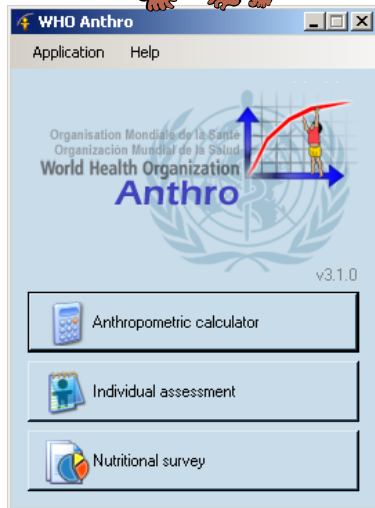


# WHO Anthro for Personal Computers Manual

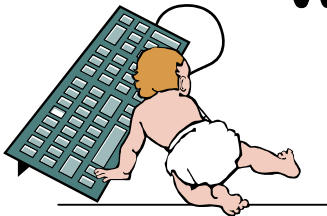
Have I now achieved a motor milestone?



Hey, I want to know how tall I am by WHO standards!



## Software for assessing growth and development of the world's children



Let's get going!



World Health Organization



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## **WHO Anthro software license agreement:**

### **On the use of the WHO Anthro for personal computers, version 3.1 Software for assessing growth and development of the world's children**

This End User License Agreement accompanies the WHO Anthro software for personal computers and all related documentation. It refers to this current software version and any upgrades or modified versions of it licensed by WHO. Please read this Agreement carefully before starting the installation. By installing this software you (the User) accept all the terms and conditions of this Agreement.

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The software includes the following system components Microsoft .NET 2.0 Compact Framework and Microsoft SQL Server 2005 Compact Edition.

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#### **(i) Suggested citation**

Any mention of the software in published reports should include the following citation of the source: WHO Anthro for personal computers, version 3.1, 2010: Software for assessing growth and development of the world's children. Geneva: WHO, 2010 (<http://www.who.int/childgrowth/software/en/>).



# **WHO Anthro for Personal Computers**

Software for assessing growth  
and development of the world's children

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## Abbreviations

The following abbreviations are used in this manual:

AC	Anthropometric calculator module
BAP	BMI-for-age percentile
BAZ	BMI-for-age z-score
BMI	Body mass index (weight in kg divided by height in metres squared)
DoB	Date of birth
DoV	Date of visit
FAO	United Nations Food and Agricultural Organization
HAP	Length or height-for-age percentile
HAZ	Length or height-for-age z-score
HC	Head circumference
HCP	Head circumference-for-age percentile
HCZ	Head circumference-for-age z-score
IA	Individual assessment module
ID	Identification number
MGRS	WHO Multicentre Growth Reference Study
MM	Motor milestones
MS	Microsoft
MUAC	Mid-upper arm circumference
MUACP	Mid-upper arm circumference-for-age percentile
MUACZ	Mid-upper arm circumference-for-age z-score
NA	Not available
NCHS	National Center for Health Statistics
NS	Nutritional survey module
OS	Operating system
PC	Personal computer
SALB	Second Administrative Level Boundaries
SD	Standard deviation
SSF	Subscapular skinfold
SSFP	Subscapular skinfold-for-age percentile
SSFZ	Subscapular skinfold-for-age z-score
TSF	Triceps skinfold
TSFP	Triceps skinfold-for-age percentile
TSFZ	Triceps skinfold-for-age z-score
WAP	Weight-for-age percentile
WAZ	Weight-for-age z-score
WHO	World Health Organization
WHP	Weight-for-height percentile
WHZ	Weight-for-length and weight-for-height z-score



## What is WHO Anthro for personal computers

WHO Anthro version 3.1 for personal computers, hereafter referred to as WHO Anthro, is a software for use on desktop personal computers or laptops using MS Windows. It was developed to facilitate application of the WHO Child Growth Standards in monitoring growth and motor development in individuals and populations of children up to 5 years of age.

A first version of this software was published in 2006 together with the first set of the WHO Child Growth Standards (i.e. weight-for-age, height-for-age, weight-for-height, BMI-for-age and windows of achievement for six gross motor milestones). In 2007 WHO published the second set of standards for the indicators head-circumference-for-age, arm-circumference-for-age, triceps and subscapular skinfold-for-age, triggering the need to update the software. This provided the opportunity to further enhance the software, include French and Spanish language versions as well as an online help facility.

The version 3 provided in addition a Russian language option and enables users in the Nutritional survey module to collect address reference data and correct for cluster sampling in the analysis section.

Upon request from the country office in Mozambique we developed version 3.1 which includes the option to change the language setting to Portuguese.

WHO Anthro consists of three modules:

- *Anthropometric calculator (AC)*
- *Individual assessment (IA)*
- *Nutritional survey (NS)*

Each module facilitates specific functions, i.e. to assess a child's nutritional status, follow a child's development and growth over time, or conduct nutritional surveys, respectively.

To continue monitoring children's growth when they are older than 60 months their individual assessment records can be imported into WHO AnthroPlus a similar software available from [www.who.int/growthref/tools](http://www.who.int/growthref/tools).

This manual provides an overview of the WHO Child Growth Standards including the motor development milestones, and instructions on how to apply them with the software. It provides guidance on software installation and management, navigation through the fields, entering data and deriving results.

WHO Anthro for personal computers (PCs) mirrors the functionalities of WHO Anthro for mobile devices (MDs), the sister software that has been developed for MDs running MS PocketPC 2003 or MS Windows Mobile 5.0. As both platforms are MS Windows-based, data can easily be exchanged between them. Both softwares use common command icons, enable the user to execute similar functions, and allow importing data from and exporting data to compatible file formats. WHO Anthro for PCs applies, by default, the new WHO Child Growth Standards and the former NCHS reference can be selected as an option for deriving results in the *IA* and the *NS*.

The WHO Anthro software for PC and MD, their manuals can be downloaded from [www.who.int/childgrowth/software](http://www.who.int/childgrowth/software).

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fax: +44 22 791 4156

Or go to web site [www.who.int/childgrowth](http://www.who.int/childgrowth)



## Organization of this manual

The first section of this manual provides background information and presents the application of the WHO child growth standards including the gross motor development milestones.

The next part describes the various software products and provides information on general installation options and technical requirements.



Given that several software features and applications are common in all modules, particularly concerning data-entry, these are outlined beforehand.

A separate section describes the specifications of the PC platform with step-by-step working examples for each of the modules.

In the last sections the user will find guidance on other functions and troubleshooting.

## Typographic conventions

This manual uses the following typographic conventions:

<b>Item</b>	<b>Example/description</b>
Interface buttons with text	Click <Search>
Interface icon	Click  (same as <Add>)
Keyboard keys	Press <Ctrl + Alt + Delete>
Menu paths	Click < → File → Open>
Interface fields/items (labels, boxes etc.)	<i>Name</i>
User input	Type [Jane] in the <i>Name</i> field
System menu paths	Click <  Start → Programs>
Interface windows	<i>Main</i>

Whenever the manual refers to titles or names that appear on the software interface, these are printed in italics.

Important notes to users appear grey-shaded, as shown here, to be distinguished from the running text.



# 1. The WHO Child Growth Standards

## 1.1 Background and innovative aspects

In 1990 the WHO constituted a Working Group on Infant Growth to develop recommendations for appropriate uses and interpretation of anthropometry in infants and young children. The Working Group's report (WHO, 1994) led to the conclusion that the National Center for Health Statistics (NCHS)/WHO international reference was flawed and failed to depict physiologic growth adequately. Its scientific weaknesses were sufficient to interfere with the sound nutritional management of young children, and the Working Group concluded that new growth curves were needed.

Consequently the WHO Multicentre Growth Reference Study (MGRS) was implemented to provide data to construct growth curves from birth to 5 years of age (de Onis et al., 2004). A key characteristic of the new standard is that it makes breastfeeding the biological "norm" and establishes the breastfed infant as the normative growth model. Health policies and public support for breastfeeding should be strengthened by having breastfed infants as the reference for normal growth and development.

The pooled sample from the six countries (Brazil, Ghana, India, Norway, Oman and the USA) that participated in the MGRS allowed the development of a truly international standard, reiterating the fact that children grow similarly when their health and care needs are met.

The wealth of data collected allowed the replacement of the international NCHS/WHO references on attained growth (weight-for-age, length/height-for-age, and weight-for-length/height) and the development of new standards for body mass index (BMI)-for-age, head circumference-for-age, arm circumference-for-age, triceps skinfold-for-age and subscapular skinfold-for-age. In addition, the accompanying windows of achievement for six gross motor development milestones provide a unique link between a child's physical growth and motor development.

Detailed descriptions of how the MGRS was implemented and the WHO Child Growth Standards were constructed are available elsewhere (de Onis et al., 2004; de Onis et al., 2006, WHO, 2006; WHO, 2007).

## 1.2 Technical details on attained growth indicators

The attained growth standards comprise the indicators weight-for-age, length/height-for-age, weight-for-length, weight-for-height, BMI-for age, head circumference-for-age, arm circumference-for-age, triceps skinfold-for-age and subscapular skinfold-for-age. The same sample and methodology was used to derive all the standards tables.

All nine indicators have separate tables and charts for boys and girls, and for using the z-score and percentile classification system.

The standards' ranges for each indicator are:

Indicators	Ranges
Weight-for-length	45 to 110 cm
Weight-for-height	65 to 120 cm
Weight-for-age	0-60 completed months
Length/height-for-age	
BMI-for-age	
Head circumference-for-age	
Arm circumference-for-age	3 to 60 completed months
Triceps skinfold-for-age	
Subscapular skinfold-for-age	

For all standards involving length or height measurements, recumbent length should be used for children younger than 24 months and standing height, for children 24 months and older. The software provides a mandatory box to tick, alongside the child's length or height data, to specify whether the measurement was taken in recumbent or standing position. The software will automatically convert



height to length for a child younger than 24 months whose height has been measured instead of length, and length to height for a child aged 24 months or older whose length was measured instead of height.

If age is not known but the type of measurement — i.e. standing (height) or recumbent (length) is provided — then the software uses that information to derive the results. If survey data have records with age unknown and no information on the type of measurement, then the software will assume that the measurement was recumbent length if the value is below 87 cm, or otherwise standing height. The cut-off point of 87 cm reflects the standards' median for boys and girls height-for-age z-score (HAZ) at 24 months. The WHO standards' median height is 87.1 cm for boys and 85.7 cm for girls, and median length is 87.8 cm for boys and 86.4 cm for girls. The mean of these four values is 86.75 cm which was rounded to 87 cm in order to obtain the cut-off point for shifting from length to height in case age and the type of measurement are unknown.

The standards' data tables for all age-based indicators are in days, and in 0.1 cm for weight-for-length/height. The tables and charts of the WHO Child Growth Standards are accessible in electronic format at [www.who.int/childgrowth/standards/en](http://www.who.int/childgrowth/standards/en). Detailed descriptions of the technical aspects of the standards can be found elsewhere (de Onis et al., 2006; WHO, 2006; WHO, 2007).

### 1.3 Standard growth measurement procedures

Before applying the WHO growth standards and in order to collect reliable data users should follow standardized measurement procedures. Detailed measuring protocols can be found in:

1) de Onis M, Onyango AW, Van den Broeck J, Chumlea WC, Martorell R for the WHO Multicentre Growth Reference Study Group. Measurement and standardization protocols for anthropometry used in the construction of a new international growth reference. Food and Nutrition Bulletin 2004;25(Supplement1):S27-36 (see <http://www.who.int/childgrowth/mgrs/en>).

2) World Health Organization. Training Course on Child Growth Assessment (<http://www.who.int/childgrowth/training/en>).

Among the most important points to ensure the collection of accurate anthropometric data are:

- Make sure all equipment is correctly calibrated on a regular basis.
- Conduct training based on recommended measurement protocols as well as standardization sessions for those who collect the data.
- Take the child's date of birth from a written record if available. Otherwise ask for both the child's date of birth and age on the day measured, since the year of birth is frequently reported incorrectly. If birth dates are not recorded or known with certainty, probe the caregiver for the approximate date of birth based on a local events calendar.
- Measure recumbent length in children younger than 24 months of age and standing height from 24 months onwards. In case this cannot be adhered to because, e.g. a child is too sick to stand, the software is designed to automatically convert the measurement.
- Always enter the information on whether recumbent length or standing height was measured.
- If age is not known, children who can stand up and are willing to stand should be measured standing whereas children who cannot stand up or are too weak to do so should be measured in recumbent position.
- Always indicate if the child has oedema or not.
- After the age, sex, weight, and length/height information have been entered, the user should check the results by using the graphing option to view single and multiple measurements. If a child appears to have extreme values beyond the flag boundaries s/he should be re-measured immediately.

### 1.4 Motor development milestones

The objective of the motor milestones interface is to monitor the acquisition of the following six gross motor milestones:

- Sitting without support



- Standing with assistance
- Hands-and-knees crawling
- Walking with assistance
- Standing alone
- Walking alone

These milestones are considered fundamental to acquiring self-sufficient, erect locomotion and are relatively simple to evaluate (Wijnhoven et al., 2004). The ideal age range to assess the achievement of these motor milestones is between 3 and 24 months. In order to achieve a motor milestone all the criteria for a given milestone need to be observed.

The software allows for two types of assessment, longitudinally via the *Individual assessment (IA)* module and cross-sectionally via the *Nutritional survey (NS)* module. Longitudinal assessments, generally conducted in the context of routine health visits, can monitor the timing and sequence of milestone achievements by individual children. The *NS* module, in turn, permits an evaluation of a child's achievement status in a single episode.

Descriptions of the achievement criteria and standardized testing procedures for each milestone are outlined in the *IA* and *NS* modules and can also be found elsewhere (Wijnhoven et al., 2004).

## 2. WHO Anthro setup

### 2.1 Requirements

The WHO Anthro software is meant to be applied by a wide range of users including those with limited software handling knowledge. Therefore this section is intentionally as non-technical as possible. It presents the minimum information necessary for the user concerning requirements, installation of the software and the default configurations.

Before the application can be installed, the PC or laptop must have the following Operating System (OS) and software pre-installed:

- Operating System: Windows 2000, Windows Server 2003, Windows XP, or Windows Vista.
- The .NET 2.0 runtime (22.4 Mb)

To check installed version of Windows:

- Go to *Start* → *Control Panel* → *System* → *General*

If the necessary OS is missing, please contact your IT Support.

To check if the .NET 2.0 runtime is installed:

- Go to *Start* → *Control Panel* → *Add or Remove Programs*, then verify if 'Microsoft .NET Framework 2.0' is listed under *Currently installed programs*

If .NET Framework 2.0 is missing, go the following link to download it:

- <http://www.microsoft.com/downloads/details.aspx?familyid=0856EACB-4362-4B0D-8EDD-AAB15C5E04F5&displaylang=en>

Minimum available disk space needed is around 6 Mb (for the application itself), plus sufficient additional disk space for Windows to function properly. Please note that the application size on disk (i.e. database size) will grow proportionally to the amount of data manipulated in the application (and thus stored in the database). To check available space on the hard drive:

- Right click on the hard drive (usually it's the C drive), then select *Properties* → *General*

### 2.2 Installation

The user may choose either to download the software from the WHO Child Growth Standards web site [www.who.int/childgrowth/software/en](http://www.who.int/childgrowth/software/en) or to install it from a CD-ROM.



The first version of the software (WHO Anthro 2005) and the present version (WHO Anthro) are two independent applications. Users of the first version may install the present one and operate them both in parallel. We recommend, however, to remove Anthro 2005 once one is familiar with WHO Anthro.

This new version can simply be installed over version 2. The data aggregated in version 2 will be retained in the installation process and does not get overwritten (see section 2.3 below).

To install the application:

- Run *WHO Anthro setup.exe* and follow the instructions on the screen

To run the application, do either of the following:

- On your desktop, double-click the WHO Anthro icon, or
- In *Start* → *Programs* → *WHO* → *WHO Anthro*

## Program files

The folder WHO Anthro contains the following 18 program files and 6 folders:

Name	Size	Type
Address		File Folder
es		File Folder
fr		File Folder
Help		File Folder
pt		File Folder
ru		File Folder
Log.xml	1 KB	XML Document
sqlceca30.dll	281 KB	Application Extension
sqlcompact30.dll	52 KB	Application Extension
sqlceer30EN.dll	127 KB	Application Extension
sqlceme30.dll	44 KB	Application Extension
sqlceoledb30.dll	130 KB	Application Extension
sqlceqp30.dll	514 KB	Application Extension
sqlcese30.dll	278 KB	Application Extension
System.Data.SqlServerCe.dll	231 KB	Application Extension
tmp.xls	0 KB	Microsoft Excel Worksheet
unins000.dat	6 KB	DAT File
unins000.exe	700 KB	Application
WHO Anthro setup.exe	3,785 KB	Application
WHO Anthro.exe	1,600 KB	Application
WHO Anthro.exe.config	3 KB	CONFIG File
WHOAnthroII.BLL.PC.dll	164 KB	Application Extension
WHOAnthroII.DAL.PC.dll	85 KB	Application Extension
WHOAnthroII.sdf	2,172 KB	SDF File

## 2.3 Re-installation

If the user needs to re-install the software (with the same or a newer version) the re-installation process will retain the database file with all aggregated data. There will be no need to un-install the software.

To re-install WHO Anthro:

- Download and save the software
- Double click on *WHO Anthro setup.exe*
- Follow installation instructions



## 2.4 Un-install the software

In case the user wants to completely remove WHO Anthro, click on the programme unins000.exe that comes with the installation package.

Name	Size	Type
Address		File Folder
es		File Folder
fr		File Folder
Help		File Folder
pt		File Folder
ru		File Folder
Log.xml	1 KB	XML Document
sqlceca30.dll	281 KB	Application Extension
sqlcecompact30.dll	52 KB	Application Extension
sqlceer30EN.dll	127 KB	Application Extension
sqlceme30.dll	44 KB	Application Extension
sqlceoledb30.dll	130 KB	Application Extension
sqlceqp30.dll	514 KB	Application Extension
sqlcese30.dll	276 KB	Application Extension
System.Data.SqlServerCe.dll	231 KB	Application Extension
tmp.xls	0 KB	Microsoft Excel Worksheet
unins000.dat	6 KB	DAT File
unins000.exe	700 KB	Application
WHO Anthro setup.exe	3,785 KB	Application
WHO Anthro.exe	1,600 KB	Application
WHO Anthro.exe.config	3 KB	CONFIG File
WHOAnthroII.BLL.PC.dll	164 KB	Application Extension
WHOAnthroII.DAL.PC.dll	85 KB	Application Extension
WHOAnthroII.sdf	2,172 KB	SDF File

Note that this process will delete the aggregated data in the SDF file and all collected information will be lost if not saved beforehand to a separate location.

