Cystic Fibrosis our focus

UK Cystic Fibrosis Registry

Annual Data Report 2013: Summary
July 2014

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The Cystic Fibrosis Trust makes a daily difference to the lives of people with cystic fibrosis and those who care for them by:

- investing in cutting-edge research;
- driving up standards of care;
- offering support and advice to people with cystic fibrosis and their families;
- campaigning hard on behalf of the 10000+ people with cystic fibrosis in the UK; and
- shouting loud to raise awareness, increase understanding of cystic fibrosis and raise vital funds.

Get involved at cysticfibrosis.org.uk

Introduction

We are pleased to present this summary of the UK Cystic Fibrosis (CF) Registry's 2013 scientific report. It is the second year in which we have provided this summary, in a user-friendly form, to ensure that all those with cystic fibrosis and their families have full access to the information contained in the scientific report.

We hope that the information contained in this report will improve general understanding of cystic fibrosis. Most of all, we hope it will help people with cystic fibrosis and their families take an active role alongside their clinical teams in shaping their treatment.

This second report has a particular research theme. We highlight research in the area of lung infections to enable better treatments to be developed; research exploring the potential for improving the quality of donor lungs for transplant; and there is an update on the project looking at how to identify and deliver excellent care across all centres. For the first time, this year we have included analysis by centre as part of our work in sharing information on outcomes around the country.

As with last year, this report includes the median survival rate for people with cystic fibrosis in the UK. This measure has increased for each of the last four years, rising to more than 43 years in 2012. In this report, however, the figure is 36.6.

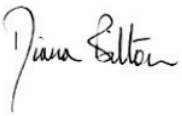
Interpretation of this figure should be treated with caution, not least because of statistical variations relating to the number of deaths in any one year. It is not an indicator of the likely life expectancy of a child born with cystic fibrosis today.

The general trend in survival for cystic fibrosis is upwards, and this is likely to continue for years to come. We are working to establish better ways of reflecting this in the future.

The number of people with cystic fibrosis registered, 10338 in 2013, is a figure that increases year on year. This increase is due to improved survival, newborn screening and increasing awareness among clinicians in the diagnosis of adults with cystic fibrosis. As the number registered increases, providing more data to analyse, we are better able to compare outcomes over time and show where improvements are being made.

In this 50th anniversary year of the Cystic Fibrosis Trust, we repeat our gratitude to all the people with cystic fibrosis and their families who agree to share their data for the purposes of the Registry. In doing so they are helping support vital research and improved services for all those touched by the condition.

Ed Owen
Chief Executive,
Cystic Fibrosis Trust



Professor Diana Bilton
Chair,
Registry Steering Committee

Summary of findings

These are some of the key findings in the analysis of the Registry data for 2013:

- There were 146 deaths reported in 2013, at a median age of 29 years. This means half of the people with cystic fibrosis (CF) who died in 2013 were older than 29 years.
- The median survival for the CF population is currently 36.6 years, compared to 34.4 in 2009. Out of 146 deaths in 2013, five were in the under-16 age group.
- In 2013, the median FEV_1 in children aged six to 11 years was greater than 85%.
- There has been a statistically significant* increase in the use of nebulised drug treatment in 2013 compared to 2008 in all age groups, which should result in better long-term outcomes.
- There has been a reduction in chronic pseudomonas infection in 2013 compared to 2008. This reduction was statistically significant* in several age groups.
- 50 people with cystic fibrosis received a double lung or heart and lung transplant in 2013, compared to 19 in 2009.

***A difference described as 'statistically significant' means that it is very unlikely that the difference observed is purely down to chance.**

About the Registry

The Registry tracks the health and treatment of people with cystic fibrosis; information is collected every year from more than 10000 people who receive care at accredited CF centres and agree to participate in the Registry.

The data collected includes area of residence, gender, age, height, weight, CF mutations, pulmonary function test results, medication use and problems (complications) related to cystic fibrosis.

This completely anonymised data set, held on a secure and confidential computer database, is available to clinicians, researchers, NHS commissioners and to industry, under the scrutiny of the CF Registry Steering Committee.

This data is used to:

- facilitate research and development aimed at improving outcomes for people with cystic fibrosis;
- support the planning and commissioning of cystic fibrosis NHS services at designated centres;
- enable centre-specific analysis in order to identify best care which can then be instituted across all centres; and
- support research protocol development by providing information about people with cystic fibrosis who may meet the criteria for a particular research project.

Information about the governance of the Registry and the Registry Steering Committee can be found in Annexes 2 and 3.

Key facts about the UK cystic fibrosis population in 2013

- 10338 people were registered and, of these, 88% had complete data* entered into the Registry.
- There were 261 new diagnoses in 2013 – equivalent to five a week.
- Of the 54 children with complete data born in 2013, 39 (72%) were identified solely by newborn screening.
- More than 57% of those registered were over 16 years old.
- 70.9% of those aged 16 or over were working or studying, compared to 68.8% in 2009.
- More than 850 people with cystic fibrosis were aged 40 years or older.

What is 'complete data'?
'Complete data' means the number of complete sets of data from the annual reviews of people with cystic fibrosis – these are used for the production of the Registry annual reports.

Genotypes

Cystic fibrosis is an inherited genetic condition. The gene that causes cystic fibrosis is the blueprint for a protein called the Cystic Fibrosis Transmembrane Conductance Regulator (CFTR). Everyone has two copies of the gene for CFTR. To develop cystic fibrosis, both CFTR genes must be affected by a mutation.

Many different mutations have been found for CFTR. To cause cystic fibrosis, the mutations in the two CFTR genes do not have to be the same, so it is important for you and your child to know the details of both mutations. Parents of people with cystic fibrosis are known as carriers, as one copy of the CFTR gene carries the mutation while the second remains unaffected and functions normally.

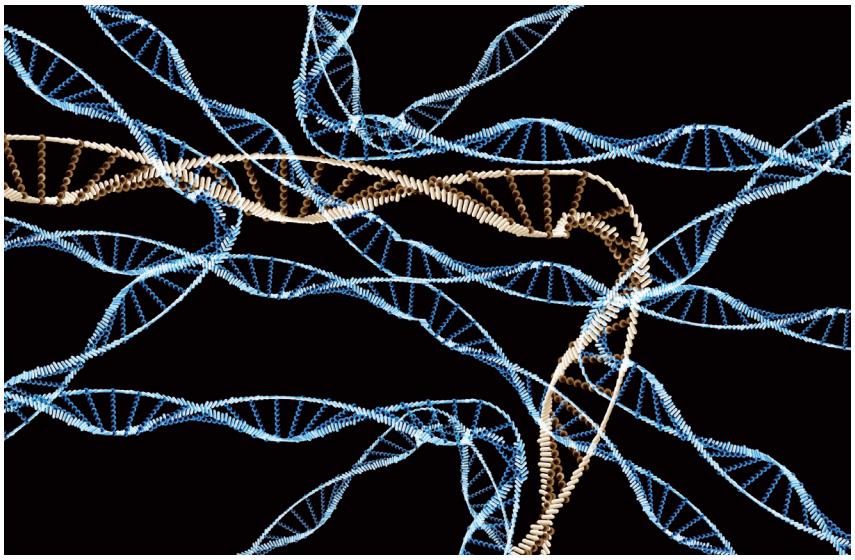
In the past, it was useful but not essential to know the precise mutations that caused cystic fibrosis. However, this situation changed following the development of a drug (ivacaftor) that works in people with cystic fibrosis who carry one copy of the G551D mutation. Following this breakthrough, other companies are now trying to find treatments that may improve the function of other mutations, although we need to be realistic and understand that drug discovery takes a long time. It is now very important for you or your child to know the mutation on both genes. Having this information on the Registry will help identify people to be included in new trials of mutation-specific drugs, leading to personalised treatment.

