CeSSIAM Summer 2017

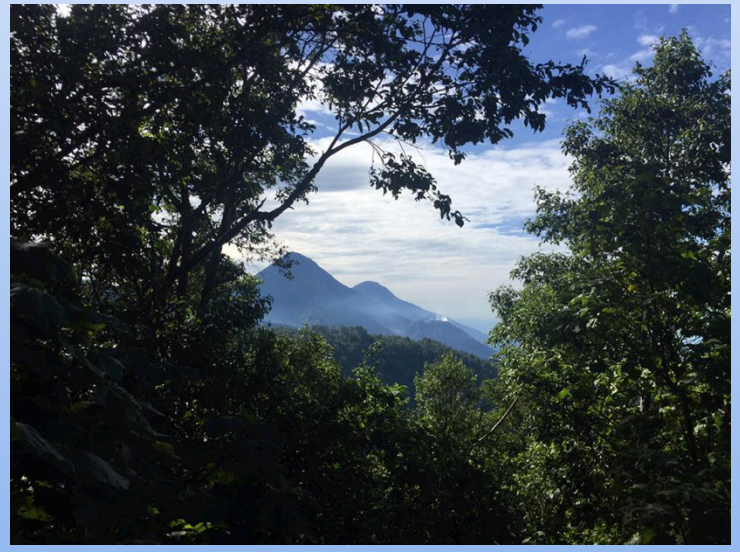
Isabelle Gallagher

Location: Xela

- Western Highlands of Guatemala
- Quetzaltenango province
- 2nd biggest city in Guatemala
- 2330 meters of elevation

Outline

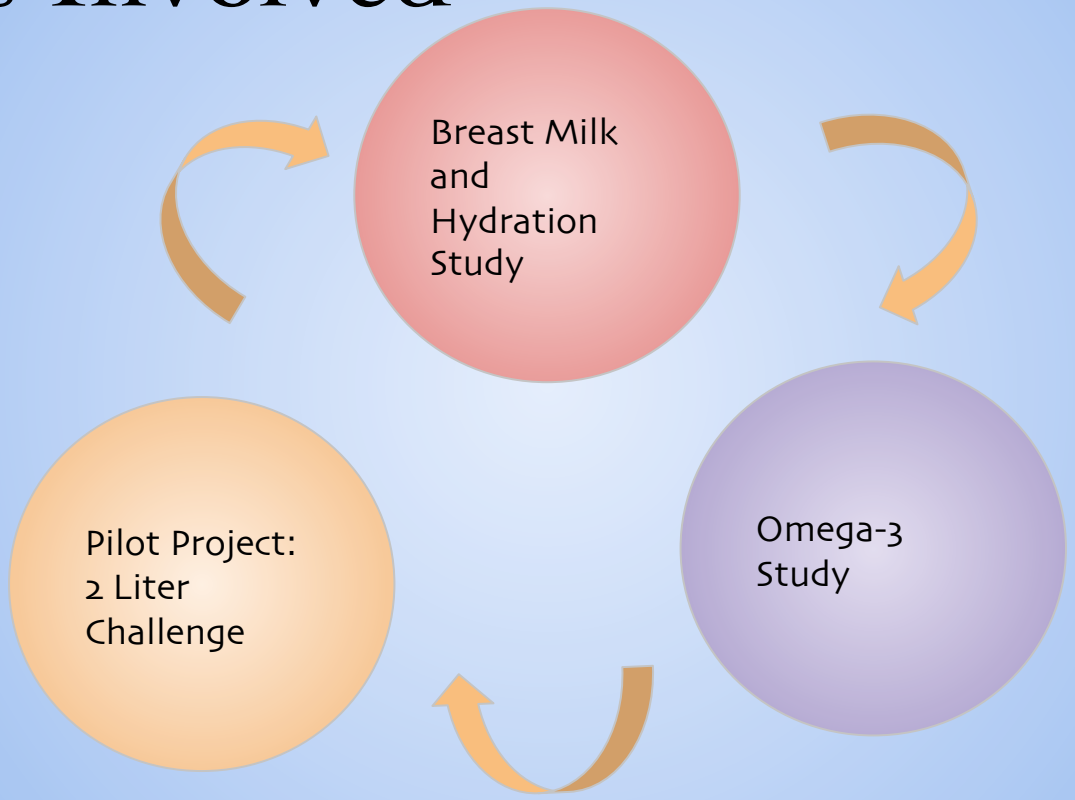
1. My first week of training
2. The three studies I worked on
3. Breast Milk Composition and Hydration Study
4. Omega-3 Study
5. Project "2 Liter Challenge"
6. 2 Liter Challenge analysis
7. Open for questions
8. Acknowledgements



