0) | 4265 (71.07) | 1736 (28.93) |
| **Greece** | 4 (3.96) | 49 (48.51) | 40 (39.60) | 0 (0) | 0 (0) | 8 (7.92) | 3 (2.97) | 50 (49.50) | 48 (47.52) |
| **Hungary** | 0 (0) | 587 (98.99) | 6 (1.01) | 0 (0) | 0 (0) | 0 (0) | 593 (100) | 0 (0) | 0 (0) |
| **Ireland** | 3 (0.29) | 913 (87.62) | 30 (2.88) | 0 (0) | 0 (0) | 96 (9.21) | 19 (1.82) | 862 (82.73) | 161 (15.45) |
| **Israel** | 6 (1.17) | 410 (79.92) | 10 (1.95) | 5 (0.97) | 0 (0) | 82 (15.98) | 5 (0.97) | 419 (81.68) | 89 (17.35) |
| **Italy** | 459 (9.93) | 3191 (69.05) | 56 (1.21) | 30 (0.65) | 8 (0.17) | 877 (18.98) | 519 (11.23) | 2804 (60.68) | 1298 (28.09) |
| **Latvia** | 0 (0) | 10 (38.46) | 1 (3.85) | 0 (0) | 0 (0) | 15 (57.69) | 0 (0) | 12 (46.15) | 14 (53.85) |
| **Lithuania** | 0 (0) | 11 (100) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 11 (100) | 0 (0) |
| **Rep of Macedonia** | 2 (2.30) | 46 (52.87) | 2 (2.30) | 19 (21.84) | 0 (0) | 18 (20.69) | 2 (2.30) | 46 (52.87) | 39 (44.83) |
| **Rep of Moldova** | 0 (0) | 56 (100) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 26 (46.43) | 30 (53.57) |
| **The Netherlands** | 54 (4.39) | 1030 (83.67) | 53 (4.31) | 9 (0.73) | 77 (6.26) | 8 (0.65) | 40 (3.25) | 837 (67.99) | 354 (28.76) |
| **Portugal** | 4 (2.37) | 144 (85.21) | 3 (1.78) | 0 (0) | 0 (0) | 18 (10.65) | 2 (1.18) | 123 (72.78) | 44 (26.04) |
| **Romania** | 0 (0) | 26 (89.66) | 0 (0) | 0 (0) | 0 (0) | 3 (10.34) | 0 (0) | 26 (89.66) | 3 (10.34) |

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

[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]*

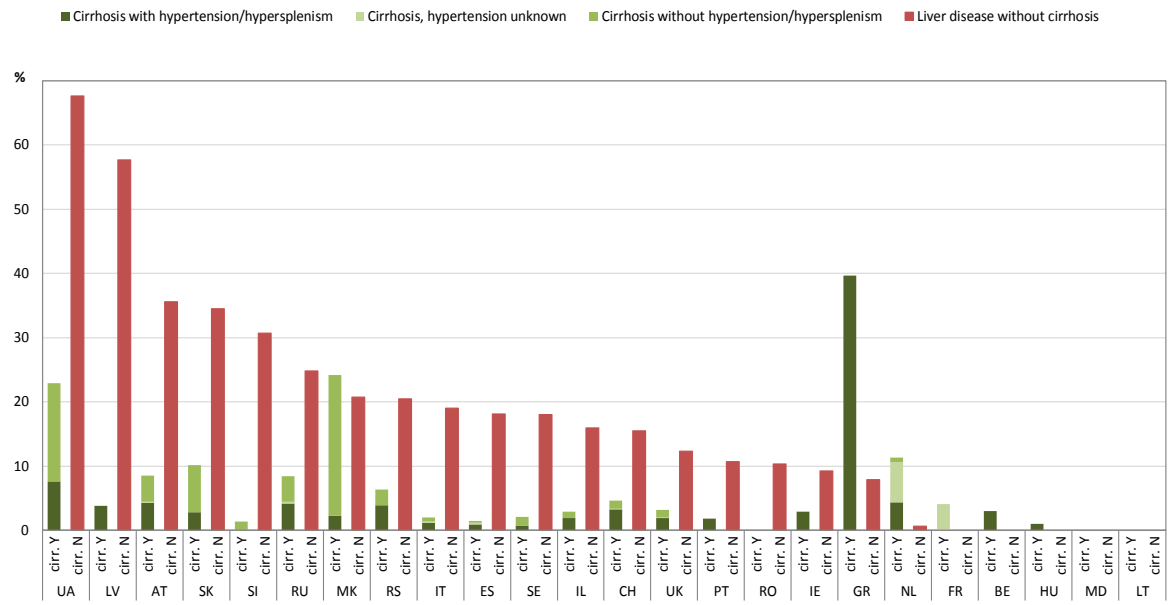
| Country | Liver disease this year number (%) | | | | | | Ursodeoxycholic acid this year number (%) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Missing/ unknown | No liver disease | Cirrhosis | | | Liver disease without cirrhosis | Missing/ unknown | No | Yes |
| | | | Cirrhosis with portal hypertension/ hypersplenism | Cirrhosis no portal hypertension/ hypersplenism | Cirrhosis, portal hypertension unknown | | | | |
| **Russian Federation** | 38 (3.54) | 680 (63.31) | 45 (4.19) | 42 (3.91) | 3 (0.28) | 266 (24.77) | 19 (1.77) | 73 (6.80) | 982 (91.43) |
| **Serbia**[4] | 1 (0.79) | 92 (72.44) | 5 (3.94) | 3 (2.36) | 0 (0) | 26 (20.47) | 2 (1.57) | 94 (74.02) | 31 (24.41) |
| **Slovak Republic** | 2 (1.13) | 96 (54.24) | 5 (2.82) | 13 (7.34) | 0 (0) | 61 (34.46) | 3 (1.69) | 76 (42.94) | 98 (55.37) |
| **Slovenia** | 0 (0) | 51 (68.00) | 0 (0) | 1 (1.33) | 0 (0) | 23 (30.67) | 0 (0) | 31 (41.33) | 44 (58.67) |
| **Spain** | 19 (1.61) | 929 (78.80) | 11 (0.93) | 3 (0.25) | 3 (0.25) | 214 (18.15) | 18 (1.53) | 905 (76.76) | 256 (21.71) |
| **Sweden**[5] | 0 (0) | 465 (79.90) | 4 (0.69) | 8 (1.37) | 0 (0) | 105 (18.04) | 14 (2.41) | 435 (74.74) | 133 (22.85) |
| **Switzerland** | 21 (3.57) | 449 (76.36) | 19 (3.23) | 7 (1.19) | 1 (0.17) | 91 (15.48) | 6 (1.02) | 417 (70.92) | 165 (28.06) |
| **Ukraine** | 2 (1.90) | 8 (7.62) | 8 (7.62) | 16 (15.24) | 0 (0) | 71 (67.62) | 2 (1.90) | 5 (4.76) | 98 (93.33) |
| **United Kingdom** | 0 (0) | 7326 (84.44) | 166 (1.91) | 108 (1.24) | 5 (0.06) | 1071 (12.34) | 242 (2.79) | 6653 (76.68) | 1781 (20.53) |