8799 people, that is more than 97% of everyone on the Registry in 2013, have been genotyped with a recorded value. However, in some of these only one mutation was recorded, and in a few, no mutation was recorded. The Cystic Fibrosis Trust is supporting a project to ensure people are retested so that both mutations can be identified, using the latest technology.

Single mutations 2013

Mutation	Number	Per cent
DF508	7990	90.81
G551D	514	5.84
R117H	398	4.52
G542X	318	3.61
621+1G->T	186	2.11
1717-1G->A	120	1.36
N1303K	115	1.31
2789+5G->A	104	1.18
1898+1G->A	97	1.10
DI507	91	1.03
3659delC	89	1.01

Around half of people with cystic fibrosis have two copies of DF508, the most common mutation. This table lists the most common CF mutations.



Clinical care of people with cystic fibrosis

The Trust works closely with the specialist CF centres and clinics across the UK, with professional bodies such as the British Thoracic Society and the British Paediatric Respiratory Society, and with NHS commissioners, to drive up standards of care.

This is achieved through setting national standards and a process of audit or peer review of those standards in the CF centres and clinics.

Recognised specialist CF centres provide access to a multidisciplinary team of specialist doctors, nurses and allied health professionals, as set out in the nationally recognised standards of care, which can be downloaded from the Trust's website at cysticfibrosis.org.uk/publications.

Research has been instrumental in driving up standards of care, most notably by demonstrating the benefits of screening newborns for cystic fibrosis.

The process of peer review of CF centres, against the recognised standards, includes providing a range of information from the Registry on treatment and outcomes. This information is produced as appropriate depending on whether the centre is looking after children or adults.

The purpose is to:

Check the completeness of a centre's records on the Registry.

Check whether a particular centre is producing outcomes that are in the range of the national average.

Look at how all centres are working towards certain goals, such as:

- increasing the recording of genetic mutations;
- increasing the number of people with cystic fibrosis being prescribed mucolytics such as DNase to break down mucus in the lungs;
- increasing the number of people with cystic fibrosis who are receiving inhaled antibiotics to prevent lung function decline;
- reducing the number of children aged less than 11 years with chronic pseudomonas to 0%; and
- reducing the rate of chronic pseudomonas in adults.

What is meant by 'median'?

In the following sections we summarise some of the key findings from the 2013 report and the term 'median' is used in several of the graphs.

Median is a type of average, denoting the value or quantity lying at the midpoint of the distribution of observed values or quantities. For example, "the median duration of hospital stay was 10 days" means that half of the people were in hospital for fewer than 10 days and half for more.

Monitoring outcomes of care

The core purpose of the Registry is to collect routine clinical data that is used to improve clinical outcomes. Each CF centre can analyse its own data at any time, either for an individual or for a group of people with cystic fibrosis.

Each year, data in the Registry is analysed, a report is produced and the findings discussed by the cystic fibrosis community as part of our mission to improve care.

Clinic appointments

At each clinic appointment a set of measures is undertaken to monitor the condition of people with cystic fibrosis. These routine measures are weight and height, lung function and cough swabs. The purpose is to assess whether there is a decline in function and whether a change is needed in the care being provided. We are also interested in monitoring the effects of any new drug treatment.

Body mass index

Body mass index (BMI) is an important measure because research has shown that people with cystic fibrosis with a good BMI do better in terms of lung function and survival.

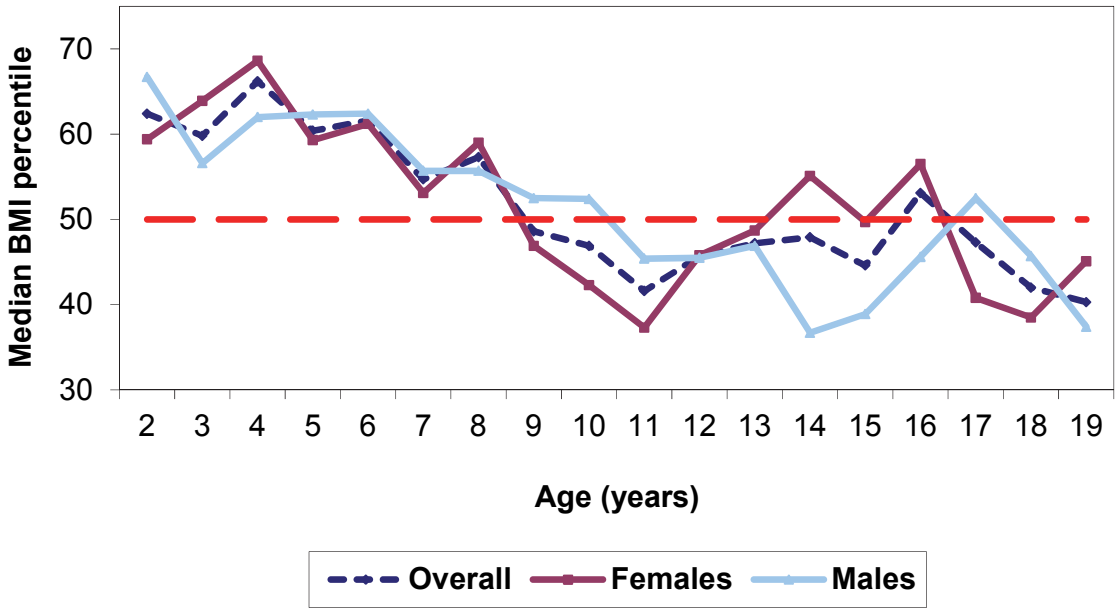
BMI is a number calculated from weight and height. This number does not measure body fat directly, but it can be considered as an alternative for direct measures of body fat.

Although the BMI number is calculated the same way for both children and adults, the criteria used to interpret the meaning of the BMI number for children and teens are different from those used for adults. For children and teens, BMI age and sex-specific percentiles are used for two reasons:

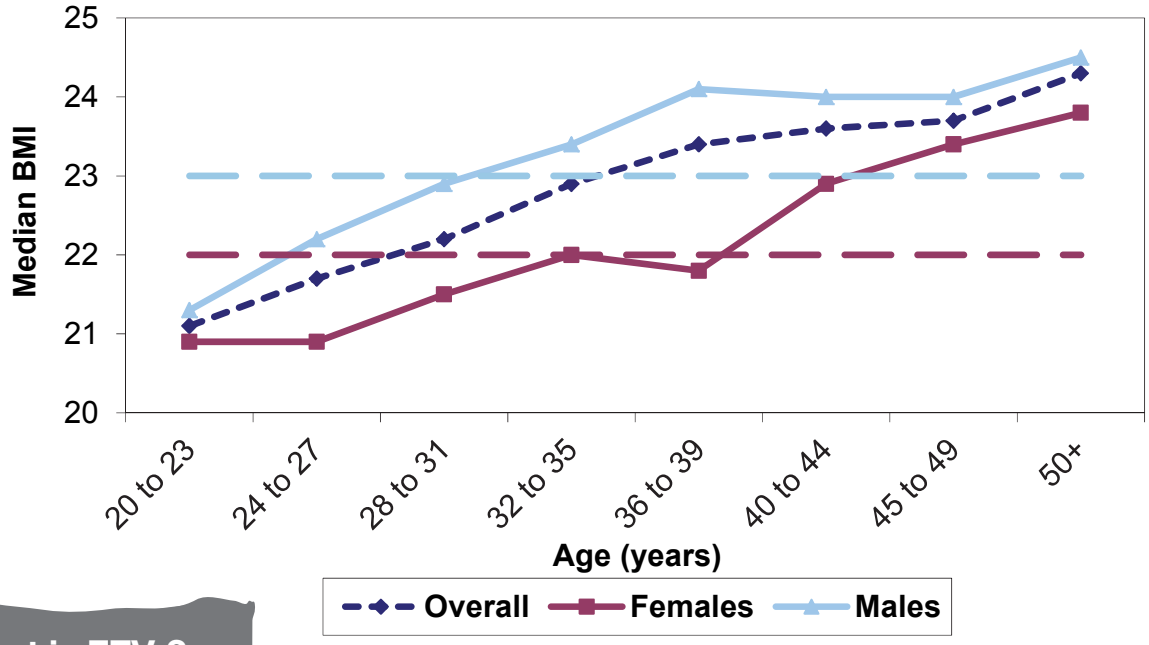
- The amount of body fat changes with age.
- The amount of body fat differs between girls and boys.