To begin: Training

- Infant and child standardized anthropometric measurements
- Fundamentals of seca BIA use and analysis
- Exact, quantitative measurements of breast milk
- SPSS statistical software
- Spanish

Projects Involved



Composition of Breastmilk and Hydration Status in Women of Different Lactation Stages

- **Background**
  - Constant dynamic
  - Vitamins and micronutrients depend on maternal diet
  - Hydration enters and leaves the body through different mechanisms
    - Compare with women that are breastfeeding

- **Related studies**
  - Garcia and Vossenaar found deficient in protein intake (2015)
  - Vossenaar (2012) found deficiency in vit A, vit B, zinc, calcium
  - Deegan (2012) found very high vit B12 deficiency

Composition of Breastmilk and Hydration Status in Women of Different Lactation Stages

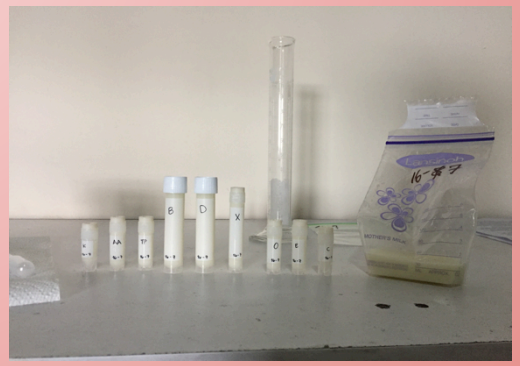
•**Purpose:**

- Analyze earlier stages of lactation
- Look at specific micronutrients and vitamins and and the stages of lactation
- Compare the BIA response to the osmolality reading

Composition of Breastmilk and Hydration Status in Women of Different Lactation Stages

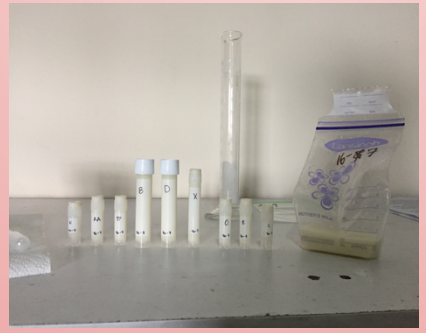
- **Methods**:
  - 4 subgroups of women
    - **40** (±4), **80** (±6), **120** (±12), **160** (±12)
    - Centro de Salud Zona 3
  - 2 samples of milk
    - Use unfeed first
    - 90 minutes then use the other
    - 35 mL total
  - Urine sample
  - BIA analysis
  - Infant anthropometric measures

- **Data storage and analysis**
  - Micronutrients: Vit. E, D, K, B, choline, protein, amino acids, fat, omega-3.
    - Store at -20, then send off to labs for analysis
    - Centrifuge crematacrit



Future interests in analysis…

- **CeSSIAM:**
  - Relate each concentration of the micronutrient the to lactation stage
  - Analyze deficiencies, gather information for a future, all encompassing supplement



- **My specific interests: (if possible)**
  - Look at choline, Vit B, omega-3
  - Micronutrients that are fundamental for brain development (Krebs, 2017) (Nyaradi, 2013)
  - Cognitive and behavioral
  - Not much research on infancy brain development and micronutrients in breast milk
  - Choline is the precursor to the neurotransmitter acetylcholine
    - Strong influence on learning

Omega-3 Study with Mothers from Different Locations and Social Classes

•**Background**

- Omega-3 is very important for child development
- Previous study with low levels of Omega-3 in Retalhuleu
- Easy carts that allow a quick procedure

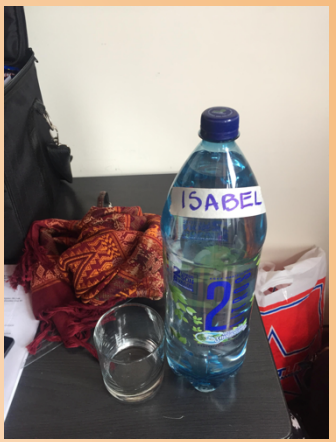
•**Objectives and Hypotheses**

- Collect from different regions and social classes
- The distance from the Ocean will be a dependent variable
- 33% less than predicted

•**Procedure**

- Babies 26-64 days
- Quick questionnaire/interview
- Less than 1 mL of breast milk

Project- “2 Liter Challenge”