[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 2011, by country.***

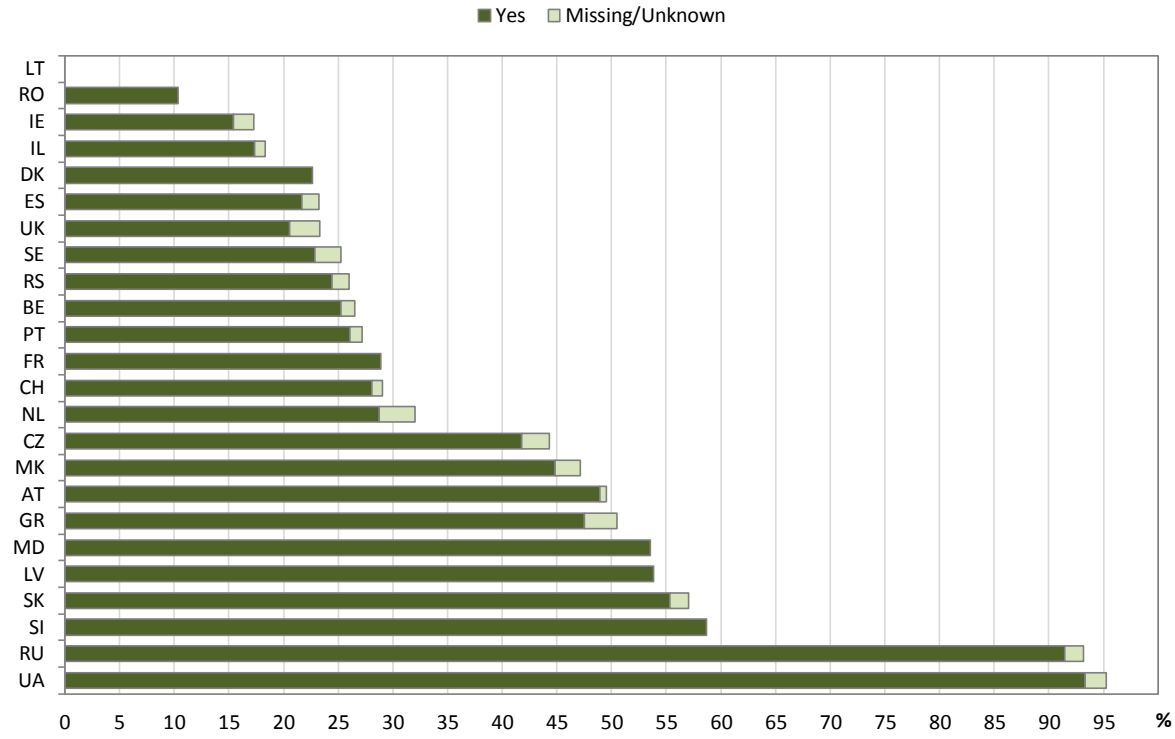



Note: We excluded from the graph the countries where the information on liver disease was missing for more than 10% of the patients.

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 issues with local software. 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, page 119). 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 2011, 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.

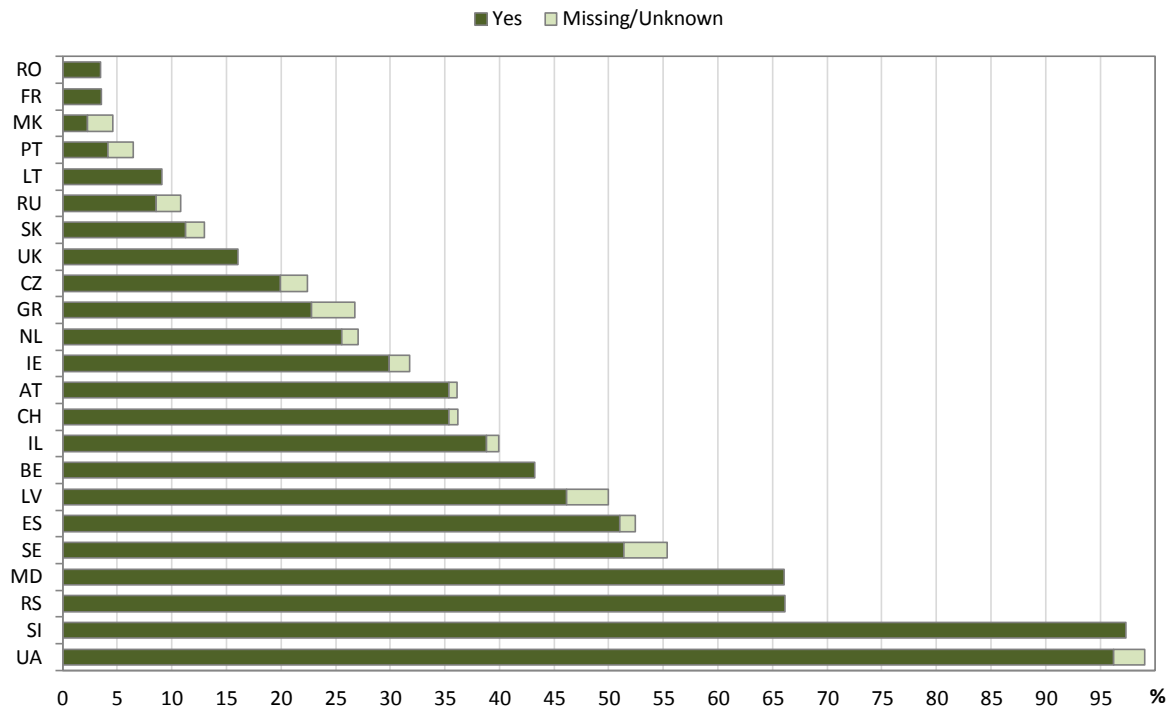
## *Table 7.4 Use of hypertonic saline, rhDNase and bronchodilators in all patients seen in 2011, by country.*

