Adult Body Composition and Stunting in women aged 35 and above in Nahualá, Guatemala

Assessed using height, weight, knee-height, arm span, waist circumference and full-length sagittal photographs

By Marlou-Floor Kenkhuis
Contents

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- Purpose
- Background and Relevance
- Methodology
- Results
- Discussions
Purpose

- Stunting and obesity is highly prevalent in the Guatemalan population and presents many health issues. This study aims to quantify certain anthropometric measures in an effort to better understand the effect that the Double Burden of Malnutrition has on health indicators like BMI, WC, WtHR and Torso/Leg Ratios in women. In addition a comparison is made between Quetzaltenango and Nahualá and ages 35-59 and 60 and older.
Definitions - Stunting

- Too short for age
- **Stunting** is defined as <-2 SD of the WHO Child Growth Standards median for **height for age** (6)
- Stunting in women is <145cm bron
Definitions – BMI (Body Mass Index)

- BMI = Weight (kg) / Height (m)^2

- Cut-off Points

<table>
<thead>
<tr>
<th>BMI Range</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI &lt; 17.0</td>
<td>Indicates moderate to severe thinness</td>
</tr>
<tr>
<td>BMI 17.0–18.4</td>
<td>Indicates middle underweight</td>
</tr>
<tr>
<td>BMI 18.5–24.9</td>
<td>Indicates normal weight</td>
</tr>
<tr>
<td>BMI 25.0–29.9</td>
<td>Indicates overweight</td>
</tr>
<tr>
<td>BMI ≥30</td>
<td>Indicates obesity</td>
</tr>
</tbody>
</table>
## Definitions – Waist Circumference

- Measured at ‘clinical waist’
- Categories

<table>
<thead>
<tr>
<th>Level</th>
<th>Category</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Females less than 80 cm</td>
<td>Indicates normal weight</td>
</tr>
<tr>
<td>1</td>
<td>Females between 80-88 cm</td>
<td>Indicates overweight</td>
</tr>
<tr>
<td>2</td>
<td>Females greater than 88 cm</td>
<td>Indicates obesity</td>
</tr>
</tbody>
</table>
Background

- Stunting and obesity are highly prevalent in Guatemalan population and presents many health issues
  - Guatemalan children have the highest prevalence of stunting in Latin America
    - Higher rates of stunting than other nations in the region with similar income status (4)
  - 67% of Guatemalans ages 15 and above are overweight of which 29% are obese
  - Highest prevalence of double burden of malnutrition in Guatemalan families (16-18%)
- Currently not much evidence regarding stunting prevalence of adults in Guatemalan population but stunting in adulthood is a direct consequence of childhood stunting
How do you measure health

• Traditionally BMI is used to analyze nutrition in individual and populations

• However, in stunted population in developing countries BMI alone should be interpreted with cautions. Measures in addition to BMI are needed for a more complete assessment.

• Considerations
  • Older people tend to have more body fat for similar BMI
  • No differentiation between muscle weight and fat weight
  • Decrease in height with advancing age greater in women starting from 30 years of age
Other ways to measure height

- Arm span
  - Long bones in arms and legs do not change throughout life – **maximum height**

- Knee height
  - Dependent on population for which the algorithm was calculated – **current height**
    - Black women: Height = 68.1 + (1.86 x knee height) – (0.06 x age)
Objectives

- In women between the ages of 35 – 59 and 60- older in Nahualá, Guatemala
  - How valid are the alternative measures of BMI (Knee Height and Armspan)?
  - How do the action levels for WC and WC/Height correlate?
  - How do the measurements between elderly and middle-aged population compare
  - How do the measurements between Nahualá (rural) and Quetzaltenango (urban) population compare
Setting

- Location = Nahualá
- Participants = Group 35-59 = 81 participants
  = Group 60-older = 75 participants
- Photo measurements 50 in each age group, 100 in total
- Institution = Center for Studies of Sensory Impairment, Aging and Metabolism (CESSIAM)
- Comparison is made with Quetzaltenango, data obtained in a previous study
Methodology

- Field work
- Recruitment
- Measurements
  - Knee-height
  - Weight
  - Standing Height
  - Armspan
  - Photographs (sagittal view)
  - Waist circumference
- Data Collection
- Results
- Analysis
Field work - Procedure

- Introduction by nurses or translators – People who came to the health care center. Or recruited by the recruiters/translators by going door by door.
- Consent: Eligible participants are consented to the study.
  
