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

Let's get going!

Have I now achieved a motor milestone?
WHO Anthro software license agreement:

On the use of the WHO Anthro for personal computers, version 2.
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.

The software and all related documentation are and shall at all times remain the intellectual property of the World Health Organization. Nothing contained in this Agreement shall be deemed to convey to the User any title or ownership in the software or the related documentation. The software is being made available by WHO for use in its present form for the application of the WHO Child Growth Standards. With an identification of the source WHO Anthro may be freely distributed and copied in whole, but not in part nor for sale or for use in conjunction with any commercial or promotional purpose.

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

The User is not permitted to modify, adapt, translate, reverse-engineer, decompile, disassemble, or otherwise attempt to discover the source code of the software, without prior permission from WHO. In addition, the User is not permitted to use any part of the contents of the software to develop a product that is to be sold or licensed for a fee. Users interested in developing any derived products are asked to contact: Department of Nutrition, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland (fax: +41 22 791 4156).

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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

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

Designed and developed by

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Amani Siyam
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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 of the United Nations
- 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 2 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.

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.

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.

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fax: +44 22 791 4156

Or go to web site 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:

<table>
<thead>
<tr>
<th>Item</th>
<th>Example/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface buttons with text</td>
<td>Click <code>&lt;Search&gt;</code></td>
</tr>
<tr>
<td>Interface icon</td>
<td>Click (same as <code>&lt;Add&gt;</code>)</td>
</tr>
<tr>
<td>Keyboard keys</td>
<td>Press <code>&lt;Ctrl + Alt + Delete&gt;</code></td>
</tr>
<tr>
<td>Menu paths</td>
<td>Click <code>&lt; → File → Open&gt;</code></td>
</tr>
<tr>
<td>Interface fields/items (labels, boxes etc.)</td>
<td>Name</td>
</tr>
<tr>
<td>User input</td>
<td>Type [Jane] in the <code>Name</code> field</td>
</tr>
<tr>
<td>System menu paths</td>
<td>Click <code>&lt; → Start → Programs&gt;</code></td>
</tr>
<tr>
<td>Interface windows</td>
<td><code>Main</code></td>
</tr>
</tbody>
</table>

Whenever the manual refers to titles or names which appear on the software interface, these appear 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 first set of attained growth standards comprises the indicators weight-for-age, length/height-for-age, weight-for-length, weight-for-height and BMI-for-age and the second set the indicators 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 both sets of standards.

For all indicators there are separate tables and charts for boys and girls using the z-score and percentile classification system.

The standards' ranges for each indicator are:

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight-for-length</td>
<td>45 to 110 cm</td>
</tr>
<tr>
<td>Weight-for-height</td>
<td>65 to 120 cm</td>
</tr>
<tr>
<td>Weight-for-age</td>
<td></td>
</tr>
<tr>
<td>Length/height-for-age</td>
<td>0-60 completed months</td>
</tr>
<tr>
<td>BMI-for-age</td>
<td></td>
</tr>
<tr>
<td>Head circumference-for-age</td>
<td></td>
</tr>
<tr>
<td>Arm circumference-for-age</td>
<td></td>
</tr>
<tr>
<td>Triceps skinfold-for-age</td>
<td>3 to 60 completed months</td>
</tr>
<tr>
<td>Subscapular skinfold-for-age</td>
<td></td>
</tr>
</tbody>
</table>

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. A full description 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:


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 local event calendars.
- 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 any kind of user. 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:

- 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:


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 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 software applications. Users of the first version may install the present one and operate them both in parallel. We recommend users, however, to delete Anthro 2005 once familiar with WHO Anthro.

To install the application:

- Run WHO Anthro setup.exe and follow the instructions

To run the application, do either of the following:

- On your desktop, double-click the WHO Anthro icon
- In Start ➔ Programs ➔ WHO ➔ WHO Anthro

Program files
The folder WHO Anthro contains the following 17 program files and 3 folders:

2.3 Re-installation
In case a re-installation of the software becomes necessary (or a new version becomes available) and the user wants to keep the data already entered, it is important to first copy the database file WHOAnthroII.sdf to a safe location before un-installing WHO Anthro.

To un-install:
2.4 Un-install the software

Go to Add or Remove Programs (from the Windows control panel), find WHO Anthro and choose Remove (confirm when prompted to).

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 Configurations

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.

To change from the default language (English) to French or Spanish, 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 x and then restart WHO Anthro.

