Summer Internship Work

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Center for Studies of Sensory Impairment, Aging and Metabolism (CeSSIAM)

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- We are indebted to the children who participated on this study for their collaboration.

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VALIDATION OF SELF-ELABORATED PICTORIAL DESCRIPTIONS OF HOUSEHOLD ANIMALS BY SCHOOLCHILDREN: ACCURACY AS A FUNCTION OF AGE

Kimberly Shiu, Anna Barr, Noel W. Solomons, Mónica Orozco

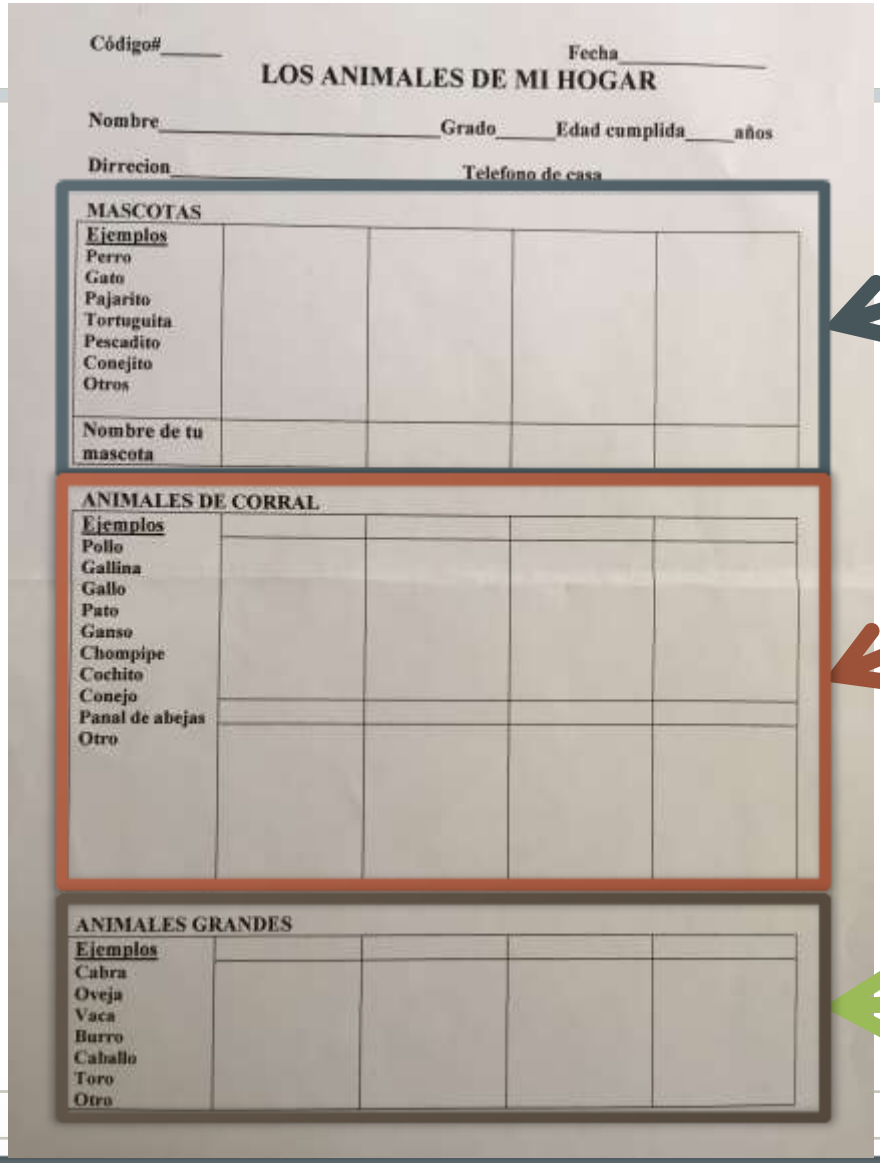
Positives of Animal Ownership

- Save money
- Earn money
- Potentially healthy food
- Less vulnerability in terms of poverty and finances
- Fertilizer for crops
- Less loneliness and depression

Negatives of Animal Ownership

- Zoonoses
  - Toxoplasmosis
  - Salmonella
  - Rabies
- Immune system burden
- Respiratory problems