So for children and teens, BMI is age and sex-specific. For this reason, percentiles are the most commonly used indicator to assess the size and growth patterns of individual children because the percentile indicates the relative position of the child's BMI number among children of the same sex and age.

Median BMI percentiles among children and young people (aged 19 years and under) in 2013 (n=4237): The red dotted line indicates the 50th percentile – the aim is to monitor and maintain weight for height as close to this target as possible.



Median BMI values among adults aged 20 and older in 2013 (n=4086)
The purple dotted line indicates a BMI of 22, which is a marker used to target BMI in adult women; the blue dotted line indicates a BMI of 23, which is a marker used for adult men.



What is FEV_1?

For an ADULT, the following is a guide to FEV_1 percentage predicted measurements and what they may mean:

- FEV_1 greater than 85% predicted is considered as normal or near normal for the general population.
- 70–85% predicted shows mild lung disease.
- 40–69% predicted shows moderate lung disease.
- Less than 40% predicted can be a sign of severe lung disease.

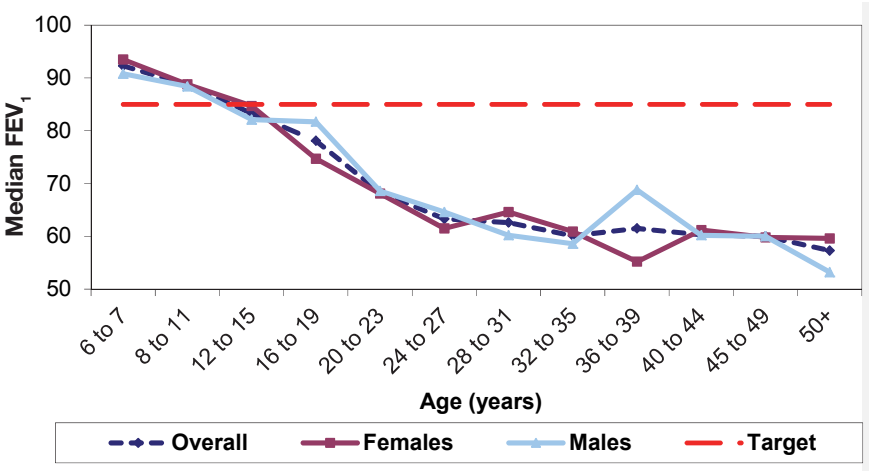
Lung function

At routine CF clinic appointments, a lung function test is performed and the key measure is called the forced expiratory volume in one second (FEV_1). This measures how much air comes out of the lungs in the first second when someone blows out hard and fast. An FEV_1 of 100% means that lung function is exactly the same as that of an average person of the same age, height and sex who does not have cystic fibrosis – in other words, 100% equals totally normal. However, as we are all slightly different, values between 86% and 115% are considered to be within a normal range.

The aim of good cystic fibrosis care is to preserve the best possible lung function for as long as possible. This is important for adults, as lung function with a FEV_1 of 50% and above will enable people to live relatively normal lives, and is associated with fewer difficulties in completing activities of daily living.

On the Registry we look at FEV_1 % predicted across the different age groups. You will see from the graph below that we are moving towards the goal of keeping lung function in children as near normal as possible.

Median FEV_1 (% predicted) among people with CF aged 6 years and older excluding those post lung transplant (n=6923)



The red dotted line in this graph illustrates a target FEV_1 % predicted of 85%. Anything above this indicates normal or near-normal lung function values.

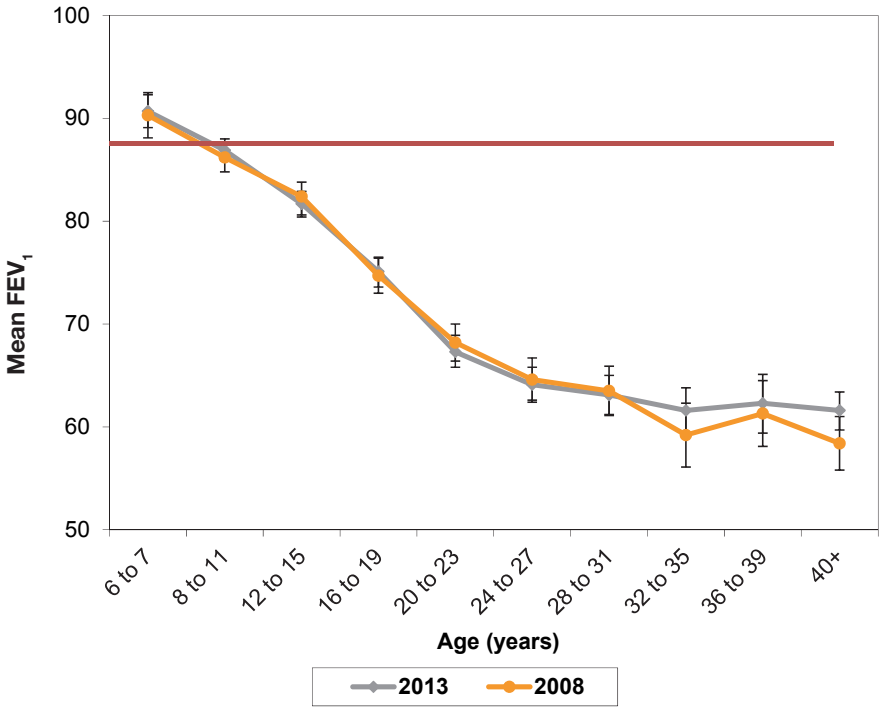
In 2013, the median FEV_1 in children aged 6–11 years was greater than 85%.

For an individual we are interested in change in function – a lower measure does not necessarily mean there is a problem, but a persistent decline over several clinic visits may signal a need for further investigation.

Over time we want to see the average lung function of all people with cystic fibrosis at different ages increase, as a result of excellent care and the introduction of new therapies.

The following graph is from an analysis to determine whether there were statistically significant differences in lung function in 2013 compared to 2008, by age category. The results show that there was a small but statistically significant difference among patients aged 40 years and older, with lung function higher in 2013.