When French or Spanish language 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; if not, 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 WHOAnthroII.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:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>🔄</td>
<td>Add</td>
</tr>
<tr>
<td>🔙</td>
<td>Back/Return to the higher-level screen</td>
</tr>
<tr>
<td>✗</td>
<td>Cancel</td>
</tr>
<tr>
<td>✗</td>
<td>Delete (child, record, survey, etc.)</td>
</tr>
<tr>
<td>🔐</td>
<td>Edit</td>
</tr>
<tr>
<td>📈</td>
<td>Graph</td>
</tr>
<tr>
<td>📄</td>
<td>Import</td>
</tr>
<tr>
<td>🔍</td>
<td>Open</td>
</tr>
<tr>
<td>🔬</td>
<td>Reset</td>
</tr>
<tr>
<td>🔷</td>
<td>Restore</td>
</tr>
<tr>
<td>📚</td>
<td>Save</td>
</tr>
<tr>
<td>🔍</td>
<td>Search</td>
</tr>
<tr>
<td>✖</td>
<td>Add new section (for managing additional data)</td>
</tr>
<tr>
<td>✖</td>
<td>Add new variable (for managing additional data)</td>
</tr>
<tr>
<td>⚽</td>
<td>Archive</td>
</tr>
<tr>
<td>⚽</td>
<td>Add to Archive</td>
</tr>
<tr>
<td>🔄</td>
<td>Copy (graph image to clipboard)</td>
</tr>
<tr>
<td>📄</td>
<td>Anthropometry report (Excel)</td>
</tr>
<tr>
<td>📄</td>
<td>WHO Global Database (Excel)</td>
</tr>
<tr>
<td>📄</td>
<td>Export MM report (Excel)</td>
</tr>
<tr>
<td>📄</td>
<td>Export</td>
</tr>
<tr>
<td>🔐</td>
<td>Filter</td>
</tr>
<tr>
<td>🔐</td>
<td>Clear filter</td>
</tr>
<tr>
<td>🎟</td>
<td>Options</td>
</tr>
<tr>
<td>🗯</td>
<td>Print</td>
</tr>
</tbody>
</table>

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.

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).
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 as follows. One year has 365.25 days and thus one month (365.25 divided by 12 [months]) is equal to 30.4375 days. A child born 11 November 2004 and measured 11 November 2005 appears hence as having an age of 11 completed months (365 divided by 30.4375 equals 11.99). However the nutritional status indicators 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 date a year previous from that.

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 open month.**

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

**Clicking on the **<** or **>** 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 chosen name of the 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:

\[ \text{Age (in days)} = \text{DoV-DoB} \]

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, Annex 1 of the FAO field manual (FAO, 1990) provides information on how to develop such a local 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.

### 3.2.2 Oedema

Children with oedema have swollen limbs and may look well fed. Having oedema, however, is a clinical sign of being severely undernourished. Ideally, any suspected child should be assessed for oedema before measuring 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 this entered weight value for such a child and only computes the weight-independent indicator z-scores and percentiles. 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) 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.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg)</td>
<td>0.9</td>
<td>40.0</td>
</tr>
<tr>
<td>Length/height (cm)</td>
<td>38.0</td>
<td>139.0</td>
</tr>
<tr>
<td>Head circumference (cm)</td>
<td>26.0</td>
<td>60.0</td>
</tr>
<tr>
<td>Arm circumference (cm)</td>
<td>7.0</td>
<td>29.0</td>
</tr>
<tr>
<td>Triceps skinfold (mm)</td>
<td>2.0</td>
<td>32.0</td>
</tr>
<tr>
<td>Subscapular skinfold (mm)</td>
<td>2.0</td>
<td>34.0</td>
</tr>
</tbody>
</table>

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 converted height 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 3.3.6). 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.
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:

<table>
<thead>
<tr>
<th>Indicators</th>
<th>WHO standards</th>
<th>NCHS reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight-for-length/height</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Length/height-for-age</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Weight-for-age</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>BMI-for-age</td>
<td>✓</td>
<td>NA*</td>
</tr>
<tr>
<td>Head circumference-for-age</td>
<td>✓</td>
<td>NA</td>
</tr>
<tr>
<td>Mid-upper arm circumference-for-age</td>
<td>✓</td>
<td>NA</td>
</tr>
<tr>
<td>Triceps skinfold-for-age</td>
<td>✓</td>
<td>NA</td>
</tr>
<tr>
<td>Subscapular skinfold-for-age</td>
<td>✓</td>
<td>NA</td>
</tr>
</tbody>
</table>

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).

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 3.3.1 and 3.4.3.

3.3.1 BMI
When weight and length/height have been entered the software derives the BMI (kg/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.

On the parents window 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 measurements 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 ±3 SD (equivalent respectively to the 0.135th and 99.865th percentiles) are invariant to changes in respective z-scores.

The cut-off classification lines presented on charts and anthropometry reports are:
- Weight-for-age and length/height-for-age: <-3 SD, <-2 SD, >+2 SD and >+3 SD
- Weight-for-length/height, BMI-for-age, head circumference-for-age, mid-upper arm circumference-for-age (MUAC-for-age), triceps and subscapular skinfold-for-age: <-3 SD, <-2 SD, <-1 SD, >+1 SD, >+2 SD and >+3 SD

In the percentile classification system charts all indicators present the following classification lines: 3rd, 15th, 50th, 85th and 97th percentiles.
3.3.3 Colour coding

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

<table>
<thead>
<tr>
<th>Colour</th>
<th>Applied to</th>
<th>z-scores</th>
<th>Percentiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>numeric range</td>
<td>≥ -1 and ≤ +1 SD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>graph line</td>
<td>Median</td>
<td>50th percentile</td>
</tr>
<tr>
<td>Gold</td>
<td>numeric range</td>
<td>≥ -2 and &lt; -1 SD;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>or &gt; +1 and ≤ +2 SD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>graph line</td>
<td>-1 SD and +1 SD</td>
<td>15th and 85th percentiles</td>
</tr>
<tr>
<td>Red</td>
<td>numeric range</td>
<td>≥ -3 and &lt; -2 SD;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>or &gt; +2 and ≤ +3 SD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>graph line</td>
<td>-2 SD and +2 SD</td>
<td>3rd and 97th percentiles</td>
</tr>
<tr>
<td>Black</td>
<td>numeric range</td>
<td>&lt; -3 or &gt; +3 SD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>graph line</td>
<td>-3 SD and +3 SD</td>
<td>NA*</td>
</tr>
</tbody>
</table>

* NA = not available

3.3.4 Graphs

Graphing results enables the observer 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.