Pictorial Instrument



Código#_____ Fecha_____

LOS ANIMALES DE MI HOGAR

Nombre_____Grado_____Edad cumplida____años

Direccion_____ Telefono de casa

MASCOTAS

Ejemplos				
Perro Gato Pajarito Tortuguita Pescadito Conejito Otros				
Nombre de tu mascota				

ANIMALES DE CORRAL

Ejemplos				
Pollo Gallina Gallo Pato Ganso Chompipe Cochito Conejo Panal de abejas Otro				

ANIMALES GRANDES

Ejemplos				
Cabra Oveja Vaca Burro Caballo Toro Otro				

Draw every pet, continue on back. Write the name of the pet.

Draw one of every type of barnyard animal you own. Write the species name and amount.

Draw one of every type of livestock animal you own. Write the species name and amount.

Method

Classroom

Children ages 9-12

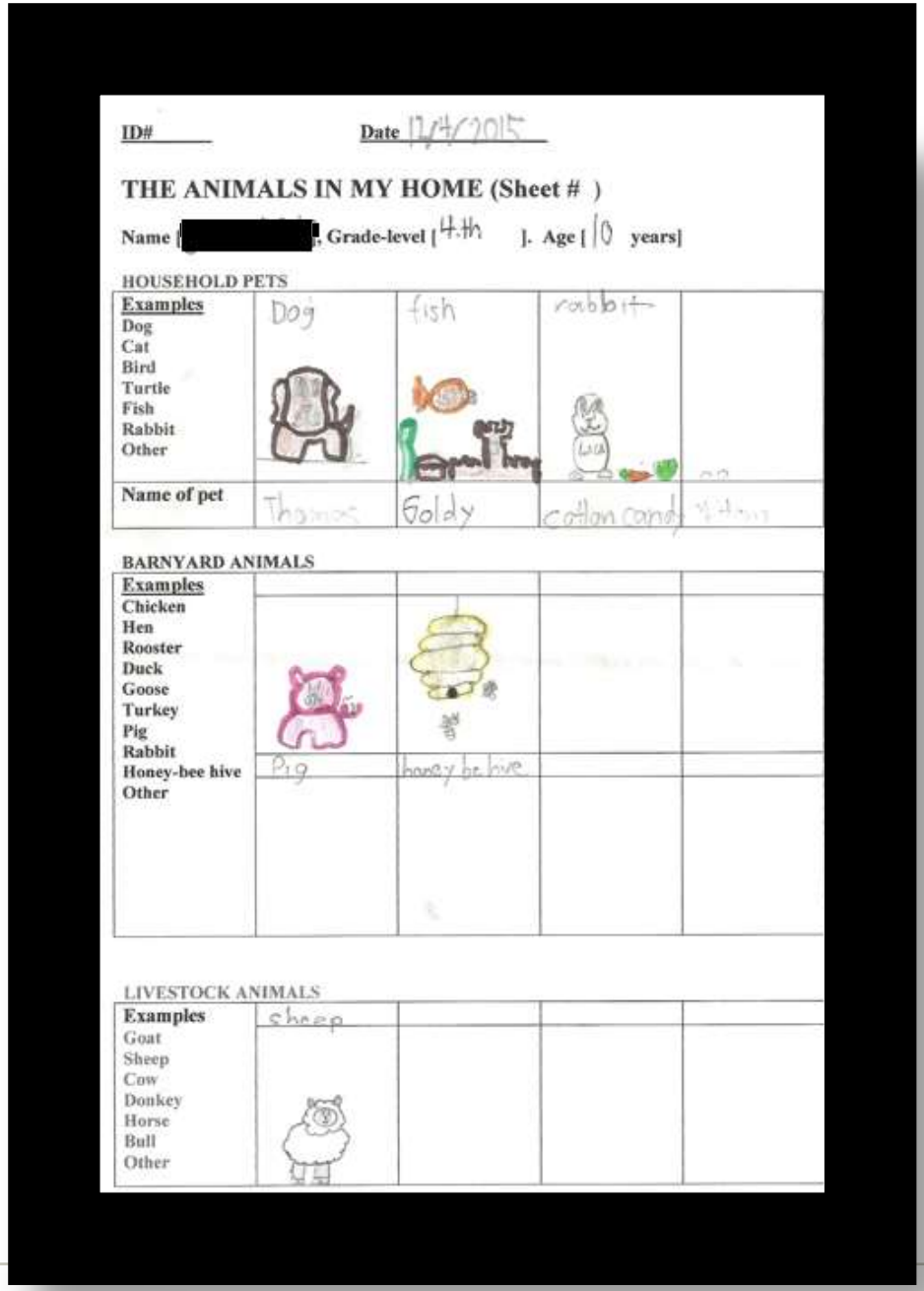
Overnight

Home Visit

Hypothesis

We hypothesize that a useful degree of self-reporting for survey purposes can be achieved from a pictorial methods at least in some children, and that the older the child, the better will be the validity of reporting.

If this instrument is considered a valid way of reporting animals, it can be used in lieu of home visits.



ID# _____ Date 12/4/2015

THE ANIMALS IN MY HOME (Sheet #)

