Moringa Data

Instructions to keep track of progress, and analyze data

By: Cristhian Valor

First Step: Data Collection

- Templates have been created in order to ease data collection
- Survey form is used on-site to collect data on each parameter
- For each trip at least 50 forms must be printed out
- To access form: Google Drive/ International Medical Outreach/E-Board Info/Sgt./Research/Moringa
- Form title: H2H Surveys Template.**pdf**

Data collection (continued)

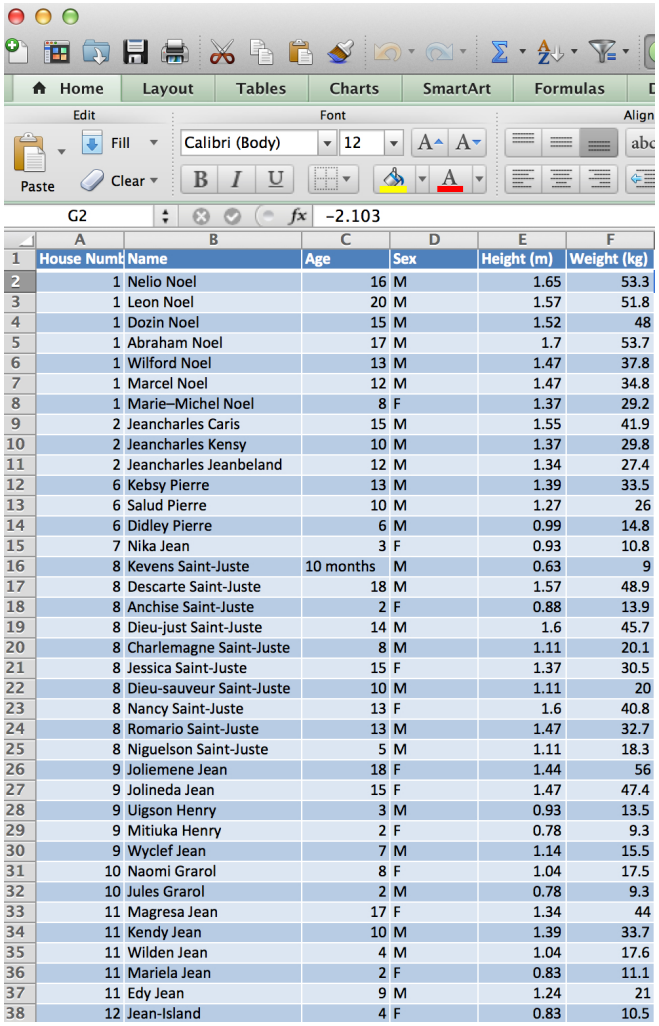
- Collect data for each parameter as each question of the survey gives us insight of the particular situation of each household.
- However, the vital parameters are the anthropometric values (names, age, sex, height, weight) as well as household number.
- New parameters such as plant health (height, width, condition, etc.) are also important!

Data Input

- Once raw data is acquired and brought back to the U.S. it must be digitalized to maintain proper record of it.
- Fill out the provided template (H2H Survey Template.**docx**) (Google Drive/International Medical Outreach/E-Board Info/Sgt./Research/ Moringa)
- **DO NOT SAVE** the new data on top of the template, otherwise you lose the template form. Save as a different file, ex: H2H_Data_Winter_14
- Digitalizing data is a pain in the ass! Get help from directors or members