| 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** | 4 (0.78) | 329 (63.88) | 182 (35.34) | 8 (1.55) | 265 (51.46) | 242 (46.99) | 3 (0.58) | 64 (12.43) | 448 (86.99) |
| **Belgium** | 0 (0) | 653 (56.78) | 497 (43.22) | 0 (0) | 436 (37.91) | 714 (62.09) | 0 (0) | 380 (33.04) | 770 (66.96) |
| **Czech Republic** | 14 (2.49) | 436 (77.58) | 112 (19.93) | 14 (2.49) | 222 (39.50) | 326 (58.01) | 14 (2.49) | 290 (51.60) | 258 (45.91) |
| **Denmark** | 433 (100) | 0 (0) | 0 (0) | 0 (0) | 93 (21.48) | 340 (78.52) | 433 (100) | 0 (0) | 0 (0) |
| **France** | 0 (0) | 5787 (96.43) | 214 (3.57) | 0 (0) | 3189 (53.14) | 2812 (46.86) | 0 (0) | 3067 (51.11) | 2934 (48.89) |
| **Greece** | 4 (3.96) | 74 (73.27) | 23 (22.77) | 5 (4.95) | 34 (33.66) | 62 (61.39) | 3 (2.97) | 46 (45.54) | 52 (51.49) |
| **Hungary** | 593 (100) | 0 (0) | 0 (0) | 593 (100) | 0 (0) | 0 (0) | 593 (100) | 0 (0) | 0 (0) |
| **Ireland** | 19 (1.82) | 711 (68.23) | 312 (29.94) | 19 (1.82) | 647 (62.10) | 376 (36.08) | 19 (1.82) | 470 (45.11) | 553 (53.07) |
| **Israel** | 6 (1.17) | 308 (60.04) | 199 (38.79) | 3 (0.58) | 226 (44.06) | 284 (55.36) | 4 (0.78) | 226 (44.05) | 283 (55.17) |
| **Italy** | 1225 (26.51) | 2297 (49.71) | 1099 (23.78) | 517 (11.19) | 2972 (64.32) | 1132 (24.49) | 1226 (26.53) | 943 (20.41) | 2452 (53.06) |
| **Latvia** | 1 (3.85) | 13 (50.00) | 12 (46.15) | 1 (3.85) | 5 (19.23) | 20 (76.92) | 0 (0) | 1 (3.85) | 25 (96.15) |
| **Lithuania** | 0 (0) | 10 (90.91) | 1 (9.09) | 0 (0) | 2 (18.18) | 9 (81.82) | 0 (0) | 2 (18.18) | 9 (81.82) |
| **Rep of Macedonia** | 2 (2.30) | 83 (95.40) | 2 (2.30) | 2 (2.30) | 39 (44.83) | 46 (52.87) | 2 (2.30) | 3 (3.45) | 82 (94.25) |
| **Rep of Moldova** | 0 (0) | 19 (33.93) | 37 (66.07) | 0 (0) | 56 (100) | 0 (0) | 0 (0) | 22 (39.29) | 34 (60.71) |
| **The Netherlands** | 18 (1.46) | 898 (72.95) | 315 (25.59) | 19 (1.54) | 432 (35.10) | 780 (63.36) | 20 1.62 | 626 50.86 | 585 47.52 |
| **Portugal** | 4 (2.37) | 158 (93.49) | 7 (4.14) | 1 (0.59) | 57 (33.73) | 111 (65.68) | 1 (0.59) | 81 (47.93) | 87 (51.48) |
| **Romania** | 0 (0) | 28 (96.55) | 1 (3.45) | 0 (0) | 4 (13.79) | 25 (86.21) | 0 (0) | 2 (6.90) | 27 (93.10) |
| **Russian Federation** | 24 (2.23) | 958 (89.20) | 92 (8.57) | 18 (1.68) | 75 (6.98) | 981 (91.34) | 46 (4.28) | 369 (34.36) | 659 (61.36) |
| **Serbia** | 0 (0) | 43 (33.86) | 84 (66.14) | 1 (0.79) | 64 (50.39) | 62 (48.82) | 1 (0.79) | 4 (3.15) | 122 (96.06) |
| **Slovak Republic** | 3 (1.69) | 154 (87.01) | 20 (11.30) | 4 (2.26) | 67 (37.85) | 106 (59.89) | 4 (2.26) | 74 (41.81) | 99 (55.93) |
| **Slovenia** | 0 (0) | 2 (2.67) | 73 (97.33) | 0 (0) | 44 (58.67) | 31 (41.33) | 1 (1.33) | 63 (84.00) | 11 (14.67) |
| **Spain** | 17 (1.44) | 561 (47.58) | 601 (50.98) | 17 (1.44) | 929 (78.80) | 233 (19.76) | 18 (1.53) | 385 (32.65) | 776 (65.82) |
| **Sweden** | 23 (3.95) | 260 (44.67) | 299 (51.37) | 14 (2.41) | 447 (76.80) | 121 (20.79) | 17 (2.92) | 60 (10.31) | 505 (86.77) |
| **Switzerland** | 5 (0.85) | 375 (63.78) | 208 (35.37) | 5 (0.85) | 357 (60.71) | 226 (38.44) | 5 (0.85) | 64 (10.88) | 519 (88.27) |
| **Ukraine** | 3 (2.86) | 1 (0.95) | 101 (96.19) | 1 (0.95) | 104 (99.05) | 0 (0) | 3 (2.86) | 42 (40.00) | 60 (57.14) |
| **United Kingdom**[1] | 0 (0) | 7285 (83.97) | 1391 (16.03) | 0 (0) | 4733 (54.55) | 3943 (45.45) | 0 (0) | 3960 (45.64) | 4716 (54.36) |

[1] 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.