Name [redacted], Grade-level [4th]. Age [10 years]

HOUSEHOLD PETS

Examples Dog Cat Bird Turtle Fish Rabbit Other	Dog	fish	rabbit	
Name of pet	Thomas	Goldy	cotton candy	

BARNYARD ANIMALS

Examples Chicken Hen Rooster Duck Goose Turkey Pig Rabbit Honey-bee hive Other				
	Pig	honey be hive		

LIVESTOCK ANIMALS

Examples Goat Sheep Cow Donkey Horse Bull Other	sheep			

Example in English

Form translated into Spanish for study

Data Analysis

Key Definitions:

- Omission: The failure to report an animal(s) that truly exists in the household.
- Intromission: The report of an animal(s) that truly does not exist in the household.

- All animals reported, using the forms and their photocopies for each phase, were entered into a database using Microsoft Excel, version 14.4.5.
- Fishers Exact Testing performed

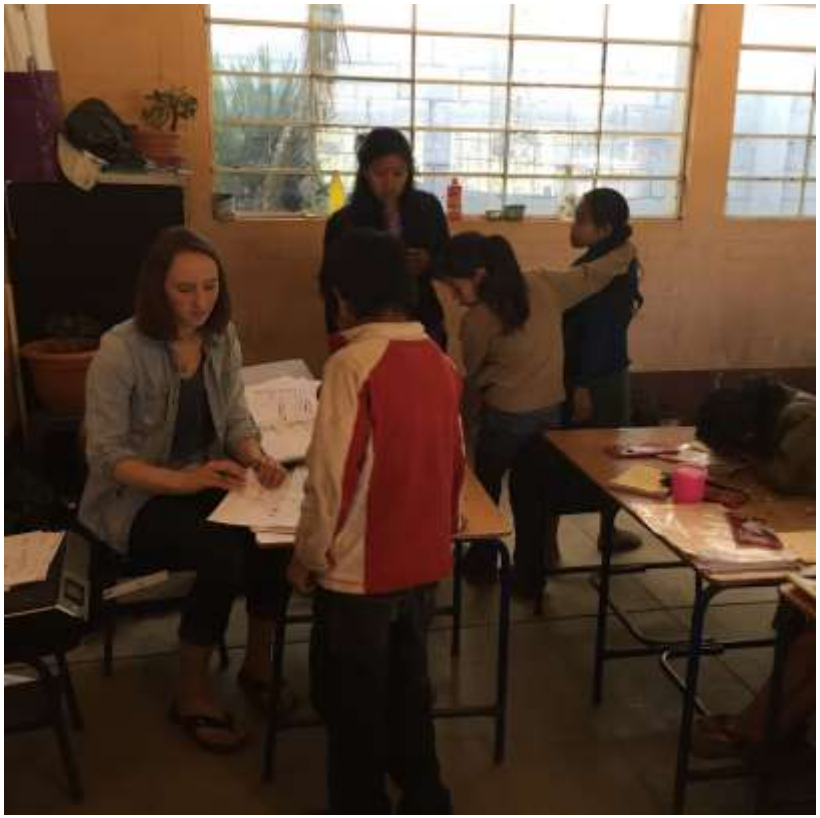
Results

- Validated animals: 552, with 101 pets, 444 barnyard animals, and 7 livestock out of 30 children who received home visits.
- The per-household median was 17.5, and the mean number of household animals per household for this segment of the population was 18.4±10.3.
- Number of validated animals per household ranged from 2 to 48.