  Inclusion Criteria
  - 35-older
  - Women
  - Nahualá
  - Exclude pregnant physically unable to participate
- Participants were asked to remove shoes, jackets/sweaters, keys and wallet
Field work - Knee Height

- Instructed to sit in a chair
- Knee Height measured on the right leg with the thigh/leg and leg/foot at 90 degrees
  - Knee anthropometric caliper (MediForm) was used
  - Measured to the nearest tenth of a centimeter
Field work - Weight

- Instructed to stand on the scale and look forward in Frankfort Plane gaze
  - Measured to the nearest tenth kilogram
  - Corrected for clothing in analysis (Western or traditional clothing)
Field Work – Standing Height

- Instructed to stand against the wall with their heels together and back and heels touching the wall.
- Look in forward in Frankfort Plane gaze
- Measured with Carpenter’s Square tool to the nearest tenth of a centimeter
Field Work - Armspan

- Instructed to stand up on a box and extend their arms on chest height with their palms facing forwards
  - Specialized meter stick was utilized
  - Measured to the nearest tenth of a centimeter
Field work – Photos

- Participants were instructed to stand on a box with their right side facing the camera and with their right arm crossed over the chess
- Feet were together and horizontal with the plane of the box
- Tagging the iliac crest
- Take picture from Sagittal view
- 1 in front to give to the participant for participation
Field Work – Waist Circumference

- Participants were instructed to remove their *Faja* and lift their shirt/*Guipil* and to lower pants/skirts / *Cortes*
  - Measured at the ‘clinical waist’ halfway between iliac crest and lowest rib
  - Measured using a flexible meter tape in a private area of the data collection site to the nearest tenth of a centimeter
Field Work - Procedure

- After measuring we returned the preliminary results to the participants including:
  - Weight
  - Height
  - BMI
  - Waist circumference
  - Photo (following day)
Age (years)

Nahualá
Total

Median: 58.0
Mean ± SD: 58.6 ± 13.5
Min:35.0 Max: 90.0
N=156

Median: 47.0
Mean ± SD: 47.7 ± 7.2
Min:35.0 Max: 59.0
N=81

Median: 69.0
Mean ± SD: 70.4 ± 7.3
Min:60.0 Max: 90.0
N=75

35-59

Median: 47.0
Mean ± SD: 46.6 ± 7.4
Min:34.0 Max: 59.0
N=113

Median: 70.0
Mean ± SD: 71.5 ± 7.6
Min:61.0 Max: 93.0
N=64

60-older

Nahualá
Quetzaltenango
Adjusted Weight (kg)

Nahualá

Total

Median: 48.6
Mean ± SD: 50.2 ± 10.8
Min:31.3 Max: 77.5
N=156

35-59

Median: 55.3
Mean ± SD: 54.9 ± 11.1
Min:32.0 Max: 77.5
N=81

60-older

Median: 45.0
Mean ± SD: 45.1 ± 7.8
Min:31.3 Max: 68.4
N=75

Nahualá

Quetzaltenango

Median: 66.6
Mean ± SD: 66.5 ± 11.5
Min: 42.6 Max: 99.0
N=113

Median: 54.9
Mean ± SD: 55.6 ± 13.4
Min:34.1 Max: 106.1
N=67

*The age groups 35-59 and 60-older in Nahualá are significantly different for adjusted weight with p-value : <0.001
Standing Height (cm)

Nahualá Total

Median: 141.2
Mean ± SD: 140.9 ± 5.9
Min: 126.0 Max: 155.5
N=156

35-59

Median: 143.0
Mean ± SD: 142.9 ± 5.6
Min: 131.5 Max: 155.5
N=81

60-older

Median: 139.8
Mean ± SD: 138.7 ± 5.5
Min: 126.0 Max: 152.6
N=75

Nahualá

Median: 148.0
Mean ± SD: 148.7 ± 6.1
Min: 134.0 Max: 170.0
N=113

Quetzaltenango

Median: 144.5
Mean ± SD: 144.0 ± 6.4
Min: 127.0 Max: 158.0
N=67

• The age groups 35-59 and 60-older in Nahualá are significantly different for standing height with p-value : <0.001
Height Armspan (cm)