Transfer Data to Excel

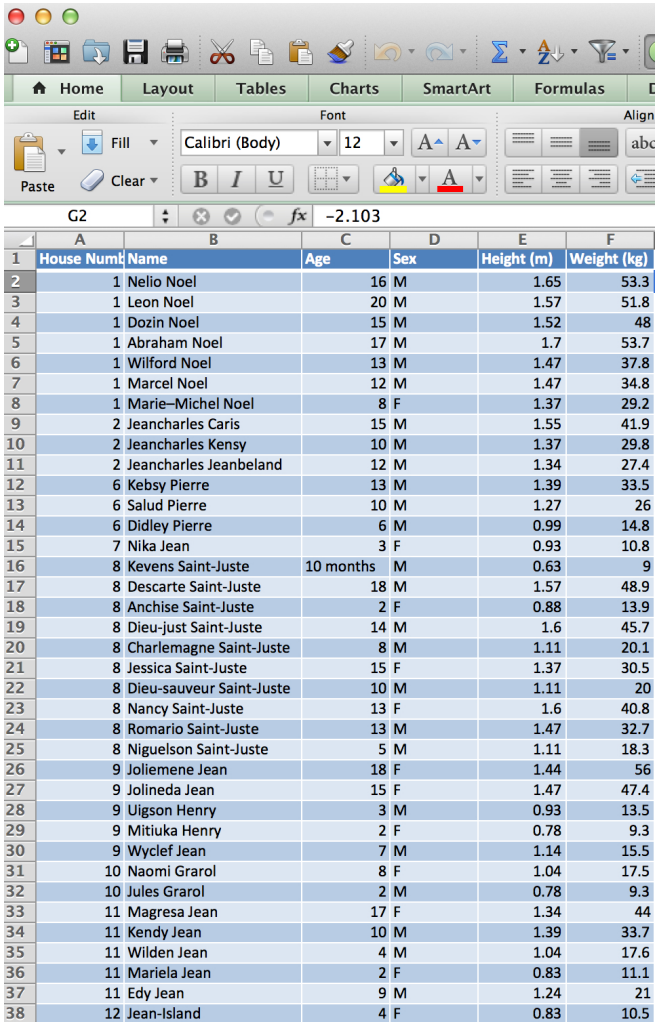
- Once you have digitalized the raw data, the data is still raw…
- Is there an easy or automatic way to transfer data to excel?? NOT that I know of…Sorry!
- There is a table already created for you…ready to fill out!
- To Access: Google Drive/ International Medical Outreach/E-Board Info/ Sgt./Research/Moringa/ Data.xls (Sheet #2)



	A	B	C	D	E	F
1	House Numb	Name	Age	Sex	Height (m)	Weight (kg)
2	1	Nelio Noel	16	M	1.65	53.3
3	1	Leon Noel	20	M	1.57	51.8
4	1	Dozin Noel	15	M	1.52	48
5	1	Abraham Noel	17	M	1.7	53.7
6	1	Wilford Noel	13	M	1.47	37.8
7	1	Marcel Noel	12	M	1.47	34.8
8	1	Marie–Michel Noel	8	F	1.37	29.2
9	2	Jeancharles Caris	15	M	1.55	41.9
10	2	Jeancharles Kensy	10	M	1.37	29.8
11	2	Jeancharles Jeanbeland	12	M	1.34	27.4
12	6	Kebsy Pierre	13	M	1.39	33.5
13	6	Salud Pierre	10	M	1.27	26
14	6	Didley Pierre	6	M	0.99	14.8
15	7	Nika Jean	3	F	0.93	10.8
16	8	Kevens Saint-Juste	10 months	M	0.63	9
17	8	Descarte Saint-Juste	18	M	1.57	48.9
18	8	Anchise Saint-Juste	2	F	0.88	13.9
19	8	Dieu-just Saint-Juste	14	M	1.6	45.7
20	8	Charlemagne Saint-Juste	8	M	1.11	20.1
21	8	Jessica Saint-Juste	15	F	1.37	30.5
22	8	Dieu-sauveur Saint-Juste	10	M	1.11	20
23	8	Nancy Saint-Juste	13	F	1.6	40.8
24	8	Romario Saint-Juste	13	M	1.47	32.7
25	8	Niguelson Saint-Juste	5	M	1.11	18.3
26	9	Joliemene Jean	18	F	1.44	56
27	9	Jolineda Jean	15	F	1.47	47.4
28	9	Uigson Henry	3	M	0.93	13.5
29	9	Mitiuka Henry	2	F	0.78	9.3
30	9	Wyclef Jean	7	M	1.14	15.5
31	10	Naomi Grarol	8	F	1.04	17.5
32	10	Jules Grarol	2	M	0.78	9.3
33	11	Magresa Jean	17	F	1.34	44
34	11	Kendy Jean	10	M	1.39	33.7
35	11	Wilden Jean	4	M	1.04	17.6
36	11	Mariela Jean	2	F	0.83	11.1
37	11	Edy Jean	9	M	1.24	21
38	12	Jean-Island	4	F	0.83	10.5

Transfer Data to Excel

- Plug in only anthropometric values, names and respective household numbers
- And your data should look like this…