Mean FEV_1 (% predicted) among people with CF aged 6 years and older by year in 2008 and 2013 (excluding people post lung transplant)



Keeping lungs healthy – airway clearance

Medication alone cannot keep cystic fibrosis lungs healthy. Getting the thick mucus out of the lungs is key. Children can be introduced to breathing exercises in the form of a game from the age of two or three. From the age of nine, most children can start doing part of the physiotherapy for themselves.

Why is chest physiotherapy important?

Chest physiotherapy helps prevent thick, sticky mucus in the lungs from blocking the airways, which can reduce infection and prevent lung damage. Parents are taught how to do physiotherapy with their child by the physiotherapist in the CF clinic. Adults with cystic fibrosis can learn to carry out their own physiotherapy.

Why is exercise important?

Exercise is particularly important for people with cystic fibrosis because it helps to clear mucus from the lungs and improves physical bulk and strength.

Children with cystic fibrosis should be encouraged to take part in as much physical activity as possible – ideally types of exercise that leave you out of breath, like running, swimming, football or tennis.

It is important to let teachers at school know that exercise should be encouraged because they may not know if it is good or bad for someone with cystic fibrosis. Your hospital physiotherapist can advise on the right exercises and activities for you or your child.

Keeping lungs healthy – medication

Medication can be taken in various ways, whether inhaled into the lungs using nebulisers or inhalers, taken orally or injected.

- Bronchodilator drugs can open your airways by relaxing the surrounding muscles, relieving tightness and shortness of breath.
- Antibiotics help treat or control infection.
- Steroids to reduce inflammation in the airways can be used in specific circumstances.
- Mucolytics such as DNase break down mucus, making it easier to clear.

Nebulised drug treatment by age – DNase

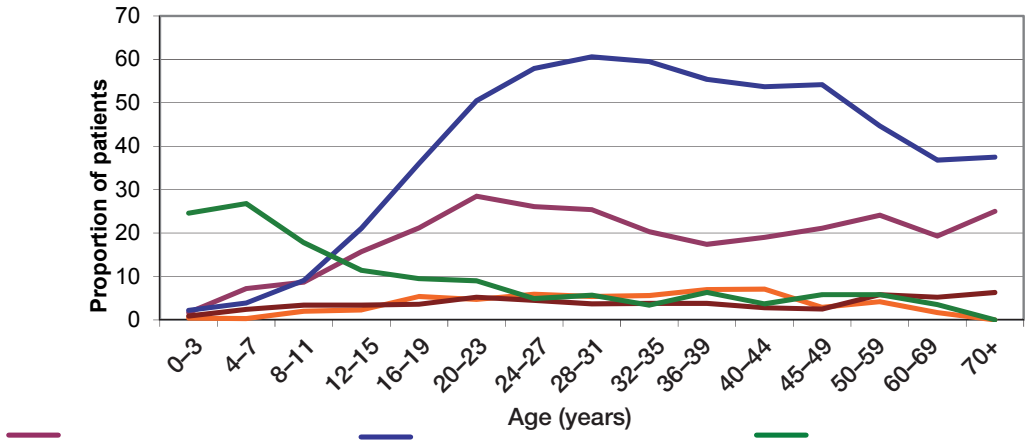
	2008		2013	
	Number	(%)	Number	(%)
0–3 yrs	46	(7.6)	100	(10.2)
4–7	125	(20.1)	332	(33.1)
8–11	227	(34.2)	496	(55.2)
12–15	359	(46.4)	627	(65.7)
16–19	377	(49.5)	635	(63.2)
20–23	319	(44.0)	625	(62.9)
24–27	288	(47.6)	537	(64.2)
28–31	182	(43.4)	413	(58.7)
32–35	108	(41.5)	283	(56.3)
36–39	83	(35.0)	157	(49.8)
40–44	147	(35.7)*	168	(47.6)
45–49			113	(47.1)
50+			129	(48.9)
Overall	**2261**	**(37.2)**	**4615**	**(51.0)**

*In 2008 those aged 40 years and older were grouped together.

The figures in the table indicate a statistically significant increase in the use of nebulised drug treatment in 2013 compared to 2008 in all age groups. This is something we hope will result in better long-term outcomes.

Infection

Lung infections by age group in 2013

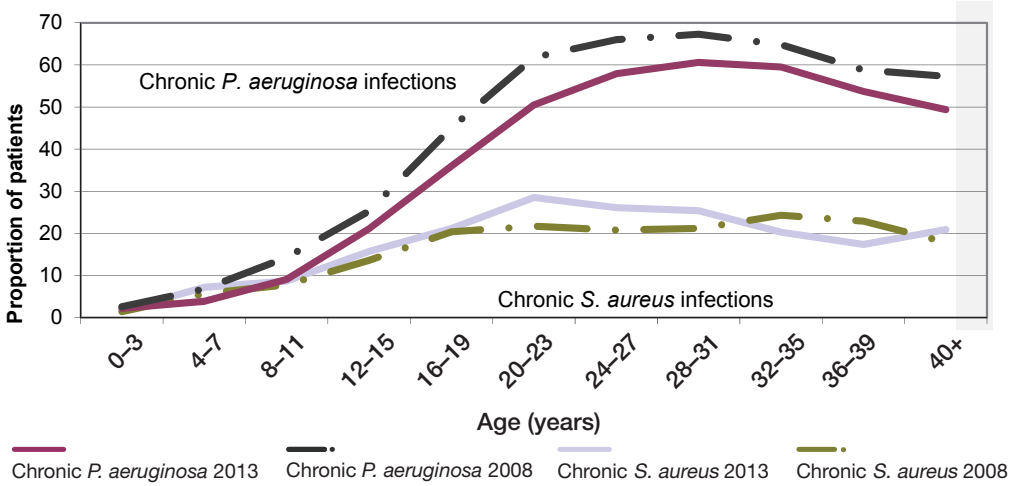


Chronic *S. aureus*; n=1511 (17.2%)
Chronic *P. aeruginosa*; n=2960 (33.5%)
H.influenzae; n=1121 (12.4%)
B. cepacia; n=326 (3.6%)
MRSA; n=310 (3.4%)

Current treatments and good cross-infection measures mean that we can aim to reduce the number of people with cystic fibrosis transferring from paediatric to adult care with chronic *Pseudomonas aeruginosa* infection. The current objective is for less than 30% of the paediatric population to be chronically infected at the time of transfer. A future aim is to see this reduce to less than 20%.

In the following graph we show the improvement in *Pseudomonas aeruginosa* and chronic *S. aureus* infections between 2008 and 2013.

Lung infections by age group in 2008 and 2013



Chronic *P. aeruginosa* 2013
Chronic *P. aeruginosa* 2008
Chronic *S. aureus* 2013
Chronic *S. aureus* 2008

This graph shows a reduction in chronic pseudomonas in 2013 compared to 2008. Last year we reported that this reduction was statistically significant in some age groups; this year we are pleased to report that when comparing data from 2008 and 2013, chronic *Pseudomonas aeruginosa* infection rates are lower across all age groups and they reach statistically significant differences in the age groups from 4–31 years.

This improvement relates to the application of guidelines for infection control and aggressive early treatment protocols aimed at eradicating new pseudomonas infections.

This analysis demonstrates the Registry's value in monitoring improvements in quality of care, and provides commissioners with evidence of the importance of their investment in the Registry.

Medication

The consensus view in the UK is that 90% of people with cystic fibrosis who are chronically infected with *Pseudomonas aeruginosa* should be prescribed at least one of the nebulised antibiotics in this table.