WHO Anthro has other components that should not be removed in case other installed software uses the same components:

- Microsoft .NET 2.0 Compact Framework
- Microsoft SQL Server 2005 CE

## 2.5 Configuration and language versions

The date format in WHO Anthro is automatically set to match the user's date format as selected on the PC set-up functions. The user interface screens are fixed in size and colours, and cannot be altered.


Changing the language can only be done from inside the Application menu bar.

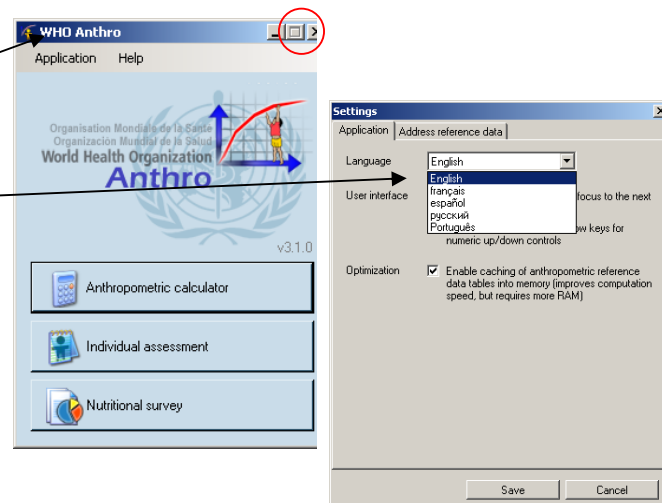
To change from the default language (English) to French, Spanish or Portuguese, the user has to change the regional settings by clicking:

*Application* → *Settings*

Click on drop-down menu <▼> and select the preferred language.

Click <Save> and then <OK> button in the message window "The application must be restarted for all the new settings to take effect."

Close the program by clicking on  or the corresponding icon and then restart WHO Anthro.





When French, Spanish or Russian language options have been selected but the operating system language of the PC is English, the buttons on message boxes will still read, e.g. <OK> and <Cancel>. This behaviour is standard in .Net.

Note that the software by default runs in English (independent of the OS language). Users have to manually select the preferred alternative language. Once selected, the language remains set until it is changed again in *Settings*.

Other default configurations are (see image above):

- 'Enter key' enabled to facilitate moving easily from one data-entry field to the next
- Mouse wheel disabled to avoid accidental changes on numeric up/down controls when entering measurements
- Reference data tables are automatically cached in memory to improve application performance

To produce an output, e.g. report of results, the application looks for Excel and uses it if present; otherwise, the software opens the default program set by the user for reading TXT files.

Data from the *IA* and *NS* modules are saved to the database file *WHOAnthroll.sdf*.

Note if that file has become corrupted, the application will notify that there is a problem connecting to the database. In that case the software needs to be reinstalled.

### 3. Basic software functions

The following section outlines the module functions that are similar throughout the software.

#### 3.1 Icons

WHO Anthro uses the following command icons with consistent functions:

Icon	Description
	Add
	Back/Return to the higher-level screen
	Cancel
	Delete (child, record, survey, etc.)
	Edit
	Graph
	Import
	Open
	Reset
	Restore
	Save
	Search
	Add new section (for managing additional data)
	Add new variable (for managing additional data)
	Archive
	Add to Archive
	Copy (graph image to clipboard)
	Anthropometry report (Excel)
	WHO Global Database (Excel)
	Export MM report (Excel)



Icon	Description
	Export
	Filter
	Clear filter
	Options
	Print

## 3.2 Data entry

The child's age, weight, oedema status (yes/no), length/height and type of measurement (recumbent or standing) are the basic variables required to derive the most common nutritional status indicators, i.e. weight-for-age, height-for-age, weight-for-height and BMI-for-age. Additional attained growth indicators based on WHO standards can be derived as long as the measurements for head circumference, arm circumference, triceps and subscapular skinfolds are available. Tab and Enter keys as well as the mouse-click allow the user to move from one field to the next.

### 3.2.1 Age

The software uses date of birth (DoB) and date of visit (DoV) to derive and display age in years and completed months (total completed months in parenthesis).

Age: 1yr 3mo (15mo)

The user is advised to double check this derived age with the caregiver to confirm that it is correct.

In order to account for leap years, age in completed months is calculated on the principal that one year has 365.25 days and thus one month (365.25 divided by 12 [months]) is equal to 30.4375 days. Therefore a child born 11 November 2004 and measured 11 November 2005 appears as having an age of 11 completed months (365 divided by 30.4375 equals 11.99). Note that the nutritional status indicators, however, are derived using the child's exact age in days (see below).

DoV is by default set to the current system (today's) date and DoB to the same date of the previous year.

The user is asked to enter the child's exact date of birth (DoB). The date can be entered either by typing it in or selecting a date via the calendar window (see image below). To open the calendar, click on <▼> on the right side of the date field.

The calendar has multiple modes of selecting dates.



Clicking on a date within the open month.

Clicking on the **Today** text will automatically shift the calendar and selected date to the current system date.

Clicking on the <◀>=<Previous month> or <▶>=<Next month> buttons changes the display one month at a time in the direction selected.

Clicking on the month opens a list with all months in the year from where the user can select again by clicking on the name of the chosen month.

Clicking on the year, e.g. <2007> opens scroll buttons that facilitate scrolling the year forward and backward.

To apply the WHO standards the software uses DoB and DoV to calculate the precise age in days:  
Age (in days) =DoV-DoB

The reason for deriving age in days is that all age-based indicator tables of the WHO Child Growth Standards are by units of days.

The software was specifically designed to enhance the quality of age estimation. If the exact **day of birth** is unknown, the user should fill in the year and month of birth and tick the box next to "Approximate date". When that field is ticked, the software attributes a random day to complete the date of birth. This date is then used to derive an exact age in days.



The child's age is an important piece of information and those collecting data should probe the child's caregiver to obtain at least an approximated date of birth (i.e. year and month). A useful tool to obtain an approximate DoB is a local events calendar. For example, the FAO guidelines (FAO, 2009) provide detailed information on how to develop such a local events calendar.

Only if there is absolutely no recollection of when the child was born, should the user tick the box next to "Unknown date". If that box is ticked, none of the age-based indicators can be derived, and only a weight-for-height z-score (WHZ) and percentile (WHP) will be calculated. In a survey the child will thus only contribute to the overall prevalence of this indicator.

Note, when age is imported as exactly 24 months, the software will derive 731 days and not 730.5 days.

### 3.2.2 Oedema

Children with oedema have swollen limbs and may look well fed, but oedema is a clinical sign of being severely undernourished. Ideally, any suspected oedema should be assessed before measuring the child's weight. To determine whether oedema is present, grasp the foot so that it rests in your hands with your thumb on top of the foot. Press the thumb down gently for a few seconds. The child has oedema if a pit (dent) remains in the foot after lifting your thumb. If the child has oedema of both feet, fluid retention increases the child's weight, masking what may actually be very low weight. In case the child has oedema the user should tick the respective box in the data-entry window. Consequently no weight measurement needs to be taken as it will be flawed. In case the user measures the child's weight and ticks the "Yes" button for oedema, the software discards the weight value for such a child and computes the weight-independent indicator z-scores and percentiles only. In deriving prevalences at population level, however, a child with oedema has to be counted as below  $<-3$  SD for all weight-related indicators. This logic is followed in all analysis options in the *Nutritional survey* module.

The default status for the data-entry window in all modules is that a new child has "No" oedema. If the child has oedema the user has to click the respective radio button.

### 3.2.3 Anthropometric data

Detailed procedures for measuring anthropometry can be found in the MGRS anthropometric training video and in the module, *Measuring a Child's Growth*, of the WHO child growth assessment course (available at [www.who.int/childgrowth/training](http://www.who.int/childgrowth/training)). It is recommended that those responsible for measuring anthropometry use these resources or be trained to take reliable measurements.

To enhance validity at data-entry and data-import, the software is programmed to accept the following value ranges (inclusive at min and max) for each measurement. Should the user enter a value outside those ranges, the entry field returns to blank.

Measurement	Min	Max
Weight (kg)	0.9	58.0
Length/height (cm)	38.0	150.0
Head circumference (cm)	25.0	64.0
Arm circumference (cm)	6.0	35.0
Triceps skinfold (mm)	1.8	40.0
Subscapular skinfold (mm)	1.8	40.0

#### Weight

Measurements should be entered in kilograms with maximum 2 decimals.

#### Recumbent length and standing height

Length and height measurements should be entered in centimetres with maximum 2 decimals.

In line with standard measurement procedures, the software derives for children younger than 24 months length-based indicators, and for children 24 months and older height-based indicators. There exist settings and scenarios, however, where it is not possible to comply with this recommendation and a child older than 24 months has to be measured lying down — for example when a child is too sick and too weak to stand, or when, because of time/equipment constraints, it is only possible to measure all children lying down. In these instances the software makes the necessary adjustment by



subtracting 0.7 cm from the child's length to derive an estimated height. Similarly, if a child is measured standing when s/he should be measured in the recumbent position, given his/her age, the software adds 0.7 cm to derive an estimated length. The 0.7 cm difference between length and height is based on the analysis of the MGRS sample of children (18-30 months of age) who had both length and height measurements taken.

**Note:** To obtain results of the length/height-based indicators, the user must always specify and tick the appropriate button, indicating how the child was measured, i.e. in recumbent or standing position.

When interpreting the results, the following should be kept in mind: The software converts the length/height measurement to conform to the foregoing recommendation and uses that converted value for deriving all relevant indicator results (including BMI, see 3.3.1). The software interface always shows the corresponding indicator name, i.e. length-for-age for all children younger than 2 years (or up to 730 days, inclusive) and height-for-age for all children 2 years and older (731 days or more). Therefore for a child that was measured lying down but is older than 2 years, the indicators will read: Weight-for-height and height-for-age; and the BMI as well as the BMI-for-age z-score are derived based on the height converted from length.

If age is not known but the type of measurement (i.e. recumbent or standing) is given, the software uses that information to derive either length- or height-based indicators (see section 3.3.5). If neither age nor type of measurement is known, the software considers any measurement below 87 cm as length and any measurement 87 cm and above as height. The cut-off point of 87 cm reflects the standards' median of boys' and girls' length and height at 24 months. According to the WHO standards the median height is 87.1 cm for boys and 85.7 cm for girls, and the median length is 87.8 cm for boys and 86.4 cm for girls. The mean of these four values is 86.75 cm.

#### **Head circumference and MUAC**

Enter the measurement result in cm with maximum 2 decimals.

#### **Triceps- and subscapular skinfolds**

Enter the measurement result in mm with maximum 2 decimals.

### **3.2.4 Motor development**

To complement the assessment and monitoring of a child's physical growth, the *Individual assessment* and the *Nutritional survey* modules enable the user to collect and analyse children's motor development for six gross motor milestones (i.e. Sitting without support, standing with assistance, hands-and-knees crawling, walking with assistance, standing alone and walking alone). This feature is recommended for use in children 3-24 months of age. Achievement is judged by observing several criteria per milestone. Given that judgment is by definition prone to bias, observers should be trained to follow standardized procedures in assessing milestone achievement (for details see Wijnhoven et al., 2004).

## **3.3 Results**

All software modules enable the user to derive nutritional status information (in z-scores and percentiles) for all indicators based on the WHO standards. In the IA and the NS module the user can choose to produce results based on the NCHS reference for those indicators that have a reference table:

<b>Indicators</b>	<b>WHO standards</b>	<b>NCHS reference</b>
Weight-for-length/height	✓	✓
Length/height-for-age	✓	✓
Weight-for-age	✓	✓
BMI-for-age	✓	NA
Head circumference-for-age	✓	NA
Mid-upper arm circumference-for-age	✓	NA



Indicators	WHO standards	NCHS reference
Triceps skinfold-for-age	✓	NA
Subscapular skinfold-for-age	✓	NA

NA = not available

For details on how to interpret each of the nutritional status indicators, users are referred to the WHO Technical Report Series 854, Physical status: the use and interpretation of anthropometry, chapter 5, pp.162-171 (WHO, 1995), and the training course on Child Growth Assessment, Module C: Interpreting Growth Indicators ([www.who.int/childgrowth/training](http://www.who.int/childgrowth/training)).

Note that by default the results are derived using the WHO standards. On how to apply the NCHS reference in the *IA* and *NS* modules, see sections 3.3.6, 4.3.8 and 4.4.4.

### 3.3.1 BMI

When weight and length/height have been entered the software derives the BMI ( $\text{kg}/\text{m}^2$ ) for the child and the parent(s) and/or caregiver. This index has been added to the other indicators of child nutritional status as it is commonly used to assess nutritional status in older children. Similar to BMI-for-age, BMI values are derived based on length for all children younger than 2 years, and on height for children 2 years and older. If a child younger than 2 years has been measured standing — the standard procedure is to measure in recumbent position — 0.7 cm is added to the child's height and the converted length is used to calculate the BMI. In case a child aged 2 years or older has length measured, 0.7 cm is subtracted to convert it to a height measurement before the BMI is derived. In case the age of the child is unknown the measurement in cm given is used without any conversion to derive the BMI value. A child's BMI value has to be distinguished from the BMI-for-age z-score value which is based on the WHO standards and appears with the other indicators' results.

In the window for parents' data the user has the option to collect the adults' weight and height data to derive their BMI. This information can be useful in the interpretation of the child's nutritional status. For details on the measurement and the interpretation of BMI in adults users are referred to the relevant WHO publications (WHO, 1995; WHO, 2003).

### 3.3.2 Percentiles and z-scores

The default classification system used to present child nutritional status is that of z-scores or standard deviation (SD) scores. This classification system has been recommended by WHO for its capability to describe nutritional status including at the extreme ends of the distribution and allow derivation of summary statistics, i.e. means and SDs of z-scores (WHO, 1995).

Given the widespread use of percentiles in clinical settings the software also derives these. The percentiles are based on exact z-scores. Therefore, use of the displayed z-score value (rounded to 2 decimals) to hand-calculate the percentile might yield a slightly different result from that displayed by the software.

The z-scores appear as not available (*NA*) when:

- child's age is above 60 completed months
- child's age is unknown, consequently WAZ, HAZ, BAZ, HCZ, MUACZ, TSFZ and SSFZ are *NA*
- child's length is <45 cm or >110 cm and his/her age is less than 24 months, consequently all length-based indicators are *NA*
- child's height is < 65 cm or >120 cm and his/her age is 24 months or older, consequently all height-based indicators are *NA*
- child's age is less than 3 months, consequently MUACZ, TSFZ and SSFZ are *NA*

Please note that percentiles read "NA" for all z-score values <-3 SD and >+3 SD because percentiles beyond  $\pm 3$  SD (equivalent respectively to the 0.135<sup>th</sup> and 99.865<sup>th</sup> percentiles) are invariant to changes in respective z-scores.



### 3.3.3 Colour coding


The following colour codes are applied to visually distinguish the different levels of severity:

Colour	Applied to	z-scores (z)	Percentiles
Green	numeric range	$-1 \text{ SD} \leq z \leq +1 \text{ SD}$	
	graph line	Median	50th percentile
Gold	numeric range	$-2 \text{ SD} \leq z < -1 \text{ SD};$ or $+1 < z \leq +2 \text{ SD}$	
	graph line	-1 SD and +1 SD	15th and 85th percentiles
Red	numeric range	$-3 \leq z < -2 \text{ SD};$ or $+2 < z \leq +3 \text{ SD}$	
	graph line	-2 SD and +2 SD	3rd and 97th percentiles
Black	numeric range	$z < -3 \text{ SD}; z > +3 \text{ SD}$	
	graph line	-3 SD and +3 SD	NA*

\* NA = not available

### 3.3.4 Graphs

Graphing results enables the user to visualize the child's growth in relation to the standard curves. This display feature provides a means of sharing the results with the child's caregiver and also to visually assess the growth pattern over time. In view of the likely continuation of using child growth charts on paper, the graphing option enables the user furthermore to double check that the entry made on the paper chart corresponds with the display on the computer screen.

It is recommended to always maximize the graph window by clicking on  (or corresponding icon in your MS version) to take full advantage of this viewing feature. This is also to avoid possible truncation of the text.

The user can view the graph for each indicator using either the z-score or percentile classification system.

For the WHO standards the graph options for child growth data are:

- Weight-for-length between 45 and 110 cm
- Weight-for-height between 65 and 120 cm
- Weight-for-age 0-60 completed months
- Adjacent length-for-age and height-for-age with a vertical line at 2 years of age to mark the change from length to height; from 0-60 completed months
- Adjacent length- and height-based BMI-for-age with a vertical line at 2 years of age to mark the change from length to height; from 0-60 completed months
- HC-for-age from 0-60 completed months
- MUAC-for-age from 3-60 completed months
- TSF-for-age from 3-60 completed months
- SSF-for-age from 3-60 completed months

For the NCHS reference the graph options for child growth data are:

- Weight-for-length/height from 49 to 145 cm
- Weight-for-age from 0-60 completed months
- Adjacent length-for-age and height-for-age with a vertical line at 2 years of age to mark the change from length to height; from 0-60 completed months



Note that measurements corresponding to missing z-score values, presented as "NA", are not plotted.

The graphed curves for the WHO standards and NCHS reference correspond to common classification lines. For the z-score classification system the lines displayed are:

- Weight-for-age and length/height-for-age: -3 SD, -2 SD, median, +2 and +3 SD
- Weight-for-length/height, BMI-for-age, head circumference-for-age, MUAC-for-age, triceps and subscapular skinfold-for-age: -3 SD, -2 SD, -1SD, median, +1 SD, +2 SD and +3 SD

Using the percentile classification system the following cut-off lines are displayed for all indicators: 3rd, 15th, 50th, 85th and 97th percentile.

Even though percentile values smaller than 0.135<sup>th</sup> and beyond 99.865<sup>th</sup> (equivalent to -3.00 and +3.00 SD respectively) read "NA" in the results window, the corresponding anthropometric measurements are plotted as long as they fall within the plotting range of age, kg, cm and mm represented in the respective graphs.

### 3.3.5 Note on WHO standards versus NCHS reference

In the modules of *Individual assessment* and *Nutritional survey* the user can choose to apply either the WHO standards (default setting) or the NCHS reference.