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23	8	Nancy Saint-Juste	13	F	1.6	40.8
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37	11	Edy Jean	9	M	1.24	21
38	12	Jean-Island	4	F	0.83	10.5

Analyzing Data

- **The reasons we collect anthropometric values:**
  - These parameters are stipulated by the WHO in order to compare an individual to a reference population.
  - These values once converted into different z-scores that give us insight on the current nutrition and health status of our population
  - With moringa and its proper consumption, we should see an improvement of these values.
  - These values can be plugged into WHO growth charts as a visual representation of the child's growth when compared to international growth standards

Z-scores

- **There are several types of Z-scores:**
  - Height-to-Age Z-score (HAZ):
    - Tells us about the length growth of a child when compared to a reference population of the same age. (Values below -2.00 are considered growth stunt)
  - Weight-to-Age Z-score (WAZ):
    - Tells us about the weight growth of a child when compared to a reference population of the same age. (Values below -2.00 are considered underweight)
  - Weight-to-Height Z-score (WHZ):
    - Tells us about the density, (bone and muscle composition) of a child when compared to a reference population of the same age. (Values below -2.00 are considered wasting)

Z-scores (ctd.)

- Z-scores are calculated through some intricate formula, taking into account the standard deviations found from the WHO's international reference population child growth study.
- A reference population is exactly that… A group of people of the same age from all over the world who were surveyed by the WHO in order to establish a standard for growth at a particular age despite of environment and genetics. The differences in growth patterns from all four corners of the world give us a Standard Deviation. Standard Deviations allow us to calculate Z-scores.

How to Calculate Z-scores

- Go to your statistics books and open the random numbers table. Pick row number 69 and match it to the 4th column then take that number and calculate the degree of confidence…. I'm just kidding.
- **Here is the formula:**
  - $$\frac{[(\text{Measured Value})-(\text{Mean Value of Ref. Pop.})]}{\text{SD of Ref. Population}}$$

    However to simplify things here is an online calculator for you: https://web.emmes.com/study/ped/resources/htwtcalc.htm

    Just plug in the values (Age in months, Height in cm. and Weight in Kg.) and it will calculate your Z-scores for HAZ and WAZ.

How to Calculate Z-scores (Ctd.)

- Now you have calculated HAZ and WAZ
- Time to calculate WHZ
  - WHZ is tricky because there is no online calculator for it
  - So now you are going to have to really use a table
  - Table starts in page 7 of this document (read entire document for further information):
    - http://www.who.int/nutrition/publications/severemalnutrition/9789241598163_eng.pdf
    - The limitation of this table is that it is for children from 45 cm to 120 cm in length. Anyone outside this range cannot be calculated. For them we use BMI.
    - So from your individual, find the height on the table and match the weight to a SD (take gender into account). Your Z-score will be the number next to the SD. (Example in next Slide)

WHZ calculation example

- Lets say that Marie Michel Noel is 100 cm tall and she weighs 12.8 kg…
- Match 100 cm to 12.8 kg and write -2.00 as your Z-score on the WHZ column of your Excel sheet.
- Voila! You have completed the Z-score section!

Weight-for-Height Reference Card (87 cm and above)