Inhaled antibiotic use in 2008

People with chronic pseudomonas	Overall (n=2098)	<16 years (n=299)	≥16 years (n=1789)
	Number (%)	Number (%)	Number (%)
Tobramycin solution	412 (19.6)	48 (16.1)	364 (20.2)
Other aminoglycoside	43 (2.0)	5 (0.2)	38 (2.1)
Colistin	914 (45.2)	174 (52.7)	740 (43.6)
Promixin	490 (23.4)	73 (24.4)	417 (23.2)
At least one of above in 2008	**1597 (76.1)**	**257 (86.0)**	**1340 (75.5)**

Inhaled antibiotic use in 2013

People with chronic pseudomonas	Overall (n=2960)	<16 years (n=329)	≥16 years (n=2631)
	Number (%)	Number (%)	Number (%)
Tobramycin solution	929 (31.4)	103 (31.3)	826 (31.4)
Other aminoglycoside	108 (3.6)	13 (4.0)	95 (3.6)
Colistin	1173 (39.6)	176 (53.5)	997 (37.9)
Promixin	881 (29.8)	140 (42.6)	741 (28.2)
Aztreonam	201 (6.8)	2 (0.6)	199 (7.6)
At least one of above in 2013	**2368 (80.0)**	**302 (91.8)**	**2066 (78.5)**

Cross-infection, or cross-contamination, occurs when one person spreads an infection to another, either directly or indirectly. For people with cystic fibrosis, cross-infection can be very harmful and poses a particular threat, which is why they should not meet face to face. The risk of cross-infection increases the longer people with cystic fibrosis are in close proximity to one another. There is less risk of transmission of 'bugs' in an outdoor environment, but meeting indoors, travelling with other people with cystic fibrosis, or spending time with them socially has a high level of risk.

Cystic fibrosis centres and clinics are advised to ensure segregation measures are in place. An expert working group of clinicians has released new advice to help protect people with cystic fibrosis from cross-infection.

Research on infection

It is important to continue research in the area of lung infections for people with cystic fibrosis, so better treatments and care can be developed. This year, the Trust announced the award of large grants to two consortia. These bring together world experts to combine their research expertise and tackle issues that are important for people with cystic fibrosis.

The first consortium is led by Professor Jane Davies at the Royal Brompton Hospital and is investigating chronic pseudomonas lung infection. The second, led by Dr Andres Floto at Papworth Hospital, will provide valuable information on *M. abscessus* (or NTM, non-tuberculous mycobacteria). This complements additional data that will be provided through the Registry to map the current status of NTM across the UK.

What is the difference between prevalence and incidence?

Prevalence is the proportion of the cystic fibrosis population on the Registry with a certain condition. Incidence is the proportion of people with cystic fibrosis for whom the year in question was the first year in which the condition was reported.

Complications

Complications are problems related to cystic fibrosis, such as cystic fibrosis-related diabetes (CFRD).

CFRD is one of the most common CF complications and is different from diabetes in people without cystic fibrosis. In 2013, 30% of people with cystic fibrosis aged 16 years and older were receiving treatment for CFRD.

Because research shows that early diagnosis and treatment of CFRD leads to better nutrition and health, people with cystic fibrosis aged 10 years and older should be tested for CFRD every year. The test is called an oral glucose tolerance test (OGTT).

Number and % of people with cystic fibrosis receiving treatment for CFRD

	Overall (n=6594) Number (%)	<16 years (n=1381) Number (%)	≥16 years (n=5213) Number (%)
Treatment for CF-related diabetes	1711 (26.0)	127 (9.2)	1584 (30.4)

Prevalence of other complications reported in 2013 in percentage of people with cystic fibrosis

	Overall (n=9052) Number (%)	<16 years (n=3839) Number (%)	≥16 years (n=5213) Number (%)
ABPA	948 (10.5)	277 (7.2)	671 (12.9)
Non-tuberculous mycobacteria or atypical mycobacteria	265 (2.9)	79 (2.1)	186 (3.6)
Osteoporosis	469 (5.2)	7 (0.2)	462 (8.9)
Arthropathy	506 (5.6)	18 (0.5)	488 (9.4)

Incidence of other complications newly identified in 2013 in percentage of people with cystic fibrosis

	Overall (n=9052) Number (%)	<16 years (n=3839) Number (%)	≥16 years (n=5213) Number (%)
ABPA	157 (1.7)	58 (1.5)	99 (1.9)
Non-tuberculous mycobacteria or atypical mycobacteria	134 (1.5)	33 (0.9)	101 (1.9)

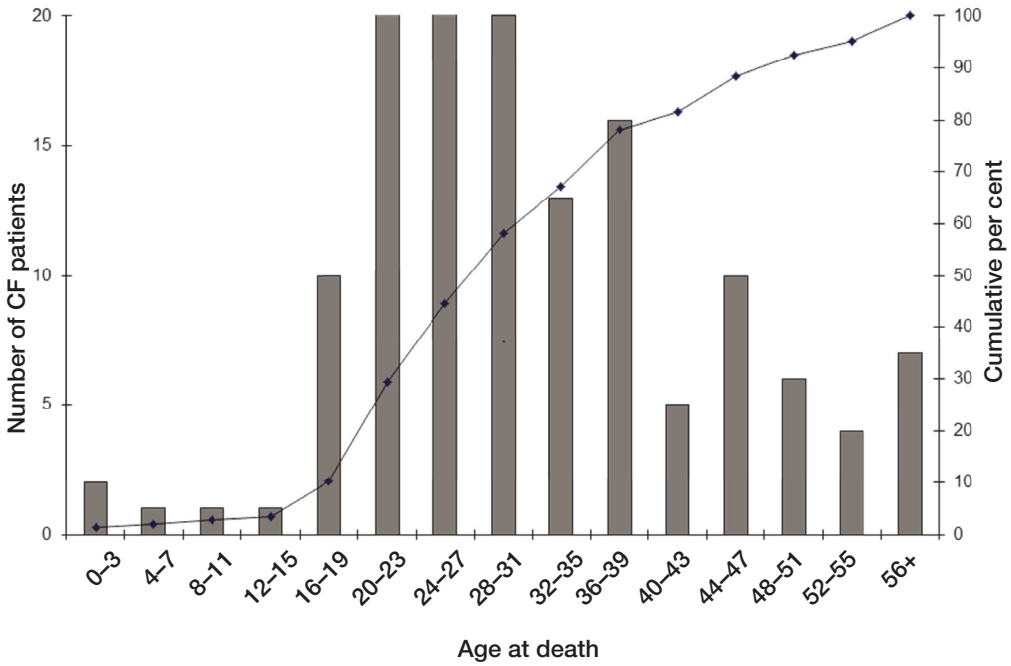
Survival

There has been a general trend of increasing median predicted survival for people with cystic fibrosis over the last 25 years, due to a number of factors. These include specialist centre care, better nutritional support and improved treatment of lung infections with aggressive use of antibiotics.

There were 146 recorded deaths in 2013, which is 1.4% of the total population on the Registry. The median age at death was 29 years, with a range from 0 to 74 years.

The median predicted survival in 2013 was 36.6 years, in contrast to 43.5 years in 2012. Year-to-year fluctuations are normal when measuring health outcomes for any disease or medical condition, particularly if in one year there are more deaths than usual. What is important is the steady increase in survival over time.

Age distribution of deaths in 2013



Is there an association between newborn screening and survival?