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 from birth to 5 years (0-60 completed months)
- Adjacent length-for-age and height-for-age with a vertical line at 2 years of age to mark the separation of length and height; from birth to 5 years (0-60 completed months)
- Adjacent length- and height-based BMI-for-age with a vertical line at 2 years of age to mark the separation of length and height; from birth to 5 years (0-60 completed months)
- Head circumference-for-age from birth to 5 years (0-60 completed months)
- MUAC-for-age from 3 months to 5 years (3-60 completed months)
- Triceps skinfold-for-age from 3 months to 5 years (3-60 completed months)
- Subscapular skinfold-for-age from 3 months to 5 years (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 birth to 5 years (0-60 completed months)
- Adjacent length-for-age and height-for-age with a vertical line at 2 years of age to mark the separation of length and height; from birth to 5 years (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 common cut-off lines are displayed for all indicators: 3rd, 15th, 50th, 85th and 97th percentile.

Even though percentile values smaller than 0.135th and beyond 99.865th (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 limits of age, kg, cm and mm represented in the respective graphs.

3.3.5 Note on z-score and percentile calculations

If age is missing or unknown only WHZ, WHP and BMI will be calculated.

If Weight is missing, the software can derive HAZ, HAP, HCZ, HCP, MUACZ, MUACP, TSFZ, TSFP, SSFZ and SSFP; while WHZ, WHP, WAZ, WAP, BAZ, BAP and BMI cannot be calculated.

If Length/Height is missing, the software derives only WAZ, HCZ, MUACZ, TSFZ and SSFZ; while WHZ, HAZ, BAZ and BMI cannot be calculated.

If a child has oedema the software derives only HAZ, HAP, HCZ, HCP, MUACZ, TSFZ TSFP, SSFZ and SSFP, while WHZ, WHP, WAZ, WAP, BAZ, BAP and BMI are not calculated.

To calculate age the software applies the following procedure:

Age (in days) =DoV-DoB

The result is used for obtaining z-scores and percentiles, and is stored with all decimal places.

The child's age influences how the software handles the variables Length/Height and Measured. For example, if a child is 24 months or older and has a length measurement, 0.7 cm is subtracted to derive an estimated height. Similarly, if a child is younger than 24 months and is measured standing, the software adds 0.7 cm to derive an estimated length.

3.3.6 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, 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 2.4.2) 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).
<table>
<thead>
<tr>
<th>Sex</th>
<th>Age group (months)</th>
<th>Type of measurement (l/h)</th>
<th>Conversion</th>
<th>Data tables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WHO standard</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>boys and girls</td>
<td>&lt;24</td>
<td>l</td>
<td>l + 0.7 cm</td>
<td>Length table 45-110 cm</td>
</tr>
<tr>
<td></td>
<td>≥24</td>
<td>h</td>
<td>h – 0.7 cm</td>
<td>Height table 65-120 cm</td>
</tr>
<tr>
<td>NCHS reference</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>&lt;24</td>
<td>l</td>
<td>None</td>
<td>Length table 49-103 cm</td>
</tr>
<tr>
<td></td>
<td>≥24</td>
<td>h</td>
<td>None</td>
<td>Height table 55-145 cm</td>
</tr>
<tr>
<td>Girls</td>
<td>&lt;24</td>
<td>l</td>
<td>None</td>
<td>Length table 49-101 cm</td>
</tr>
<tr>
<td></td>
<td>≥24</td>
<td>h</td>
<td>None</td>
<td>Height table 55-137 cm</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Sex</th>
<th>Age group (months)</th>
<th>Data tables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WHO standard</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>boys and girls</td>
<td>&lt;24</td>
<td>Length table 45-110 cm</td>
</tr>
<tr>
<td></td>
<td>≥24</td>
<td>Height table 65-120 cm</td>
</tr>
<tr>
<td>NCHS reference</td>
<td>Boys</td>
<td>Length table 49-103 cm</td>
</tr>
<tr>
<td></td>
<td>≥24</td>
<td>Height table 55-145 cm</td>
</tr>
<tr>
<td>girls</td>
<td>&lt;24</td>
<td>Length table 49-101 cm</td>
</tr>
<tr>
<td></td>
<td>≥24</td>
<td>Height table 55-137 cm</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Sex</th>
<th>Type of measurement (l/h)</th>
<th>Data tables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WHO standard</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>boys and girls</td>
<td>l</td>
<td>Length table 45-110 cm</td>
</tr>
<tr>
<td></td>
<td>h</td>
<td>Height table 65-120 cm</td>
</tr>
<tr>
<td>NCHS reference</td>
<td>boys</td>
<td>Length table 49-103 cm</td>
</tr>
<tr>
<td></td>
<td>girls</td>
<td>Length table 49-101 cm</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Sex</th>
<th>Type of measurement (l/h)</th>
<th>Data tables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WHO standard</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>boys and girls</td>
<td>l</td>
<td>Length table 45-110 cm</td>
</tr>
<tr>
<td></td>
<td>h</td>
<td>Height table 65-120 cm</td>
</tr>
<tr>
<td>NCHS reference</td>
<td>boys</td>
<td>Length table 49-103 cm</td>
</tr>
<tr>
<td></td>
<td>girls</td>
<td>Length table 49-101 cm</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Sex</th>
<th>Type of measurement (l/h)</th>
<th>Data tables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WHO standard</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>boys and girls</td>
<td>l</td>
<td>Length table 45-110 cm</td>
</tr>
<tr>
<td></td>
<td>h</td>
<td>Height table 65-120 cm</td>
</tr>
<tr>
<td>NCHS reference</td>
<td>boys</td>
<td>Length table 49-103 cm</td>
</tr>
<tr>
<td></td>
<td>girls</td>
<td>Length table 49-101 cm</td>
</tr>
</tbody>
</table>