Boys' weight (kg)					Height	Girls' weight (kg)				
-4 SD	-3 SD	-2 SD	-1 SD	Médian	(cm)	Médian	-1 SD	-2 SD	-3 SD	-4 SD
8.9	9.6	10.4	11.2	12.2	87	11.9	10.9	10.0	9.2	8.4
9.1	9.8	10.6	11.5	12.4	88	12.1	11.1	10.2	9.4	8.6
9.3	10.0	10.8	11.7	12.6	89	12.4	11.4	10.4	9.6	8.8
9.4	10.2	11.0	11.9	12.9	90	12.6	11.6	10.6	9.8	9.0
9.6	10.4	11.2	12.1	13.1	91	12.9	11.8	10.9	10.0	9.1
9.8	10.6	11.4	12.3	13.4	92	13.1	12.0	11.1	10.2	9.3
9.9	10.8	11.6	12.6	13.6	93	13.4	12.3	11.3	10.4	9.5
10.1	11.0	11.8	12.8	13.8	94	13.6	12.5	11.5	10.6	9.7
10.3	11.1	12.0	13.0	14.1	95	13.9	12.7	11.7	10.8	9.8
10.4	11.3	12.2	13.2	14.3	96	14.1	12.9	11.9	10.9	10.0
10.6	11.5	12.4	13.4	14.6	97	14.4	13.2	12.1	11.1	10.2
10.8	11.7	12.6	13.7	14.8	98	14.7	13.4	12.3	11.3	10.4
11.0	11.9	12.9	13.9	15.1	99	14.9	13.7	12.5	11.5	10.5
11.2	12.1	13.1	14.2	15.4	100	15.2	13.9	12.8	11.7	10.7
11.3	12.3	13.3	14.4	15.6	101	15.5	14.2	13.0	12.0	10.9
11.5	12.5	13.6	14.7	15.9	102	15.8	14.5	13.3	12.2	11.1
11.7	12.8	13.8	14.9	16.2	103	16.1	14.7	13.5	12.4	11.3
11.9	13.0	14.0	15.2	16.5	104	16.4	15.0	13.8	12.6	11.5
12.1	13.2	14.3	15.5	16.8	105	16.8	15.3	14.0	12.9	11.8
12.3	13.4	14.5	15.8	17.2	106	17.1	15.6	14.3	13.1	12.0

Percentiles

- Percentiles are a way to compare your parameter values to a reference population of the same age.
- How is this different from Z-scores?
  - When calculating percentiles you are not taking into account standard deviations meaning…
  - Not taking into account environment and genetics
  - To illustrate the point:
    - Imagine a Mexican indigenous child at a school in Germany (where breeding to create a perfect race took place during WWII). He will be considered short when compared to the rest of the class. However if the kid is bullied and returns to Guadalajara, he might now be considered normal for his age.
  - Percentiles was the old way to calculate growth standards. Old but still relevant.

To Calculate Percentiles…

- Open your online calculator (link on slide 10) and you should notice that when the calculator calculates Z-scores, it also calculates Percentiles for Height-to-Age and Weight-to-Age.
- Percentiles for WHZ do not need to be calculated

BMI

- Last but not least is BMI
- You all know what BMI is (Body Mass Index)
- It tells us whether we are too thin and should eat more or whether we are obese and should stay away from Pizza and Beer and get on a treadmill…
- **The BMI Categories are:**

  Underweight = <18.5

  Normal weight = 18.5–24.9

  Overweight = 25–29.9

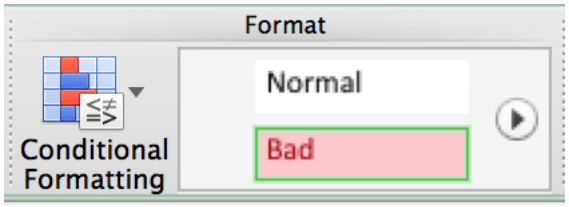
  Obesity = BMI of 30 or greater

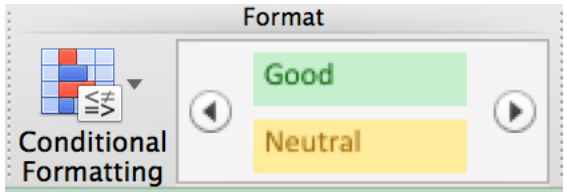
BMI is calculated by:

weight (kg) / [height (m)]2

Now…Color Code!

- Now that you have filled out your table…guess what? IT IS STILL RAW DATA!
- Before you analyze the data I suggest you color code.
- You can color code using excel's color code tool.