Results

Fishers Exact Testing revealed:

- No interaction between age and omissions in reporting.
- However, with intromissions, older age emerged as a factor toward greater accuracy. Significant differences between ages 12 and 9, ages 12 and 10, and 11 and 9.



Results

- Older children seemed to have a better grasp on what animals they actually owned
- Ages 10, 11, 12 seem most reliable when using this instrument

Continued Work

- Addressing if this is considered a valid way of gathering data amongst even older children
- Practical implications for these findings for future studies on animal ownership
- Finishing publication

Trunk-to-leg ratio in regions of extreme stunting prevalence in the Western Highlands of Guatemala: A comparative perspective and interpretation

Kimberly Shiu, Joni Beintema, Windy Mulia Liem, Rosario Garcia, Colleen Doak, Monica Orozco and Noel W. Solomons

Measurements at SOSEP Centers

GOBIERNO DE LA REPÚBLICA DE
GUATEMALA
SECRETARÍA DE OBRAS SOCIALES
DE LA ESPOSA DEL PRESIDENTE

Visiting SOSEP Centers to weigh and measure the heights of the kids

Later the nutritionists of CeSSIAM will return to deliver the results

Background

- Relevance to Guatemala:

Highest prevalence of stunting in the Americas

46.5% of children under 5 years old are considered stunted*

*ENSMI 2014-2015

Work in Xela

- Matching pairs for the 102 pairs that a previous CeSSIAM student, Joni Beintema, included
  Two sets of pairs: one chronologically and one enriched by the lowest height-for-age z-scores
- Determination of demographic, anthropometric and body segment ratio characteristics (mean ± standard deviation and median) based on this pair-matched (sex and age) study sample

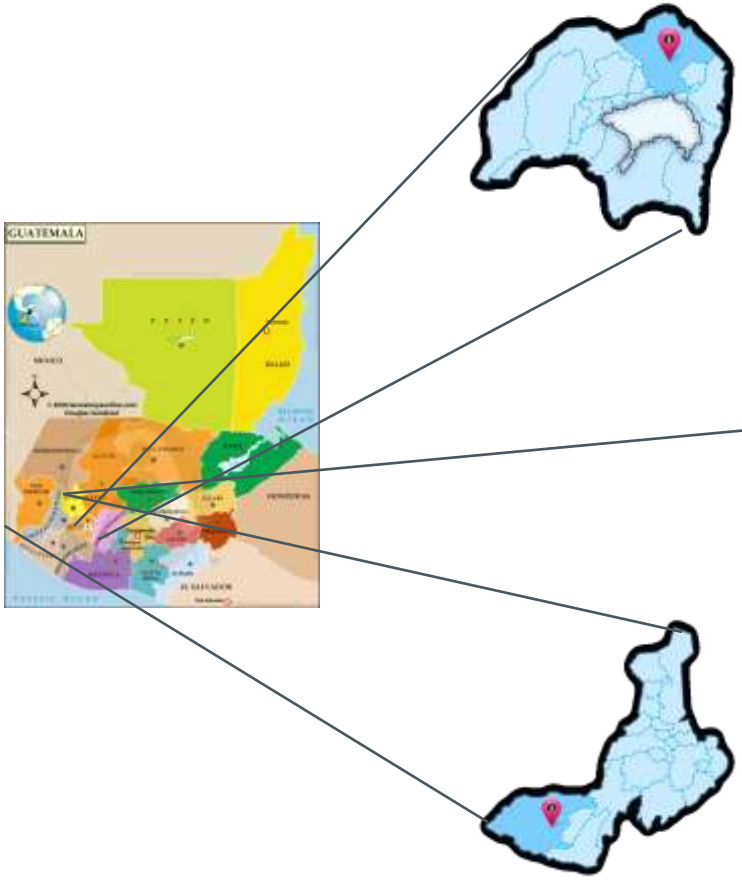
Comparison of Socioeconomic and Ethnic Backgrounds

With regards to the work of Beintema and coworkers:

- Quetzaltenango represented individuals from mostly European-ascent of middle-upper income who attended private schools
- Sololá represented low-income individuals of predominately Mayan-ascent who attended public schools

Demographic Comparison

Sololá



Santa María Chiquimula

Quetzaltenango

Why a Photographic Method?