1 *l = length; h = height*

2 NCHS reference users without access to software are referred to the printed data tables
If neither age nor type of measurement is known:

<table>
<thead>
<tr>
<th>Sex</th>
<th>Length/height (cm)</th>
<th>Data tables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WHO standard</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>boys and girls</td>
<td>&lt;87</td>
<td>Length table 45-86.9 cm</td>
</tr>
<tr>
<td></td>
<td>≥87</td>
<td>Height table 87-120 cm</td>
</tr>
<tr>
<td><strong>NCHS reference</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>boys</td>
<td>&lt;85</td>
<td>Length table 49-84.5 cm</td>
</tr>
<tr>
<td></td>
<td>≥85</td>
<td>Height table 85-145 cm</td>
</tr>
<tr>
<td>girls</td>
<td>&lt;85</td>
<td>Length table 49-84.5 cm</td>
</tr>
<tr>
<td></td>
<td>≥85</td>
<td>Height table 85-137 cm</td>
</tr>
</tbody>
</table>

### 3.4 Variables and codes

#### 3.4.1 Data codes

Complete lists of data format 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:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Lower SD</th>
<th>Upper SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAZ</td>
<td>-6</td>
<td>+5</td>
</tr>
<tr>
<td>HAZ</td>
<td>-6</td>
<td>+6</td>
</tr>
<tr>
<td>WHZ</td>
<td>-5</td>
<td>+5</td>
</tr>
<tr>
<td>BAZ</td>
<td>-5</td>
<td>+5</td>
</tr>
<tr>
<td>HCZ</td>
<td>-5</td>
<td>+5</td>
</tr>
<tr>
<td>MUACZ</td>
<td>-5</td>
<td>+5</td>
</tr>
<tr>
<td>TSFZ</td>
<td>-5</td>
<td>+5</td>
</tr>
<tr>
<td>SSFZ</td>
<td>-5</td>
<td>+5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Lower SD</th>
<th>Upper SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAZ</td>
<td>-6</td>
<td>+6</td>
</tr>
<tr>
<td>HAZ</td>
<td>-6</td>
<td>+6</td>
</tr>
<tr>
<td>WHZ</td>
<td>-4</td>
<td>+6</td>
</tr>
</tbody>
</table>

Values beyond these limits are flagged and the cells appear pink in the NS module. For such highlighted cells the user should check that no data-entry error has occurred and if possible re-measure the child.

In a nutritional survey analysis all flagged z-scores should be excluded. When choosing any of the report options in WHO Anthro these flags are applied automatically. It is recommended that users who export their data for further analysis in a different software program apply the same flag limits 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).

**Note:** Once a milestone has been achieved, i.e. the response is "1" in the column "Observed", data for all subsequent visits will carry "0" for the "Assessed" and "1" for "Observed" column, respectively, because having been observed, the child no longer needs to be assessed for that milestone.

If the child was not assessed for motor development the exported field values will be empty.

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 4.3.2 and 4.4.5).
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.

Menu options

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 2.5)

2) Address settings:

- not to use existing address reference data, i.e. manually key in all information

- use available UN Second Administrative Level Boundary files (SALB);

- use lists for country, state, province, district, as specified by the user.

Selection can be turned on or off on this page by ticking or un-ticking the respective choice.

The use of address reference data is 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

The data-entry page has anchor values entered corresponding to a healthy child of 11 months.

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.

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.

Please click on the respective radio button to specify 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.

The Results are displayed 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 range 0-100%,...
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.

To the right of the y-axis is the result displayed (depending on whether z-scores or percentiles are selected).

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 z-score is NA due to missing data or raw data beyond the standard tables’ ranges (see section 1.2).

To close the graph click on at top right corner.

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

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

To send the graph to a printer, click on .

To copy the image to the clipboard, click on .

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 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 a view of multiple visits in order to visualize trends in child growth. This module is recommended for use by paediatricians to monitor the growth of the children attending their clinics.

On the main window click on this button to open the module.