Given that the WHO standards are the default setting, if the user selects NCHS, saves the record, exits the module and comes back to the same child record later, the default z-scores that appear will be those based on the WHO standards and not on the NCHS reference.

When the NCHS reference is selected:

- Results can be derived for the age group 0-60 completed months (same as for WHO standards)
- No BMI-for-age, MUAC-for-age, HC-for-age, subscapular and triceps skinfolds-for age can be derived

When comparing results based on the WHO standards versus the NCHS reference the user has to bear in mind the different flag limits (see below 3.4.2) and their respective specifications, particularly concerning how weight-for-length/height z-scores are derived:

- If age and type of measurement are known (following the recommended data collection method), WHO standards impose conversion from length (l) to height (h) or vice versa when needed (e.g. if a child younger than 2 years was measured standing or a child aged 2 years and older was measured lying down), while the NCHS reference does not. A conversion factor of 1.0 cm was recommended for the NCHS reference but was hardly ever applied in the field (WHO, 1995).

Sex	Age group (months)	Type of measurement (l/h) <sup>1</sup>	Conversion	Data tables
<b>WHO standard</b>				
boys and girls	<24	l		Length table 45-110 cm
	<24	h	h + 0.7 cm	Length table 45-110 cm
	≥24	l	l - 0.7 cm	Height table 65-120 cm
	≥24	h		Height table 65-120 cm
<b>NCHS reference</b>				
boys	<24	l		Length table 49-103 cm
	<24	h	None	Length table 49-103 cm
	≥24	l	None	Height table 55-145 cm
	≥24	h		Height table 55-145 cm
girls	<24	l		Length table 49-101 cm



Sex	Age group (months)	Type of measurement (l/h) <sup>1</sup>	Conversion	Data tables
	<24	h	None	Length table 49-101 cm
	≥24	l	None	Height table 55-137 cm
	≥24	h		Height table 55-137 cm

<sup>1</sup> l = length; h = height

When only age is known but not the type of measurement:

Sex	Age group (months)	Data tables
<b>WHO standard</b>		
boys and girls	<24	Length table 45-110 cm
	≥24	Height table 65-120 cm
<b>NCHS reference</b>		
boys	<24	Length table 49-103 cm
	≥24	Height table 55-145 cm
girls	<24	Length table 49-101 cm
	≥24	Height table 55-137 cm

When only type of measurement is known but not the age:

Sex	Type of measurement (l/h) <sup>1</sup>	Data tables
<b>WHO standard</b>		
boys and girls	l	Length table 45-110 cm
	h	Height table 65-120 cm
<b>NCHS reference<sup>2</sup></b>		
boys	l	Length table 49-103 cm
	h	Height table 55-145 cm
girls	l	Length table 49-101 cm
	h	Height table 55-137 cm

<sup>1</sup> l = length; h = height

<sup>2</sup> NCHS reference users without access to software are referred to the printed data tables

If neither age nor type of measurement is known:

Sex	Length/height (cm)	Data tables
<b>WHO standard</b>		
boys and girls	<87	Length table 45-86.9 cm
	≥87	Height table 87-120 cm
<b>NCHS reference</b>		
boys	<85	Length table 49-84.5 cm
	≥85	Height table 85-145 cm
girls	<85	Length table 49-84.5 cm
	≥85	Height table 85-137 cm



## 3.4 Variables and codes

### 3.4.1 Data codes

Complete lists of data formats and variable codes for the different file formats in *IA* and *NS* module are presented in 5.5.3 and 5.5.4.

### 3.4.2 Flags and error tracking

The following lower and upper SD boundaries are the set flag limits for identifying any extreme or potentially incorrect z-score values for each indicator using:

#### WHO standards:

Indicator	Lower SD	Upper SD
WAZ	-6	+5
HAZ	-6	+6
WHZ	-5	+5
BAZ	-5	+5
HCZ	-5	+5
MUACZ	-5	+5
TSFZ	-5	+5
SSFZ	-5	+5

#### NCHS reference:

Indicator	Lower SD	Upper SD
WAZ	-6	+6
HAZ	-6	+6
WHZ	-4	+6

In the *AC* and *IA* modules users should check the results against these limits. A black background colour alerts the user if a resulting z-score is beyond -3 or +3 SD which is plausible but reflects extreme nutritional status. SD values beyond any of the corresponding limits shown above are considered implausible and the user is encouraged to check for data-entry errors.

In the *NS* module where data-entry takes place rapidly and often under strenuous conditions, any resulting z-score beyond these limits is automatically flagged (highlighting the value cell in pink) and the flag code appears in the column next to the results. In that case, the user should immediately check if there is a data-entry error or else re-measure the child.

In the analysis of nutritional survey data all flagged z-scores should be excluded. The report options in WHO Anthro are thus programmed to exclude any z-score value beyond these flag limits. However, flagged z-scores remain available when the data are exported. Thus, users who export the data into a different software for analysis should apply the same flag limits as exclusion criteria in order to obtain consistent results.

### 3.4.3 Motor milestone codes

The exported motor milestones data are coded "0 = no" and "1 = yes" for each of the six motor milestones to indicate whether it has been "Assessed" and "Observed" or "Reported" (relevant in the *NS* module).

If the child was not assessed for motor development the exported field values will be with value "0".

Colour codes visualize the child's current development status. These codes are specific to the *IA* and *NS* modules and are thus described in the respective sections (see 4.3.3 and 4.4.6).



## 4. Software modules: use and functions

To open the WHO Anthro *Main* window either double-click on the icon



created on the desktop in the installation process or go to:

*Start* → *All Programs* → *WHO* → *WHO Anthro*

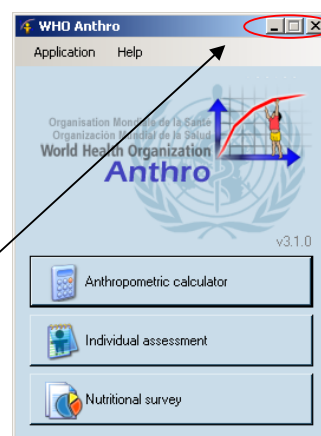
### 4.1 Main window

From the main window the user can open the three modules: *Anthropometric calculator (AC)*, *Individual assessment (IA)*, *Nutritional survey (NS)*.

To open a module use tab or arrow keys and press *<Enter>* or point with the mouse on the respective button name and left click .

Another way to open the modules is via the menu button; Click on *Application* and select module.

The menu icons on the top right work as in any other MS application, to minimize and close the application. Resizing to fill the screen is not possible for the main window.



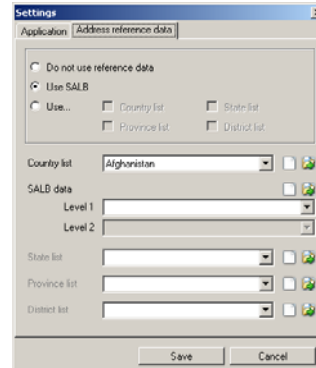
### Settings

The menu under *Application* enables the user to open the *Settings* window which consists of two tab-sections:

1) *Application settings*: To choose the language and to change default configurations (see section 2.5)

2) *Address settings*:

- Do not use existing address reference data, i.e. manually key in all information
- Use available UN Second Administrative Level Boundary files (SALB) see [www.unsalb.org](http://www.unsalb.org) ;
- Use lists for country, state, province, district, as specified by the user.



The selection can be turned on or off on this page by ticking or un-ticking the respective radio button on the upper part of the window. According to the choice made the selections appear active or inactive (grey). For example, the image above shows that SALB is active (which is linked to country list) while State, Province and District lists are grey and thus inactive.

The choice defined in *Settings* rules the type of data collection available in the IA and NS modules.

The address data can be useful in tracking children at the individual level and for further stratification in the survey analysis. The use of address reference data is further outlined in section 5.1.



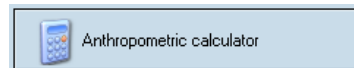
## 4.2 Anthropometric calculator (AC)

This module facilitates deriving nutritional status results for an individual child based on the WHO standards for the indicators: weight-for-age, length/height-for-age, weight for length/height, BMI-for-age, head circumference-for-age, mid-upper arm circumference-for-age, triceps and subscapular skinfolds-for-age in z-scores and percentiles; as well as the BMI unrelated to age. The user can view the measurements on a graph using the z-score and percentile classification system. In the AC module, the user cannot save any data. In order to keep a copy of the screen image, press the <Alt+ Print Screen> keys and paste the image into e.g. a MS Word file.

To enter data and move from one field to the next one can use the keyboard and press the <Tab> (<Shift + Tab> to go back) or <Enter> keys, or else use the mouse to point cursor on the empty field and left click.

### 4.2.1 Data-entry window

To open the module click on the button or select the AC from the application menu.



The module consists of one window which serves for data-entry and results viewing. The data-entry fields show anchor values corresponding to a healthy girl of 11 months.

Open online help page  
Drop-down functions to open calendar

BMI value based on  $\text{kg/m}^2$

Click here to close and return to main menu.

Enter anthropometric data with scrollbar or keyboard; specify how length/height was measured and if child has oedema.

Results in percentiles (slider control display and value with 1 decimal); z-scores with 2 decimals and coloured background.

Click on to open the corresponding graph.

Calculated age based on date of birth (DoB) and date of visit (DoV). Double check with the caregiver that this age is correct.

If the year and month of birth are known but it is impossible to obtain the exact day of birth, the observer is advised to tick the box *Approximate date*. The program then randomly selects a day within the given month and year.

If the year and month of birth are not known the observer is advised to use a local events calendar to identify two events between which the birth took place (see section 3.2.1) and thus estimate an approximate month and year of birth.

Should it be impossible to trace even the month and year of birth, the user is advised to tick the box *Unknown date*. This box is linked to the results and only weight-for-length/height and BMI, i.e. age-independent indicators, will be derived.





Always specify the child's sex, if s/he has oedema and how length/height was measured.

To fill in the weight and length/height data the user can either overwrite the anchor values (e.g. 9.0 kg and 73.0 cm), or use the scroll up/down buttons to select the exact measurement in kg, cm or mm. The maximum level of precision for any measurement is 2 decimal places. To move from one field to the next one can use the keyboard and press the <Tab> (<Shift + Tab> to go back), <Enter> key or the mouse to point the cursor and left mouse-click to activate the field.

The *Results* are displayed below for the percentile and the z-score classification system based on the WHO standards. A slider control gives the percentile position of the measurement within the 0-100% range, and to the right of each slider image the corresponding percentile value is displayed rounded to one decimal. The next column presents the respective z-score value with two decimals.

#### 4.2.2 Graphs

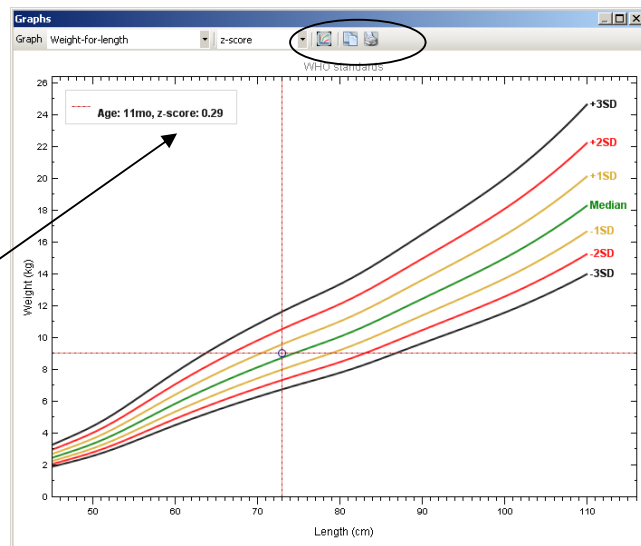
Clicking on  next to the z-score result opens the respective measurement in relation to the WHO standards.

Click on  (or corresponding icon) to maximize window.

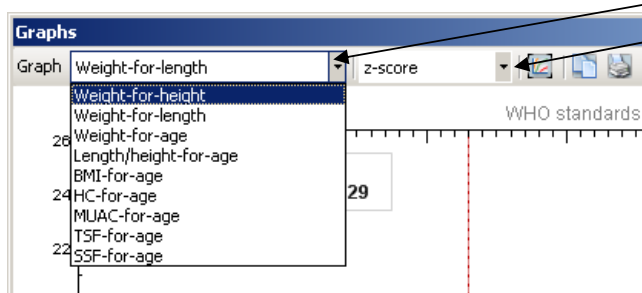
The result (z-score or percentile) is displayed in the top left corner of the plot area.

On top of the graph the user is reminded that these curves depict the WHO standards.


If a measurement cannot be plotted the message (No data) appears on a blank screen. This happens when a measurement is outside the plotting range (but possibly valid z-score), or if a z-score is not available (NA) due to missing data or the raw data are beyond the standard tables' ranges (see section 1.2).




From any open graph the user can select all the other graphs (see image with open drop-down list).



Another drop-down menu allows to switch from the default z-score classification to the percentile system.

To enlarge a section of the graph hold down the left mouse click and drag the mouse to select the desired area of the graph. When the left mouse click is released, the selected area will appear enlarged. To return to the original dimension, click on .

To copy the image to the clipboard, click on .

To send the graph to a printer, click on .



To close the graph click on  at top right corner Or the corresponding icon of your MS version.

The copied graph has no title so that the user can tailor the image to what s/he needs. To avoid confusion, though, it is recommended to label the graph immediately after pasting it into a document from the clipboard and to specify the indicator.

**Note:** In this module no data can be saved.

### 4.3 Individual assessment (IA)

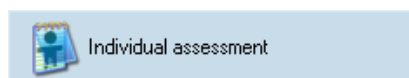
This module enables the user to collect and save longitudinal data for children who are repeatedly examined from birth to 5 years of age. The collected data can comprise anthropometry and/or motor development. The child's nutritional status data can be derived and graphically displayed based on the WHO standards (default setting) or NCHS reference, using the z-score and percentile classification system. The graphical display in this module offers views of single or multiple visits. This function helps to visualize trends in child growth. The IA module is particularly useful for paediatricians who want to monitor the growth of the children attending their clinics or for researchers gathering longitudinal data.

Once a child has passed the 60 months of age and further growth monitoring is intended the data can be transferred to WHO AnthroPlus, a software developed for assessing nutritional status in the 5-19 year-olds.

**Note:** To transfer data from WHO Anthro to WHO AnthroPlus, the user has to use XML format.


The module also allows users to define additional data variables to be collected during each child visit. For consistency purpose users should define these variables before starting the data collection as this template will then be applicable to all children.

To open the module from the start window click on this button or select the IA from the application menu.



#### 4.3.1 Main window

The module's main window consists of two parts: To the left is the active list, showing three example children; to the right is the child-specific window.

Tick a box next to child's name and click on  to open a child record. The child's details, parental data and list of visits appears in the window to the right. The column width can be adjusted by holding the cursor over the lines and dragging the left mouse click.



Menu options      Access to online help page      Child window with fields to enter name, DoB, specify sex, ID and open sub windows to enter parental data as well as address information and general notes (e.g. LBW).

Active list with example children and ID in parenthesis

List of visits (1 row = 1 visit) with selected visit highlighted in blue; visit results by indicator below. Click on to open graph.

Icons on top enable user to manage the list (i.e. add, open, delete, archive, search and view archive)

Use arrow or <Enter> keys, or mouse to select other visits.

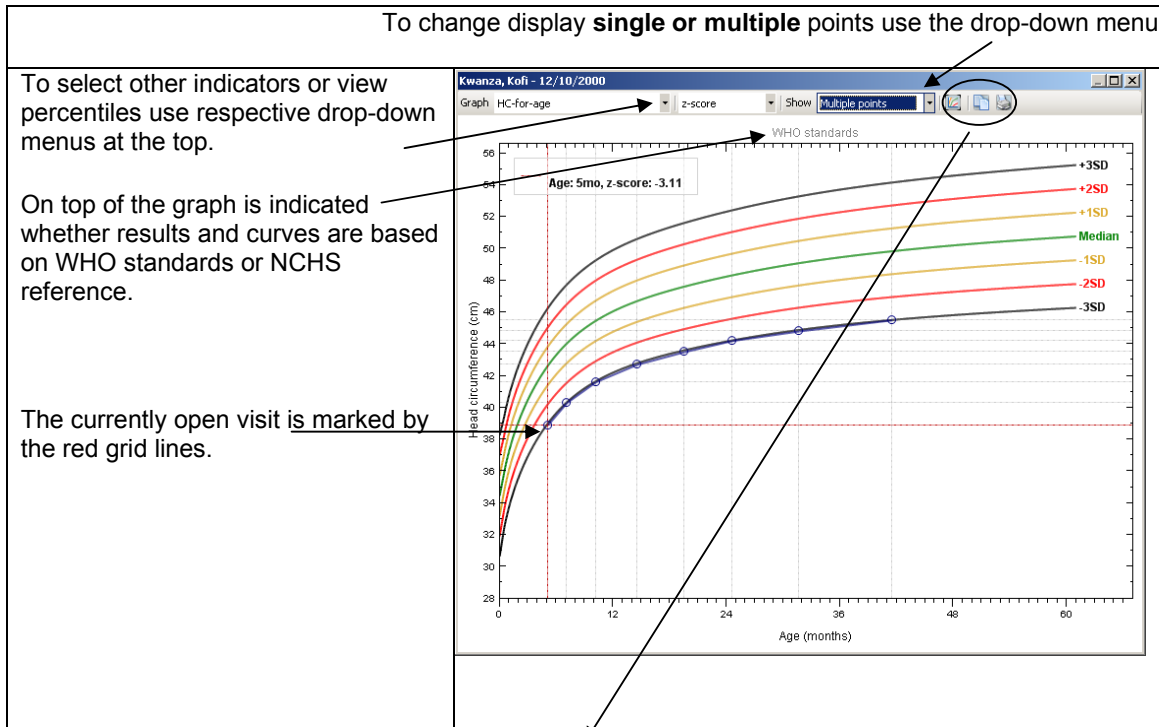
Click on icons: to add new visit ; to open a visit or double-click on selected (highlighted) row; to delete selected visit .

### Notes

This field enables the user to collect child-specific data such as birth conditions (e.g. LBW), metabolic diseases, etc. which might be important to remember each time the child is seen. These notes will also be exported when choosing this function.

### Graphs

Click on (or corresponding icon) to maximize the graph window.



To enlarge a section of the graph hold down the left mouse click and drag the mouse to select the desired area of the graph. Release the left mouse click and the selected area will appear enlarged. To return to the original dimension, click on

To copy the image to clipboard, click on

To send image to printer, click on

To close graph, click on or corresponding icon in your MS version.