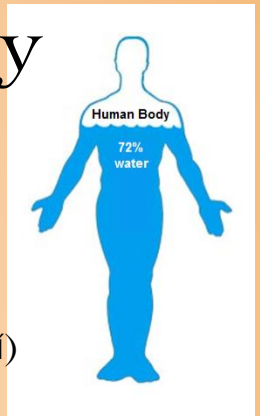


- Women of CeSSIAM for analysis
- Anthropogmetric measures
- BIA
- Drink 2 liters of water (no bathroom in between)
- Post-BIA measure
- Wait 15 minutes- no bathroom, 3rd BIA

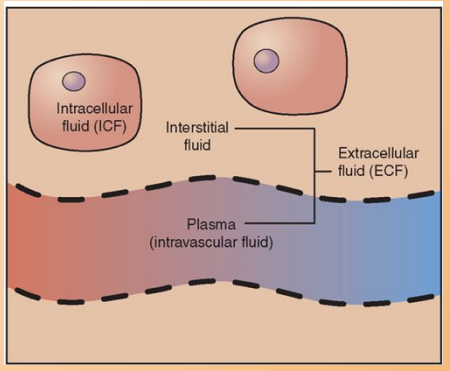
What is BIA (Westphal, 2013)

- 8 electrodes to analyze body composition (2 per limb)
- 4 for electrical currents to enter the body, 4 for the detection of the voltage drop
- Non-invasive, transportable, fast
- Accurate of FFM, TBW, ECW measurements
- Effective for healthy adults of all populations
- Chronological age is not a dependent variable (Dixon, 2006)
- But, how would it respond to "fluid overflow"

Background on Analysing Water in the Body



- TBW→ Total amount of water in body
  - Very important to keep replacing, lost from breathing, sweating, urinating, etc
  - TBW = ECW + ICW
  - Different between gender, men have less than women but average is 73.2% (Khalil, 2014)
- ECW→ Water that is not inside your cells
  - 3/4 of TBW
  - Blood plasma, transcellular, interstitial fluid
  - Controls the flow of electrolytes, oxygen delivery, and clears waste
- ICW→ Water within your cells
  - Transports molecules, continues pathways



Previous study- Dixon, 2006

- 21 men (19.7)
- 3 groups; 591 mL of water, carbohydrate drink, or nothing
- 5 minutes to consume
- Post BIA 20, 40, 60 min after (LBIA)
- Following H2O or carbohydrate consumption, no significant changes in impedance or TBW for any of the time periods

Reference points

- Hydration average is 73.2% (Khalil, 2014)
- ECW should be ¾ of TBW with ICW (Khalil, 2014)
- ECW should not increase in relation to your ICW
  - Unhealthy fat mass, kidney failure, inflammation
- BIA contains underlying assumptions
- Past, inconsistent results with TBW following fluid intake (Dixon, 2006)

Analysis plan

- Analyze the TBW, ECW, Hydration % changes between 1st, 2nd, 3rd measures
  - Descriptive measurements
  - Repeated Measure ANOVA
- Display results in bar graphs

TBW Descriptive Stats

Descriptive Statistics in liters

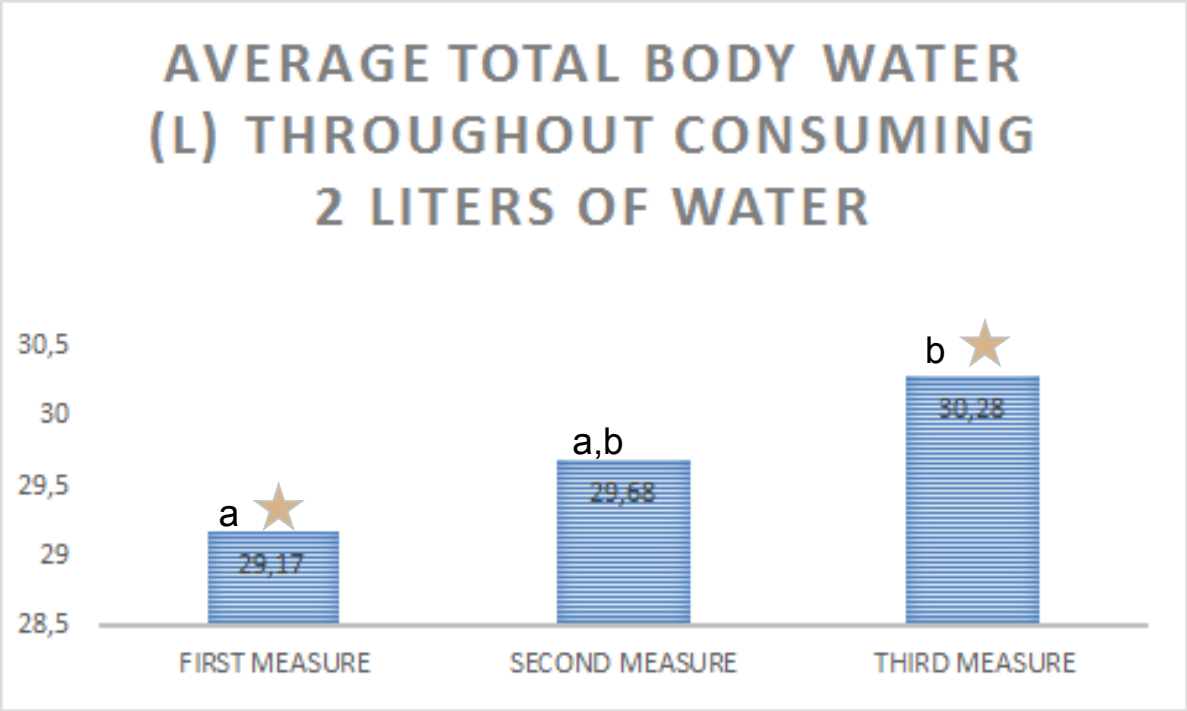
	Mean	SD	N	Median	Range
agua1	29,17	3,055	11	27.8	25.9-34.8
agua2	29,68	3,576	11	28.9	23.6-34.9
agua3	30,28	2,886	11	29.3	26.7-35.4