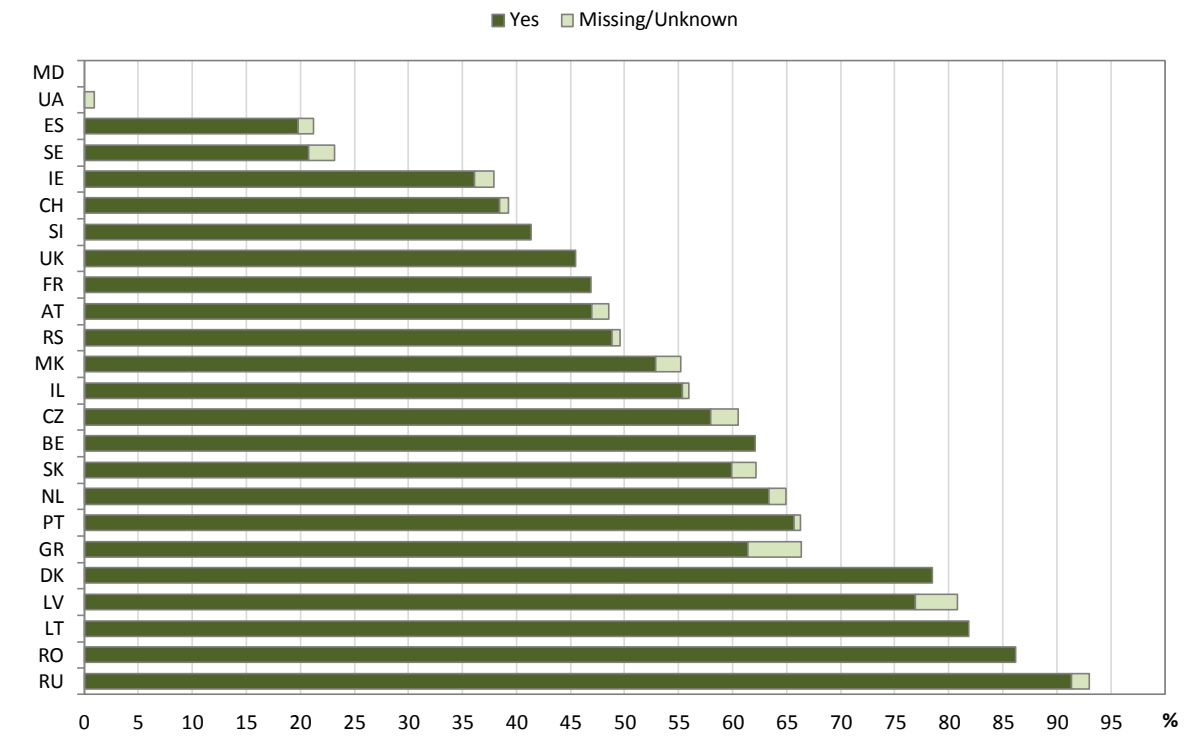
### *Figure 7.5 Use of inhaled hypertonic saline in all patients seen in 2011, by country.*




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.

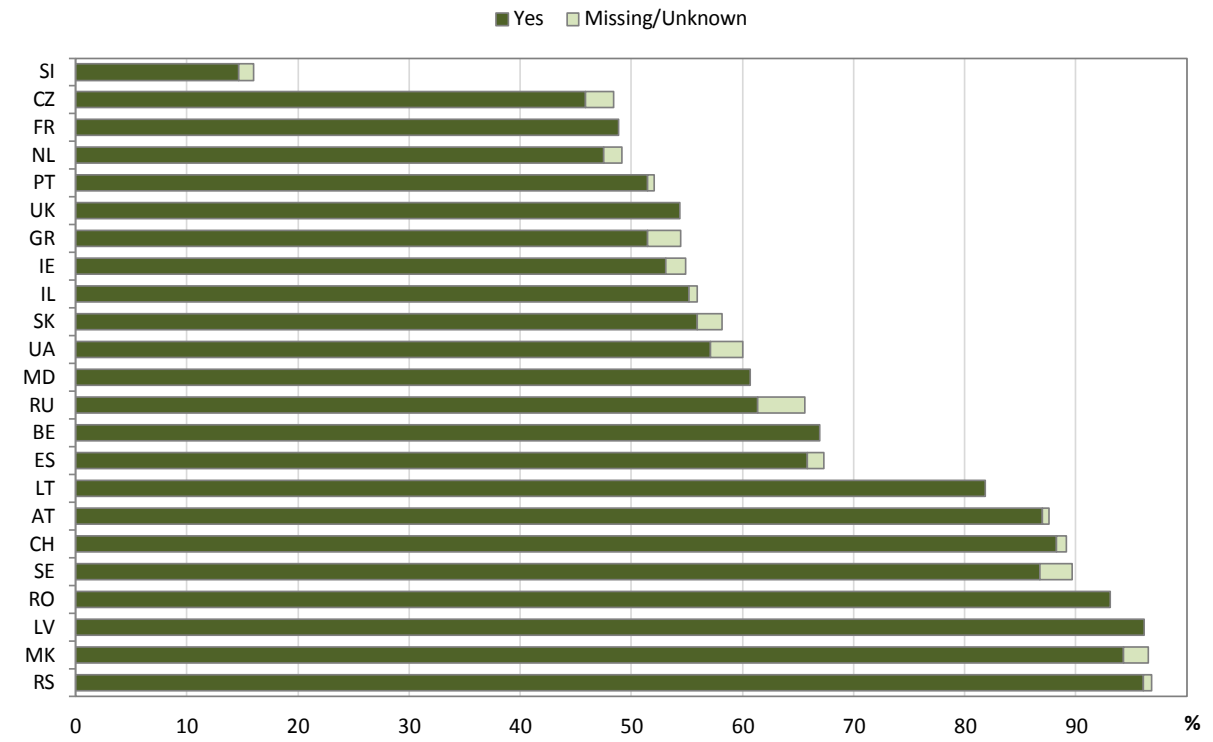
***Figure 7.6 Use of rhDNase in all patients seen in 2011, by country.***




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 2011, 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 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.

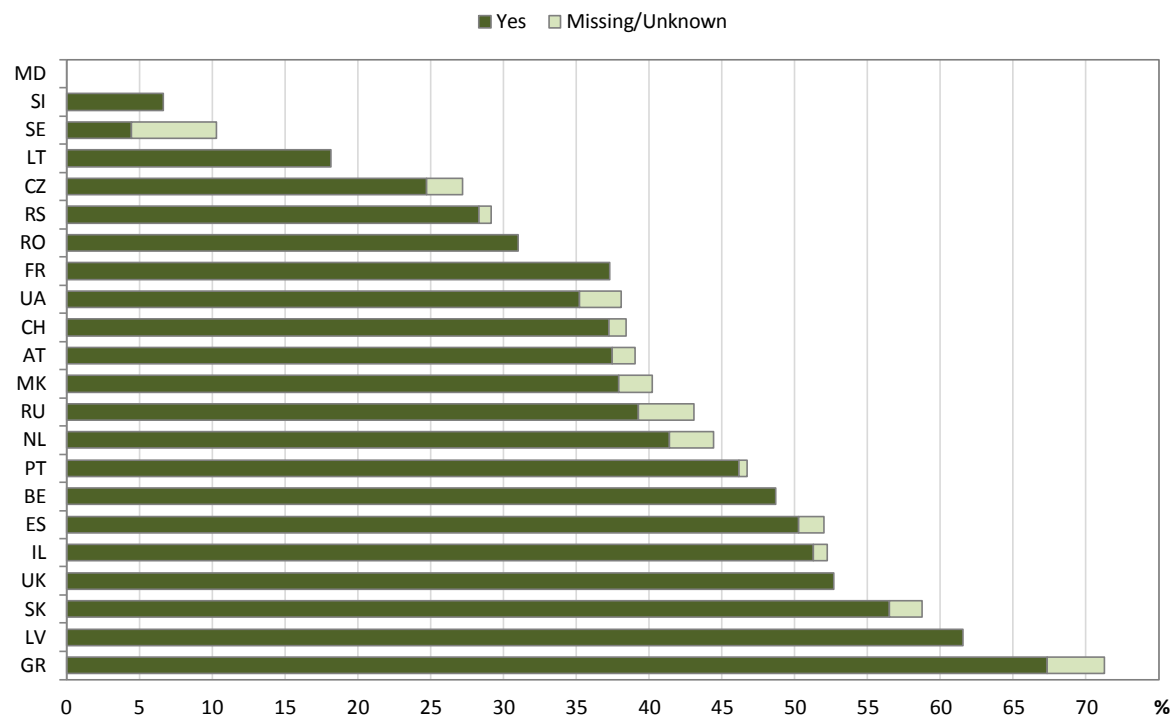
## *Table 7.5 Use of inhaled antibiotics, macrolides and oxygen in all patients seen in 2011, by country.*