As the copied graph has no title, it is recommended to add customized titles in the word processor environment specifying the indicator immediately after copying.

If a measurement cannot be plotted, the message "(No data)" appears on a blank screen. This is the case when a measurement is outside the plotting range, even if the z-score is valid. It also happens when z-score is NA due to missing data or when raw data are beyond the standard tables' ranges (see section 1.2).

Clicking on the menu bar *Individual assessment* enables the user to activate the following functions:

- |                                  |   |   |   |
|----------------------------------|---|---|---|
| • <i>New child</i> ----->        | • | } | Icons on top of active list of children |
| • <i>Delete selected</i> ----->  | • |   |   |
| • <i>Archive selected</i> -----> | • |   |   |
| • <i>Search list</i> ----->      | • |   |   |
| • <i>View archive</i> ----->     | • |   |   |



- *Manage additional data*
- *Options*
- *Import from file*
- *Export to file*
- *Close module* → Same as or corresponding icon in your MS version

See sections 4.3.5, 4.3.6, 4.3.7 and 4.3.8

Once a child's window has been opened the user can select from the menu bar *Selected child* the functions:

- Save changes → same as
- Cancel changes → same as
- Generate child report → same as (see section 3.3.4)

### 4.3.2 New child

The steps to enter a new child are:

- Click on at the top of the active list of children to open blank *New child* window.
- Enter first and last name; specify child's sex; the ID attribution by default is set to automatic(to change to manual go to *Options*)
- Enter DoB using keyboard or drop-down calendar; DoV is automatically set to today's date and age is derived and displayed below in years and months (see also 3.2.1).
- Click on to save and the new child's name with ID is added to the list on the left.

#### **Optional information on parents and address**

In the new child window the user has the option to collect information on the parents and the child's address. The respective fields are to the right side of the child window.

*Mother, Father and Address* are separate fields

To add information, click on . Note that free text typed directly into the fields without opening will not be saved.

To edit existing information, click on .

If either have been clicked but no information entered, the system displays *(No data)*.

The screenshot shows a window titled 'New child' with three main input fields on the right side:

- Mother:** A dropdown menu with the selected value 'mamasurtu, usa (1)'. Below it, small text reads 'Created by WH0-HQ-1\tsiyama, last updated by WH0-HQ-1\bloessnerm [06/09/2007]'.
- Father:** A dropdown menu with the selected value '(No data) (1)'. Below it, small text reads 'Created by WH0-HQ-1\tsiyama, last updated by NA [21/08/2007]'.
- Address:** An empty text input field.

Each field has a green plus icon to its right for adding new data and a floppy disk icon for saving or editing existing data.



To enter DoB either use the keyboard or the drop-down calendar in the same way as for the child. The derived age appears below.


Both the mother's and father's window include the option to enter their weight and height.

A separate *Notes* field enables the user to collect additional information for each parent.

With available weight and height data the software derives the BMI (kg/m<sup>2</sup>)

Click on <Save> to save and close the window. Click on <Cancel> to close without saving.

Saving the field automatically triggers the allocation of an ID for the parents (list of mothers/fathers) regardless of whether data have been entered or not. Note that the parental ID is not linked to the one of the child. When saved the added mothers and fathers information is available from the drop-down list and can be used for other children.

Click on  next to *Address* to open the data-entry window.

Depending on what option the user has selected in *Settings* the Address window looks like one of the images below:

Do not use reference data

If "do not use reference data" is selected then all fields are available to enter any free text.

SALB

When "SALB" or "Use...lists" are specified, the *Address* window includes a comprehensive list of countries and territories to choose from. To select a country or territory open the drop-down menu.

Use ...lists

All fields are optional and the user can complete as many or as few fields as deemed important. For example: ZIP/postal code (maximum 15 characters); Phone number (maximum 20 characters).

To activate SALB level 1 and 2 fields the user first has to upload the relevant country SALB file under *Settings* in the *Main* window (see sections 4.1 and 5.1.2). Once that is done, go to the address window, select country with the drop-down menu and the SALB fields will be activated automatically. Consequently the user can select the country's administrative levels from the drop down lists of SALB level 1 and level 2.


For more information on the use of address reference data and of SALB files see section 5.1. The user can edit the address reference data option in *Settings* at any time.

When saved the address data is available from the drop down list and can be used for other children.


If the user opens the Mother/Father/Address windows without entering any information and clicking on <Save>, the window gets closed and the system displays (No data).


### Add new visit

A new visit can be included to an existing child or to a newly created child. In the image below a new visit is being included for Jane Smith, one of the example children.


- Click on  in the visits section of the child window to open the new visit window which consists of two tab sections: *Anthro* and *Motor*.



- To change DoV (default is today's date) use keyboard or calendar; DoB and derived age are displayed below. DoV and derived age apply automatically to the anthropometric and motor development data
- In the <Anthro> tab section, enter measurements, specify how length/height was measured and whether the child has oedema.
- The *Notes* field is visit-specific and enables to collect important information relevant to this visit.
- As no additional data have been defined, the field appears grey.
- In <Motor> tab section the user can assess achievement for 6 MMs (see section 4.3.3).
- Clicking on  at the top left corner opens the graph with the plotted measurement in the Anthro section and the MM windows of achievements in the Motor section.


- Click on the <Save> button to save the added visit data and close visit window.
- Click on <Cancel> to close the visit window without saving the entries made.
- To save changes made to the child's data file, click on  at the top of the child window or use the menu, *Selected child* → *Save changes*.
- To enter another child and his/her visit data repeat the steps outlined above.

Note: Measurement data from previous visits can be opened and edited at any time but the date of visit for a previously saved entry cannot be changed

To close the module, click on  or use the menu, *Individual assessment* → *Close module*.


The *Observer ID* that appears on the list of visits is defined by the user log-in of the PC.




### Delete

To delete a child and his/her visit data, click on a tick box to select child in the list of children and then click on  or select from menu *Individual assessment* → *Delete selected*. A message window will pop up where the user has to confirm that s/he wants to delete the selected child. If a child is deleted all her/his baseline information and visit data are also deleted.

### Archive

The archive function enables the user to move one or several children from the active list momentarily into an archive.

Tick the box in front of child's name to select and click on ; or select and go to menu *Individual assessment* → *Archive selected*. The selected children disappear from the active list as they are moved into the archive.


To retrieve a child from the archive click on  or go to menu *Individual assessment* → *View archive*. Select the child and click on . To return to the active list click on .

Note: There is no space limit in the archive, but the user should be aware that operations may take longer to perform on this file as its size increases. If children's data are no longer needed, it is better to export and archive them in an external file (best in XML format).



The XML format is recommended as it will facilitate the import of the child data into the WHO AnthroPlus software.

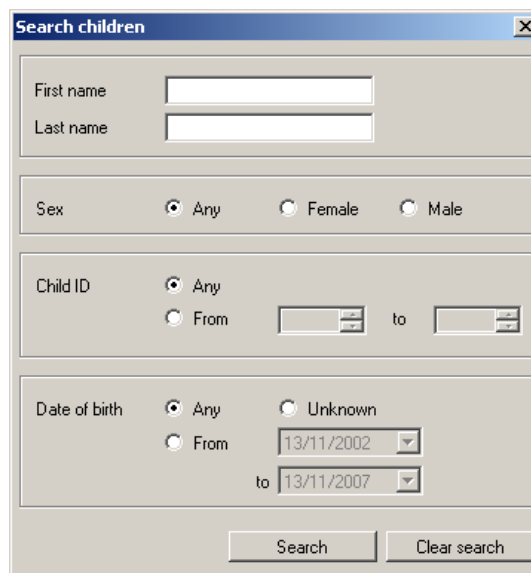
### Search

To search for a child (or several children) in the active list click on  or select *Individual assessment* → *Search list*. This opens the search window.

Possible search criteria are:

- First and last name of the child
- Child's sex
- Child's ID: click on *From* to activate the entry fields for a range with lower end upper limit inclusive
- Date of birth: To enter a range with lower and upper date inclusive, click on *From* to activate the date fields


Enter one or several criteria and click <Search>.



The screenshot shows a dialog box titled "Search children" with a close button (X) in the top right corner. The dialog is divided into several sections:

- First name** and **Last name**: Each has a text input field.
- Sex**: Three radio buttons labeled "Any" (selected), "Female", and "Male".
- Child ID**: Two radio buttons labeled "Any" (selected) and "From". To the right of "From" are two date input fields separated by the word "to".
- Date of birth**: Two radio buttons labeled "Any" (selected) and "Unknown". Below them is a "From" section with two date input fields separated by "to".
- At the bottom, there are two buttons: "Search" and "Clear search".

The search for names is not case-sensitive and uses pattern-matching to give best possible search results. An asterisk "\*" can be used as a wildcard if the full name is unknown, e.g. entering [L\*] will find Lopez. This allows for searching for a name even if only a part of it is known, e.g. searching for \*a\* in first name will list both Flora and Jane; searching for \*an\* will only list Jane. Similarly searching for \*anz\* in family name will list only Kwanza.

The active list will show the child or the children that match the specified search criteria. A search can be further refined by entering additional search criteria. To return to the complete list click on <Clear search>, and click on  to close the Search window.

### 4.3.3 Motor milestones assessment

This function enables the user to collect data on a child's motor development along with or independently of the anthropometric data. For background information on Motor milestones (MM) see section 1.4.

To explain the functions of this module, open the first visit of Kofi Kwanza, one of the example children.

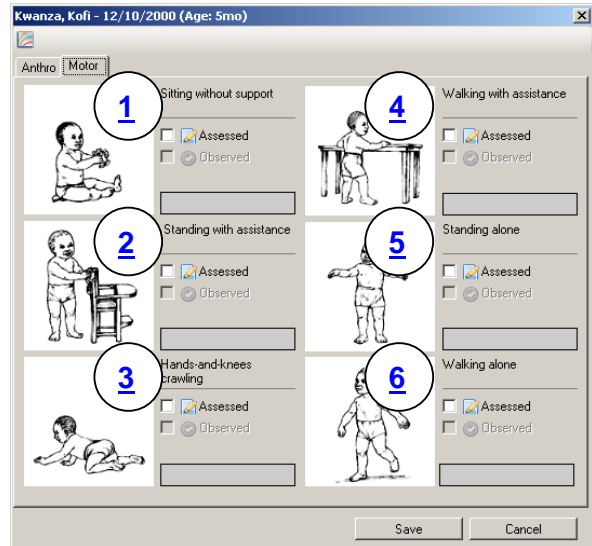


Clicking on <Motor> opens the *Motor milestones overview* window with the images of the 6 gross motor milestones.

The MM sequence is presented in two columns read from top to bottom.

On top, for easy reference, the menu line displays the child's name, visit date and current age.

To open any MM tick   and then  .

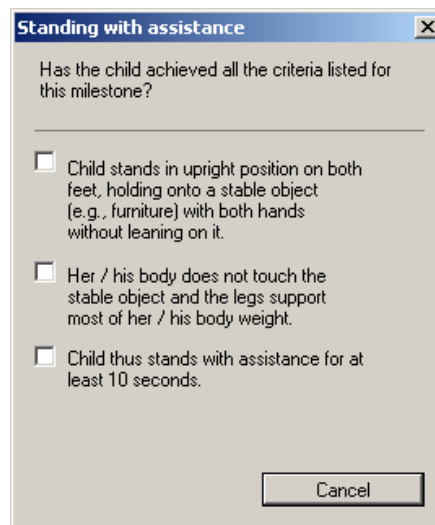


Each MM has detailed criteria that the user has to observe and tick in the MM-specific window (see example for MM 2 "Standing with assistance" on the right).

Only when all criteria for a milestone have been ticked is the milestone classified as achieved.

When the user has ticked all the criteria following their observation then the window closes automatically and a colour code is attributed according to the child's achievement status.


If the observer can not confirm that the child performs all the criteria, s/he has to click on <Cancel>.

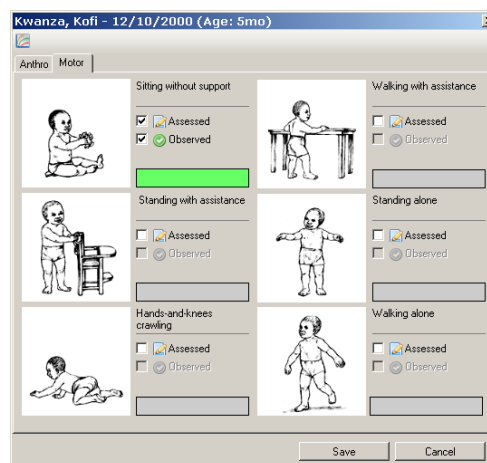


Open MM 1 and tick all the criteria.

The following image to the right will show up.

The colour codes for achievement status are to facilitate the quick overview without opening the graph of the windows of achievement.

At each visit, the user is able to summarize the child's achievement status of the 6 MM by clicking on  to obtain a graph of the windows of achievement.

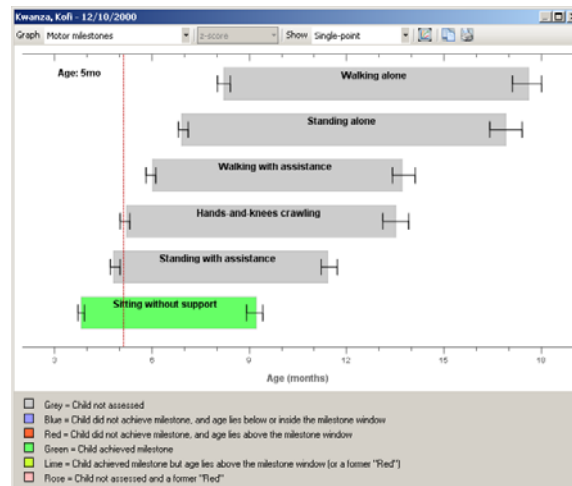


The colour scheme for the MM assessment in the *IA* module is as follows:



- Grey = Child not assessed
- Blue = Child did not achieve milestone, and age lies below or inside the milestone window
- Red = Child did not achieve milestone, and age lies above the milestone window
- Green = Child achieved milestone
- Lime = Child achieved milestone but age lies above the milestone window (or a former "Red")
- Rose = Child not assessed and a former "Red"

The MM overview window shows broad bands to signal normal variation in the achievement of these 6 milestones among healthy children. For detailed explanations on the windows of achievement see reference of WHO Multicentre Growth Reference Study Group, 2006.



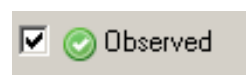
### Reset of MM

Given that the child is being assessed over time at several visits, assessment errors may be detected. The software allows the user to reset an assessed and observed milestone immediately or retrospectively:

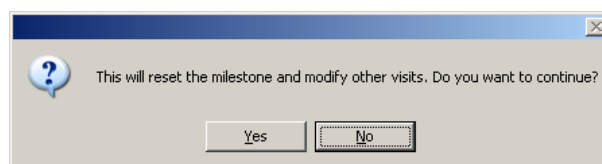
At a current visit, the user may click on all criteria as met, confirm the achievement of the motor milestone, but then decide that this is not correct and wish to alter this information.

If a milestone was observed at a previous visit and saved as achieved, but at present the child demonstrates a questionable state of attainment, the reset action affects the current visit entry and backwards to the visit of the milestone's first observed achievement.

To reset "un-tick" the box next to Observed.

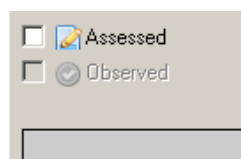


For a retrospective reset the following pop-up message will appear (see right image).



Confirm with <Yes> or cancel by clicking <No>.

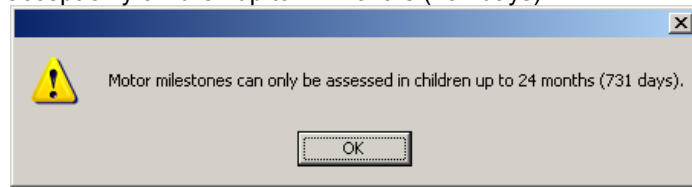
The reset milestone on the overview will appear grey indicating that the child has not yet been assessed for this MM.





The assessment of motor development is recommended for children 3-24 months of age. The software has thus been programmed to accept only children up to 24 months (731 days).

If the user clicks on <Motor> and the child is beyond that age limit, a pop-up window with a warning message appears (see image).

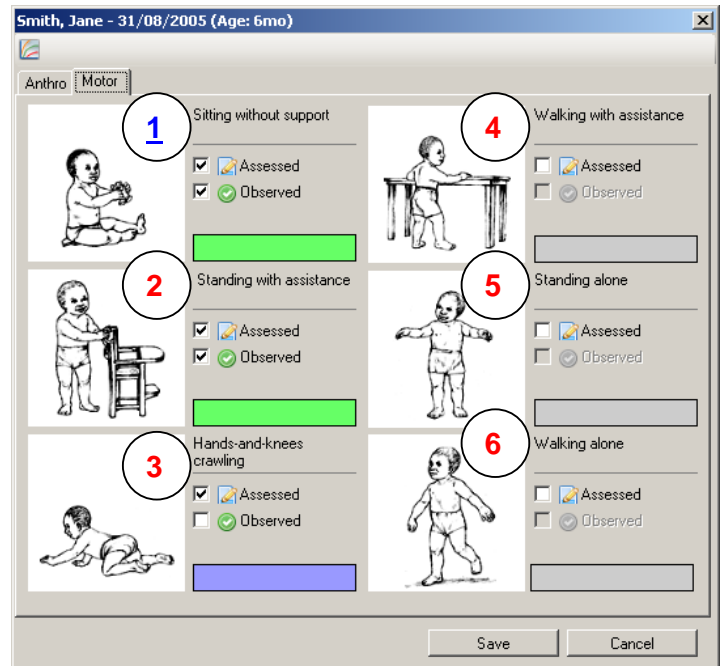


In order to continue, click <OK> and then <Cancel>.

All MM fields are inactive as no data can be collected for children older than 24 months. Click <Anthro> to return to the other tab section, or click <Cancel> to close the visit window.

Open the example Jane Smith and double-click on the first row to open her visit of 31 August 2005:

Click on the <Motor> tab to open the overview window.



At this visit, Jane has been assessed for the first 3 MMs, i.e. *Sitting without support*, *Standing with assistance* and *Hands-and-knees crawling*.

Jane performed all criteria for MM 1 and MM 2, thus these appear green. She did not achieve all criteria for MM 3, but given that her age (6 months) was within the window of achievement, the colour blue is attributed to this MM.