Nahualá Total

Median: 143.8
Mean ± SD: 143.3 ± 6.5
Min:128.5 Max: 163.1
N=156

35-59

Median: 145.4
Mean ± SD: 145.3 ± 6.7
Min:131.3 Max: 163.1
N=81

60-older

Median: 142.2
Mean ± SD: 142.5 ± 6.0
Min:128.5 Max: 155.0
N=75

Nahualá

Median: 150.0
Mean ± SD: 151.1 ± 6.5
Min:138.0 Max: 168.0
N=113

Quetzaltenango

Median: 146.5
Mean ± SD: 146.3 ± 7.6
Min:119.2 Max: 161.1
N=67

*The age groups 35-59 and 60-older in Nahualá are significantly different for height armspan with p-value : 0.008
<table>
<thead>
<tr>
<th>Age Group</th>
<th>Median (cm)</th>
<th>Mean ± SD (cm)</th>
<th>Min (cm)</th>
<th>Max (cm)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>35-59</td>
<td>143.4</td>
<td>143.7 ± 4.4</td>
<td>135.2</td>
<td>154.2</td>
<td>81</td>
</tr>
<tr>
<td>60-older</td>
<td>139.8</td>
<td>139.6 ± 4.6</td>
<td>131.1</td>
<td>149.9</td>
<td>75</td>
</tr>
<tr>
<td>Total</td>
<td>141.9</td>
<td>141.8 ± 4.9</td>
<td>131.8</td>
<td>154.2</td>
<td>156</td>
</tr>
<tr>
<td>35-59</td>
<td>148.2</td>
<td>148.4 ± 5.3</td>
<td>135.3</td>
<td>167.8</td>
<td>113</td>
</tr>
<tr>
<td>60-older</td>
<td>144.9</td>
<td>144.7 ± 4.7</td>
<td>136.1</td>
<td>160.8</td>
<td>67</td>
</tr>
</tbody>
</table>

*The age groups 35-59 and 60-older in Nahualá are significantly different for height knee-height with p-value :<0.001*
<table>
<thead>
<tr>
<th>Age Group</th>
<th>Median BMI</th>
<th>Mean ± SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nahualá Total</td>
<td>Median: 24.9</td>
<td>Mean ± SD: 25.5 ± 4.4</td>
<td>Min:16.8</td>
<td>Max: 40.7</td>
</tr>
<tr>
<td>35-59</td>
<td>Median: 26.8</td>
<td>Mean ± SD: 27.1 ± 4.5</td>
<td>Min:18.1</td>
<td>Max: 40.7</td>
</tr>
<tr>
<td>60-older</td>
<td>Median: 23.4</td>
<td>Mean ± SD: 23.8 ± 3.6</td>
<td>Min:16.8</td>
<td>Max: 32.8</td>
</tr>
<tr>
<td>Quetzaltenango</td>
<td>Median: 29.2</td>
<td>Mean ± SD: 30.0 ± 4.7</td>
<td>Min: 20.5</td>
<td>Max: 43.9</td>
</tr>
<tr>
<td></td>
<td>Median: 26.2</td>
<td>Mean ± SD: 26.7 ± 5.1</td>
<td>Min:18.9</td>
<td>Max: 44.0</td>
</tr>
</tbody>
</table>

*The age groups 35-59 and 60-older in Nahualá are significantly different for BMI (standing height) with p-value: <0.001*
BMI from Armspan (kg/m²)

Nahualá
Total

Median: 24.1  
Mean ± SD: 24.3 ± 4.5  
Min:15.0 Max: 38.0  
N=156

35-59

Median: 26.5  
Mean ± SD: 26.3 ± 4.5  
Min:17.9 Max: 38.0  
N=81

60-older

Median: 21.8  
Mean ± SD: 22.2 ± 3.5  
Min:15.0 Max: 30.2  
N=75

Median: 28.7  
Mean ± SD: 29.1 ± 4.9  
Min: 19.4 Max: 44.5  
N=113

Quetzaltenango

Median: 25.1  
Mean ± SD: 25.9 ± 5.1  
Min:16.6 Max: 43.8  
N=67

The age groups 35-59 and 60-older in Nahualá are significantly different for BMI (armspan) with p-value: <0.001
**BMI from Knee-Height (kg/m²)**