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

Click on the tick box next to child’s name and click on to open. The child’s details, parental data and list of visits appears in the window to the right.

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

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

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

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, 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

To change display from single point to multiple use the drop-down menu.

On top of the graph is indicated whether results and curves are based on WHO standards or NCHS reference.

To view the graph with NCHS reference go back to Individual assessment \(\rightarrow\) Options and click on radio button next to NCHS.

The currently open visit is marked by the red grid lines.

To select other indicators or view percentiles use respective drop-down menus at the top.

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, even if the z-score is valid. It also happens when z-score is NA due to missing data or raw data beyond the standard tables' ranges (see section 1.2).

To copy the image to clipboard, click on .

To send image to printer, click on .

To close graph, click on .

As the copied graph has no title, it is recommended to add a preliminary title specifying the indicator immediately after copying.

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

- New child  
- Delete selected  
- Archive selected  
- Search list  
- View archive  

Icons on top of active list of children
• Manage additional data
• Options
• Import from file
• Export to file
• Close module  
  Same as

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 3.3.3)

4.3.1 New child
The steps to enter a new child are:

• Click on at the top of the active list of children to open blank child window.
• Enter first and last name; specify child’s sex; ID (default automatic); enter DoB using keyboard or drop-down calendar; DoV is automatically set to today’s date and age below is derived (see also 3.2.1).
• 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.
  • In <Anthro> section, enter measurements and 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 (additional data have to be defined in the IA menu).
  • In <Motor> section the user can assess achievement for 6 MMs, read from top to bottom in the overview window (see section 4.3.2).
• Click on the <Save> button to save 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 repeat the steps outlined above.

Note: Measurement data from previous visits can be opened and edited at any time.

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

In the list of children, click on a tick box to select child and then on [X] 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 visit data will be deleted.

Archive

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

Tick the box in front of child's name to select and click on [X]; 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 [X] or go to menu Individual assessment → View archive. Select the child and click on [X]. To return to the active list click on [X].

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 them.

Search

To search for a child click on [X] or select Individual assessment → Search list.

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.

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 active list will show the children that match these search criteria. To return to the complete list click on <Clear search>, and click on [X] to close the Search window.
Manage additional data

This function facilitates the systematic collection of semi-structured clinical and other 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.

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

Click on + to add a new section.

Click on + to add a new variable to a created section.

Users are advised to create all sections and variables and then click on <Save>.

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.

Click on <Save> to close the window; click <Cancel> to discard unsaved changes and close the window.

The additional data sections and variables once saved, apply to all new child visits in the IA module; the corresponding data can be collected in the visit window (see sections 4.3.1).

To delete an existing additional data section or variable, click on the item to select and then click on ×. A warning message will pop up asking the user to confirm the action. Note that when deleting a section all variables within that section will be deleted. The data already collected for these variables will remain in the previous visits. To avoid confusion it is recommended to clarify the additional data that would need to be collected before starting a database of individual assessment.

The created variables and sections always appear in the language the user applied when adding them, i.e. they are not translated.

Note: This function is not designed to replace a comprehensive questionnaire and it should only be used for a minimum of additional variables necessary in context of the child growth and development assessment.

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.

**Parental data**

To access parental data go to the right side of the child window where separate fields show Mother and Father.

To add information, click on ➕.

To edit existing information, click on 🔄.

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

In the example above, both the mother's and father's window include weight and height data but only the mother's name has been entered.

The user has the option to enter DoB in the same way as for the child. The derived age appears below.

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

**Address information**

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

Depending on what option the user has selected in Settings the Address window can look like either of the images below:

- **No address reference data**
  - If the user has no address reference data selected then all fields are available to enter any free text.

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

The user can enter the address data necessary to track the child in the future. 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 section 4.1 and step by step example). 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.

4.3.2 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.

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

The MM sequence is from top to bottom, left column to right column.

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

To open a MM tick and then . Each MM has detailed criteria that the user has to observe and tick on the MM-specific window. Only when all criteria for a milestone have been ticked is the milestone classified as achieved.

Colour codes for achievement status facilitate the overview.

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

<table>
<thead>
<tr>
<th>Colour</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grey</td>
<td>Not assessed</td>
</tr>
<tr>
<td>Blue</td>
<td>Assessed but not observed and child's age below or within milestone window</td>
</tr>
<tr>
<td>Red</td>
<td>Assessed but not observed and child's age above milestone window</td>
</tr>
<tr>
<td>Green</td>
<td>Assessed and observed and child's age below or within milestone window</td>
</tr>
<tr>
<td>Lime</td>
<td>Assessed and observed and child's age above milestone's window (or a former &quot;Red&quot;)</td>
</tr>
<tr>
<td>Rose</td>
<td>Not assessed and a former &quot;Red&quot;</td>
</tr>
</tbody>
</table>

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. These windows are broad bands, 5 to 10 months wide, 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 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>.

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 2nd 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 3rd visit at 17 months of age and click on .

She now performed all criteria for MM 3. 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 MM 5, Standing alone ( green colour) but could not yet perform all criteria for MM 6, 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 19 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 child's age is above the upper bound 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.