The Registry works closely with the CF UK Newborn Screening Programme Centre, providing data to ensure the best possible audit of outcomes of screening for cystic fibrosis. Since October 2007 all newborns in the UK are screened for cystic fibrosis. Research shows that people with cystic fibrosis who are diagnosed early are likely to have better lung function later in life than those diagnosed later because of symptoms. It is thought that early diagnosis may play an important role in improving survival. Year-on-year analysis of Registry data will help us better understand the importance of early diagnosis.

The earlier cystic fibrosis is diagnosed, the sooner treatment can begin.

Of the 54 children with complete Registry data born in 2013, 39 (72%) were identified solely by newborn screening.

To help doctors and nurses care for babies diagnosed with cystic fibrosis through newborn screening, the Trust has worked with experts in cystic fibrosis and infant care to develop care standards. The CF infant care standards outline care to keep babies with cystic fibrosis as healthy as possible.

‘The Standards of Care of Children and Adults with Cystic Fibrosis in the UK’ can be downloaded from cysticfibrosis.org.uk/publications.

Research exploring the potential for improving the quality of donor lungs

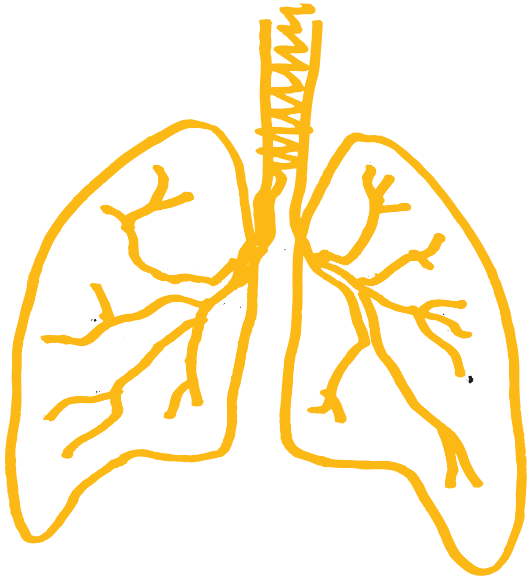
In 2014, the Trust awarded a research grant to Dr James Fildes (University of Manchester) and to Professor Andrew Fisher (University of Newcastle) to continue their groundbreaking research in the area of lung transplantation.

The new grant will support work to improve our understanding of the factors in donated lungs that can influence the success of transplantation. In particular, it will support the development of laboratory tests that can quickly identify which lungs can be improved.

Transplantation

Great steps forward in specialist care and treatment have meant that people with cystic fibrosis are living longer and healthier, but some will reach a point where they require a lung transplant to prolong their life.

The success rate of lung transplants for people with cystic fibrosis is encouraging, and recipients will enjoy a good quality of life, but the procedure does carry considerable risks, including rejection or infection. It is also important to remember that a transplant is not always the most appropriate form of treatment for someone who is severely ill with cystic fibrosis.



The following table shows the number of transplants in recent years.

	2009	2010	2011	2012	2013
Number of PwCF that year with annual review data evaluated for transplants	143	169	204	225	220
Number accepted on the transplant list	79	82	121	120	136
Number receiving transplants	25*	29	51*	55**	57*
Types of transplants received:					
Bilateral lung	19	26	43	45	50
Heart and lung	0	1	4	1	0
Liver	5	1	2	7	4
Other	2	1	3	4	4

* One person received two transplants
** Two people received two transplants

Monitoring outcomes by care centre/clinic

In this section of the report we present some of the data on care outcomes across the different CF centres, and provide an update on how Registry researchers are working on new ways of accounting for differences between centres. The aim is to learn from each other and ensure optimum care for the cystic fibrosis community.

It is clear that outcomes in terms of lung function, for example, can be affected by a variety of factors. These include those related to the care received, such as use of CF medication, and those related to the person with cystic fibrosis – such as genotype, age and socioeconomic status. As a result, 'better lung function' does not necessarily equate to 'better centre'.

For example, if the median FEV_1 is lower in one adult clinic compared to another, this may simply be because that clinic happens to care for a greater number of older people, and lung function generally declines with age in cystic fibrosis.

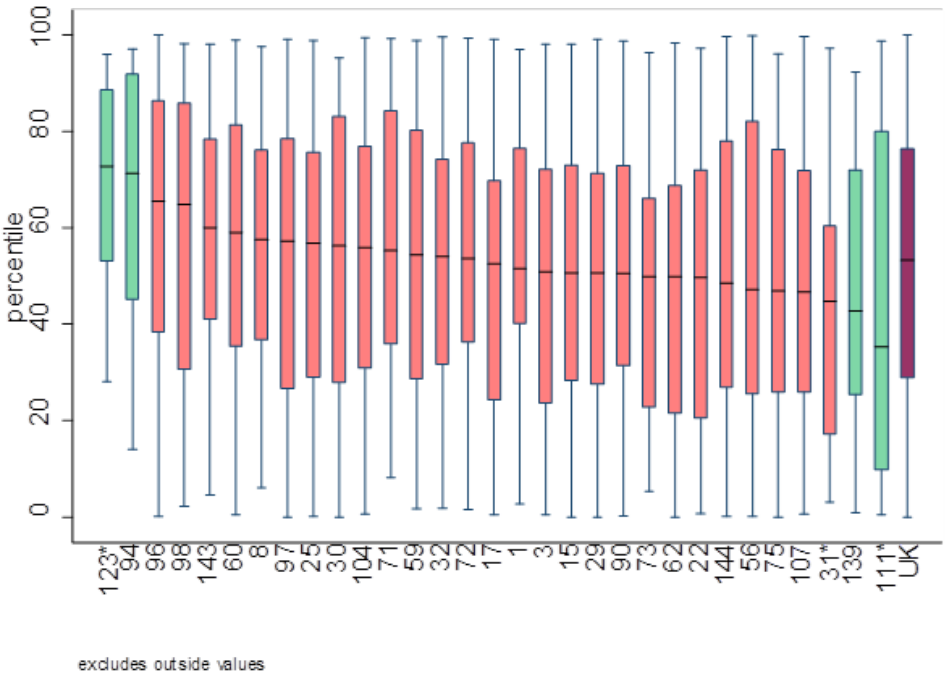
What are 'box and whisker plots'?

The graphs below are sometimes called 'box and whisker plots'. They show the distribution of data from each centre. The 'box' shows the range of values that contain the middle 50% of data, the line in the middle shows the median. A bigger 'box' suggests a wider range of values in the data. If the median is not in the middle of the box, it suggests that there are more values at one extreme of the spectrum than the other. This happens naturally with data and is not necessarily a cause for concern. The length of the 'whiskers' (the lines extending from the box) helps to illustrate how much variability there is in the data outside the box. Longer whiskers mean more spread. For the report, we did not include the outside values as this would have created a great deal of spread.

When we compare centres using these graphs, we look at whether the medians are the same while also tracking how much variability there is in the data.