- Allows for evaluation of body segments
  Non-invasive, less tactile than other methods, easily reproducible
  Allows for future reference to the photo
- Other method, sitting height ratio to determine trunk length
  Limited due to thickness of buttocks
- Different methods are more intrusive, especially when working with young children

Equipment Needed

- Digital camera (Nikon Coolpix L830, Nikon, Tokyo, Japan), and a tripod with bubble level (Triopo GT-2804, Triopo, Zheijang, China)
- Colored stickers
- Printer (Canon IP100, Canon Inc., Tokyo, Japan)
- Stadiometer

Methods

- Children remove shoes and bulky clothing
- Height and weight are measured
- Children stand on the stadiometer, with feet aligned straight
- Head-to-trunk posture is sustained by maintaining a ‘Frankfort plane’ gaze
- Colored stickers, contrasting with children’s clothes, are placed horizontal on the ridge of the iliac crest
- Children place their hands on their heart or hold their clothing up

Taking the Photograph

- Tripod is set up three meters away from the stadiometer
- Tripod is ensured to be horizontal using bubble levels
- Child's code number is written on the placard
- Camera is vertical and aimed at the child's waist
- Several photographs will be taken
- If needed, the child's posture will be adjusted

Estimation of Body-Segment Ratios

- Using landmark of the iliac crest, the photograph will be measured using a ruler to the nearest millimeter (mm).
- Measurements:
  1, the length from the crown of the head to the sole of the foot to define the total length; and 2, the length from the sole of the foot to the level of the colored sticker on the photograph, which identified the iliac crest (hip), i.e. leg length
- Trunk length = total – leg length
- Trunk-to-leg ratio = trunk length/leg length

Study Locations

SOSEP Center and School in **La Estancia**
Total: 75

Communities in Totonicapán:
Colegio: 19
Pajoj: 8
Patzam: 17
Patzununa: 14
Rancho 2: 8
Rancho 4: 13
Rancho 6: 7
Santa Teresita:40
Xejuyub: 11
Total: 137

La Estancia School

Totonicapán

Why La Estancia and Toto?

- Previous work conducted in affluent private school children in Quetzaltenango (stunting prevalence = 5.9%) and low-income children of Sololá (stunting prevalence = 46.1%)
- Purposely recruited from communities known to have even more severe stunting rates than Sololá thanks to Maria Jose Soto's work in La Estancia (stunting prevalence = 81%) and the National Health Survey's information about Totonicapán (stunting prevalence = 70% for children under 5 years old)

Previous Findings from Joni's Study

- The Quetzaltenango children were on average 7.0 cm taller and 2.8 kg heavier than their Sololá-counterparts.
- **5.2 cm** of the difference was attributed to **leg length**.
- Trunk-to-leg ratios of 0.76 (Q) and 0.82 (S).
- The ratio declined with age.
- Minimal differences by sex.

Two LE-Toto Samples

Chronologically admitted

admitted by date and time that the child was measured if they fit the sex and age quota needed

versus

stunting-enriched

admitted by having the lowest HAZ scores available for a match

Both treated independently despite having overlapping individuals.