| 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** | 8 (1.55) | 314 (60.97) | 193 (37.48) | 6 (1.17) | 491 (95.33) | 18 (3.50) | 6 (1.17) | 431 (83.68) | 78 (15.15) |
| **Belgium** | 0 (0) | 590 (51.30) | 560 (48.70) | 0 (0) | 1118 (97.22) | 32 (2.78) | 0 (0) | 633 (55.04) | 517 (44.96) |
| **Czech Republic** | 14 (2.49) | 409 (72.78) | 139 (24.73) | 14 (2.49) | 535 (95.20) | 13 (2.31) | 14 (2.49) | 445 (79.18) | 103 (18.33) |
| **Denmark** | 433 (100) | 0 (0) | 0 (0) | 433 (100) | 0 (0) | 0 (0) | 433 (100) | 0 (0) | 0 (0) |
| **France**[1] | 0 (0) | 3763 (62.71) | 2238 (37.29) | 0 (0) | 5646 (94.08) | 355 (5.92) | 0 (0) | 3477 (57.94) | 2524 (42.06) |
| **Greece** | 4 (3.96) | 29 (28.71) | 68 (67.33) | 5 (4.95) | 93 (92.08) | 3 (2.97) | 4 (3.96) | 78 (77.23) | 19 (18.81) |
| **Hungary** | 593 (100) | 0 (0) | 0 (0) | 593 (100) | 0 (0) | 0 (0) | 593 (100) | 0 (0) | 0 (0) |
| **Ireland** | 133 (12.76) | 447 (42.90) | 462 (44.34) | 19 (1.82) | 1002 (96.16) | 21 (2.02) | 37 (3.55) | 626 (60.08) | 379 (36.37) |
| **Israel** | 5 (0.97) | 245 (47.76) | 263 (51.27) | 4 (0.78) | 493 (96.10) | 16 (3.12) | 4 (0.78) | 242 (47.17) | 267 (52.05) |
| **Italy** | 517 (11.19) | 2758 (59.68) | 1346 (29.13) | 517 (11.19) | 3891 (84.20) | 213 (4.61) | 518 (11.21) | 2728 (59.03) | 1375 (29.76) |
| **Latvia** | 0 (0) | 10 (38.46) | 16 (61.54) | 0 (0) | 24 (92.31) | 2 (7.69) | 0 (0) | 17 (65.38) | 9 (34.62) |
| **Lithuania** | 0 (0) | 9 (81.82) | 2 (18.18) | 0 (0) | 7 (63.64) | 4 (36.36) | 0 (0) | 9 (81.82) | 2 (18.18) |
| **Rep of Macedonia** | 2 (2.30) | 52 (59.77) | 33 (37.93) | 2 (2.30) | 85 (97.70) | 0 (0) | 2 (2.30) | 71 (81.61) | 14 (16.09) |
| **Rep of Moldova** | 0 (0) | 56 (100) | 0 (0) | 0 (0) | 56 (100) | 0 (0) | 0 (0) | 38 (67.86) | 18 (32.14) |
| **The Netherlands** | 37 (3.01) | 684 (55.56) | 510 (41.43) | 22 (1.78) | 1156 (93.91) | 53 (4.31) | 151 (12.27) | 551 (44.76) | 529 (42.97) |
| **Portugal** | 1 (0.59) | 90 (53.26) | 78 (46.15) | 3 (1.77) | 150 (88.76) | 16 (9.47) | 2 (1.18) | 115 (68.05) | 52 (30.77) |
| **Romania** | 0 (0) | 20 (68.97) | 9 (31.03) | 0 (0) | 29 (100) | 0 (0) | 0 (0) | 27 (93.10) | 2 (6.90) |
| **Russian Federation** | 41 (3.82) | 611 (56.89) | 422 (39.29) | 37 (3.45) | 973 (90.60) | 64 (5.95) | 164 (15.27) | 604 (56.24) | 306 (28.49) |
| **Serbia** | 1 (0.79) | 90 (70.87) | 36 (28.34) | 0 (0) | 118 (92.91) | 9 (7.09) | 2 (1.57) | 108 (85.04) | 17 (13.39) |
| **Slovak Republic** | 4 (2.26) | 73 (41.24) | 100 (56.5) | 4 (2.26) | 169 (95.48) | 4 (2.26) | 3 (1.69) | 90 (50.85) | 84 (47.46) |
| **Slovenia** | 0 (0) | 70 (93.33) | 5 (6.67) | 0 (0) | 73 (97.33) | 2 (2.67) | 0 (0) | 65 (86.67) | 10 (13.33) |
| **Spain** | 20 (1.70) | 566 (48.00) | 593 (50.30) | 17 (1.44) | 1126 (95.50) | 36 (3.06) | 20 (1.70) | 712 (60.39) | 447 (37.91) |
| **Sweden** | 34 (5.84) | 522 (89.69) | 26 (4.47) | 19 (3.26) | 549 (94.33) | 14 (2.41) | 20 (3.44) | 360 (61.85) | 202 (34.71) |
| **Switzerland** | 7 (1.19) | 362 (61.56) | 219 (37.24) | 6 (1.02) | 562 (95.58) | 20 (3.40) | 5 (0.85) | 406 (69.06) | 177 (30.10) |
| **Ukraine** | 3 (2.86) | 65 (61.90) | 37 (35.24) | 1 (0.95) | 99 (94.29) | 5 (4.76) | 3 (2.86) | 7 (6.67) | 95 (90.48) |
| **United Kingdom**[2] | 0 (0) | 4104 (47.30) | 4572 (52.70) | 276 (3.18) | 7832 (90.27) | 568 (6.55) | 0 (0) | 4885 (56.30) | 3791 (43.70) |

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

Table 7.5 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).