**Nahualá Total**

- **Median**: 25.0
- **Mean ± SD**: 25.2 ± 4.4
- **Min**: 16.3 **Max**: 36.6
- **N**: 156

**35-59**

- **Median**: 27.3
- **Mean ± SD**: 26.9 ± 4.5
- **Min**: 17.6 **Max**: 36.6
- **N**: 81

**60-older**

- **Median**: 23.6
- **Mean ± SD**: 23.5 ± 3.5
- **Min**: 16.3 **Max**: 31.9
- **N**: 75

**Nahualá**

**Quetzaltenango**

- **Median**: 30.1
- **Mean ± SD**: 30.2 ± 4.9
- **Min**: 20.4 **Max**: 45.7
- **N**: 113

- **Median**: 26.1
- **Mean ± SD**: 26.3 ± 5.2
- **Min**: 18.2 **Max**: 45.3
- **N**: 67

*The age groups 35-59 and 60-older in Nahualá are significantly different for BMI (knee-height) with p-value: <0.001*
Waist Circumference (cm)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Median</th>
<th>Mean ± SD</th>
<th>Min: Max</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nahualá</td>
<td>80.7</td>
<td>81.2 ± 9.8</td>
<td>56.6:101.1</td>
<td>156</td>
</tr>
<tr>
<td>35-59</td>
<td>84.6</td>
<td>83.4 ± 10.0</td>
<td>56.6:101.1</td>
<td>81</td>
</tr>
<tr>
<td>60-older</td>
<td>78.4</td>
<td>78.8 ± 9.1</td>
<td>58.7:100.4</td>
<td>75</td>
</tr>
<tr>
<td>Quetzaltenango</td>
<td>93.0</td>
<td>93.9 ± 10.4</td>
<td>72.0:120.0</td>
<td>113</td>
</tr>
<tr>
<td>35-59</td>
<td>91.5</td>
<td>92.1 ± 11.6</td>
<td>64.5:123.2</td>
<td>67</td>
</tr>
</tbody>
</table>

*The age groups 35-59 and 60-older in Nahualá are significantly different for waist circumference with p-value : 0.003
**Waist-to-Height Ratio (WtHR)**

Nahualá Total

- **Median**: 0.58
- **Mean ± SD**: 0.58 ± 0.07
- **Min**: 0.41  **Max**: 0.73
- **N**: 156

35-59

- **Median**: 0.60
- **Mean ± SD**: 0.58 ± 0.07
- **Min**: 0.42  **Max**: 0.73
- **N**: 81

60-older

- **Median**: 0.57
- **Mean ± SD**: 0.57 ± 0.07
- **Min**: 0.41  **Max**: 0.71
- **N**: 75

Nahualá

- **Median**: 0.63
- **Mean ± SD**: 0.63 ± 0.07
- **Min**: 0.50  **Max**: 0.86
- **N**: 158

Quetzaltenango

- **Median**: 0.64
- **Mean ± SD**: 0.64 ± 0.08
- **Min**: 0.44  **Max**: 0.79
- **N**: 67

*The age groups 35-59 and 60-older in Nahualá is NOT significantly different for WtHR with p-value : 0.28*
Stunted: 78.2%
Non-stunted: 21.8%
N=156

Stunted: 67.9%
Non-stunted: 32.1%
N=81

Stunted: 89.3%
Non-stunted: 10.7%
N=75

Stunted: 28.3%
Non-stunted: 71.7%
N=113

Stunted: 52.2%
Non-stunted: 47.8%
N=67

Nahualá

Quetzaltenango
Analysis - Height and BMI

- Height: 3 measurements
  - Standing height: directly from standing height measurement
  - Armspan height: directly from armspan measurement
  - Height from Knee-Height: calculated
    - Adjusted height in cm (females) \(72.08 + (1.84 \times \text{knee-height cm}) - (0.131 \times \text{age})\)