Analysis of Measurements

- World Health Organization Standards (children under 5 years old) and References (children aged 5 to 19 years)
- Usage of WHOAnthro, WHOAnthroPlus, and SPSSStatistics
  - **BMI-for-Age Z-scores**
  - **Height–for-Age Z-scores (HAZ)**
  - **Weight–for-Age Z-scores (WAZ)**

Data Analysis

Overweight for children was defined as:

- <5 years old

  ≥ 2 SD BMI-for-Age Z-score

- ≥5y years old

  ≥ 1 SD BMI-for-Age Z-score

Stunting was defined as ≤ -2 SD HAZ

Comparisons

Variables	Quetzaltenango n=102	Sololá n=102	LE – Toto Chronological n=102	LE – Toto Enriched n=102
% Overweight (< 5 years)	19.6	2.0	1.0	2.9
% Overweight (≥ 5years)	23.5	9.8	0	0
% Stunted	5.9	46.1	68.6	87.3
% Underweight	2.9	22.6	33.3	56.9

Comparisons to Quetzaltenango

Chronologically admitted:

10.6cm shorter and 4.6kg lighter

($p < 0.001$)

7.7cm of the difference in height is attributed to the legs

Lower heights and weights continue amongst the sexes ($p < 0.001$)

Comparisons to Quetzaltenango

Enriched:

12.4cm shorter and 4.9kg lighter

($p < 0.001$)

9.5cm of the difference in height is attributed to the legs

Lower heights and weights continue amongst the sexes ($p < 0.001$)

Comparisons to Quetzaltenango

Variables	Quetzaltenango n=102		LE – Toto Chronological n=102		LE – Toto Enriched n=102	
	mean±SD	[median]	mean±SD	[median]	mean±SD	[median]
Age (yrs)	5.6 ± 1.0	[6.0]	5.6 ± 1.0	[6.0]	5.6 ± 1.0	[6.0]
Height (cm)	114.0±7.0[a]	[114.0]	103.9±7.0[b]	[103.4]	101.2±7.7[c]	[101.6]
Weight (kg)	21.2±4.6[a]	[20.4]	16.4±2.4[b]	[15.8]	15.5±2.5[b]	[15.5]
BMI (kg/m^2)	16.2±2.3[a]	[15.7]	15.1±0.9[b]	[15.0]	15.0±1.0[b]	[15.0]
HAZ	-0.40±0.9[a]	[-0.43]	-2.47 ±0.8[b]	[-2.4]	-2.92 ±0.79[c]	[-2.85]
WAZ	0.05±1.2[a]	[-0.17]	-1.81±0.8[b]	[-1.69]	-2.20±0.73[c]	[-2.19]
BMI-for-Age	0.40±1.3[a]	[0.20]	-0.20±0.7[b]	[-0.25]	-0.27±0.71[b]	[-0.30]

Comparisons to Quetzaltenango

Variables	Quetzaltenango n=102		LE – Toto Chronological n=102		LE – Toto Enriched n=102	
	mean±SD	[median]	mean±SD	[median]	mean±SD	[median]
Trunk length	49.1±2.9[a]	[48.5]	46.8±4.2[b]	[46.7]	45.7±3.3[c]	[45.9]
Leg length	64.9±5.8[a]	[64.3]	57.1 ±4.2[b]	[56.6]	55.5 ±5.6[c]	[54.8]
Trunk-to-leg ratio	0.76±0.07[a]	[0.76]	0.82±0.08[b]	[0.81]	0.83±0.08[a,b]	[0.82]
Trunk-to-stature ratio	0.43±0.02[a]	[0.43]	0.45±0.02[b]	[0.45]	0.45±0.02[a]	[0.45]

Comparisons to Sololá

Chronologically admitted:

3.6cm shorter and 1.8kg lighter ($p < 0.001$)

2.5cm of the difference in height is attributed to the legs

Lower heights and weights continue amongst the sexes ($p < 0.001$)

Comparisons to Sololá

Enriched:

5.4cm shorter and 2.1kg lighter ($p < 0.001$)

4.3cm of the difference in height is attributed to the legs

Lower heights and weights continue amongst the sexes ($p < 0.001$)