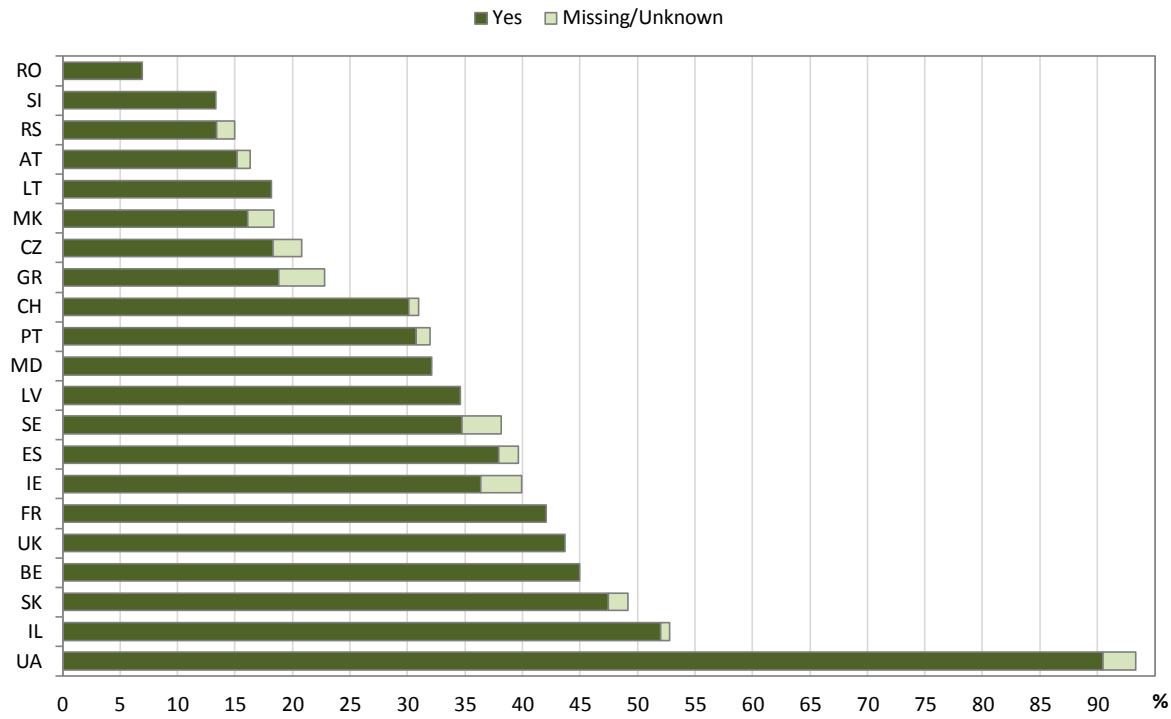
### *Figure 7.8 Use of inhaled antibiotics in all patients seen in 2011, by country.*




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 year. The frequency varies considerably, from 5 to 67%. 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.

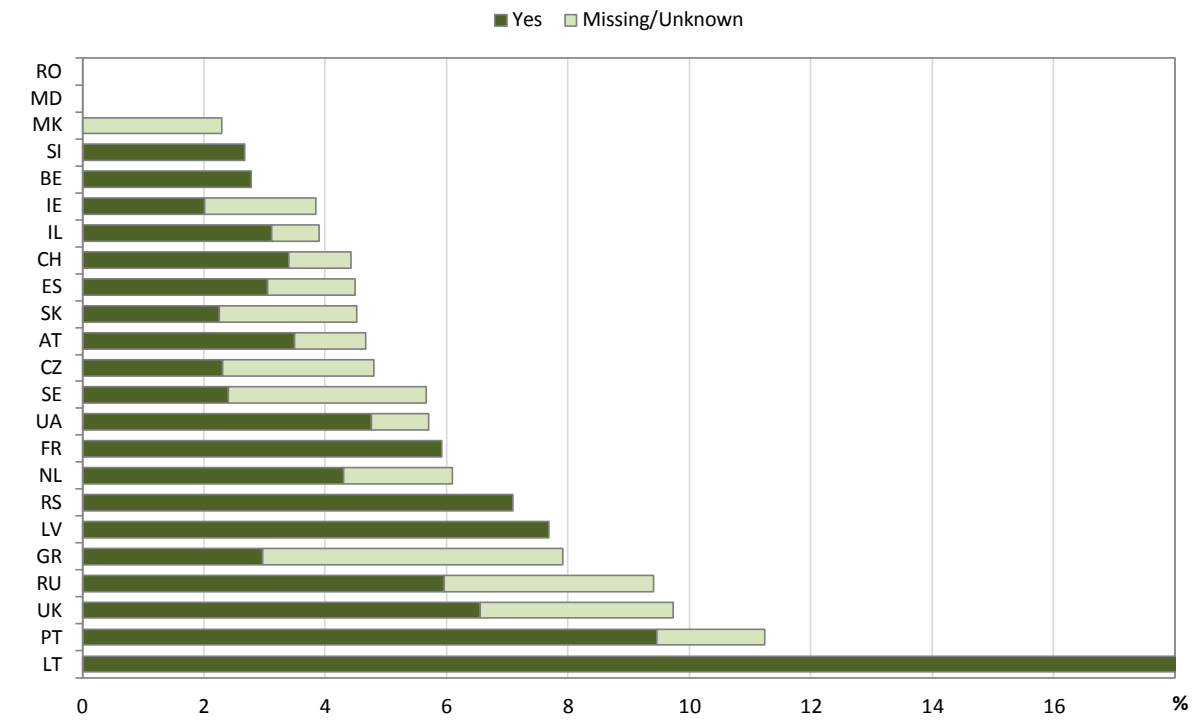
***Figure 7.9 Use of macrolides in all patients seen in 2011, by country.***




