WHO Child Growth Standards
Implications for everyday practice

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1 year 2 years 3 years 4 years 5 years
WHO Child Growth Standards

Why?
Milestones in the development of the WHO child growth standards


- Comprehensive review shows growth patterns of healthy breastfed infants differ from the current NCHS/WHO international reference

- A new growth reference is needed to improve infant health management

- The reference population should reflect health recommendations in view of the frequent use of references as “standards”
Mean Z-scores of healthy breastfed infants relative to the NCHS/WHO reference

Source: An Evaluation of Infant Growth, WHO, 1994
Milestones in the development of the WHO child growth standards

1993  WHO Expert Committee
   - Recommends development of a new international growth reference
   - Based on an international sample of “healthy” infants

1994  WHA resolution (WHA 47.5)
   - Endorses need for new reference
   - Requests it to be based on breastfed infants
WHO Child Growth Standards

How?
A Growth Curve for the 21st Century

The WHO Multicentre Growth Reference Study

Department of Nutrition
World Health Organization
Geneva, Switzerland
Approaches for developing growth references

- **Descriptive approach (existing growth charts):**
  defines growth on the basis of representative samples of healthy groups, i.e., without identifiable disease

- **Prescriptive approach (new approach by WHO):**
  defines growth on the basis of health and feeding practices known to promote optimal growth and selects the sample accordingly
WHO Growth Reference Study
Prescriptive Approach

- **Optimal Nutrition**
  - Breastfed infants
  - Appropriate complementary feeding

- **Optimal Environment**
  - No microbiological contamination
  - No smoking

- **Optimal Health Care**
  - Immunization
  - Pediatric routines

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World Health Organization
Conceptual basis for the selection of the population

"What we want is not a higher standard of perfection in a few, but a higher average, and this can be best produced by the elimination of the lowest of all and a free intermingling of the rest"

Alfred Russel Wallace (1900)
WHO Child Growth Standards

Study sample

- Six countries
- <5% stunting, wasting, underweight
- At least 20% mothers breastfeeding
- No health/environmental constraints on growth
- Non-smoking mother
- Willing to follow feeding recommendations
- Single, term birth
- No significant morbidity
Measurement and standardization protocols

Rigorous scientific standards are applied to a complex cross-cultural field-based project.

WHO Multicentre Growth Reference Study
## Time schedule child anthropometry in longitudinal study (21 visits)

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Time frame</th>
<th>Frequency</th>
<th>No. of visits</th>
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<tbody>
<tr>
<td>Weight, length, head circumference</td>
<td>Birth</td>
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<td>Weeks 2-8</td>
<td>Bi-weekly</td>
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<td></td>
<td>3-12 months</td>
<td>Monthly</td>
<td>10</td>
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<tr>
<td></td>
<td>14-24 months</td>
<td>Bi-monthly</td>
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<td>Arm circumference</td>
<td>3-12 months</td>
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<tr>
<td>Skinfold thicknesses</td>
<td>14-24 months</td>
<td>Bi-monthly</td>
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</table>
Motor development

Six universal motor development milestones assessed between 4 and \( \approx 18 \) months of age.
The WHO Multicentre Growth Reference Study
Rationale, Planning & Implementation

Food and Nutrition Bulletin
Vol 25, Suppl no.1
March 2004
WHO Child Growth Standards

Construction growth standards

WHO, Geneva
Mean length from birth to 24 months for the six MGRS sites

Length at selected centiles for the pooled sample and the sample following the exclusion of India

Construction of growth curves

- The rigorous methods of data collection yielded very high-quality dataset.
- State-of-art statistical methods applied in a methodical way:
  - Detailed examination of 30 existing methods, including types of distributions and smoothing techniques;
  - Selection of a software package flexible enough to allow comparative testing of alternative methods and the actual generation of the curves;
  - Systematic application of the selected approach to the data to generate models that resulted in the best fit.
- Ongoing statistical review by external expert panel.
WHO Child Growth Standards

- **Attained growth**
  - Length/height-for-age
  - Weight-for-age
  - Weight-for-length/height
  - Body mass index-for-age
  - Arm circumference-for-age
  - Triceps skinfold-for-age
  - Subscapular skinfold-for-age
  - Head circumference-for-age

- **Growth velocity**
  - Weight
  - Head circumference
  - Length

April 2006
April 2007
April 2009
WHO Multicentre Growth Reference Study

Motor Development Assessment
Weight-for-age, 0-6 months
WHO Child Growth Standards