MMs 4-6 are grey as they have not been assessed at this visit because of her age.

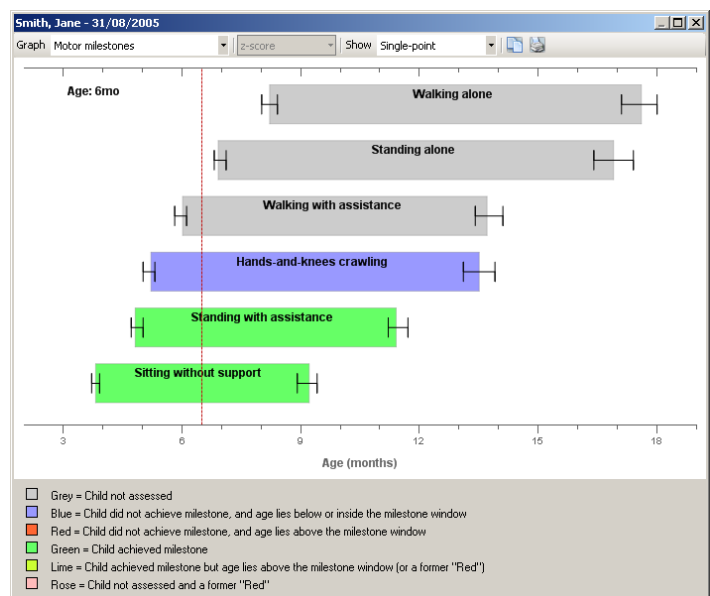
Click on to open the windows of achievement graph for the 1st visit.

This graph shows the same findings plotted on a time line (x-axis), 3 to 18 months. Each milestone has a window of expected achievement with upper and lower confidence limits.

A visit corresponds to a child's age which is marked with a dotted line. The dotted red line indicates that this refers to the currently open visit.


This graph demonstrates the natural sequence of these 6 MMs over the age range 3 to 24 months.

For easy reference, a legend of the colour codes is included below the graph.




To copy the graph to a clipboard, click on .




To print the graph, click on .  
Open Jane's 2<sup>nd</sup> visit at 14 months of age.

She was now assessed for MM 3, 4, 5 and 6 (MM 1 and 2 were observed as achieved in the previous visit and need not be assessed again).

Jane could not perform all the criteria for MM 3; she could do MM 4, but neither MM 5 nor 6. Consequently the colour code for MM 3 turned red as her age is above the upper limit for its window of achievement; MM 4 turned green and MM 5 and 6 blue because her age is still within the window of achievement for both MMs.

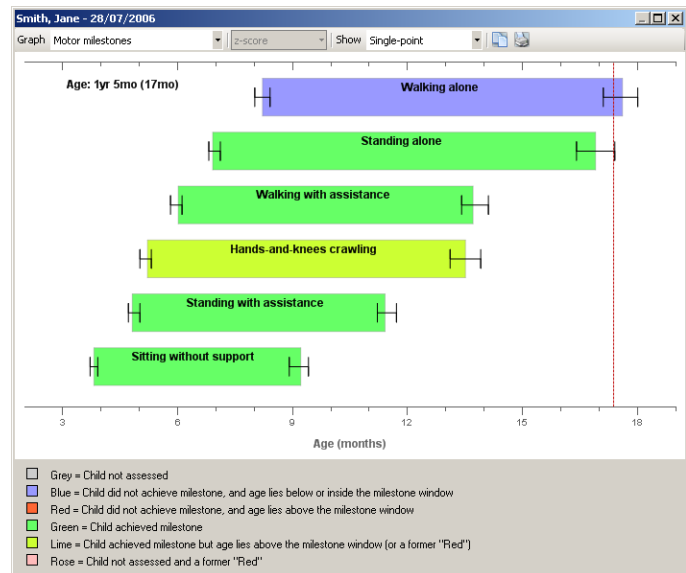
Click <Cancel> or  to close and return to the child window with the list of visits.

Note: About 4.3% of the children in the WHO Multicentre Growth Reference Study were never observed to crawl on hands and knees. Other studies also report that this milestone is sometimes not performed and that instead some other type of locomotion is used, such as bottom shuffling or crawling on the belly (WHO Multicentre Growth Reference Study Group, 2006).

Open Jane's 3<sup>rd</sup> visit at 17 months of age and click on .

She now performed all criteria for *Hands and-knees crawling*. As this achievement was assessed at an age that was beyond the upper confidence limit the colour code is "lime" and not "green".

She also achieved all criteria for *Standing alone* (→ green colour) but could not yet perform all criteria for *Walking alone* (→ blue because her age is still within the window of achievement).



As for this example, the user may wish to complete the child's motor milestones assessment at the next visit.

### Summary notes on the MM assessment


- The recommended ages for motor assessment are 3 to 24 months.
- Even though the x-axis on the graph is presented only up to 18 months – which is already beyond the upper-most confidence bound – the display functions for children up to 24 months.
- The reset function allows the user to correct a previous entry. When resetting an "Assessed" and "Observed" milestone a pop-up message will ask the user to confirm. Clicking <Yes> will



reset that milestone to unobserved for all visits between the “Observed visit date” and the present date. This change will be reflected in the overview MM graph depending on the age of the child at the visit the reset took place. If the *Assessed* button is ticked and the child's age is below or within the reset milestone window, it will appear blue; if the status of the reset milestone window, it will appear red. The status of the reset milestone will remain “Assessed” **but not** “Observed” until in a subsequent visit, ideally, the milestone is “Assessed” **and** “Observed”. The new status information is then saved and carried forward until the end of the follow-up period.

#### 4.3.4 Child report

The *IA* module enables the user to generate a child report including all the basic anthropometric data and results in z-scores.

Click on  in the child window or go to the menu *Selected child* → *Generate child report*. The software will request the user to specify the location where the \*.txt file should be saved. The file will automatically open in the program assigned to read \*.txt files. The column labels are self-explanatory. The notes created on the child level concerning birth conditions etc. are not included in the report.

This child report can be produced with results based on WHO standards and NCHS reference. To change go to *Individual assessment* → *Options* and click on the relevant radio button. A footnote on the child report specifies which comparison group was used to derive the results.

To obtain percentiles the user can go to Excel and create columns next to the z-scores and enter the formula “=NORMSDIST(select cell with z-score)”. E.g. a z-score of -2.20 is converted to 0.01390, meaning the 1.4th percentile. To return to a z-score the formula needed is “=NORMSINV(select cell with percentile)”.

#### 4.3.5 Import from file

The *IA* module allows to import child visit data from \*.DAT (Anthro 2005) and \*.XML files originating from previous WHO Anthro PC or for Anthro mobile device *IA* module.

Whatever data are imported, they need to follow the specific *IA* file schema (see section 5.5.3). The software checks that only valid data are being imported. For example, measurement data beyond valid ranges (see 3.2.3) are not imported and cells are turned to blank. The imported anthropometric measurements are truncated after 2 decimal places.

Note that a child can be imported twice with the same data. Please check the list after the import that it contains unique children so that future visits data are always aggregated on the same child record.

#### 4.3.6 Export to file

Child records that are no longer used should be exported and then deleted from the software. This will ensure that the database is not growing endlessly, and that the software functions do not slow down. The export function also allows the user to create a file for further analysis including all notes and additional data.

The user can export one child or several selected children to \*.TXT, \*.CSV or \*.XML formatted files. Only XML format allows re-importing.

To activate the *Export* function select at least one child from the list by ticking the box in front of the name, then open the menu *Individual assessment* → *Export to file*, select the folder, specify the file name under which you want to save the child data and choose the format.

The default setting for exporting results is by the WHO standards. The exported Excel file contains all basic data, the raw measurements including *Notes* and *Additional clinical data*, and results of anthropometric and motor development assessment. The information that age was based on an approximation is not exported. If this information is required for the health care provider to check the DoB at the next visit and verify it against a written record, the user should mark this in the *Notes* field.



The user can export the file with or without the resulting z-scores. When the file is exported with results, all z-scores are included even if they are beyond flag limits. It is left to the user to decide which values to exclude in any further analysis. For recommended ranges of acceptable values, see section 3.4.2.

When exporting as TXT or CSV (not XML), all additional data will be exported in separate columns. The name of each column corresponds to the ID name of the variable while the section ID name will be lost. Users are thus advised to create unique and self-explanatory variable ID labels. When exporting the IA data as XML (which is a hierarchical file format) all additional data will appear in one single element (column). After re-importing the XML file, the additional data appear again separate and the user can edit the data-entry.


The motor milestones data are exported in 12 columns coded "0=No" and "1=Yes" to indicate for each of the six motor milestones whether it has been "Assessed" and "Observed".


Note: Once a milestone has been achieved, i.e. the response is "1" in the "Observed" column, all subsequent visits will carry "0" for the "Assessed" column and "1" for the "Observed" column, respectively, because having been observed it will not be reassessed.

### 4.3.7 Manage additional data

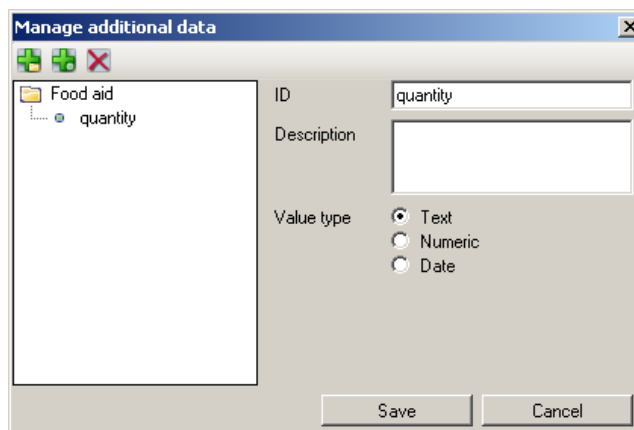
This function facilitates the systematic collection of extra data (e.g. infections, vaccination status, micronutrient deficiencies, receiving food aid, etc.). As in the design of a questionnaire, the user can define new sections and then variables within that section. The variable format can be text, numeric or date. Once defined the additional data can be collected for all new children at their future visits. It is thus important to first define the relevant additional data before starting with the data collection.


Click *Individual assessment* → *Manage additional data* to open this window.

Click on  to add a new section. Enter ID name (mandatory) and a description (optional).

Click on  to add a new variable to a created section. Enter in ID the name (mandatory), a description (optional) and specify the value type: text, numeric or date.

Users are advised to create all sections and variables and only when done then click on <Save> as this closes the window.



To delete a variable or section select the text on the left window and click on . If a section is deleted all variables within that section are automatically deleted. A warning message will pop up asking the user to confirm the action. The data already collected for these variables will remain in the previous visits. To avoid confusion it is recommended to clarify the desired additional data before starting a database of individual assessment.

The current example template can thus easily be deleted or changed to suit the user's needs. Click on <Save> to close the window; click <Cancel> to discard unsaved changes and close the window.

These additional data sections and variables apply to all new child visits in the IA module; the corresponding data can be collected in the visit window (see sections 4.3.2).



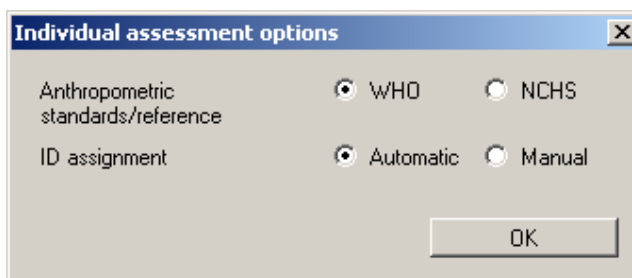
The created additional data variables and sections always appear in the language the user applied when adding them, i.e. they are not translated when changing to a different language version in *Settings*.

Note: This function is not designed to replace a comprehensive questionnaire and it should only be used for a limited number of additional variables necessary in context of the child growth and development assessment. They may increase the size of the SDF database file and reduce operational speed.

#### 4.3.8 Options

To change from WHO standards to NCHS reference, go to *Individual assessment* → *Options* and click on the relevant radio button.

This change applies only to the currently open child. As soon as the child is closed and another child selected, the WHO standards are applied (default setting).



When NCHS is selected results in z-scores and percentiles can only be derived for: weight-for-length/height, weight-for-age and length/height-for-age.

Changing from the default setting of automatic ID attribution to manual will remain selected until changed again by the user. If manual ID assignment is selected the user can enter any number with a maximum of 32 digits.



## 4.4 Nutritional survey (NS)

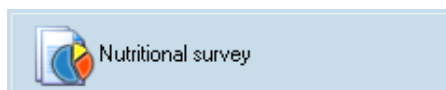
This module facilitates collecting new nutritional and/or motor development data based on a sample of children (one record per child). But the user can also edit existing surveys. Besides deriving and displaying individual results using z-scores and percentiles based on the WHO standards or the NCHS reference, this module also produces standardized summary results for the anthropometry (with and without the 95% CI) and for the MM assessment. Furthermore the user has the possibility to correct the 95% CI when a survey used a cluster sample design.

The user can import survey data files in \*.REC, \*.DBF, \*.WNS (WHO Anthro 2005 Beta version), \*.TXT, \*.CSV or \*.XML formats, while exporting survey data files is possible in \*.TXT, \*.CSV or \*.XML formats

The NS has the following differences compared to the IA module

- A child can only have one assessment of growth and/or development
- The motor milestone assessment has the option to collect "reported as achieved" milestones in addition to "assessed and observed" (given that there is only one visit, this allows for collection of reported and recalled data)
- The user can record data on: Cluster, Household and Team
- *Survey options* allow: Change of the flag limits, change of the age groupings for the summary report, and manipulation of the address reference data

To open the module click on the respective button on the start window or select it from the application menu.



### 4.4.1 Windows and functions

When opening this module, the column to the left displays the active list of surveys, showing at present two example surveys, and to the right there is the survey-specific window which is grey and inactive.

Click on tick box next to *Sample survey* and click on  to open. Then click on *ID* (the header of 4<sup>th</sup> column from the left) to sort and select the 2<sup>nd</sup> record. You should see an image like the one copied below (the date format depends on what the user selected in his/her *Settings*).







Menu options      Open online help page      Window with child records of open survey with the fields to enter/edit survey Name and Notes at the top

Active list with example surveys;  
Icons on top enable user to manage the surveys in this list (add, open, delete, archive and view archive)

Survey specific window:

List of records (1 row = 1 record) with selected record highlighted in blue. Use arrow or <Enter> keys or mouse to select other records.

Results by indicator of selected record are shown in lower part of the window. Click on  behind each results to open plotted graph by indicator.

Use icons:  to add new record;  to open a record or double-click on selected (highlighted) row;  to delete selected (highlighted) record(s).

To move to the right of spreadsheet use the scroll bar at the bottom; to display records further down in the spreadsheet use the scroll bar to the right.

### Survey Name

This field is mandatory, and the user has to enter a specific name for each survey. If the user opens an existing survey, changes the name and saves this change, the new name will overwrite the old one.



### Survey Notes

This field enables the user to collect other descriptive data about the survey. The information included here will also be exported next to the survey name.

### Resulting z-score columns

The anthropometric results per record and graph options work similar to the AC and IA modules. The z-scores are also included in the spreadsheet. Scroll to the right to find the grey shaded columns. There are two sets of result columns, first come the ones for WHZ, HAZ, WAZ and BAZ and further to the right, the ones for HCZ, MUACZ, TSFZ and SSFZ. If a resulting z-score is beyond the flag limits the corresponding cell appears pink to alert the user.

### Nutritional survey

Clicking on the menu *Nutritional survey* enables the user to activate the following functions:

- *New survey* ----->
  - *Delete selected* ----->
  - *Archive selected* ----->
  - *View archive* ----->
  - *Import from file*
  - *Export to file*
  - *Close module* ----->
- - 
  - 
  - 
  - 
  -
- } Icons on top of active list of surveys
- } See details in sections 4.4.11 and 4.4.12
- } Same as:

### Current survey

Once a survey has been opened the user can select from the menu bar *Current survey* the functions related to the open survey:

- *Save changes* ----->
  - *Cancel changes* ----->
  - *Survey options* ----->
  - *Manage additional data* ----->
  - *Copy records to clipboard* ----->
  - *Anthropometry report (Excel)* ----->
  - *WHO Global Database (Excel)* ----->
  - *Motor milestones report (Excel)* ----->
- - 
  - 
  - 
  - 
  - 
  - 
  -
- } *Button with same name*
- } Icons and button on top of open survey

The results in z-scores and percentiles below the open survey records refer to the selected (highlighted) child record.

The following icons and corresponding functions are available on top of the records list:

Click on to add a new record (see details 4.4.2)



Click on to open a selected child record → e.g. to edit an existing record select one and click on , introduce the changes then click on the <Save> or <Cancel> button to return to list of records

Click on to delete one or several selected child records → e.g. to delete a record, select first one or several records (CTRL + click, or SHIFT + click) and then click on . The user is prompted to confirm the wish to delete. Once deleted the records cannot be recovered in WHO Anthro.

Click on to open *Filter records* window (see section 4.4.9)

#### 4.4.2 Add new record to a survey

With the Sample survey open, click on to add a new record.

This will open an empty data-entry window similar to the one in *JA* module. The *New record* window consists of three tab sections: Anthro, Motor and Address.

In Anthro, the new fields are:

Age (in days) if DoB is not available. In section 4.4.3 below the user can find a complete conversion table for age in months to age in days. If the user intends to use the *Age (d)* field tick the box next to "*Unknown date*" under DoB and then enter age in days in the the *Age(d)* field.

Cluster, Team, ID and Household (automatic or manual depending on selection in *Survey options*) with maximum 10 digits.

Weighting factor (default set to 1.00, maximum of 16 decimals).

All measurements can be entered up to 2 decimals.

Clicking on at the top left corner will open the graph window showing the plotted measurements.

The *Notes* field is record-specific and enables the user to collect information that may be important in relation to the interpretation of the results (e.g. child was restless, very sick, needs referral, etc.).

Click on <Motor> to open the MM assessment window (see section 4.4.6).

Click on <Address> to enter any geographical or other address data as specified in the *Settings* on the Start window (see section 4.1)..

#### 4.4.3 A special note on age

With entered information on DoV and DoB, the software derives age in days for the calculation of the z-scores. Age in days and in months are then reported in separate columns on the spreadsheet.