4.3.3 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 \[\text{...}\] in the child window or go to the menu Selected child \(\rightarrow\) 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 \(\rightarrow\) Options and click on the relevant radio button. A footnote on the child report specifies what 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)'".

4.3.4 Import from file
The IA module allows to import child visit data from *.dat (Anthro 2005), *.txt, *.csv and *.xml files.

Whatever data are imported, they need to follow the specific IA file schema (see section 5.5.3). The software is checking 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 measurements are truncated after 2 decimal places.

Specific rules:

- When importing children into IA, each child's visits must be ordered chronologically. Visits going back in time will cause the imported file to be rejected.
- When importing from either a *.txt or *.csv file, child data is replicated on each line in the file (each line representing a visit) as a consequence of the 'flat' (i.e. non-hierarchical) format. The application thus checks for each new line if it represents another visit for the same child as for the previous line(s), or if it represents the 1st visit for another child; the app will choose the latter option if any of the following fields differ: DisplayID, FirstName, LastName, DateOfBirth or Sex.
- In conclusion of the 2 previous specific rules, it is impossible to import a *.txt or *.csv file containing the same child twice. Either the file is rejected because the visits are not chronologically ordered, or the child is imported once with the visits merged (if the last visit of the 1st occurrence of the child happen to precede the 1st visit of the 2nd occurrence).

4.3.5 Export to file
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 what to exclude. For recommended ranges for acceptable values, see section 3.4.2.

The Export function is activated once a child or several children have been selected from the active list. This function uses the default selection of the results based on 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 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 is not reassessed.
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)
- Editing existing surveys
- Deriving and displaying individual results using z-scores and percentiles based on the WHO standards or the NCHS reference
- Deriving standardized summary results for anthropometry and MM assessment
- Exporting survey data files 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 changing the flag limits.

From the main window click this button to open the module.
4.4.1 Windows and functions
To the left is the active list, showing at present one example survey; to the right is the survey-specific window.

Click on tick box next to nutrisurvey50.dbf and click on \(\text{ }\) to open. Then click on ID to sort and select 2nd 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 on top the fields to enter/edit survey Name and Notes.**

**Active list with example survey; icons on top enable user to manage the list (add, open, delete, archive and view archive)**

**List of records (1 row = 1 record) with selected record highlighted in blue; respective results by indicator below. Click on \(\text{ }\) to open graphs.**

Use arrow or \(<\text{Enter}>\) keys or mouse to select other records.

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

**Survey Name**

This field enables the user to provide a specific name to the survey. If the user opens an existing survey and changes the name the new name will overwrite the old one.
Survey Notes

This field enables the user to collect data such as geographic location. The information included here will also be exported next to the survey name.

Results

The anthropometric results per record and graph options work similar to the AC module. The z-scores are also included in the spreadsheet. Scroll to the right to find the grey shaded columns.

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

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

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)

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

Click on + to add a new record

Click on to open a selected child record
Click on \( \times \) to delete one or several selected child records

Click on \( \square \) to open Filter records window

**Add new record to a survey**

Clicking on \( \square \) opens a data-entry window similar to the one in IA module.

The new fields are:

- **Age (in days)** if DoB is not available. In 4.4.2 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.

- **Cluster, Team, ID and Household** (automatic or manual depending on selection in Survey options).

- **Weighting factor** (default set to 1.00, maximum with 16 decimals)

- **All measurements** can be entered up to 2 decimals.

Click on \( \square \) to open the graph window.

Click on \(<\)Motor\(>\) to open the MM assessment window (see section 4.4.5).

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.)

To edit an existing record select one and click on \( \square \). Click on the <Save> or <Cancel> button to return to list of records.

To delete a record, select first one or several records (Ctrl + click, or Shift + click) and then click on \( \times \). User is prompted to confirm the wish to delete. Once deleted the records cannot be recovered in WHO Anthro.

**Manage additional data**

This function is similar to IA (see details in section 4.3.1). Every new user-defined variable is added as a new column to the right of the spreadsheet. Note that only for new children added will this variable be available for data collection. Thus, ideally the additional variables should be defined before data collection starts.

To add sections and variables go to Current survey \( \rightarrow \) Manage additional data and create sections and variables as outlined in 4.3.1.

Concerning existing survey data for which the user wants to continue the collection of additional data after import into Anthro the software at present is set to automatically upload any additional data variables into the existing Additional data section [Imported]. This works as long as the user does not delete the sample survey. With that section specified the user is able to collect all these additional data for new children and to edit all the existing child records (i.e. which were included in the data file before the import).
If the user deletes a variable, it is automatically deleted from the spreadsheet and the column disappears permanently.

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

### 4.4.2 A special note on age

When the user has entered DoV and DoB, the age is automatically derived 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 exact DoB 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 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 age in days. If age is available in years, the user has to translate the value into months, multiplying the number of years by 12.

3) The user may consistently enter day=15 (i.e. the middle of the month) into the DoB field.

