

UKCF Database

Calculation of Centile and Standard Deviation values for BMI, Height and Weight:

The calculations are the same for each of these. They all use the table GrowthLookup.

This example uses Height. For each patient, in the year being analysed,

- Get the height and age for each clinic visit in the year
- Calculate average height and average age for the year
- Calculate SDScore as shown by the example below
- Take a female whose calculated average age is 5.2
- Take the next age up in the GrowthLookup table, ie. 5.25, not 5.167

Age	FHeightL	FHeightM	FHeightS
5.167	1	109.83	0.0414
5.25	1	110.39	0.04149

- Use the corresponding L, M and S values for the Height and sex of the patient
L value = 1, M value = 110.39, S value = 0.04149 for the example above
- Use these to calculate the SDScore using the equation:

$$\text{SDScore} = \left(\left(\frac{\text{SDSnumber}}{M} \right)^L - 1 \right) / (L * S)$$

where SDSnumber = Patient's average height

ie: SDScore =

$$\left[\left(\frac{\text{Patient's Av. Ht. (SDSnumber)}}{\text{M value (eg 110.39)}} \right)^L - 1 \right] \div (L * S)$$

And this calculation gives the number (ie the SDScore) to put into one of the 14 Standard Deviation categories displayed in the final graph.

- The Centile value is calculated from the Standard Deviation Score (SDScore) as follows:
- Suppose the SDScore was 2.5
- Work out the values of π , z-score, and t-score using the following formulae
- $z = 1 / (\text{sqrt}(2 * \pi)) * \text{Exp}(-(\text{SDScore} * \text{SDScore}) / 2)$

$$z = \frac{1}{\sqrt{2\pi}} * e^{-\frac{2.5^2}{2}}$$

- $t = 1 / (1 + (0.33267 * \text{SDScore}))$

$$t = \frac{1}{1 + (0.33267 * 2.5)}$$

- there are three more constants $a1 = 0.4361836$, $a2 = -0.1201676$ and $a3 = 0.937298$
- work out $\text{temp} = a1 * t + a2 * (t^2) + a3 * (t^3)$
- Centile value is now $= (1 - (z * \text{temp})) * 100$
- For negative values, Centile $= (z * \text{temp}) * 100$

FEV1 Equations used:

Two spirometry equations were used for patients aged to 18 years, and 18 and above. These gave values for Predicted FEV1. Percent predicted was then calculated as $FEV1/Predicted\ FEV1 * 100$

Below 18 : From Polgar, Pulmonary Function Testing in Children

Male : $0.812 * Height ^ 2.77$ (Height in m)

Female : $0.788 * Height ^ 2.73$

18 and Above : From Reuben M Cherniak, Pulmonary Function Testing

Male: $0.04525 * Height - 0.03509 * Age - 2.59946$ (Height in cm)

Female : $0.04071 * Height - 0.02147 * Age - 2.56958$

FVC Equations used:

Two spirometry equations were used for patients to 18 years old, and 18 and above. These gave values for Predicted FVC. Percent predicted was then calculated as $FVC /Predicted\ FVC * 100$

Below 18 : From Polgar, Pulmonary Function Testing in Children

Male : $1.004 * Height ^ 2.72$ (Height in m)

Female : $0.946 * Height ^ 2.61$

18 and Above : From Reuben M Cherniak, Pulmonary Function Testing

Male: $0.06584 * Height - 0.02954 * Age - 5.12451$ (Height in cm)

Female : $0.05557 * Height - 0.00793 * Age - 4.89036$

Height-Weight-Lung Function : Accuracy checks

As clinics country-wide are now starting to gather and analyse increasing amounts of good quality data, it is important to ensure the accuracy of this data. To this end, the checks outlined below are carried out on all the data entered.

Sometimes, the reason for an error can lie in the Biography having either a wrong Year of Birth or Sex for a given patient.

The checks to be performed are as follows:

- **Height or Weight Standard Deviation (also used for BMI calculation)**
Most patient should fall in the range + or - 3.5 standard deviations from the mean. If they do not, they are either very very short or very very tall for their age and sex, or very very light or very very heavy. If the calculated standard deviation is outside this range, the program prints a line for the date of the clinic visit. The calculation of the height or weight standard deviation uses the following information:
Height or Weight - from clinic visit (often the two may have simply been entered the wrong way round)
Date of clinic visit - from clinic visit (used to calculate patient's age at time of visit)
Year of Birth - from Biography (used to calculate patient's age at time of visit)
Sex - from Biography
- **FEV1 or FVC Percent predicted out of range 5% - 135%**
If the value of FEVpc or FVCpc is outside this range, the program prints a line for the date of the clinic visit. The calculation of *FEV1 percent predicted* or *FVC percent predicted* uses the following information:
FEV1 or FVC - from clinic visit
Height - from clinic visit
Date of clinic visit - from clinic visit (used to calculate patient's age at time of visit)
Year of Birth - from Biography (used to calculate patient's age at time of visit)
Sex - from Biography