If the exact **day** of birth is not known, the user can:

- 1) Either probe to obtain month and year of birth and then tick the box next to *Approximate date*. In this case the randomly derived DoB is used to derive age-based indicators but on



the column in the spreadsheet the day of birth is displayed as "XX" to make up a DoB that reads something like **XX**/mm/yyyy. In the export process the derived date is exported in full (without "XX") and the column *ApproxDateOfBirth* is set =1.

- 2) If the caregiver remembers only the child's age in months, the user can look up the age in days from the conversion table below and enter the child's age in days into the field at the top right of the *New record* window. This age information is re-converted to months and also displayed as an un-rounded value with two decimal places on the spreadsheet. To classify the results into age groups the completed months are used and not the age in days.
- 3) If age is only available in years, the user has to translate the value into months, multiplying the number of years by 12. Note that the results will only be a rough estimate for any age-based indicator.
- 4) The user may consistently enter day=15 (i.e. the middle of the month) into the DoB field.

When importing survey data sets with age available only in months, the respective variable needs to be mapped in the import process and the data will be converted by the software into age in days to derive z-scores.

### Age conversion table

Age in days is derived using the formula: Number of months  $\times$  30.4375. For example age in days at 24 months is:  $24 \times 30.4375 = 730.5$  (rounded to 731 days). The table below provides converted age in days from month 1 to 60.


Months	Days
1	30.4
2	60.9
3	91.3
4	121.8
5	152.2
6	182.6
7	213.1
8	243.5
9	273.9
10	304.4
11	334.8
12	365.3
13	395.7
14	426.1
15	456.6
16	487.0
17	517.4
18	547.9
19	578.3
20	608.8

Months	Days
21	639.2
22	669.6
23	700.1
24	730.5
25	760.9
26	791.4
27	821.8
28	852.3
29	882.7
30	913.1
31	943.6
32	974.0
33	1004.4
34	1034.9
35	1065.3
36	1095.8
37	1126.2
38	1156.6
39	1187.1
40	1217.5

Months	Days
41	1247.9
42	1278.4
43	1308.8
44	1339.3
45	1369.7
46	1400.1
47	1430.6
48	1461.0
49	1491.4
50	1521.9
51	1552.3
52	1582.8
53	1613.2
54	1643.6
55	1674.1
56	1704.5
57	1734.9
58	1765.4
59	1795.8
60	1826.3



#### 4.4.4 Options

To open *Options* window click on  or select the respective function from the *Current survey* menu.

At the top the user can change from default WHO standards to the NCHS reference.

The default setting is to have automatic child and household ID assignment, while IDs are assigned manually for the variables *Cluster* and *Team*.

The default age groups are: 0-5, 6-11, 12-23, 24-35, 36-47, 48-60 months (inclusive lower and upper limits), e.g. 12-23 months comprises all one-year-olds to children just under 2 years old (i.e. 23.99 months or <24 months).

To change the standard age groups insert new lower ends. The upper ends are then automatically adjusted accordingly. The only exception is the upper end of 60 months. If the survey did only include children up to a lesser age (e.g. 59 months) this can be changed accordingly at the upper end.

If there is the need to change the address reference data just for the NS module, the user can select it here without having to go back to the *Settings*.

The flag limits can be changed here. Since these changes will have an impact on the analysis results, they have to be documented and the flag limits reported together with the prevalence results.

When the NCHS reference is selected the flag limits automatically change to those recommended for the NCHS. Again, the user can change those but should clearly report the changes together with the results.

**Survey options**

Anthropometric standards/reference:  WHO  NCHS

Auto ID:

- Cluster
- Team no.
- ID
- Household no.

Age groups (months):

0	5
6	11
12	23
24	35
36	47
48	60

Reference data:

- Do not use reference data
- Use SALB
- Use...
  - Country list
  - State list
  - Province list
  - District list

z-score ranges:

Weight-for-length/height	-5.0	5.0
Weight-for-age	-6.0	5.0
Length/height-for-age	-6.0	6.0
BMI-for-age	-5.0	5.0
HC-for-age	-5.0	5.0
MUAC-for-age	-5.0	5.0
TSF-for-age	-5.0	5.0
SSF-for-age	-5.0	5.0

Buttons:

Clicking the *<Reset>* button restores the default settings.

The defined age groups should cover the complete sample used for the analysis.

#### 4.4.5 Flagging on data entry

According to the set flag limits, the software flags out in purple on the spreadsheet any extreme, potentially incorrect or out-of-range values (see section 3.4.2). As mentioned above, the default flag limits can be changed in the *Options* window.

Note that on the selected row due to the dark blue background the colour purple is difficult to see.

If z-scores appear as flagged the user is advised to check for potential data-entry errors (e.g. age, weight, length/height) and, if possible, to correct the data before proceeding. After editing a file or altering the flag limits, the user is advised to save the file, then re-open and scroll through the *FLAG* column to ensure that all changes have been applied and are correctly displayed in the data file before proceeding to the analysis. All flagged z-scores will be excluded from the analysis.



Missing z-score values appear as blank cells and are taken into consideration in assigning flag codes (see below).


### Flag codes

In the FLAG column adjacent to the z-scores the software displays a record-specific flag.

Flag	Error tracking
None	Valid z-scores were derived for all indicators.
WHZ	Check for the minimum and maximum limits of length (45 cm and 110 cm) and height (65 cm and 120 cm). If the child's length or height is within those limits, this could be an extremely thin or heavy child. If height is incorrect, the HAZ would be expected to be close to an extreme value (but not extreme enough to be flagged), and if weight is incorrect, then the WAZ would be expected to be close to an extreme value (but not extreme enough to be flagged).
HAZ	This could be an extremely short or tall child, but it is recommended to double check the height data to assure that it is correct and consistent on the data collection form and the computer file. Alternatively, the age could be incorrect; therefore one should look at the WAZ value to see if it appears extreme.
WAZ	Either weight or age may be incorrect.
WHZ & HAZ	Length or height is most likely incorrect or missing.
WHZ & WAZ	Weight is likely to be incorrect or missing (it could also be due to the child being classified as having oedema).
HAZ & WAZ	Age information is may be incorrect, missing, or out of range.
WHZ, HAZ & WAZ	This may indicate that sex is unknown, or that at least two of the variables age, weight and height, are missing, are incorrectly recorded, extreme, or beyond the limits of the growth standards.
BAZ	This may indicate an unusual combination of WAZ and HAZ. Given the close association between BAZ and WHZ, in most cases where BAZ is flagged WHZ also will be flagged.

To date there is little experience with limits and combinations of the indicators head circumference-for-age, MUAC-for-age, triceps and subscapular skinfold-for-age. Therefore no error tracking assistance has been derived for these indicators.

#### 4.4.6 Motor milestones assessment

It is recommended to assess the six gross motor milestones in children 3-24 months. Select the sample md\_ns\_survey from the active list on the right and click on .



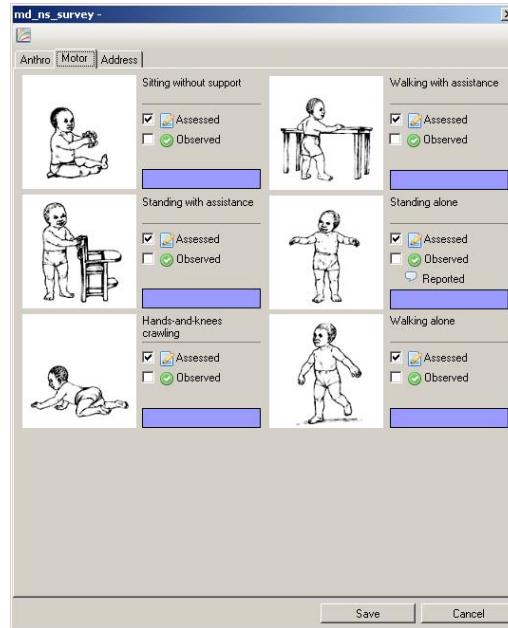
Sort the spreadsheet by ID number and open the girl with ID=1.


Click on the Motor tab section to open it and you will see the image to the right.

This girl has been assessed for all 6 milestones. She achieved none but her age lies below or inside the milestone windows.

To see the overview click on .

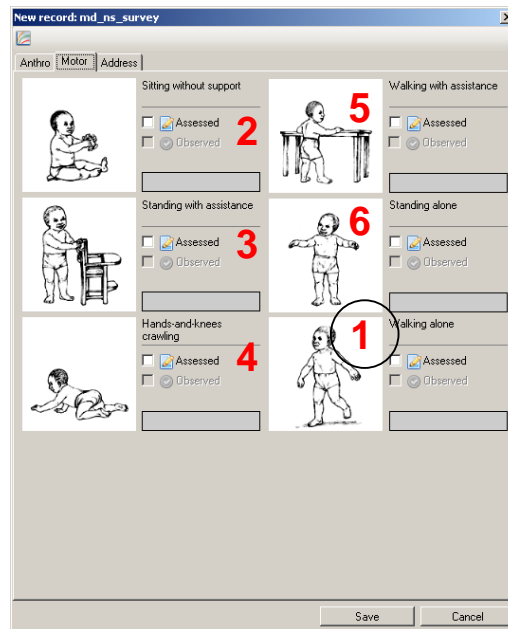
To get back to the spreadsheet, close the overview window, then click on <Cancel> to close the data entry window as shown on the right.



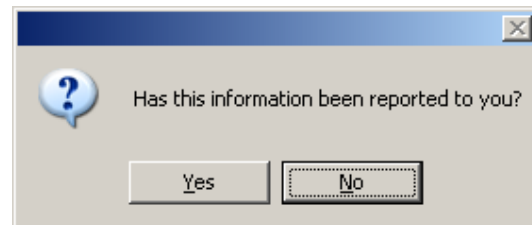
To add a new record to the sample survey click on  and then on the Motor tab on top of the new record window. The layout looks the same as for the IA module but the process of data collection is slightly different.

Given that in a typical survey the observer has only one opportunity to assess the child, the recommended sequence is to start by assessing MM 6, *Walking alone*.

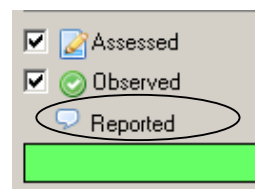
If the child fulfils all the criteria for *Walking alone*, the software is programmed to assume that all earlier milestones have also been achieved and they do not need to be assessed. If the child cannot walk alone and the parent or caregiver does not report that the child is able to do so, then the user should proceed to assess MM 1, 2, 3, 4 and 5.



For the same reason the user can also collect the achievement of MM based on recall information by the caregiver. If all criteria for a MM are reported by the parent or caregiver the user ticks the respective boxes for each criterion, and a pop-up window will ask the user whether this information was reported.



Clicking <Yes> will return to the overview window showing achievement with a callout symbol. The achievement status is classified as "reported as achieved".





Once saved the data are included in the spreadsheet with a column for each MM. The column labels for the MM assessment are outlined below:

Label	MM name
<i>WalkA</i>	Walking alone
<i>Sit</i>	Sitting without support
<i>StandW</i>	Standing with assistance
<i>Crawl</i>	Hands-and-knees crawling
<i>WalkW</i>	Walking with assistance
<i>StandA</i>	Standing alone

Although in the natural sequence, the milestone *Walking alone* is the latest to be achieved, in order to save time it is used here as a trigger to whether earlier milestones would require assessment. If the child is uncooperative but reported by the caregiver to be able to perform all the criteria the user should also tick the boxes and then confirm that the assessment was reported.


The colour scheme the *Nutritional survey* module is as follows:

<input type="checkbox"/>	Grey = Child not assessed
<input type="checkbox"/>	Blue = Child did not achieve milestone, and age lies below or inside the milestone window
<input type="checkbox"/>	Red = Child did not achieve milestone, and age lies above the milestone window
<input type="checkbox"/>	Green = Child achieved milestone

Given that there is no difference in the analysis if a child was assessed and could not achieve the criteria or s/he was reported as being unable to achieve a milestone, the codes for these two statuses have been combined. Data collected with Anthro 2005 and WHO Anthro mobile using separate codes can be imported into the updated version and analysed without any problems. The sample *md\_ns\_survey* has been originally collected with the WHO Anthro mobile device software and thus shows the old coding scheme, i.e.:

Blank	Child was not assessed or reported by the caregiver
"0"	Child was assessed and unable to meet the criteria of achievement
"1"	Child was assessed and met all the criteria of achievement
"2"	Child could not be assessed, but has been reported by the caregiver as unable to meet the criteria of achievement
"3"	Child could not be assessed, but has been reported by the caregiver as able to meet all the criteria of achievement

The user can easily edit all data in the child record ( i.e. anthropometry, motor milestones and address). To edit, double-click on the row with the respective child record to open the record's window, overwrite the data in the respective field and click on <Save> to return to the *NS* records spreadsheet screen. Clicking on <Cancel> returns the user to the list of child records without saving the changes.

The software can summarize the MM data in the *Motor milestones report*, by clicking on  (see section 4.4.10).

The MM data may also be imported (see section 4.4.11).

#### 4.4.7 Address data

A separate tab section in the data-entry enables the user to collect address information for each record. The type of the address data that can be collected needs to be defined in the *Settings* window from the software *Start* window (see section 4.1).



According to choice made the data-entry screen will look like one of the following:

If user has chosen "Do not use reference data", s/he can enter free text or numbers into the fields as shown in the image to the right.

District	<input type="text"/>
Province	<input type="text"/>
State	<input type="text"/>
Country	<input type="text"/>

To use SALB reference data the user has to first upload the relevant data files. The advantage of SALB is that the administrative boundary codes can be used for mapping. As soon as the country is selected from the drop down list automatically the respective level 1 and 2 SALB files will be loaded and the user only needs to select from the drop down. There is no risk of spelling mistakes.

Country	<input type="text"/>
SALB Lev. 1	<input type="text"/>
SALB Lev. 2	<input type="text"/>

If user has selected to used tailored lists for the distinct administrative levels, again these need to be uploaded in the Settings.

District	<input type="text"/>
Province	<input type="text"/>
State	<input type="text"/>
Country	<input type="text"/>

To attribute a record to a certain e.g. District the user can choose from the drop-down menu.

The included address information is automatically carried over to the next entered record. The address data is available in the exported file and can also be used for further analysis.

#### 4.4.8 Manage additional data

This function is similar to *IA* (see details in section 4.3.7). Every new user-defined variable is added as a new column to the right of the spreadsheet. The additional data variables should be defined before starting with the survey data collection. If they are added later they will only apply to new child records.

Similarly, changing the additional data template half way through a survey will only affect the records created after the change. Existing records are left with their existing additional data structure. Exported records will always show the columns of the additional data variables as defined in the template. If this information has not been collected for some records the corresponding cells will be blank.

To add sections and variables go to *Current survey* → *Manage additional data* and create sections and variables as outlined in 4.3.7.

When an existing survey data file (e.g. \*.REC or \*.DBF) is imported into Anthro, the additional data variables (e.g. hemoglobin, dehydration, etc.) are retained as such. The user can continue collecting this information in the Anthro environment and also edit existing records. Users are advised though to limit the additional data variables as these increase the software's database size and thus slow down its functioning.

In the exported file formats CSV and TXT the additional variables are presented in separate columns to facilitate further analysis. To ensure that there is no confusion users are reminded to label the variables with unique names. In case a name is repeated the software will append a number to avoid duplicates, e.g. Sport, Sport2 etc. in the exported data. If there is more than one variable with the same section ID and variable ID, the values for the duplicate variables will be lost when exporting (as they are indistinguishable the retained value is always that of the first variable matching the section ID/variable ID combination).



Note that XML is now the only format keeping all data strictly intact (TXT/CSV files lose additional data section structure as described).

Best practice is to export a survey data set after analysis and when it is no longer used. Once archived outside the software is completed, delete the survey from the software in order to keep the database file as small as possible.

As a guidance, below are the sizes occupied on disk by a survey with more than 10'000 records including additional data variables:

- Original DBF file ~2.5 MB
- Exported as TXT ~1 MB
- Exported as XML ~9 MB
- Size in SDF database ~35 MB

Note that the software's database \*.SDF file can be as large as 2 GB.

As in the IA, the created additional data variables and sections always appear in the language the user applied when adding them, i.e. they are not translated between language versions.

## 4.4.9 Special spreadsheet functions

### Move, sort and filter child records

Besides the scrollbars, there are keyboard shortcut functions to move easily through list of records:

Ctrl + ↑ = go to top of list

Ctrl + ↓ = go to bottom of list

Ctrl + → = go to the right of list

Ctrl + ← = go to the left of list

The columns with the calculated z-scores in the spreadsheet are grey shaded to easily distinguish them from the rest.

Note that on the selected row due to the dark blue background the purple flag is difficult to see but the information in flag column adding a visual alert when looking at a record.


Recumbent	Height (cm)	WHZ	HAZ	WAZ	BAZ	Flag	HC (cm)	MUAC (cm)
No	94.90	-0.47	-1.57	-0.89	-0.43	WHZ_WAZ	47.30	14.50
No	99.70	-0.47	-0.94	-0.89	-0.43		51.00	15.10
No	105.40	-0.44	-0.11	-0.35	-0.44		51.50	15.80
No	102.90	-0.34	-0.75	-0.69	-0.37		48.80	15.30
No	115.60	1.49	1.95	2.23	1.71		53.00	19.00
No	96.70	1.35	-2.51	-0.69	1.48		49.00	15.30
No	87.20	0.76	-2.66	-0.99	1.18		47.70	16.10
No	96.20	0.04	-2.85	-1.75	0.27		50.00	13.80
No	99.00	-0.42	-2.00	-1.54	-0.43		48.30	14.60
No	83.30	1.06	-4.15	-1.70	1.68		49.50	14.20
No	101.80	0.68	-1.42	-0.44	0.72		51.10	15.10

TSF (mm)	SSF (mm)	HCZ	MUACZ	TSFZ	SSFZ	Wt. factor	WalaA	Sit	StandW
9.50	5.20	-1.95	-1.24	0.46	-0.75	1.95044			
9.80	5.20	0.52	-0.83	0.97	-0.94	1.65846			
7.20	6.10	0.72	0.36	-0.26	0.95	1.09859			
8.30	5.50	-0.60	-0.88	-0.19	-0.46	1.33952			
9.60	6.40	1.66	1.71	0.90	0.80	1.13254			
6.80	7.80	-1.02	0.78	-0.49	1.59	1.79277			
10.00	6.00	-1.33	0.23	1.10	0.26	1.83263			
6.30	4.20	-0.46	-2.14	-0.76	-1.46	1.16602			
8.50	4.80	-1.13	-1.95	-0.15	-1.14	1.02409			
8.80	6.60	-0.94	-1.45	0.53	0.78	1.34453			
9.70	6.50	0.33	-1.00	0.94	0.88	1.3532			

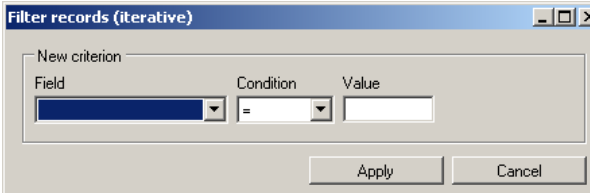
To sort the survey records for any variable click on the header cell. Whether the result is in ascending or descending order can be seen by the added symbol, i.e. ▲ = ascending, ▼ = descending. For text variables, sorting in descending order auto-resizes the column to display all the characters.