- BMI: 3 measurements
  - Calculated for all study participants from all heights
  - \(\text{BMI} = \frac{\text{kg}}{(\text{height in m})^2}\)
  - BMI categories: underweight, normal weight, overweight, obese
Sensitivity and specificity “stunting”

<table>
<thead>
<tr>
<th></th>
<th>Standing Height</th>
<th>Standing Height</th>
<th>Standing Height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stunted</td>
<td>Non-Stunted</td>
<td>Stunted</td>
</tr>
<tr>
<td>Height-Armspan</td>
<td></td>
<td></td>
<td>82</td>
</tr>
<tr>
<td>Sensitivity: 96.5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specificity: 43.7%</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Armspan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height-KneeHeight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity: 90.7%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specificity: 60.5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Armspan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Armspan-KneeHeight</td>
<td></td>
<td></td>
<td>80</td>
</tr>
<tr>
<td>Sensitivity: 67.8%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specificity: 86.8%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Pearson correlation “height”

Height and Armspan

```
R=0.853
P<0.001
```

Height and KneeHeight

```
R=0.860
P<0.001
```

Armspan and KneeHeight

```
R=0.804
P<0.001
```
Difference “height” (cm)

Height-Armspan
20.5% Same*

Median: -3.00
Mean ± SD: -3.03 ± 3.42
Min: -10.60 Max: 6.00
N=156

Height-KneeHeight
26.9% Same*

Median: -0.75
Mean ± SD: -0.86 ± 3.02
Min: -13.28 Max: 6.00
N=156

Armspan-KneeHeight
16% Same*

Median: 2.50
Mean ± SD: 2.17 ± 3.89
Min: -9.48 Max: 11.52
N=156

* Same is qualified as difference less than -1.0 and +1.0cm
Percentage “Overweight” and “Obesity”

Nahualá

Total

Normal: 51.3%
Overweight: 32.7%
Obesity: 16.0%
N=156

35-59

Normal: 37.0%
Overweight: 35.8%
Obesity: 27.2%
N=81

Normal:11.5%
Overweight: 46.0%
Obesity: 42.5%
N=113

60-older

Normal: 66.7%
Overweight: 29.3%
Obesity: 4.0%
N=75

Normal: 35.8%
Overweight: 44.8%
Obesity: 19.4%
N=67

* BMI based on measured standing height
Pearson correlation “BMI”

BMI Height and BMI Armspan

![Graph showing correlation between BMI Height and BMI Armspan with R=0.964 and P<0.001.]

BMI Height and BMI KneeHeight

![Graph showing correlation between BMI Height and BMI KneeHeight with R=0.966 and P<0.001.]

BMI Armspan and BMI KneeHeight

![Graph showing correlation between BMI Armspan and BMI KneeHeight with R=0.954 and P<0.001.]

R=0.964
P<0.001

R=0.966
P<0.001

R=0.954
P<0.001
## Contingency Table “BMI”

### BMI Standing Height

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Overweight</th>
<th>Obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>75</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>Overweight</td>
<td>5</td>
<td>34</td>
<td>8</td>
</tr>
<tr>
<td>Obesity</td>
<td>0</td>
<td>1</td>
<td>17</td>
</tr>
</tbody>
</table>

Percent Concordant: 126/156 = 80.8%

### BMI Height Knee-Height

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Overweight</th>
<th>Obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>74</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Overweight</td>
<td>6</td>
<td>44</td>
<td>5</td>
</tr>
<tr>
<td>Obesity</td>
<td>0</td>
<td>3</td>
<td>20</td>
</tr>
</tbody>
</table>

Percent Concordant: 138/156 = 88.4%

### BMI Armspan

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Overweight</th>
<th>Obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>75</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Overweight</td>
<td>16</td>
<td>36</td>
<td>3</td>
</tr>
<tr>
<td>Obesity</td>
<td>0</td>
<td>5</td>
<td>18</td>
</tr>
</tbody>
</table>

Percent Concordant: 129/156 = 82.7%
### Percentage “level 0,1 or 2” of waist circumference