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 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 2011, 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 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 2011 with transplanted lungs, by age and sex.*

| Age | Males | Females | Total | Transplants performed during the survey year |
|---|---|---|---|---|
| **5-9** | 1 | 1 | 2 | 2 |
| **10-14** | 11 | 15 | 26 | 5 |
| **15-19** | 31 | 51 | 82 | 19 |
| **20-24** | 78 | 107 | 185 | 48 |
| **25-29** | 119 | 138 | 257 | 56 |
| **30-34** | 128 | 143 | 271 | 36 |
| **35-39** | 137 | 103 | 240 | 24 |
| **40-44** | 110 | 83 | 193 | 7 |
| **45+** | 80 | 58 | 138 | 15 |
| **Total** | 695 | 699 | 1394 | 212 |

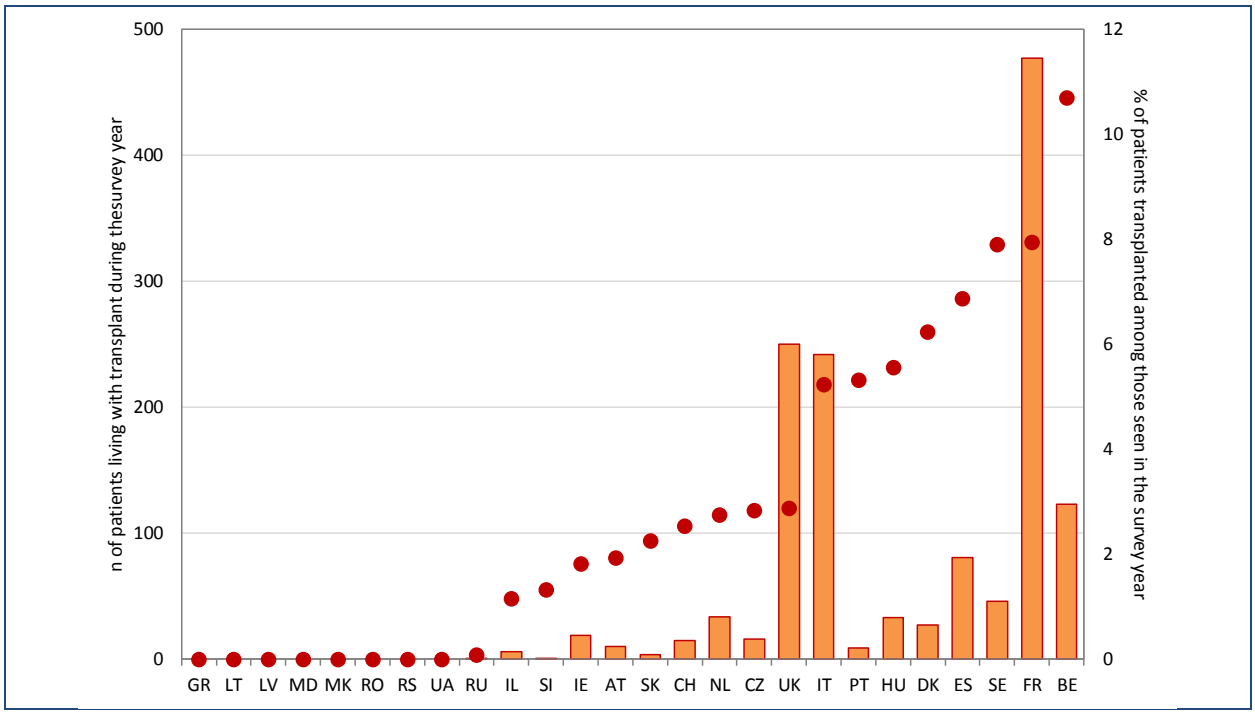
This table shows the number of patients alive in 2011 who have had a lung transplant at some time in their life, by age group, as well as the number of patients transplanted during 2011.

### *Table 8.2 Number of patients living in 2011 with transplanted liver, by age and sex.*

| Age | Males | Females | Total | Transplants performed during the survey year |
|---|---|---|---|---|
| **0-4** | 1 | 0 | 1 | 0 |
| **5-9** | 2 | 1 | 3 | 0 |
| **10-14** | 5 | 4 | 9 | 2 |
| **15-19** | 16 | 5 | 21 | 2 |
| **20-24** | 22 | 18 | 40 | 1 |
| **25-29** | 22 | 8 | 30 | 1 |
| **30-34** | 23 | 10 | 33 | 2 |
| **35-39** | 12 | 4 | 16 | 1 |
| **40-44** | 4 | 3 | 7 | 0 |
| **45+** | 2 | 1 | 3 | 0 |
| **Total** | 109 | 54 | 163 | 9 |

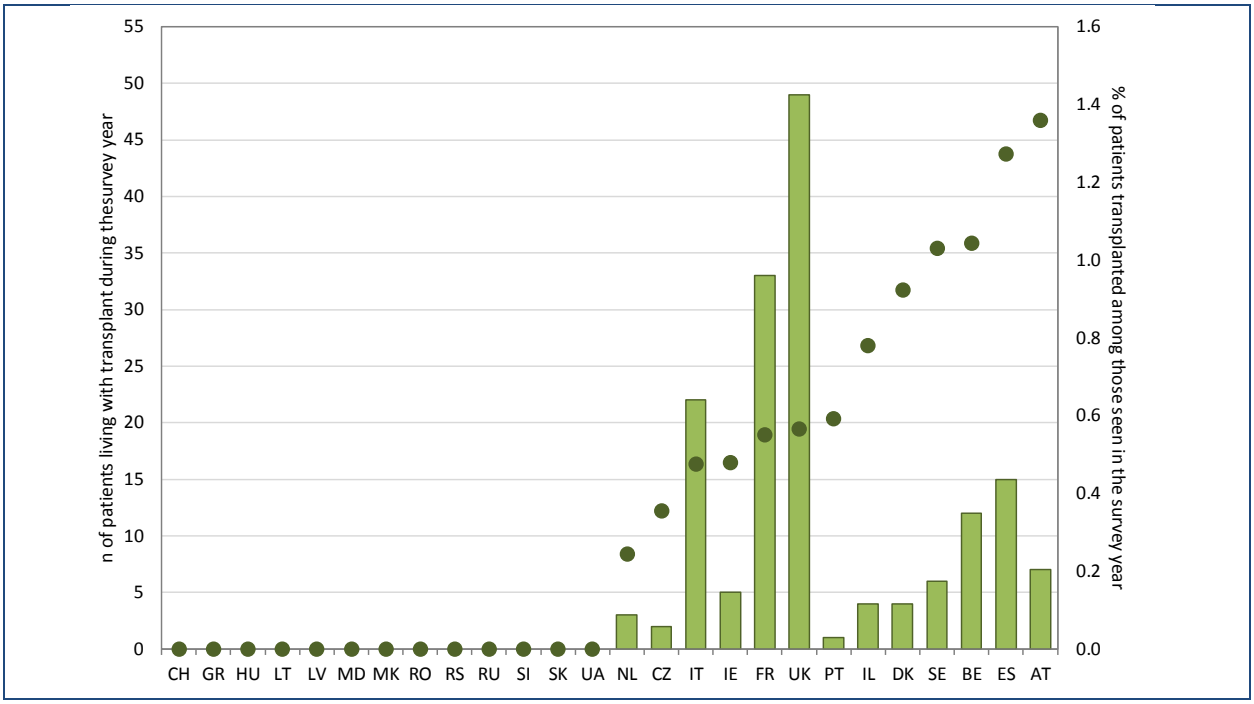
This table shows the number of patients alive in 2011 who have had a liver transplant at some time in their life, by age group, as well as the number of patients transplanted during 2011.