Analysis by paediatric care centre/clinic (n=4206)

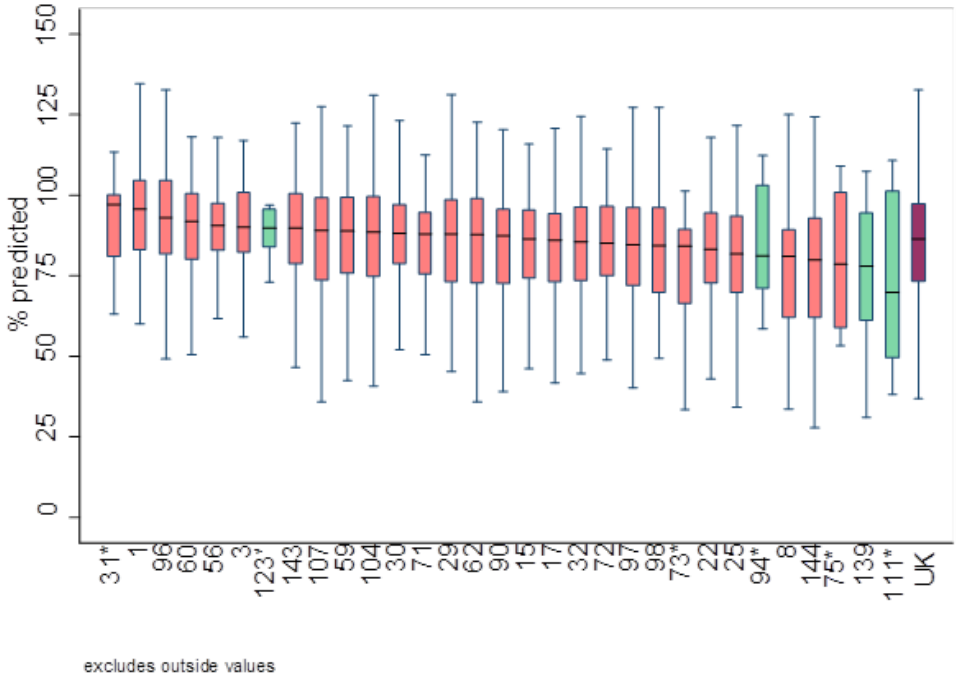
Median BMI percentiles among children (2–15 years) in 2013 by paediatric centre/clinic



* Centre/clinic with a data set submission of fewer than 20 patients

Red: centres with their network clinics. Green: stand-alone clinics. Purple: all.

Median lung function among children in 2013 by paediatric centre/clinic

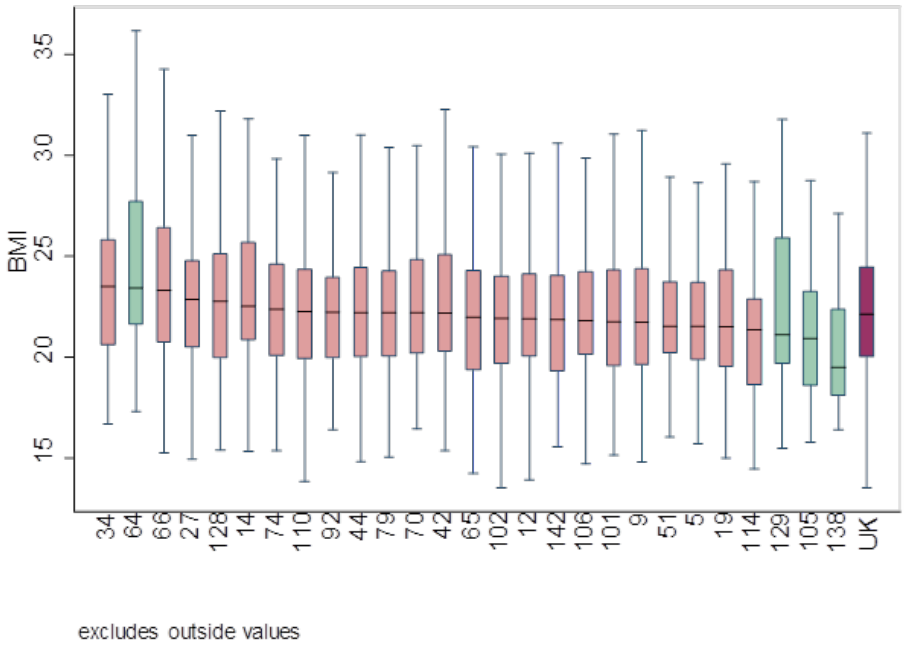


* Centre/clinic with a data set submission of fewer than 20 patients

Red: centres with their network clinics. Green: stand-alone clinics. Purple: all.

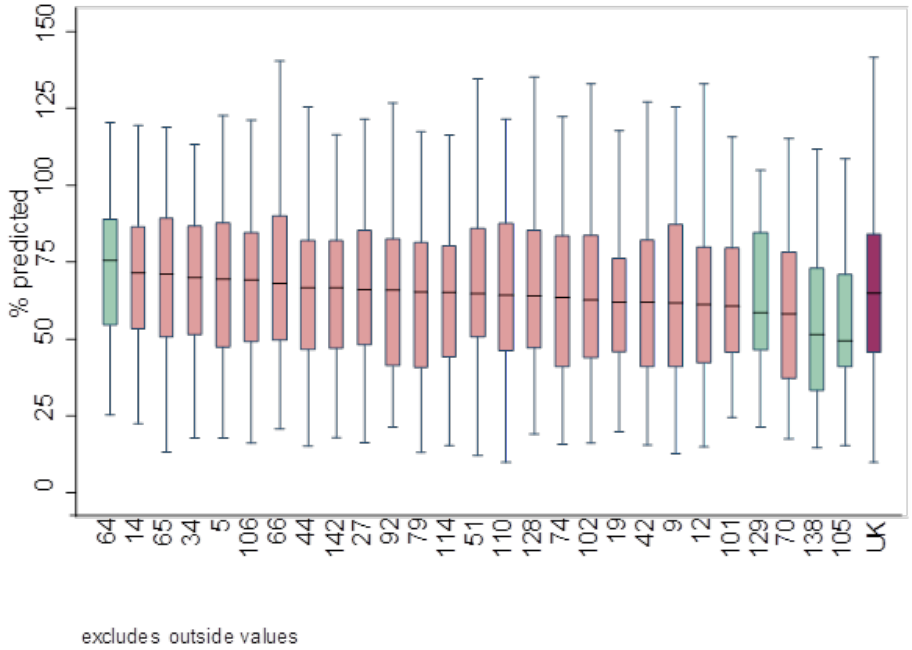
Analysis by adult care centre/clinic (n=4846)

Median BMI values among adults in 2013 by adult centre/clinic



Red: centres with their network clinics. Green: stand-alone clinics. Purple: all.

Median lung function among adults in 2013 by adult centre/clinic



Red: centres with their network clinics. Green: stand-alone clinics. Purple: all.

Research aimed at learning from care in different centres

Supported by a research grant from the National Institute of Health Research, this project aims to develop better ways of looking at outcomes across centres, with an emphasis on learning from the best processes of care. The work is being led by Dr Stephanie MacNeill, the statistician who works on the Registry, and Professor Paul Cullinan, from the National Heart and Lung Institute at Imperial College, London.

Since the project began in 2013 we have been busy analysing Registry data and conducting focus groups in Birmingham with multi-disciplinary teams of cystic fibrosis experts to learn what they think is important in delivering excellent care to patients. The results from these sessions, and from focus groups with patients and parents taking place in 2014, will help us to develop questionnaires for centres and patients on the care they provide and receive.

Ongoing analysis of Registry data will help us to identify centres with exceptional outcomes. We then aim to see how the care delivered at these centres differs (if at all) from the others, so all can learn and improve.

The importance of clinical research

As part of our research strategy 'Investing in research to change lives', which was published in 2013, the Cystic Fibrosis Trust is looking at ways to increase access to clinical trials across the UK. This is important for people with cystic fibrosis – especially at this time, when so many new opportunities are being developed.

"This is the most exciting time for the cystic fibrosis community in the nearly 25 years that I have been involved in the field. More clinical trials of new treatments have begun in the past three to five years than in the whole of the previous 20."