<table>
<thead>
<tr>
<th>Group</th>
<th>Level 0</th>
<th>Level 1</th>
<th>Level 2</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>46.8%</td>
<td>22.4%</td>
<td>30.8%</td>
<td>156</td>
</tr>
<tr>
<td>35-59</td>
<td>37.0%</td>
<td>21.0%</td>
<td>42.0%</td>
<td>81</td>
</tr>
<tr>
<td>60-older</td>
<td>57.3%</td>
<td>24.0%</td>
<td>18.7%</td>
<td>75</td>
</tr>
</tbody>
</table>
Contingency Table “WC vs BMI category”

<table>
<thead>
<tr>
<th>Waist Circumference</th>
<th>Normal</th>
<th>Overweight</th>
<th>Obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>75</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>34</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>1</td>
<td>17</td>
</tr>
</tbody>
</table>

BMI Standing Height

Concordance = \(rac{126}{156} = 80.8\%\)
Waist-to-Height Ratio (WtHR)

- Only 12.8% had WtHR of less than 0.5

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.5</td>
<td>20</td>
<td>12.8</td>
</tr>
<tr>
<td>&gt;0.5</td>
<td>136</td>
<td>87.2</td>
</tr>
</tbody>
</table>

Recall the Cut-off for risk is 0.5*

*Remember this cut-off is not as widely accepted as BMI but a proposed point by existing literature
Analysis – Photographic Measurements

- Total height: from heel to top of head
- Leg length: from iliac crest (tape) to heel
- Trunk length: from iliac crest (tape) to head
- Trunk/leg ratio: calculated (trunk length/leg length)
- Examine relationship between trunk/leg ratio and stunting
- Examine relationship between trunk/leg ratio and age
Analysis - Photo
Trunk/Leg ratio

Nahualá Total

Median: 0.69
Mean ± SD: 0.70 ± 0.07
Min: 0.51 Max: 0.86
N=100

35-59

Median: 0.70
Mean ± SD: 0.70 ± 0.08
Min: 0.52 Max: 0.86
N=50

60-older

Median: 0.68
Mean ± SD: 0.69 ± 0.07
Min: 0.51 Max: 0.84
N=50

• The age groups 35-59 and 60-older in Nahualá are NOT significantly different for trunk /leg ratio with p-value : 0.383
The age groups 35-59 and 60-older in Nahualá are NOT significantly different for trunk/height ratio with p-value : 0.399
### Trunk/Leg ratio “non-stunted vs stunted”

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Non-Stunted</th>
<th>Stunted</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nahualá Total</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>0.66</td>
<td>0.70</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>0.66 ± 0.08</td>
<td>0.71 ± 0.07</td>
</tr>
<tr>
<td>Min</td>
<td>0.51</td>
<td>0.53</td>
</tr>
<tr>
<td>Max</td>
<td>0.81</td>
<td>0.86</td>
</tr>
<tr>
<td>N</td>
<td>19</td>
<td>81</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Non-Stunted</th>
<th>Stunted</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>35-59</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>0.65</td>
<td>0.73</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>0.66 ± 0.07</td>
<td>0.72 ± 0.07</td>
</tr>
<tr>
<td>Min</td>
<td>0.52</td>
<td>0.57</td>
</tr>
<tr>
<td>Max</td>
<td>0.77</td>
<td>0.86</td>
</tr>
<tr>
<td>N</td>
<td>15</td>
<td>35</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Non-Stunted</th>
<th>Stunted</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>60-older</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>0.70</td>
<td>0.68</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>0.68 ± 0.13</td>
<td>0.69 ± 0.07</td>
</tr>
<tr>
<td>Min</td>
<td>0.51</td>
<td>0.53</td>
</tr>
<tr>
<td>Max</td>
<td>0.80</td>
<td>0.84</td>
</tr>
<tr>
<td>N</td>
<td>4</td>
<td>46</td>
</tr>
</tbody>
</table>

*Trunk/leg ratio Non-stunted vs stunted is significantly different with P=0.025

*Trunk/leg ratio Non-stunted vs stunted in age group 35-59 is significantly different with p=0.005

*Trunk/leg ratio Non-stunted vs stunted in age group 60-older is NOT significantly different with p=0.882
### Trunk/Height ratio “non-stunted vs stunted”