#### 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.

<table>
<thead>
<tr>
<th>Months</th>
<th>Days</th>
<th>Months</th>
<th>Days</th>
<th>Months</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30</td>
<td>21</td>
<td>639</td>
<td>41</td>
<td>1248</td>
</tr>
<tr>
<td>2</td>
<td>61</td>
<td>22</td>
<td>670</td>
<td>42</td>
<td>1278</td>
</tr>
<tr>
<td>3</td>
<td>91</td>
<td>23</td>
<td>700</td>
<td>43</td>
<td>1309</td>
</tr>
<tr>
<td>4</td>
<td>122</td>
<td>24</td>
<td>731</td>
<td>44</td>
<td>1339</td>
</tr>
<tr>
<td>5</td>
<td>152</td>
<td>25</td>
<td>761</td>
<td>45</td>
<td>1370</td>
</tr>
<tr>
<td>6</td>
<td>183</td>
<td>26</td>
<td>791</td>
<td>46</td>
<td>1400</td>
</tr>
<tr>
<td>7</td>
<td>213</td>
<td>27</td>
<td>822</td>
<td>47</td>
<td>1431</td>
</tr>
<tr>
<td>8</td>
<td>244</td>
<td>28</td>
<td>852</td>
<td>48</td>
<td>1461</td>
</tr>
<tr>
<td>9</td>
<td>274</td>
<td>29</td>
<td>883</td>
<td>49</td>
<td>1491</td>
</tr>
<tr>
<td>10</td>
<td>304</td>
<td>30</td>
<td>913</td>
<td>50</td>
<td>1522</td>
</tr>
<tr>
<td>11</td>
<td>335</td>
<td>31</td>
<td>944</td>
<td>51</td>
<td>1552</td>
</tr>
<tr>
<td>12</td>
<td>365</td>
<td>32</td>
<td>974</td>
<td>52</td>
<td>1583</td>
</tr>
<tr>
<td>13</td>
<td>396</td>
<td>33</td>
<td>1004</td>
<td>53</td>
<td>1613</td>
</tr>
<tr>
<td>14</td>
<td>426</td>
<td>34</td>
<td>1035</td>
<td>54</td>
<td>1644</td>
</tr>
<tr>
<td>15</td>
<td>457</td>
<td>35</td>
<td>1065</td>
<td>55</td>
<td>1674</td>
</tr>
<tr>
<td>16</td>
<td>487</td>
<td>36</td>
<td>1096</td>
<td>56</td>
<td>1705</td>
</tr>
<tr>
<td>17</td>
<td>517</td>
<td>37</td>
<td>1126</td>
<td>57</td>
<td>1735</td>
</tr>
<tr>
<td>18</td>
<td>548</td>
<td>38</td>
<td>1157</td>
<td>58</td>
<td>1765</td>
</tr>
<tr>
<td>19</td>
<td>578</td>
<td>39</td>
<td>1187</td>
<td>59</td>
<td>1796</td>
</tr>
<tr>
<td>20</td>
<td>609</td>
<td>40</td>
<td>1218</td>
<td>60</td>
<td>1826</td>
</tr>
</tbody>
</table>
4.4.3 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 needs to be changed.

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

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

4.4.4 Flagging

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

If z-scores appear as flagged the user is advised to check for potential data-entry errors (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.

<table>
<thead>
<tr>
<th>Flag</th>
<th>Error tracking</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Valid z-scores were derived for all indicators.</td>
</tr>
<tr>
<td>WHZ</td>
<td>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</td>
</tr>
</tbody>
</table>
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 most likely 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.

### 4.4.5 Motor milestones assessment

It is recommended to assess the six gross motor milestones in children 3-24 months. The data-entry window looks the same as for the IA module but the approach to data collection is slightly different.

1) 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 it) the user should proceed to assess MM 1, 2, 3, 4 and 5.

2) Given that in a survey there is only one opportunity to assess the child, in this module the user can also accept 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" and coded accordingly when exported (see section 3.4.3).

3) 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:

<table>
<thead>
<tr>
<th>Label</th>
<th>MM name</th>
</tr>
</thead>
<tbody>
<tr>
<td>WalkA</td>
<td>Walking alone</td>
</tr>
<tr>
<td>Sit</td>
<td>Sitting without support</td>
</tr>
</tbody>
</table>
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 in the *Nutritional survey* module is as follows:

<table>
<thead>
<tr>
<th>Colour</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grey</td>
<td>Not assessed/reported</td>
</tr>
<tr>
<td>Blue</td>
<td>Assessed but not observed and child’s age below or within milestone window</td>
</tr>
<tr>
<td>Red</td>
<td>Assessed but not observed and child’s age above milestone window</td>
</tr>
<tr>
<td>Green</td>
<td>Assessed and observed or reported as achieved and child’s age below or within milestone window</td>
</tr>
</tbody>
</table>

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 using separate codes can be imported into the updated version and analysed.

The user can easily edit all data in the child record (i.e. anthropometry, motor milestones and other). To edit, double-click on the child record, 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 4.4.7).

The MM data may also be imported (see 4.4.8).

### 4.4.6 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.
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 complete list of survey records.

**Copy to clipboard**

The user has the option to copy all or part of the child records of an open survey 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 + Enter>. To select multiple single lines, <Ctrl + left mouse click> on each of the records to be copied.

4.4.7 Results

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

To visually check the distribution of the survey data, click on the <Results> tab.
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 J, 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 can proceed to run the survey analysis.

Analysis and report options

There are several options that the user can choose either from the menu Current survey or by clicking on respective icons. For all options, in case of available sampling weights the full precision is used (maximum 16 decimal points) even though display appears truncated.