### Filter function

By clicking on the iterative filter function  the user can select a sub-sample of the current survey for further analysis.

Select a variable from the drop-down menu under *Field*; specify *Condition* and complete *Value* field.



To obtain the selected sub-sample click *<Apply>*; or *<Cancel>* to undo the filter selection. This filter function can be applied stepwise, i.e. first select males, then a certain age range, etc.


When a filter has been applied a new icon is added and the number of records re-counted (e.g. sex = male).




Clicking on  clears the filter and returns to the complete list of survey records.

The filter function can be used to obtain a sub-sample for further analysis in case estimates are required by another stratifying variable or different age group (e.g. 0-36 months); similarly the user can quickly view e.g. all children with WAZ<-2 SD or all oedema cases.

### Copy to clipboard

The user has the option to copy all or part of the survey records to a clipboard and paste them into another spreadsheet program, e.g. Excel. To select the rows either point the cursor, click and drag over the number of lines to copy, or use keys *<SHIFT + ↓ (down cursor)>*. To select multiple single lines, press *<CTRL + left mouse click>* on each of the rows to be copied. Click on  in the survey menu bar and the selected rows are always copied automatically with the column headings.

### 4.4.10 Results

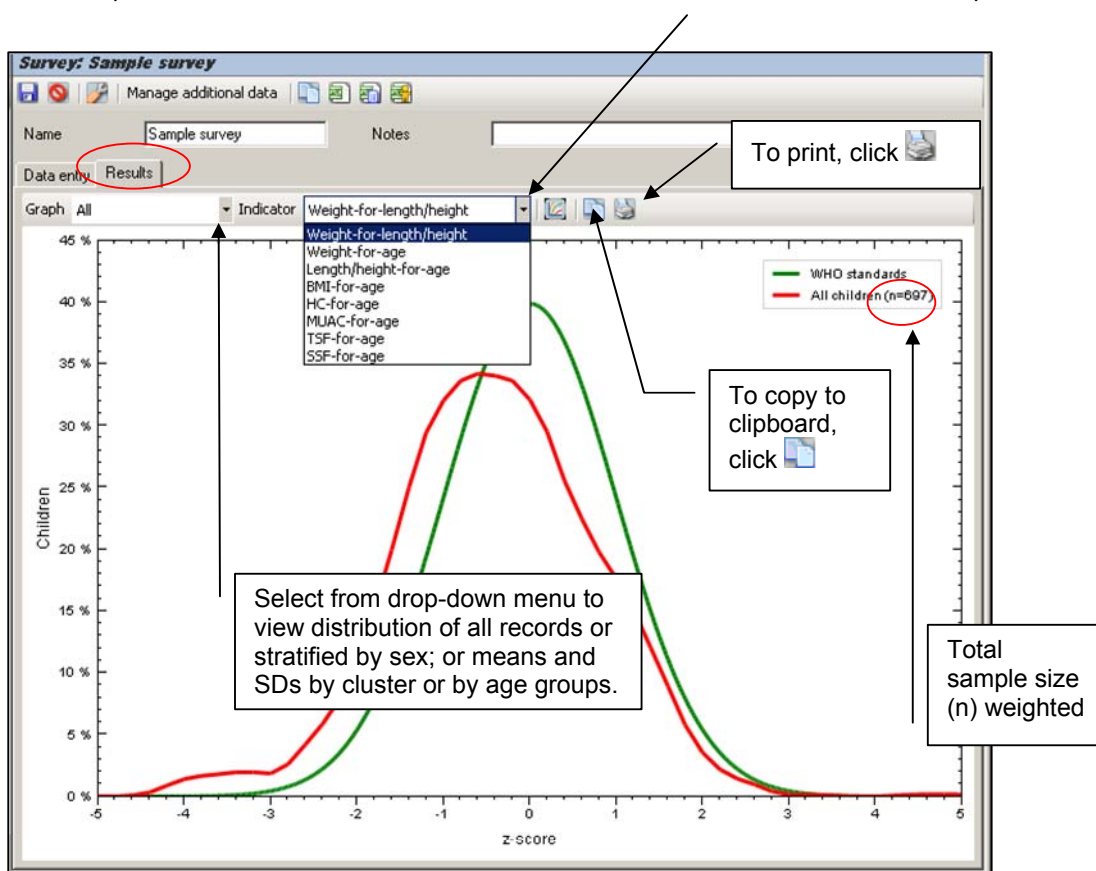
WHO Anthro *NS* module can produce results and reports using the WHO standards (default) or the NCHS reference. To change from the WHO standards to the NCHS reference click on , or open the menu *Current survey* → *Options*.

The *Results* tab window can be opened when a survey has at least 12 records. It allows the user to visually check the distribution of survey data for outliers.

The first graph shows how close the surveyed population's weight-for-length/height z-score is to the normal distribution. From the drop-down menu the user can select other indicators and further graphical overviews, i.e. by sex, cluster and age.




On this tab section the user can choose to display the z-score distributions by indicator for the survey data compared to the WHO standard curve. To select another indicator click on the drop down menu.






Note that the displayed graphs are based on the standard analysis, i.e. using all available valid z-scores for the graphed indicator. This option may result in different sample sizes by indicator. In case the survey contains sample weights, the sample size given is the weighted N. The formula used to produce the distribution graph is based on Kernel smoothing (Fox and Long, 1990).

If a distribution looks unusual or indicates the inclusion of outliers, the user may want to return to the spreadsheet and check the raw data. If no anomalies are identified the user may proceed to run the survey analysis.


To change the age groupings and flag limits click on , or open the menu *Current survey* → *Options* (see 4.4.4).

Weighted N is derived using the sample weight in the sample survey. If no sample weights are entered the programme attributes the weight 1.0 and unweighted and weighted N are identical.

## Analysis and report options

The user can choose several analysis report options. S/he can select them either from the menu *Current survey* or by clicking on respective icons, i.e.: , , or .

The report options are:

**Anthropometry report** (): Under this option the user can first specify if a correction for clustering needs to be applied in case of a cluster sample design. Secondly, the user can select between "Standard" and "Restricted" analysis.




Both options produce outputs showing prevalence by age groups and totals, stratified by sex and by cluster (if applicable) for common cut-offs, with means and SDs of z-scores, and 95% confidence intervals. The age-stratified results follow the age grouping defined in *Options* (see 4.4.4).

The *Standard* analysis makes maximum use of the collected data and includes for each indicator all valid z-scores and not just records with FLAG=0. Thus in the result tables the sample sizes per indicator may differ.

When choosing *Standard* analysis corrected for cluster sampling, the formula to derive the 95% CI is changed to correct for this sampling design by deriving wider CI estimates. The user has to load the cluster identification variable into the corresponding "Cluster" field during import or enter the variable during data-entry.

When choosing the *Standard* analysis without the correction for cluster sampling, the 95% CI are derived for a survey based on a random sample; and in this case the survey analysis can produce stratified results for any variable e.g. "Area (urban/rural)" that has been mapped into the Anthro field "Cluster".


The *Restricted* analysis includes only child records with valid z-scores for all weight and height-based indicators.

*WHO Global Database format* (www.who.int/nutgrowthdb). The output can be submitted for inclusion in this database if the survey fulfils all the data-entry criteria (see [http://www.who.int/nutgrowthdb/data\\_entry\\_inf/en/index.html](http://www.who.int/nutgrowthdb/data_entry_inf/en/index.html)). This analysis procedure also uses all valid z-scores to make full use of the available data in the survey, similar to the *Standard table*. What it does not include are the 95% confidence intervals. The sample sizes pertaining to the weight-for-age indicator are used as the overall and disaggregated N for reporting purposes in this database.

For any of the analysis options mentioned above, child records with missing age contribute to the total sample sizes and WHZ statistics (but not the age-based indicators).


Similarly, as children with oedema should not be weighed because of their flawed weight, no individual WAZ or BAZ can be derived. Therefore these children do not contribute to the respective mean and standard deviation statistics in any of the analysis reports. However, oedema cases are included as severely malnourished children in the prevalences of <-3 SD (and <-2 SD) weight-for-age and BMI-for-age. A child with oedema and unknown age (assumed to be <61 months) contributes to the **overall** sample size and prevalence of low weight-for-age, and low BMI-for-age, i.e. %<-3 SD and %<-2 SD. However, s/he will not be considered for the age disaggregated sample sizes and prevalences. The number of total oedema cases in the survey is reported in a footnote of the table.

Note that when sampling weights are available the full precision is used (maximum 16 decimal points) even though in the spreadsheet they appear truncated.

*Motor milestones report* (

In case the user is interested to run the analysis using another software, s/he can:



1) Select the desired rows on the spreadsheet and click  to copy to clipboard. When pasting the rows into another programme, e.g. Excel, the header row is automatically copied over as well.

2) Save the file and then export the survey, including results, to \*.CSV, \*.TXT or \*.XML format for further analysis purpose.

The second is the preferred option as it ensures that all records are exported and no information accidentally missed.

### **Good data analysis practice**

If a data file contains many variables, it is recommended to import into WHO Anthro only the relevant data variables needed for deriving z-scores and then export the data back and merge with the original file.

Check the survey data set before running analysis for:

- Flags due to data-entry errors
- Accidentally duplicated data-entry
- Digit preferences
- Age heaping (when only age in months is available)

The standard deviation obtained in the resulting tables is another indicator for the data quality. In a well conducted survey with good training and supervision the SD of the mean z-score is around 1.0. If the SD is for example beyond 2.0 it indicates a quality problem. An SD close to 2.0 can be found at times in the disaggregated results for the early age groups, especially for the length related indicators, as measuring length accurately can be quite difficult.

Any findings that indicate data quality problems should be included in the final survey report.

Always keep a copy of the original raw data as a backup.

The user can apply the *Cluster* column as a variable for region or urban/rural identification.

### **4.4.11 Data import**

It is possible to import data in \*.DBF, \*.REC (EpiInfo), \*.WNS(Anthro2005), \*.CSV, \*.TXT and \*.XML formats. CSV and TXT files need to use semi colons as separators.

When importing existing survey data the user has to select the data file from the folder where it is located. It is recommended to always keep a copy of the original raw data as a backup. Surveys with identical names are not overwritten. To avoid confusion it is recommended to give a unique name to each survey.

Variables imported in data sets with names such as "WAZ", "HAZ", etc. (z-scores based on NCHS reference), should be renamed before import to avoid confusion.



Files produced with the Anthro 2005 Beta version, i.e. in \*.WNS format, and those exported from other Anthro versions in XML format can be imported directly.

To import files in \*.DBF \*.REC, \*.TXT, and \*.CSV formats, the user has to map the important variables (see image on the right).

File names must have no blanks.

All basic variables needed for the Anthro analysis have to be matched with the variable fields in the original file.

To map variables click on the drop-down menu button for each and select its match from the list.

Imported measurements are truncated after 2 decimal places.

MM variables are listed at the bottom; to open and match those use scroll-bar on the right.

Anthro fields	Imported data fields
Survey date	
Cluster	
Team	
ID	
Household	
Sex	SEX
Date of birth	
Age (in months)	AGE
Weight (kg)	WEIGHT
Has oedema	
Measure	
Height (cm)	HEIGHT
Head circumference (cm)	
MUAC (cm)	
Triceps skinfold (mm)	
Subscapular skinfold (mm)	
Weighting factor	

### Notes on import:

Cluster data should be integer values (even if they are not integer, the programme will treat them as such). Text as cluster data is not imported and the column will appear blank.

If survey data have no sampling weight, if missing or "." or "," the software attributes a sampling weight=1. If a child record should be excluded from the analysis, the user is advised to insert "0" into the record's *Weighting factor* field.

When the 'weighting factor' field is mapped on the import dialog, then every missing (empty), out-of-range (i.e. negative) or other invalid sampling weight in the imported records will be set to "0" under the column labeled "Wt factor".

Missing values in *Survey date*, *Date of birth*, *Age (m)*, *Weight* and *Height* will appear as blank cells.

The programme highlights in purple any extreme or potentially wrong z-scores in the grey-shaded results columns (see section 3.4.2).

Where age appears as 24 months (= 730.5 days) in imported files, age is rounded to 731 days before deriving age-based estimates.

Any additional variables are appended to the right end of the spreadsheet.



#### 4.4.12 Data export

Anthro generates several variables in exported files (see 5.5.4). An example is "*DateOfBirthsApprox*" which is placed in a column next to DoB. This variable is coded "1" if DoB was approximated and "0" otherwise. The estimated DoB will be exported in full.

The additional variables are exported in separate columns and are thus available for further analysis.

Each line – except the first – in a \*.TXT or \*.CSV file represents one survey record, including all data for the corresponding survey.

Ambiguous field names are prefixed with the type of the object they belong to (e.g. Survey); in the absence of a prefix, fields are assumed to belong to the object represented by the lines in the file (Record).

The flag column is not retained in the exported NS files. Thus the user has to redefine and apply any flag limits that are required for further analysis.

Note that the codes for sex in the exported file are: female =0 and male =1.

### 5. Specific functions and file formats

#### 5.1 Address reference data

The software facilitates the collection of detailed address data for each child in the IA and NS modules. As a first step the user has to specify in the *Settings* how s/he want to collect the address information (see section 4.1).



In the *Address reference data* section the user can choose to not use the reference data (default setting), to use the Second Administrative Level Boundaries (SALB) datasets, or to apply user-defined country, state, province and district lists.

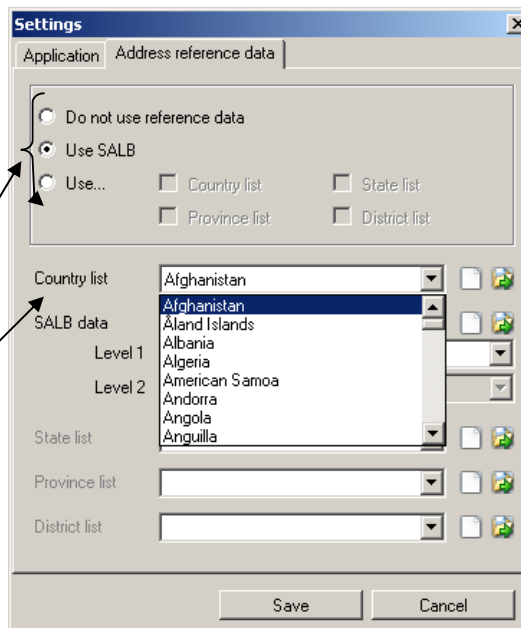
A comprehensive *Country list*, including territories and areas, comes with the installation. From this list the user can select a country/territory from the drop-down menu.

If the user chooses to not use any reference data s/he can use the country list and type in freely whatever information s/he deems important.

In order to use SALB the user has to prepare and upload the respective country file.

To tailor lists for province, state and district to match the covered area, follow instructions see 5.1.3.



With the reset icon  the user can delete the open list; while clicking on the import icon  allows to upload new country list, the SALB file or user-specified lists of province, state and district lists. It is recommended not to reset the country list as this will delete that resource file from the software which can only be recuperated via a complete removal and re-installation of the WHO Anthro software. In any point in time only one country list can be loaded.



##### 5.1.1 Country list

The *Country list* comes with ISO ALPHA-3 letter codes (not displayed) which are based on the United Nations Standard Country or Area Codes for statistical use found at: <http://unstats.un.org/unsd/methods/m49/m49.htm>.



In order to reset and replace this list click on  and then  to import the revised file. It is important when replacing or changing the country list to maintain its file structure, i.e. 1<sup>st</sup> column ISO ALPHA-3 code and 2<sup>nd</sup> column country name. Empty fields are not allowed.

### 5.1.2 SALB data

The SALB data are boundary files that are provided for the first and the second administrative sub-national level of a country. These datasets form part of the UN geographic database and can be downloaded from [www.unsalb.org](http://www.unsalb.org). Predefined SALB lists are available for most countries. SALB files facilitate the address data collection as users can select e.g. state and province names from the drop-down menu and do not have to type anything (no risk of typing errors). The files are up-to-date and enable further stratified analysis and mapping of results according to the country's administrative structure.

The meaning of SALB levels 1 and 2 depends on the internal structure and size of the country i.e. in Switzerland these levels have a different meaning than they do in Brazil.

When selecting SALB, the user has to specify the country where s/he will collect the data and then import the respective SALB data file.

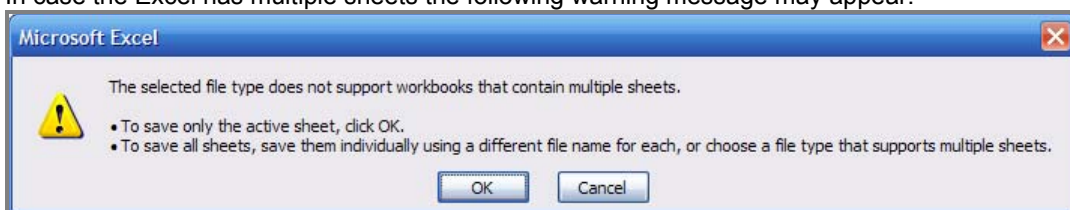
To add or update a country's SALB file, the user has to download and convert the SALB Excel file to a tab delimited text file before uploading it to the PC.