Repeated Measure ANOVA for TBW

(I) aguatotal		Mean Difference (I-J)	Std. Error	Sig.[b]
1	2	-,509	,439	,273
	3	-1.109*	,136	,000
2	1	,509	,439	,273
	3	-,600	,416	,180
3	1	1.109*	,136	,000
	2	,600	,416	,180

BIA 2 Liter Challenge Results with TBW

- The star symbolizes statistical differences



Analysis

- Significant **increase** in TBW from Pre-BIA to 15 min Post-BIA
- Consistent results unlike the Dixon Study
- More water entering the body
- Why such a big increase after 15 minutes?

Descriptive stats with ECW

Descriptive Statistics in Liters

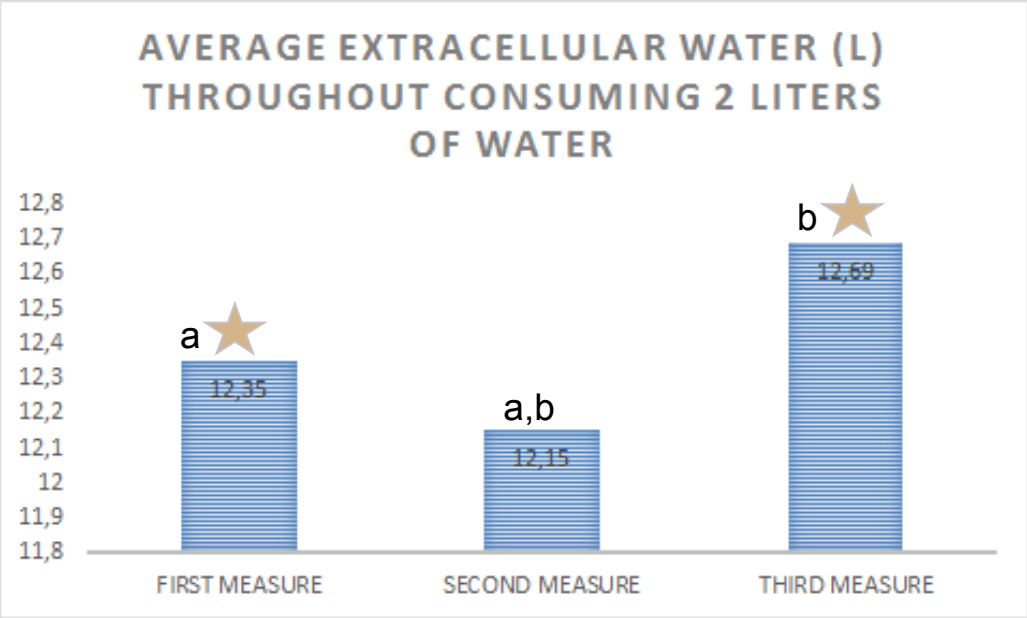
	Mean	SD	N	Median	Range
extra1	12.35	1.323	11	11.8	10.6-14.6
extra2	12.15	1.832	11	12.4	9-14.4
extra3	12.69	1.184	11	12.3	11.1-14.6

Repeated Measure ANOVA for ECW

(I) aguaextra		Mean Difference (I-J)	Std. Error	Sig.[b]
1	2	,209	,305	,508
	3	-.336*	,062	,000
2	1	-,209	,305	,508
	3	-,545	,328	,127
3	1	.336*	,062	,000
	2	,545	,328	,127

BIA 2 Liter Challenge Results with ECW

The star symbolizes statistical differences



Analysis

- No significant change right after consumption
  - Insignificant decrease (?)
- Significant **increase** from Pre-BIA to 15 minutes Post-BIA
- Water takes time to leave the cells
- What is we added 30 minutes, 60 minutes, etc?