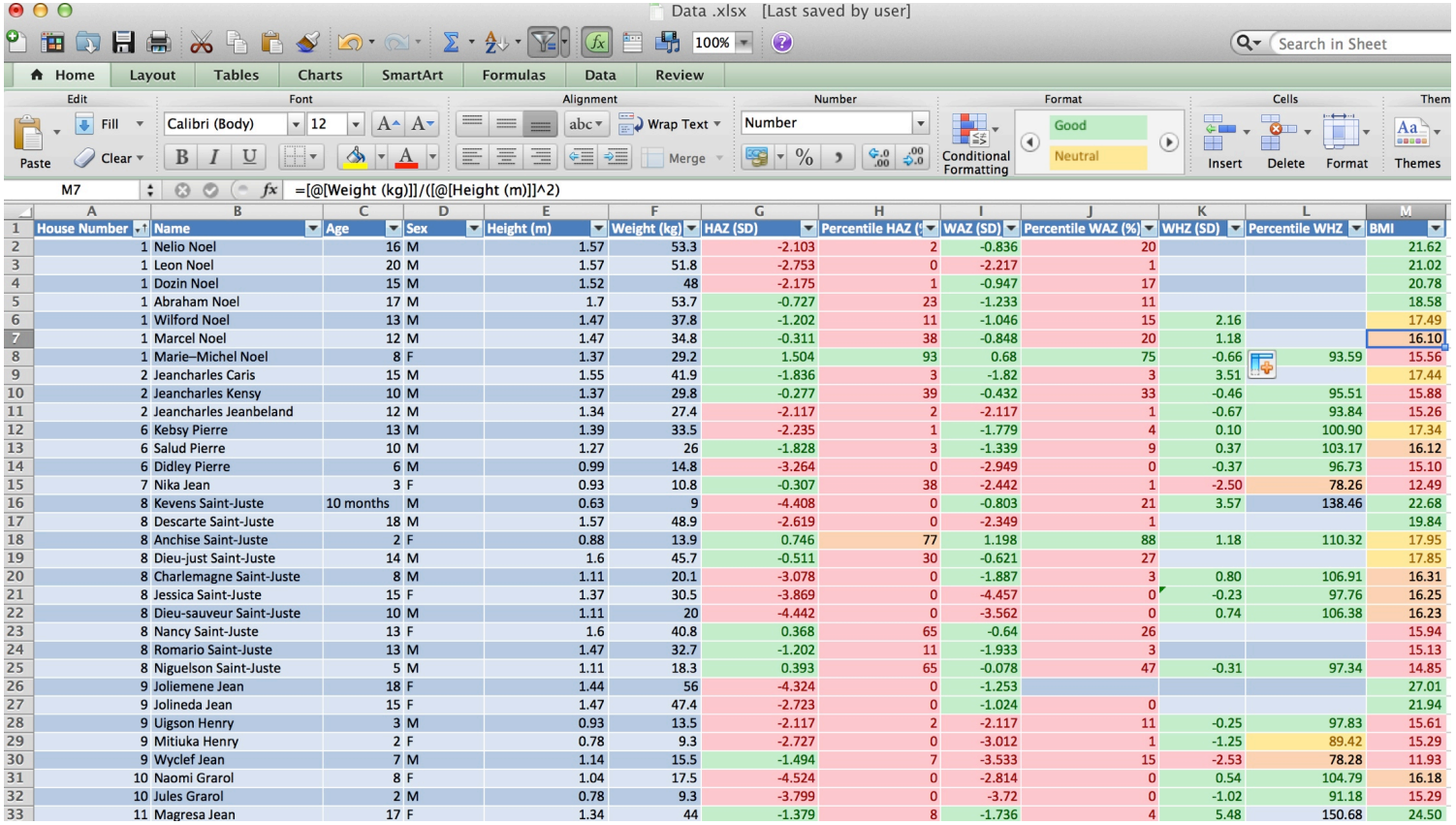




- Remember your ranges. For HAZ, WAZ, and WHZ, everything below -2.00 is bad. Select all the values below -2.00 and click on bad. For the Percentiles anything below 80% is bad. Do the same for these.
- The rest of the numbers can be labeled with green, which means good.
- For BMI you have several ranges. I used **Red** for underweight, and a color scale using 40% Accent 6 (orangy color), Neutral (Yellow), and Good (Green) for the rest.

Time to Analyze!

- Now that you have a color coded table…
- You should have something similar to this:



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	House Number	Name	Age	Sex	Height (m)	Weight (kg)	HAZ (SD)	Percentile HAZ (%	WAZ (SD)	Percentile WAZ (%)	WHZ (SD)	Percentile WHZ	BMI
2	1	Nelio Noel	16	M	1.57	53.3	-2.103	2	-0.836	20			21.62
3	1	Leon Noel	20	M	1.57	51.8	-2.753	0	-2.217	1			21.02
4	1	Dozin Noel	15	M	1.52	48	-2.175	1	-0.947	17			20.78
5	1	Abraham Noel	17	M	1.7	53.7	-0.727	23	-1.233	11			18.58
6	1	Wilford Noel	13	M	1.47	37.8	-1.202	11	-1.046	15	2.16		17.49
7	1	Marcel Noel	12	M	1.47	34.8	-0.311	38	-0.848	20	1.18		16.10
8	1	Marie–Michel Noel	8	F	1.37	29.2	1.504	93	0.68	75	-0.66	93.59	15.56
9	2	Jeancharles Caris	15	M	1.55	41.9	-1.836	3	-1.82	3	3.51		17.44
10	2	Jeancharles Kensy	10	M	1.37	29.8	-0.277	39	-0.432	33	-0.46	95.51	15.88
11	2	Jeancharles Jeanbeland	12	M	1.34	27.4	-2.117	2	-2.117	1	-0.67	93.84	15.26
12	6	Kebsy Pierre	13	M	1.39	33.5	-2.235	1	-1.779	4	0.10	100.90	17.34
13	6	Salud Pierre	10	M	1.27	26	-1.828	3	-1.339	9	0.37	103.17	16.12
14	6	Didley Pierre	6	M	0.99	14.8	-3.264	0	-2.949	0	-0.37	96.73	15.10
15	7	Nika Jean	3	F	0.93	10.8	-0.307	38	-2.442	1	-2.50	78.26	12.49
16	8	Kevens Saint-Juste	10 months	M	0.63	9	-4.408	0	-0.803	21	3.57	138.46	22.68
17	8	Descarte Saint-Juste	18	M	1.57	48.9	-2.619	0	-2.349	1			19.84
18	8	Anchise Saint-Juste	2	F	0.88	13.9	0.746	77	1.198	88	1.18	110.32	17.95
19	8	Dieu-just Saint-Juste	14	M	1.6	45.7	-0.511	30	-0.621	27			17.85
20	8	Charlemagne Saint-Juste	8	M	1.11	20.1	-3.078	0	-1.887	3	0.80	106.91	16.31
21	8	Jessica Saint-Juste	15	F	1.37	30.5	-3.869	0	-4.457	0	-0.23	97.76	16.25
22	8	Dieu-sauveur Saint-Juste	10	M	1.11	20	-4.442	0	-3.562	0	0.74	106.38	16.23
23	8	Nancy Saint-Juste	13	F	1.6	40.8	0.368	65	-0.64	26			15.94
24	8	Romario Saint-Juste	13	M	1.47	32.7	-1.202	11	-1.933	3			15.13
25	8	Niguelson Saint-Juste	5	M	1.11	18.3	0.393	65	-0.078	47	-0.31	97.34	14.85
26	9	Joliemene Jean	18	F	1.44	56	-4.324	0	-1.253				27.01
27	9	Jolineda Jean	15	F	1.47	47.4	-2.723	0	-1.024	0			21.94
28	9	Uigson Henry	3	M	0.93	13.5	-2.117	2	-2.117	11	-0.25	97.83	15.61
29	9	Mitiuka Henry	2	F	0.78	9.3	-2.727	0	-3.012	1	-1.25	89.42	15.29
30	9	Wyclef Jean	7	M	1.14	15.5	-1.494	7	-3.533	15	-2.53	78.28	11.93
31	10	Naomi Grarol	8	F	1.04	17.5	-4.524	0	-2.814	0	0.54	104.79	16.18
32	10	Jules Grarol	2	M	0.78	9.3	-3.799	0	-3.72	0	-1.02	91.18	15.29
33	11	Magresa Jean	17	F	1.34	44	-1.379	8	-1.736	4	5.48	150.68	24.50

Time to Analyze!

- Now it is time for all these numbers to tell a story… hopefully now that Moringa is growing strong it will become a good story! (This is the fun and meaningful part!)
- First of all Label your colors like this:

Color Codes	
	Adequate
	Mildly Malnourished
	Malnourished
	Severely Malnourished

Calculating Chronic Malnutrition Indices According to Percentiles

- Create a table just like this one:

Chronic Malnutrition Indices (Percentiles)	
Stunting	97%
Underweight	85%
Wasting	75%
**(Z-Scores Values preferred, since percentiles do not take into consideration	
Standard Deviation values from reference population)	

- Go to the HAZ (stunting) percentiles column, count the number of red cells and divide that by the total number of surveyed people, then multiply by 100. *Tip: use the numbers on the excel margins so that you don't have to count row by row.*
- Do the same for WAZ and WHZ (if you didn't calculate WHZ percentiles use the red cells in the BMI column"