The steps to prepare the SALB files are as follows:

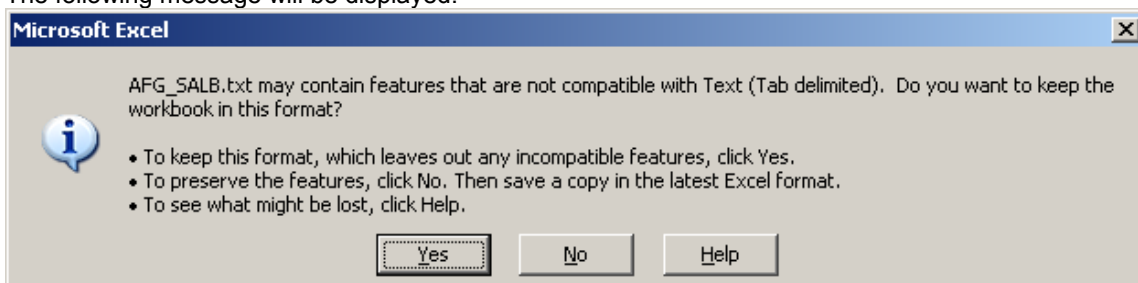
Identify the ISO-3code of the country of which you want to upload the SALB data by checking the list at <http://unstats.un.org/unsd/methods/m49/m49alpha.htm>.

To download the respective SALB xls from [www.unsalb.org](http://www.unsalb.org) it is best to immediately enter the URL, e.g. for Afghanistan [http://www.unsalb.org/tables/AFG\\_SALB\\_table.xls](http://www.unsalb.org/tables/AFG_SALB_table.xls) in the address window and click <Enter>.

- Save file in a defined folder
- Open the file in Excel
- Delete **all** header and footer rows so that the file contains only the following columns: 1st administrative level names, 1st administrative level codes, 2nd administrative level names and 2nd administrative level codes.
- In Excel go to < → File → Save As> and select: "Text (tab delimited) (\*.txt)"
- In case the Excel has multiple sheets the following warning message may appear:




- Select <OK>
- The following message will be displayed:



- Select <Yes>
- Copy the created file to a predefined folder for the address data.




- Open *Settings* from the Main window and click on  to the right of *SALB data*. Select the file and click <Open>.

Even when SALB data collection has been specified in *Settings*, the user can still collect other address information, i.e. postal code , phone number, e-mail, etc.

### Removing SALB data

To remove SALB data files go to *Settings*:

- Click on  to reset *SALB data*.
- Click on <Yes> to confirm and then <Save>

**Note:** When reset is activated, all currently imported SALB files will be deleted.

### 5.1.3 State, Province and District list

State, province and district lists can be tailored to meet user-specific needs and facilitate the collection of address information according to specific administrative or geographic settings, e.g. local administrative structures and codes. This is also helpful for the collection of address data in countries that do not yet have SALB data files.

In *Settings* the user can specify which lists to use and upload those for use in the *IA* module.

To construct these \*.TXT files follow the formats outlined in section 5.5.5.

#### Rules for importing address reference data

When a given item (e.g. country) appears more than once in the imported file, the first occurrence is taken into account and subsequent ones are ignored. Items are identified by their ID fields, i.e. ISO-3 code for countries, level 1 or level 2 code for SALB data (this rule does not apply to states, provinces and districts as they only have one field).

Imported SALB files can only contain data for one country (i.e. SALB data for more than one country must be loaded from distinct files).

#### Deleting address reference data

Countries can only be deleted if they are not referenced by SALB data. This means that SALB data must be deleted first if necessary.

## 5.2 Online help

In case the user does not have the manual available, contextual online help pages provide instantaneous, concise guidance on main module functions. There are online help pages for the *Start* window and all the main windows of each module. At present they only exist in English but translated Help pages in French, Spanish and Russian could be integrated at a later stage. Once available they can be copied into the respective programme folder to replace the existing files in English (see section 2.2).

To open click on *Help* on menu bar.

To close, click on  at the top right corner.

## 5.3 About

The *About* window presents the objective of this software and contact details to find further information, including web site address of the WHO standards and related documentation.

To open the *About* window go to main window and click on *Help* → *About*.



## 5.4 Error log and error reporting

A log function has been added (it was not present in Anthro 2005), and major errors are now reported in the *Log.xml* file, located in the application folder.

Even though exhaustive testing was performed to ensure that this software works properly, virtually all software programmes have "bugs". It would thus be appreciated if users could send a brief report on any encountered problems (random or systematic) when using WHO Anthro.

Identified bugs will be aggregated and posted on the web site [www.who.in/childgrowth/software/](http://www.who.in/childgrowth/software/). We therefore recommend always to check this list before reporting a problem. Should the same problem already appear in the list, there will be no need to send another report. However, if the problem is not yet listed then please send a bug-report describing in detail:

- The problem found
- Whether the problem appeared systematically or randomly
- Where exactly and in what module interface it occurred
- How it occurred, including what sequence of commands and/or buttons led to it
- What the expected result would have been
- If you managed to circumvent/solve the problem, how you did that

Additionally users can use screenshots and include a copy the log file when sending the bug report to the following address:

WHO Anthro  
Department of Nutrition  
World Health Organization  
Avenue Appia 20  
1211 Geneva 27  
Switzerland

fax: +44 22 791 4156

[who\\_anthro@who.int](mailto:who_anthro@who.int)

**Please note: This is not a helpline address.**

## 5.5 File formats

### 5.5.1 General rules

All imported or exported files must follow the rules below:

- File encoding must be Unicode UTF-8 (which includes ASCII).
- Within files, new lines must be encoded by carriage return/line feed (CR/LF) character pairs (Windows standard).
- When importing: If the imported file contains any invalid data, the whole file is considered invalid – the file is rejected and no data are imported. This is valid for all import file types except \*.dat and \*.wns files (generated by the Anthro2005 Beta version), for which more permissive rules are defined (see below).

#### **About \*.txt, \*.csv and \*.xml files (concerning data exchange)**

- For data that include 'change tracking' fields (i.e. CreatedBy, LastUpdatedBy and LastUpdatedAt):
  - import/export files only include CreatedBy.
  - when importing, LastUpdatedBy and LastUpdatedAt will be set to the current user's name and current date/time, respectively.



- Import/export data does not contain information on the archived state of a given object (i.e. IsArchived fields are not imported/exported); when importing, all data are treated as non-archived.
- While exported files can include the calculated values (anthropometric indicators + BMI), these values are ignored when importing and can be omitted.

#### About text (\*.txt or \*.csv) files specifically:

- These text files will hold all data in a flat format – which implies some redundancy (consequently, file size will not be optimal).
- \*.txt and \*.csv files only differ by the character used to separate fields:
  - \*.txt files use a tab (Unicode 9)
  - \*.csv files use a semicolon (Unicode 59). The format specifications below use semicolons to delimitate fields.
- The order of the fields is fixed and must follow the format defined in the following sections.
- The first line in each file contains the field header names, but its purpose is purely informative in the context of the WHO Anthro applications: when importing, the first line's content will be ignored.

### 5.5.2 Notes about the format specifications

#### Field types

The text format used for Datetime fields is: yyyy-MM-dd [HH:mm:ss] e.g. 2007-04-16, or 2007-04-16 16:52:31

#### Symbols

The following symbol conventions are used when describing text file formats (\*.txt, \*.csv, \*.dat, \*.wns and address reference data):

¶ = CR/LF

↵ = tab

[##] = character with hexadecimal value ##

<x> = value for field 'x'

### 5.5.3 IA data format

#### Text, tab-separated (\*.txt) or comma-separated (\*.csv)

Each line – except the first – in a \*.txt or \*.csv file represents one visit, including all data for the corresponding child (with mother, father and address information). Ambiguous field names are prefixed with the type of the object they belong to (e.g. Mother, Father, Address...); in the absence of a prefix, fields are assumed to belong to the object represented by the lines in the file (visit).

#### First line (field headers)

```
DisplayID;FirstName;LastName;DateOfBirth;DateOfBirthIsApprox;Sex;ChildNotes;FollowUpDate;FollowUpInterval;FollowUpRefTo;ChildCreatedBy;MotherFirstName;MotherLastName;MotherHeight;MotherWeight;MotherDateOfBirth;MotherDateOfBirthIsApprox;MotherNotes;MotherCreatedBy;FatherFirstName;FatherLastName;FatherHeight;FatherWeight;FatherDateOfBirth;FatherDateOfBirthIsApprox;FatherNotes;FatherCreatedBy;AddressStreetInfo;AddressPlace;AddressZIP;AddressDistrict;AddressProvince;AddressState;AddressCountry;AddressSALBLevel1;AddressSALBLevel2;AddressPhoneNumber;AddressEmail;AddressCreatedBy;Date;Weight;Height;IsRecumbent;HasOedema;HC;MUAC;TSF;SSF;MM1Ass;MM1Obs;MM2Ass;MM2Obs;MM3Ass;MM3Obs;MM4Ass;MM4Obs;MM5Ass;MM5Obs;MM6Ass;MM6Obs;Notes;AdditionalData;CreatedBy;WHZ;HAZ;WAZ;BAZ;HCZ;MUACZ;TSFZ;SSFZ;BMI¶
```

#### Other lines (visit data)

```
<DisplayID>;<FirstName>;<LastName>;<DateOfBirth>;<DateOfBirthIsApprox>;<Sex>;<ChildNotes>;<FollowUpDate>;<FollowUpInterval>;<FollowUpRefTo>;<ChildCreatedBy>;<MotherFirstName>;<MotherLastName>;<MotherHeight>;<MotherWeight>;<MotherDateOfBirth>;<MotherDateOfBirthIsApprox>;<MotherNotes>;<MotherCreatedBy>;<FatherFirstName>;<FatherLastN
```



```

ame>;<FatherHeight>;<FatherWeight>;<FatherDateOfBirth>;<FatherDateOfBirthIsApprox>;
<FatherNotes>;<FatherCreatedBy>;<AddressStreetInfo>;<AddressPlace>;<AddressZIP>;<Ad
dressDistrict>;<AddressProvince>;<AddressState>;<AddressCountry>;<AddressSALBLevel1
>;<AddressSALBLevel2>;<AddressPhoneNumber>;<AddressEmail>;<AddressCreatedBy>;<Date>
;<Weight>;<Height>;<IsRecumbent>;<HasOedema>;<HC>;<MUAC>;<TSF>;<SSF>;<MM1Ass>;<MM1O
bs>;<MM2Ass>;<MM2Obs>;<MM3Ass>;<MM3Obs>;<MM4Ass>;<MM4Obs>;<MM5Ass>;<MM5Obs>;<MM6Ass
>;<MM6Obs>;<Notes>;<AdditionalData>;<CreatedBy>;<WHZ>;<HAZ>;<WAZ>;<BAZ>;<HCZ>;<MUAC
Z>;<TSFZ>;<SSFZ>;<BMI>>

```

## Extensible markup language (\*.xml) files

For *IA* \*.xml files must follow the following, self-describing format (example with empty fields):

```

<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<Children>
  <Child      DisplayID=""      FirstName=""      LastName=""      DateOfBirth=""
DateOfBirthIsApprox="" Sex="" FollowUpDate="" FollowUpInterval="" FollowUpRefTo=""
Notes="" CreatedBy="" >
    <Mother  FirstName=""  LastName=""  Height=""  Weight=""  DateOfBirth=""
DateOfBirthIsApprox="" Notes="" CreatedBy="" />
    <Father  FirstName=""  LastName=""  Height=""  Weight=""  DateOfBirth=""
DateOfBirthIsApprox="" Notes="" CreatedBy="" />
    <Address  StreetInfo=""  Place=""  ZIP=""  District=""  Province=""  State=""
Country="" SALBLevel1="" SALBLevel2="" PhoneNumber="" Email="" CreatedBy="" />
    <Visits>
      <Visit Date="" Weight="" Height="" IsRecumbent="" HasOedema="" HC="" MUAC=""
TSF="" SSF="" MM1Ass="" MM1Obs="" MM2Ass="" MM2Obs="" MM3Ass="" MM3Obs="" MM4Ass=""
MM4Obs="" MM5Ass="" MM5Obs="" MM6Ass="" MM6Obs="" Notes="" AdditionalData=""
CreatedBy="" WHZ="" HAZ="" WAZ="" BAZ="" HCZ="" MUACZ="" TSFZ="" SSFZ="" BMI="" />
      <Visit .../>
    </Visits>
  </Child>
  <Child ...>...</Child>
</Children>

```

## Import \*.dat files from Anthro Beta version

The following rules apply when importing \*.dat files created by the WHO Anthro 2005 Beta version:

- Unlike other files, "invalid data" in the \*.dat files do not cause the file to be rejected.
- A child can be imported if all its mandatory fields can be read. If one or more mandatory fields are missing or invalid, the child is ignored. Valid optional fields are imported on a case-by-case basis.
- A child's visit can be imported if the corresponding child has been successfully imported, and if all its mandatory fields can be read. If one or more mandatory fields are missing or invalid, the visit is ignored. Valid optional fields are imported on a case-by-case basis.
- If any child, visit and/or specific field could not be imported, the application notifies the user after file import.

## 5.5.4 NS data format

### First line (field headers)

```

SurveyName;SurveyNotes;AdditionalDataDef;SurveyOptions;SurveyCreatedBy;Date;Cluster
;Team;DisplayID;Household;WeightingFactor;FirstName;LastName;DateOfBirth;DateOfBirt
hIsApprox;Age;Sex;Weight;Height;IsRecumbent;HasOedema;HC;MUAC;TSF;SSF;MM1Ass;MM1Obs
;MM1Rep;MM2Ass;MM2Obs;MM2Rep;MM3Ass;MM3Obs;MM3Rep;MM4Ass;MM4Obs;MM4Rep;MM5Ass;MM5Ob

```



```
s;MM5Rep;MM6Ass;MM6Obs;MM6Rep;Notes;AdditionalData;CreatedBy;WHZ;HAZ;WAZ;BAZ;HCZ;MUACZ;TSFZ;SSFZ;BMI
```

### Other lines (survey record data)

```
<SurveyName>;<SurveyNotes>;<AdditionalDataDef>;<SurveyOptions>;<SurveyCreatedBy>;<Date>;<Cluster>;<Team>;<DisplayID>;<Household>;<WeightingFactor>;<FirstName>;<LastName>;<DateOfBirth>;<DateOfBirthIsApprox>;<Age>;<Sex>;<Weight>;<Height>;<IsRecumbent>;<HasOedema>;<HC>;<MUAC>;<TSF>;<SSF>;<MM1Ass>;<MM1Obs>;<MM1Rep>;<MM2Ass>;<MM2Obs>;<MM2Rep>;<MM3Ass>;<MM3Obs>;<MM3Rep>;<MM4Ass>;<MM4Obs>;<MM4Rep>;<MM5Ass>;<MM5Obs>;<MM5Rep>;<MM6Ass>;<MM6Obs>;<MM6Rep>;<Notes>;<AdditionalData>;<CreatedBy>;<WHZ>;<HAZ>;<WAZ>;<BAZ>;<HCZ>;<MUACZ>;<TSFZ>;<SSFZ>;<BMI>
```

### Extensible markup language (\*.xml) files

For NS \*.xml files must follow the following, self-describing format (example with empty fields):

```
<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<Surveys>
  <Survey Name="" Notes="" AdditionalDataDef="" Options="" CreatedBy="">
    <Records>
      <Record Date="" Cluster="" Team="" DisplayID="" Household=""
WeightingFactor="" FirstName="" LastName="" DateOfBirth="" DateOfBirthIsApprox=""
Age="" Sex="" Weight="" Height="" IsRecumbent="" HasOedema="" HC="" MUAC="" TSF=""
SSF="" MM1Ass="" MM1Obs="" MM1Rep="" MM2Ass="" MM2Obs="" MM2Rep="" MM3Ass=""
MM3Obs="" MM3Rep="" MM4Ass="" MM4Obs="" MM4Rep="" MM5Ass="" MM5Obs="" MM5Rep=""
MM6Ass="" MM6Obs="" MM6Rep="" Notes="" AdditionalData="" CreatedBy="" WHZ="" HAZ=""
WAZ="" BAZ="" HCZ="" MUACZ="" TSFZ="" SSFZ="" BMI="" />
      <Record .../>
    </Records>
  </Survey>
</Surveys>
```

### Import \*.wns files from Beta version

The following rules apply when importing \*.wns files created by the Beta version:

- Unlike other files, invalid data in \*.wns files do not cause the whole file to be rejected.
- A survey can be imported if all its mandatory (non-optional) fields can be read. If one or more mandatory fields are missing or invalid, the survey cannot be imported.
- Valid optional fields are imported on a case-by-case basis.
- A survey record can be imported if the corresponding survey has been successfully imported, and if all its mandatory fields can be read.
- If one or more mandatory fields are missing or invalid, the record is ignored.
- Valid optional fields are imported on a case-by-case basis.
- If any record and/or specific field could not be imported, the application notifies the user.

### 5.5.5 Address reference data

To load or update address reference data in the *Settings*, for:

#### Countries

All lines in the file used for loading/updating countries should follow the format:

```
<ISO3Code>~<Name>
```



Note: No empty fields allowed.

## **SALB**

All lines in the SALB file should follow the format:

<Level1Name>~<Level1Code>~<Level2Name>~<Level2Code>~

This format makes it easy to generate files by copying/pasting relevant data from the SALB Excel sheets (published on the SALB website - [http://www3.who.int/whosis/gis/salb/salb\\_home.htm](http://www3.who.int/whosis/gis/salb/salb_home.htm)) into any text editor (e.g. Notepad).

### **Field descriptions**

- Level1Name, Level2Name: Nvarchar(50)
- Level1Code: Nvarchar(6), format as described in the SALB Code Scheme document.
- Level2Code: Nvarchar(9), unique, format as described in the SALB Code Scheme document.

Note: No empty fields allowed.

## **States**

All lines in the file used for loading/updating states should follow this format:

<Name>~

Note: No empty fields allowed.

## **Provinces**

All lines in the file used for loading/updating provinces should follow this format:

<Name>~

Note: No empty fields allowed.

## **Districts**

All lines in the file used for loading/updating districts should follow this format:

<Name>~

Note: No empty fields allowed.



## 6. Troubleshooting

The table below lists the problems a user may encounter in the software and the possible work around:

<b>Module</b>	<b>Warning message / Problem</b>	<b>Solution</b>
<i>IA</i>	Could not import *.dat : the file format is invalid	Check that *.dat file does not include archived children
<i>NS</i>	After using a file dialog for browsing for a file in Anthro (e.g. for import or export), you may notice that the folder containing the selected file, as well as its parent folders, are “locked”; this means that you cannot move, rename or delete them.	This is due to the fact that Windows keeps a reference to the folder, so that it can maintain it for the next time the file dialog is used. If you want to move, rename or delete the folder or one of its parent folders, you must either open or save a file located in another folder (from the same Anthro module), or exit Anthro.”
<i>NS</i>	Columns in the spreadsheet appear truncated	Resort the column by descending order; this will auto-resize the column to the width that will display all the characters.



## 7. References

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