Professor Stuart Elborn, Queens University, Belfast

One of the new enhancements to the Registry in 2014 is a section that records if someone is taking part in a clinical trial, so we can get a better picture of the activity in this important area. In addition, the Trust sponsored a think tank in May 2014 to bring together all stakeholders to help identify ways we can encourage more trials in the UK. People with cystic fibrosis had an opportunity to be part of this debate as the think tank was live-streamed and a number of people connected remotely. If you are interested in learning more about these new opportunities and initiatives, read 'Trials and Tribulations' in the winter 2013/14 edition of 'is' magazine at cysticfibrosis.org.uk/is.

Visit cysticfibrosis.org.uk/uktrials for a list of clinical trials currently recruiting patients in the UK.

Key messages

These are some of the key messages from the analysis of the Registry data for 2013. Increasingly we are able to compare figures over time to show where outcomes are improving.

- **Last year we reported a reduction in chronic Pseudomonas aeruginosa infection that was statistically significant in some age groups; this year we can confirm this trend. When comparing data from 2008 and 2013, chronic pseudomonas infection rates are lower across all age groups and reach statistically significant differences in the age groups from four to 31 years.**

- **The use of DNase (Pulmozyme®) continues to rise. This therapy is designed to make it easier to clear infected mucus, improving lung function and reducing the need for intravenous antibiotics. We are monitoring this and other therapies to ensure equity of access.**

- **This report analyses data from the 10338 people on the Registry in 2013, a figure that increases every year. As the Registry has grown, so too have the number of projects it supports – all in pursuit of improved care and outcomes for people with cystic fibrosis.**

Further information about how the Registry is managed, how we look after the data entered by the CF centres, and how this information is put to good use, can be found in the Registry Review 2012 which can be downloaded from cysticfibrosis.org.uk/registry

Annex 1: Cystic fibrosis centre/clinic IDs

Paediatric centres/clinics providing data in 2013 – ordered by clinic ID

Location	Centre/clinic	Clinic ID	Number of people with CF providing data in 2013
Leicester	Leicester Royal Infirmary	1	58
Sheffield	Sheffield Children's Hospital	3	140
Stoke	University Hospital of North Staffordshire	8	91
London – South West	Royal Brompton Hospital	15	312
London	King's College Hospital	17	188
Oxford	John Radcliffe Hospital	22	167
Leeds	St James's University Hospital	25	233
Southampton	Southampton General Hospital	29	211
London – East	Royal London Hospital	30	111
Inverness	Raigmore Hospital	31	16
Bristol	Bristol Royal Hospital for Children	32	175
Glasgow	Royal Hospital for Sick Children	56	123
Newcastle	Royal Victoria Infirmary	59	168
Belfast	Royal Belfast Hospital for Sick Children	60	194
Nottingham	Nottingham City Hospital	62	174
Teesside	James Cook University Hospital	71	53
Cardiff	Children's Hospital for Wales	72	164
Dundee	Ninewells Hospital	73	22
Aberdeen	Royal Aberdeen Children's Hospital	75	29
London – Central	Great Ormond Street Hospital for Children	90	180
Truro	Royal Cornwall Hospital	94	29
Exeter	Royal Devon & Exeter Hospital	96	72
Liverpool	Alder Hey Children's Hospital	97	300
Norwich	Norfolk & Norwich University Hospital	98	64
Birmingham	Birmingham Children's Hospital	104	282
Cambridge	Addenbrookes Hospital	107	130
Hull	Hull Royal Infirmary	111	29
Ayr/Kilmarnock	Crosshouse Hospital	123	22
Plymouth	Derriford Hospital	139	38
Edinburgh	Royal Hospital for Sick Children	143	117
Manchester	Royal Manchester Children's Hospital	144	314

Adult centres/clinics providing data in 2013 – ordered by clinic ID

Location	Centre/clinic	Clinic ID	Number of People with CF providing data in 2013
London – South East	King's College Hospital	5	169
Newcastle	Royal Victoria Infirmary	9	248
London – South West	Royal Brompton Hospital	12	643
Belfast	Belfast City Hospital	14	205
Frimley	Frimley Park Hospital	19	108
Birmingham	Birmingham Heartlands Hospital	27	339
Exeter	Royal Devon & Exeter Hospital	34	86
Leeds	St James's University Hospital	42	409
Edinburgh	Western General Hospital	44	212
Cambridge	Papworth Hospital	51	235
Plymouth	Derriford Hospital	64	44
Sheffield	Northern General Hospital	65	166
Liverpool	Liverpool Heart and Chest Hospital	66	257
Aberdeen	Aberdeen Royal Infirmary	70	62
Stoke-on-Trent	University Hospital of North Staffordshire	74	67
Glasgow	Gartnavel General Hospital	79	206
London – East	London Chest Hospital	92	127
Nottingham	Nottingham City Hospital	101	133
Manchester	Wythenshawe Hospital	102	376
London – South East	University Hospital Lewisham	105	50
Bristol	Bristol Royal Infirmary	106	182
Southampton	Southampton General Hospital	110	211
Norwich	Norfolk & Norwich University Hospital	114	65
Oxford	Churchill Hospital	128	93
Truro	Royal Cornwall Hospital	129	34
Hull	Castle Hill Hospital	138	41
Leicester	Glenfield Hospital	142	78

Annex 2: Governance of the Registry

The protocol governing the Registry was approved by the National Research Ethics Service in 2007 and the Registry Steering Committee was set up to oversee how the Registry is managed. It meets at least twice a year and is chaired by Professor Diana Bilton.

The Committee is responsible for:

- ensuring compliance with the protocol governing the conduct of the Registry;
- providing direction on the strategic development of the Registry;
- screening applications for access to Registry data;
- monitoring the progress of projects; and
- producing annual reports and information on Registry developments that are made available to clinicians, people with cystic fibrosis and parents.

Membership of the Committee comprises representatives from the Cystic Fibrosis Trust, people with cystic fibrosis and their carers, CF centre clinical directors, NHS commissioners and the Trust's academic partner, Imperial College. The full membership of the Committee is detailed on the next page.

Annex 3: Registry Steering Committee membership

Professor Diana Bilton (Chair)	Adult CF Centre Director, Royal Brompton Hospital, London
Dr Caroline Elston	Adult CF Centre Director, King's College Hospital, London
Dr Iolo Doull	Paediatric CF Centre Director, Cardiff Hospital, Wales
Dr Siobhan Carr	Paediatrician, Royal Brompton Hospital, London
Dr Steve Cunningham	Paediatrician, Edinburgh Royal Infirmary, Scotland
Dr Martin Wildman	Adult CF Centre Director, Northern General Hospital, Sheffield
Professor Stuart Elborn	Adult CF Centre Director, Belfast, NI and Trustee of the Trust
Dr Stephanie MacNeill	Biostatistician, Imperial College, London
Mr George Vamvakas	Biostatistician, Imperial College, London
Mrs Marian Dmochowska	Parent Representative
Mr Dominic Kavanagh	Patient Representative
Ms Katherine Collins	Director NSD, Scotland
Ms Carrie Gardner	Specialist Commissioner, NHS England
Dr Kim Cox	Lead Specialist CF Commissioner, London
Dr Lisa Davies	Specialist Commissioner, Wales
Mr Ed Owen	Chief Executive, Cystic Fibrosis Trust
Dr Janet Allen	Director of Research, Cystic Fibrosis Trust
Ms Elaine Gunn	Registry Manager, Cystic Fibrosis Trust

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