Comparisons to Sololá

Variables	Sololá n=102		LE – Toto Chronological n=102		LE – Toto Enriched n=102	
	mean±SD	[median]	mean±SD	[median]	mean±SD	[median]
Age (yrs)	5.6 ± 1.0	[6.0]	5.6 ± 1.0	[6.0]	5.6 ± 1.0	[6.0]
Height (cm)	106.6±6.6[a]	[107.0]	103.9±7.0[b]	[103.4]	101.2±7.7[c]	[101.6]
Weight (kg)	17.4±2.6[a]	[17.6]	16.4±2.4[b]	[15.8]	15.5±2.5[b]	[15.5]
BMI (kg/m^2)	15.3±1.2[a]	[15.1]	15.1±0.9[a,b]	[15.0]	15.0±1.0[b]	[15.0]
HAZ	-1.74 ±1.0[a]	[-1.83]	-2.47 ±0.8[b]	[-2.4]	-2.92 ±0.79[c]	[-2.85]
WAZ	-1.22±1.0[a]	[-1.25]	-1.81±0.8[b]	[-1.69]	-2.20±0.73[c]	[-2.19]
BMI-for-Age	-0.10±0.8[a]	[-0.17]	-0.20±0.7[b,c]	[-0.25]	-0.27±0.71[c]	[-0.30]

Comparisons to Sololá

Variables	Sololá n=102		LE – Toto Chronological n=102		LE – Toto Enriched n=102	
	mean±SD	[median]	mean±SD	[median]	mean±SD	[median]
Trunk length	47.9±2.8[a]	[48.0]	46.8±4.2[b]	[46.7]	45.7±3.3[c]	[45.9]
Leg length	58.7 ±5.0[a]	[59.1]	57.1 ±4.2[b]	[56.6]	55.5 ±5.6[c]	[54.8]
Trunk-to-leg ratio	0.82±0.07[a]	[0.82]	0.82±0.08[b]	[0.81]	0.83±0.08[a]	[0.82]
Trunk-to-stature ratio	0.45±0.02[a]	[0.45]	0.45±0.02[b]	[0.45]	0.45±0.02[a]	[0.45]

Body Segment Deficits

HAZ Interval	n
> -1,00 Reference	100
-1.00 to -1.99 Mild	84
-2.00 to -2.99 Moderate	107
≤ -3.00 Severe	52

HAZ Interval Comparison	Deficit in Leg Length (cm)	Deficit in Trunk Length (cm)
Reference versus moderate	7.5 cm (overall) 7.6 cm (boys) 7.5 cm (girls)	2.7 cm (overall) 3.8 cm (boys) 1.9 cm (girls)
Reference versus severe	13.0 cm (overall) 14.2 cm (boys) 12.7 cm (girls)	6.1 cm (overall) 6.6 cm (boys) 5.1 cm (girls)

Sorting by HAZ interval

Table 2. Progression of mean body-segment ratios by descending HAZ intervals

HAZ interval	n	Trunk to stature ratio All (n=343)	Trunk to stature ratio Boys (n=181)		Trunk to stature ratio Girls (n=162)		p-value
> -1,00	100	0.77±0.07[a]	n=57	0.78±0.07[a]	n=43	0.75±0.06[a]	**0.011***
-1.00 to -1.99	84	0.80±0.08[b]	n=48	0.82±0.08[b]	n=36	0.78±0.06[b]	**0.019***
-2.00 to -2.99	107	0.82±0.07[b]	n=50	0.82±0.08[b]	n=57	0.82±0.07[c]	0.995*
≤ -3.00	52	0.85±0.08[c]	n=26	0.87±0.07[c]	n=26	0.83±0.07[c]	**0.021***
p-value		**<0.001**[§]		**<0.001***		**<0.001***	

Comparisons by BMI

Variables	Quetzaltenango n=102		Sololá n=102		LE – Toto Chronological n=102		LE – Toto Enriched n=102	
	mean±SD	[median]	mean±SD	[median]	mean±SD	[median]	mean±SD	[median]
BMI (kg/m^2)	16.2±2.3[a]	[15.7]	15.3±1.2[b]	[15.1]	15.1±0.9[b,c]	[15.0]	15.0±1.0[c]	[15.0]

Despite being statistically significant, minimal differences were found between the BMIs of each sample.

Discussion

- Photographic imaging continues to be an easy way to measure body segments
- “Stunting-enriched” series, with its 87.3% frequency of stunted children, most likely mimics the **most profound degree** of endemic short stature that any free-living population may ever manifest.

Discussion

- Our data is consistent with previously established knowledge of stunting in the areas in which we worked

Future Work

- Finishing works for publication
- Exploratory work into upper arm/extremity length

Thank you!