Description stats with % Hydration

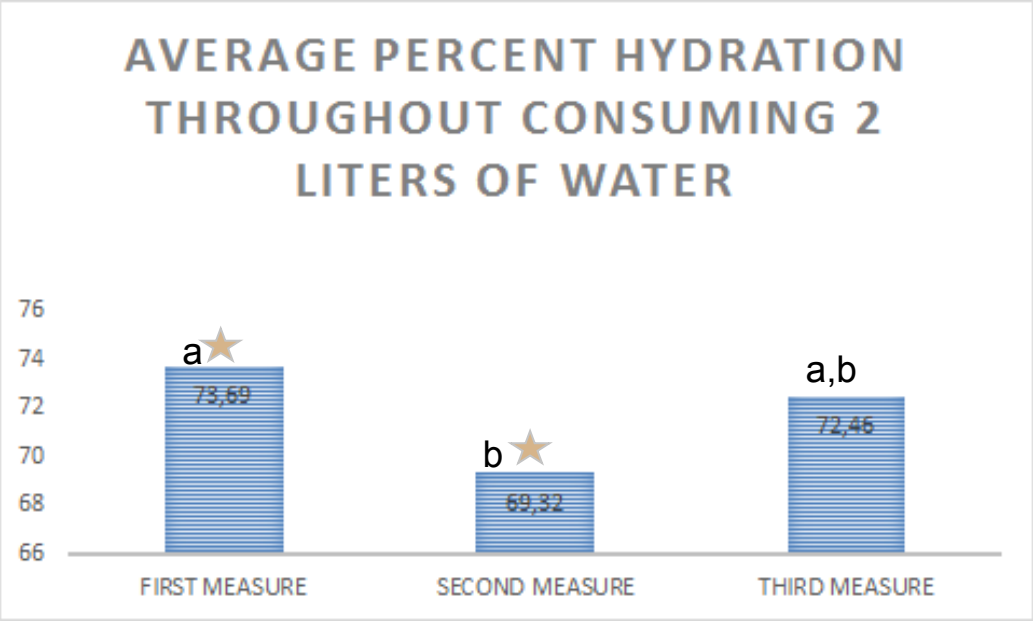
Descriptive Statistics in %					
	Mean	SD	N	Median	Range
hidratacion1	73,69	5,59	11	72.44	65.43-83.69
hidratacion2	69,32	7,72	11	69.63	52.91-80
hidratacion3	72,46	5,73	11	71.17	62.71-81.63

Repeated Measure ANOVA for % Hydration

(I) hidratacion		Mean Difference (I-J)	Std. Error	Sig.[b]
1	2	4.375*	1,627	,023
	3	1,235	,574	,057
2	1	-4.375*	1,627	,023
	3	-3,139	1,859	,122
3	1	-1,235	,574	,057
	2	3,139	1,859	,122

BIA 2 Liter Challenge Results with % Hydration

The star symbolizes statistical differences



Analysis

- Significant **decrease** from Pre-BIA to immediate Post-BIA
- Insignificant increase from Pre to 15 min Post
- % Hydration is ECW/TBW
- TBW increased post and ECW decreased post, more magnitude of change between them, leading to a significant decrease
- ACE (A C Exchange)

Discussion

- BIA able to detect liquid overflow data
- Overpowers previous studies
- The type of fluid and timing of ingestion may alter impedance results (Dixon, 2006)
- Trend of hydration status
  - 1st-2nd measure significant decrease
  - 3rd measure, increased
  - Remember % hydration = ECW/TBW

Future Implications

- Ideas for standardizing:
  - Set amount of time for consumption
  - More post BIA tests (15, 30, 60, etc..)
  - Maybe less consumption?
  - Control the diet for 24 prior to the study
- Ideas for testing two groups:
  - Use a control, no water

Acknowledgments

- The incredible CeSSIAM team: specifically Rosario, Alejandra M, Marta, Deborah, Alejandra Z
- All the women that volunteered for our projects
- My school PLQ, especially my teachers (very patient)
- Everyone else that helped me along the way

References

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