Anthropometry report: Under this option the user can further select between Standard and Restricted analysis. The Standard analysis makes maximum use of the collected data and includes for each indicator all valid z-scores, while the Restricted analysis includes only child records with valid z-scores for all weight and height-based indicators.

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 (based on random sampling method). The age-stratified results follow the age grouping defined in Options (see 4.4.3).
In the *Standard* analysis, due to the inclusion of all valid z-scores, and not just records with FLAG=0, the sample sizes per indicator in the result tables may differ. Child records with missing age contribute to the total sample sizes and WHZ statistics (but not the age-based indicators).

Given that children with oedema should not be weighed, no individual z-scores can be derived for any weight-based indicators. Therefore these children do not contribute to the respective mean and standard deviation statistics in the analysis report. However, oedema cases are included as severely malnourished children in the prevalences of <-3 SD weight-for-length/height, <-3 SD weight-for-age and <-3 SD BMI-for-age. A child with oedema and unknown age contributes to the *overall* sample size and prevalence of low weight-for-length/height, 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 to the table.

**WHO Global Database**: Produces an analysis output following the standard data-entry format of the WHO Global Database for Child Growth and Malnutrition (see 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). 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.

Children with oedema are treated in this analysis option in the same way as for the *Standard* analysis (see above).

**Motor milestones report**: Provides a prevalence of non-achievement for each milestone with an estimated 95% confidence interval based on the boundaries of the window of achievement for each milestone. The prevalence is derived using as denominator the sum of children aged above the upper limit of the milestone's window of achievement and younger than 24 months; and as numerator the sum of those within that group who have not achieved the milestone. The report also provides a prevalence of composite failure, i.e. the proportion of all children who ever failed to achieve a milestone. This prevalence is derived using as denominator the sum of children aged above the upper limit of the earliest milestone "Sits without support" (9.4 months) and younger than 24 months; and as numerator, the sum of those within that group who have not achieved at least one milestone. This prevalence shows the proportion of children who "ever failed to achieve" a milestone relative to the windows of achievement. For more details on how to interpret the MM data from surveys, see WHO Multicentre Growth Reference Study Group, 2006.

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 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.

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.
4.4.8 Data import and export

It is possible to import data in *.dbf, *.rec (EpiInfo), *.wns (Anthro2005), *.csv, *.txt and *.xml formats.

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.

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, can be imported directly.

To import files that have not been created with Anthro, in particular *.dbf and *.rec files, the user has to map the important variables (see image).

To allow import the *.dbf and *.rec 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 those use scroll-bar on the right.

Notes on import:

Cluster data should be integer values (even if they are not integer, the programme will treat them as such).

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

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 *.wns, *.rec and *.dbf files, age is rounded to 731 days before deriving age-based estimates.

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

**Specific rules when importing NS data**
When importing a *.txt or *.csv file the application checks each new line to verify if it represents another record in the same survey as the previous line(s), or if it represents the 1st record in a different survey. The application will choose the latter option if either the Name or the Notes field differs.

**Export**
Anthro generates several variables in exported files (see 5.5.4). An example is "DateOfBirthIsApprox" 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 that are appended in the import are not exported and are thus not available for further analysis. A possible work around is to select all columns, copy them to the clipboard, and then insert them into Excel.

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. Other functions**

**5.1 Address reference data**

The IA module facilitates the collection of detailed address data for each child. 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.

To use SALB the user has to prepare and upload one file per country.

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

**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. 1st column ISO ALPHA-3 code and 2nd 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 http://www3.who.int/whosis/gis/salb/salb_home.htm. 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 different meanings than they do in Brazil (for further information, see http://www3.who.int/whosis/gis/salb/salb_home.htm).

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:

Open http://www.who.int/whosis/database/gis/salb/salb_coding.htm#DATA%20DOWNLOAD.

- Select the country and year version of the SALB file to be imported, download and save
- 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:

  ![Warning Message](image)

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

  ![Warning Message](image)

- 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. To open click on Help on menu bar. To close, click on at the top right corner. These online help pages are only available in English.

### 5.3 About
To open the About window go to main window and click on Help Æ About. This 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.

### 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/. 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

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>;<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>
Extensible markup language (*.xml) files

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

```xml
<?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 ...>
</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

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

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).

First line (field headers)

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
Other lines (survey record data)

Extensible markup language (*.xml) files

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

```xml
<?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 *.rec and *.dbf files

To import *.rec (EpiInfo data files) and *.dbf files the user has to map the fields. 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".

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) 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:

<table>
<thead>
<tr>
<th>Module</th>
<th>Warning message / Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA</td>
<td>Could not import *.dat : the file format is invalid</td>
<td>Check that *.dat file does not include archived children</td>
</tr>
<tr>
<td>NS</td>
<td>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 &quot;locked&quot;; this means that you cannot move, rename or delete them.</td>
<td>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.&quot;</td>
</tr>
<tr>
<td>NS</td>
<td>Columns in the spreadsheet appear truncated</td>
<td>Resort the column by descending order; this will auto-resize the column to the width that will display all the characters.</td>
</tr>
</tbody>
</table>
7. References