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Non-Stunted</th>
<th>Stunted</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nahualá Total</td>
<td>Median: 0.40</td>
<td>Median: 0.41</td>
<td>*Trunk/leg ratio Non-stunted vs stunted is significantly different with P=0.021</td>
</tr>
<tr>
<td></td>
<td>Mean ± SD: 0.40 ± 0.03</td>
<td>Mean ± SD: 0.41 ± 0.02</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Min: 0.34 Max: 0.45</td>
<td>Min: 0.34 Max: 0.46</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N=19</td>
<td>N=81</td>
<td></td>
</tr>
<tr>
<td>35-59</td>
<td>Median: 0.40</td>
<td>Median: 0.42</td>
<td>*Trunk/leg ratio Non-stunted vs stunted in age group 35-59 is significantly different with p=0.005</td>
</tr>
<tr>
<td></td>
<td>Mean ± SD: 0.40 ± 0.07</td>
<td>Mean ± SD: 0.42 ± 0.02</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Min: 0.34 Max: 0.43</td>
<td>Min: 0.36 Max: 0.46</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N=15</td>
<td>N=35</td>
<td></td>
</tr>
<tr>
<td>60-older</td>
<td>Median: 0.40</td>
<td>Median: 0.41</td>
<td>*Trunk/leg ratio Non-stunted vs stunted in age group 60-older is NOT significantly different with p=0.883</td>
</tr>
<tr>
<td></td>
<td>Mean ± SD: 0.41 ± 0.05</td>
<td>Mean ± SD: 0.41 ± 0.02</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Min: 0.34 Max: 0.45</td>
<td>Min: 0.34 Max: 0.45</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N=4</td>
<td>N=46</td>
<td></td>
</tr>
</tbody>
</table>
Pearson correlation “Trunk/Leg ratio”

Trunk/Leg Ratio and Age

R = -0.063
P = 0.534

Trunk/Leg Ratio and Height

R = -0.272
P = 0.006
Pearson correlation “Trunk/Height ratio”

Trunk/Height Ratio and Age

\[ R = -0.063 \]
\[ P = 0.534 \]

Trunk/Height Ratio and Height

\[ R = -0.073 \]
\[ P = 0.006 \]
Conclusions - Stunting

- Total percentage stunted in Nahuala is 78.2%
  - In age group 35-59 more than twice as much stunted women in Nahualá than in Quetzaltenango
  - More stunted women in age group 60 and older than in 35-59
- Sensitivity stunting with different height measurements
  - Sensitivity of 96.5% for armspan and specificity 43.7%
  - Sensitivity of 90.7% for KneeHeight and specificity of 60.5%
Conclusion - Overweight

- Nearly 50% of all the people in Nahualá has overweight or obesity.
  - Better in comparison to Quetzaltenango
  - With 1/3 of the women normal, overweight or obesity in the age group 35-59
  - Whereas in the age group 60 and older 2/3 have a normal weight.
Conclusions - BMI

- Standing Height, Armspan and Knee-Height are all significantly correlated with each other
- BMI from standing height, armspan and knee-height are all significantly correlated with each other
  - BMI from armspan has a concordance of 80.8%
  - BMI from Height Kneeheight has a concordance of 88.4%
Conclusions – Waist circumference

• The majority (46.8) of females in age group 35-59 are in Level 2
• The majority of (57.3%) of females in age group 60 and older are in Level 0
• Waist Circumference is significantly different between the age group 35-59 and 60 and older
• Concordance of waist circumference with BMI classification was 80.8%
• Only 12.8% had WtHR of less than 0.5
• Both groups have a median WtHR greater than 0.5
Conclusions - Photographs

- The age groups 35-59 and 60 and older were NOT significantly different for trunk/leg ratio and trunk/height ratio.

- Trunk/leg ratio was significantly different between stunted and non-stunted sub-groups for total and for age groups 35-59 but not for females 60 years and older, but only 4 older women were non-stunted.

- Trunk/height ratio was significantly different between stunted and non-stunted sub-groups for total and for age groups 35-59 but not for females 60 years and older, but only 4 older women were non-stunted.
Lessons Learned

• Recruitment
  • In need of translator Spanish to Kiché
  • Door-to-door recruitment worked best – people could directly bring their identification cards (DPI) with birth date.

• Measurements
  • Difficult to find the line to measure top of the head in the photographic images because of thick hair
    • Solutions: Work with hairpins
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bedankt voor uw aandacht

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