***Figure 8.1 Number of patients living in 2011 with transplanted lungs, by country.***




This graph shows the number of patients alive in 2011 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 2011 among the patients that were seen in 2011.

***Figure 8.2 Number of patients living in 2011 with transplanted liver, by country.***




This graph shows the number of patients alive in 2011 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 2011 among the patients that were seen in 2011.

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 2011, by age and sex.*

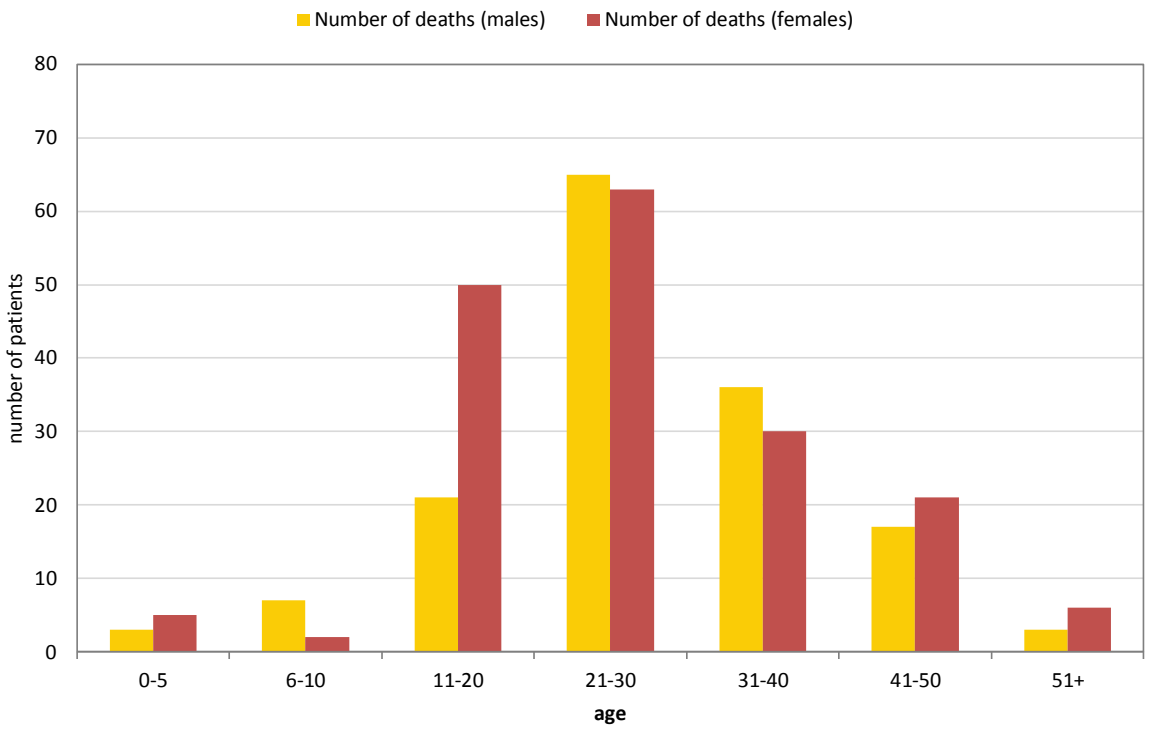
| Age at death | Number of male patients | % of deaths in this age group of all male deaths | Number of female patients | % of deaths in this age group of all female deaths | Total | % Total |
|---|---|---|---|---|---|---|
| **0-5** | 3 | 1.97 | 5 | 2.82 | 8 | 2.43 |
| **6-10** | 7 | 4.61 | 2 | 1.13 | 9 | 2.74 |
| **11-20** | 21 | 13.82 | 50 | 28.25 | 71 | 21.58 |
| **21-30** | 65 | 42.76 | 63 | 35.59 | 128 | 38.91 |
| **31-40** | 36 | 23.68 | 30 | 16.95 | 66 | 20.06 |
| **41-50** | 17 | 11.18 | 21 | 11.86 | 38 | 11.55 |
| **51+** | 3 | 1.97 | 6 | 3.39 | 9 | 2.74 |
| **Total** | 152 | | 177 | | 329 | |

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=9,746). The total number of patients presented is 30,793.

Note: For 4 patients (1 male and 3 female) date at death, and thereby age at death, is unknown.

This table shows the number of deaths in 2011 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 2011, 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=9,746). The total number of patients presented is 30,793.

Note: For 4 patients (1 male and 3 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 2011, separately by males (yellow) and females (red).

### *Table 9.2 Cause of death distribution of deaths in 2011.*

| Cause of death | Number of deaths | Percentage of all deaths |
|---|---|---|
| **Respiratory disease** | 200 | 60.06 |
| **Transplantation related** | 44 | 13.21 |
| **Non-CF related** | 22 | 6.61 |
| **Liver-GI related** | 5 | 1.50 |
| **Suicide** | 3 | 0.90 |
| **Trauma** | 6 | 1.80 |
| **Unknown** | 53 | 15.91 |
| **Total** | 333 | 100 |

Note: Ireland and United Kingdom collect 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. An overview of the published articles can be found on the webpage www.ecfs.eu/projects/ecfs-patient-registry/articles.

For an overview of the approved applications for data for which there is no publication, we refer you to 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 15$^{th}$ 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 1$^{st}$ 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 instructions from the national registries/individual centres. 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 could 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 obliged 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 the 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 9.4. Copyright, SAS Institute Inc. SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc., Cary, NC, USA.

[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 is used:
   Global Lung Function Initiative equations described by Quanjer PH et al. (Multi-ethnic reference values for spirometry for the 3-95-yr age range: the global lung function 2012 equations. Eur Respir J 2012; 40: 1324–1343).

   In previous reports and presented in Appendix 3 of this report, page 126, calculations are based on the reference values:

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.