Growth velocity

Variables: weight, length, head circumference

Increments: 1-, 2-, 3-, 4-, 6-months

Total of 160 tables!
### Simplified field tables

**Weight-for-age BOYS**  
**Birth to 13 weeks (z-scores)**

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<thead>
<tr>
<th>Weeks</th>
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<th>-2 SD</th>
<th>-1 SD</th>
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Software for PC and PDA

PC

PDA
The WHO Child Growth Standards

This web site presents the WHO Child Growth Standards. These standards were developed using data collected in the WHO Multicentre Growth Reference Study. The site presents documentation on how the physical growth curves and motor milestone windows of achievement were developed as well as application tools to support implementation of the standards.
WHO Child Growth Standards
Adoption and implementation

- Standards well received: opportunity to redefine and revitalize actions to promote child growth and development

- Incorporation of height and BMI to assess double burden (stunting and overweight)

- > 120 countries adopted and in different phases of implementation

- > 30 countries in process of adopting
National Workshop on
Adoption of New WHO Child Growth Standards
8-9 February 2007, New Delhi
Organized by
Ministry of Women and Child Development
Ministry of Health and Family Welfare
In collaboration with

unicef
World Health Organization
Motives for adoption

- Improved tool for growth assessment
- Coherence with country adoption of IYCF global strategy
- To monitor double burden of malnutrition (stunting and overweight)
- Harmonizing growth assessment systems within and between countries
Training of trainers regional workshops

- EMRO: El Cairo, February 2007
- AMRO (South America): Bolivia, April 2007
- AMRO (Central America): Nicaragua, May 2007
- AFRO: Ethiopia, June 2007
- WPRO: Malaysia, September 2007
- SEARO: Indonesia, October 2007
WHO Child Growth Standards

Did we achieved what we aimed to?
Major differences between WHO standards and existing growth charts

- Measurement schedules (21 visits in 24 mo)
- Infant feeding modes
- Standardization measurement techniques
- Availability empirical data in early months!
Mean Z-scores of healthy breastfed infants relative to the NCHS/WHO reference

Source: An Evaluation of Infant Growth, WHO, 1994
Weight-for-age Z-scores
WHO standard versus NCHS reference

Consistency

- National and international infant feeding guidelines that recommend breastfeeding as the optimal source of nutrition during infancy
  and
- The growth charts recommended for assessing the pattern of infant growth
Breastfeeding

- provides perfect nutrition
- provides initial immunization
- prevents diarrhoea
- maximizes a child’s physical and intellectual potential
- supports food security
- bonds mother and child
- helps birth spacing
- benefits maternal health
- saves money
- is environment-friendly
Severe malnutrition

- Very low weight/height (-3SD)
- 19 million preschool age children
- Mortality risk 9.4 times higher
- WHO standards impact:
  - shorter durations of treatment
  - greater rates of recovery
  - less need for inpatient care
  - fewer deaths (WHO standards better predictor of risk of mortality)
  - the standards have had a profound impact on the way programs operate

Source: Isanaka et al. Pediatrics 2009 and other recent papers
WHO Child Growth Standards

The WHO standards will play a key role in the early identification of childhood overweight and obesity.


Comparison of WHO with British 1990 BMI-for-age z-scores for boys

Implications for clinical practice

- With the WHO standards the risk of making an incorrect assessment regarding the adequacy of growth in healthy breastfed infants, and mistakenly advise unnecessary supplementation or cessation of breastfeeding is highly reduced.
- Provide a better tool for the early identification of children in the process of becoming undernourished or overweight.
- Improve management of severe malnutrition.
Implications for clinical practice

- WHO weight-based charts represent a lower plane of nutrition: fewer infants will appear thin while more will appear overweight/obese
- Shift of focus from "failure to thrive" to "overgrowth"
- Important training implications (overweight not previously a problem): how should professionals deal with fat infants?
- Will require a change in attitude of both parents and professionals to a "bonny baby": growing too fast in infancy is unhealthy
A child's right to grow to his/her full genetic potential
WHO Child Growth Standards

Never before a growth standard/reference has been scrutinized in the intense and global way as the WHO standards have been .... and they have passed the test with a good score
Growth Standards 1st set: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height, BMI-for-age and motor development indicators

Growth Standards 2nd set: Head circumference-for-age, arm circumference-for-age, triceps skinfold-for-age and subscapular skinfold-for-age
Team Work
Thank you!