Calculating Chronic Malnutrition Indices According to Z-scores

- Create a table just like this one:

Chronic Malnutrition Indices (Z-Scores)	
Degree of Stunting (HAZ)	35%
Degree of Underweight (WAZ)	35%
Degree of Wasting (WHZ)	35%

- Go to the HAZ (stunting) Z-scores column, count the number of red cells and divide that by the total number of surveyed people, then multiply by 100. *Tip: use the numbers on the excel margins so that you don't have to count row by row.*
- Do the same for WAZ and WHZ

Arriving to a Conclusion

- Here is the scientific part
- The WHO says we can diagnose an individual as malnourished by any one of the three quantitative parameters of HAZ, WAZ and WHZ.
- However, our data indicates that there is some overlap between these three parameters in some individuals
- For example we have Nelio Noel (refer to Data sheet for House-to-House Study Winter 13), he is red for HAZ but green for WAZ. Do we say he is malnourished? YES, he suffers from stunted growth.
- We also have Jeanbeland, he's red for HAZ and WAZ but green for WHZ. Malnourished!
- And we have Jean Lagac he's red in all categories… Obviously malnourished!
- So…we have to count every individual case, taking into account any possible overlap or lack thereof.

Arriving to a Conclusion

- So.. Create a table just like this one:

Malnutrition		
Prevalence of Stunted+Underweight Children (HAZ+WAZ)	26.50%	Moderately Malnourished
Prevalence of Stunted+Underweight+Wasted Children (HAZ+WAZ+WHZ)	5%	Severely Malnourished
Prevalence of Stunted or Underweight Children (HAZ/WAZ)	19%	Mildly Malnourished
Total	**50.50%**	

- Count the cases with overlap in HAZ and WAZ (Z-score columns only…not percentiles) divide the number by the total number of people surveyed and find the percentage
- Count the cases with overlap in HAZ, WAZ and WHZ (if no WHZ was calculated use BMI) do the same to find the percentage
- Count the cases without overlap (those red only in either HAZ, WAZ or WHZ/BMI) and find the percentage
- To find the total population suffering from malnutrition add these percentages and easier said than done:

YOU CAN ARRIVE TO A CONCLUSION

Statistics

- Now that you have a population result
- We have to find out who is suffering from malnutrition
- For this we do a gender and age group study:
- Find all the girls on the table and if they have a red cell across all categories (z-scores only!), count them as malnourished. Divide the number by the total of **girls** in the surveyed population and find the percentage. (Not the total population)
- Do the same for boys
- Do the same for age groups 0-5, 6-10, 11-15, 16-20

Statistics Continued

- Create tables like these

Male/Female Prevalence of Malnourishment	
Female	32%
Male	41%

Prevalence of chronic malnourishment by age group	
0-5 yrs	35%
5-10 yrs	41%
10-15 yrs	35%
15-20 yrs	44%

Stats continued

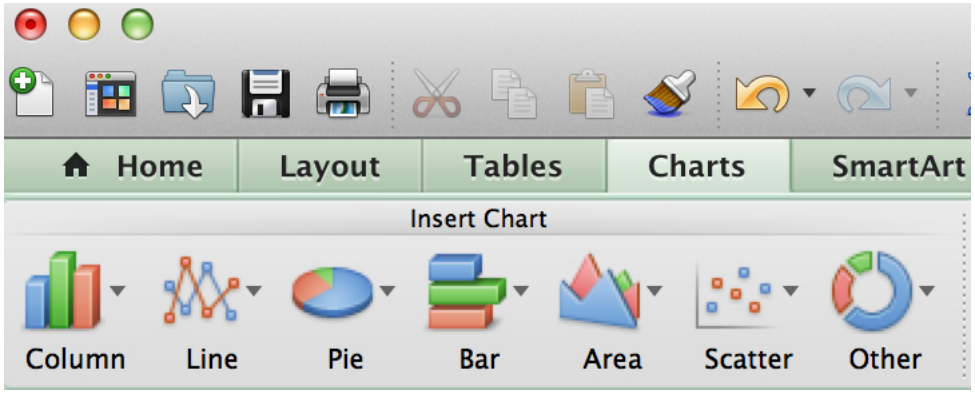
- By now you should be a Moringa Data Analysis Expert, so total the extra data acquired on the surveys (Non-anthropometric Data)
- And make tables just like these

Prevalence of Disease in Children (0-18)		
Disease	Number of Cases	Prevalence
Skin Infections (Fungal)	32	47%
Parasitic Infections (Helminthic)	23	33%
Chronic Malnutrition (Height, Weight, Anemia, Ed	25	50.50%

Steps Taken to Mitigate Disease		
Donations	Number of Units Donated	Average Per Household
Soap	500	25
Shoes (Pairs)	70	3.5
Moringa Trees Planted	320	16
Education	Awareness	Prevalence
Moringa Health Benefits	14 out of 20 households	70%
Agriculture	20 out of 20 households	100%
Proper Hygiene	12 out of 20 households	60%
Importance of Wearing Shoes	10 out of 20 households	50%

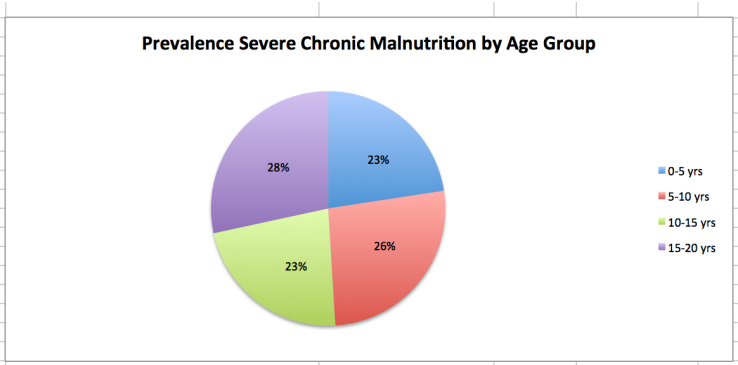
Graphs

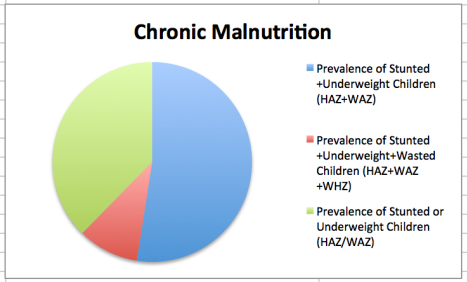
- Graphs are easy to make
- Just select your table (X and Y axis)
- Go to Charts and select the type of graph you need

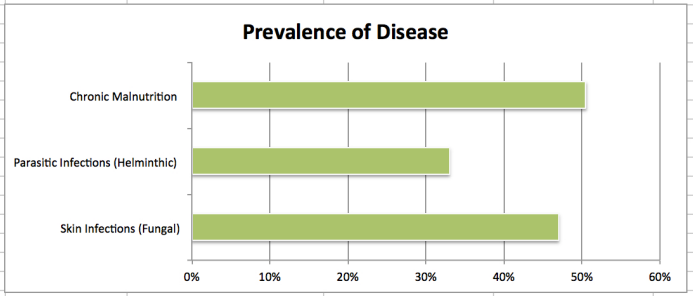


Graphs

- For all graphs use a pie chart, except for prevalence of disease. Use a Bar graph for that one. It all should look like this:







You are Finally Done!!

This entire process should take a month or two, given that you are taking classes and are busy shadowing, being an IMO member/director/officer…etc!

But be consistent, thorough, skeptical, unbiased, ethical, and have fun doing this!!

Present the finalized product to Dr. Deichen and upon his approval to the IMO and the UCF community!

References

C. Valor[1], C. Toledo[1], B. Osterhoudt[1]. Moringa: The Tree of Life Takes Root in Haiti. International Medical Outreach, Poster Presentation, March 2013. Retrieved from: https://docs.google.com/file/d/0B8N4fsPA_zynaDJOSFdRUDJoWTQ/edit

Note:

If this research ever becomes another poster or a paper… first authorships go to whoever analyzed the data, (notice there can be many first authors, don't fight about it) subsequent authorships go to whoever helped or contributed, last authorship should go to Cristhian A. Valor (for contribution of the main idea). If you are using the baseline findings in order to compare any changes that might have occurred, this reference should be cited.