

DATA SCIENCE AND ITS APPLICABILITY TO ASSESS MALNUTRITION IN ETHIOPIA.

By: Timothy Yeh

INTRODUCTION TO MALNUTRITION

- Malnutrition: Health consequences associated with not taking in enough food, energy, and nutrition needed to maintain proper health
- Factors that increase likelihood of malnutrition: low educational status, poor household, low birth weight, under-aged mothers, lack of clean water sources, absence of toilet facilities etc....
- Mitigating the prevalence of malnutrition requires addressing the issues above

A photograph of a woman in a headscarf and long dress cooking over an open fire in a rural setting. She is stirring a large pot with a long wooden spoon. Two young children are sitting nearby, one in the foreground and one in the background. The background shows a rustic structure made of stone and wood. The text 'WHY MALNUTRITION AND ETHIOPIA.' is overlaid in a white box.

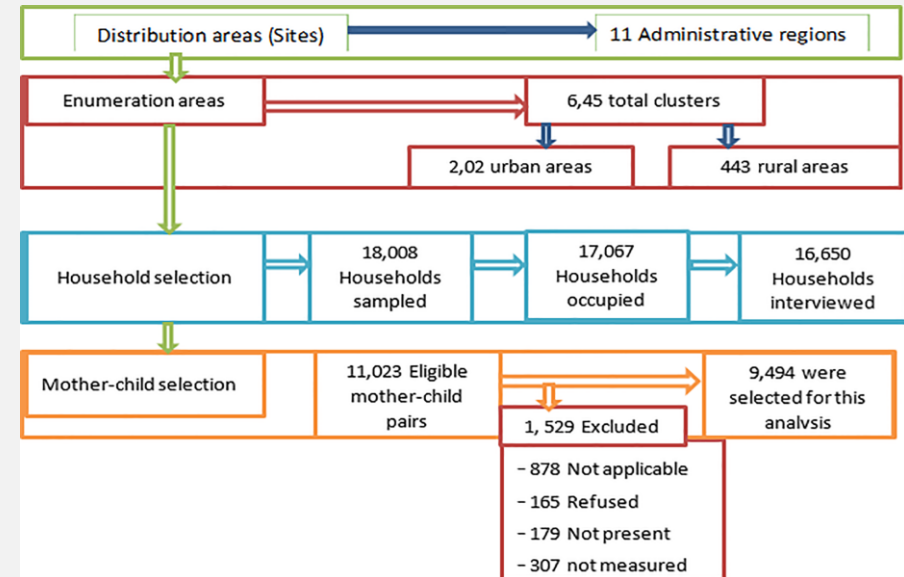
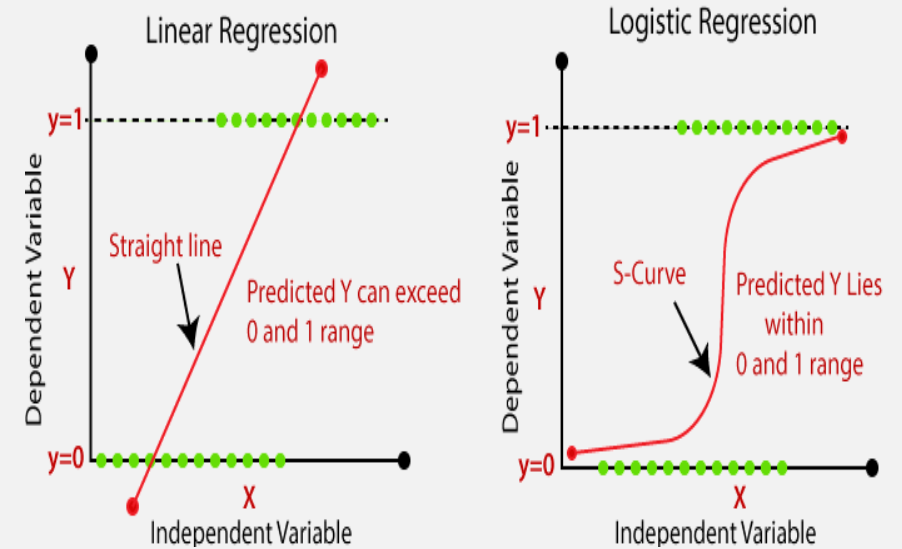
WHY MALNUTRITION AND ETHIOPIA.

- Global issue- 500 million adults, 200 million children (under 5), 3.1 million child deaths
- One of the world's poorest countries- 44% live in poverty
- Causes: Natural disasters, political conflict, poor economy
- Malnutrition in Ethiopia contributes to 50% of infant/Child deaths in Ethiopia, with nearly 300,000 dying annually.

DATA SCIENCE METHOD I: LOGISTIC REGRESSION

- Objective: assess the nutritional status of children under 5 based on undernutrition indicators in order to determine the magnitude of malnutrition
- Indicators: stunting (height/age), wasting (height/weight), and underweight (weight/age)
- Data: 2016 height-weight survey of 9494 child/mother pairings
- Method:

1. Measure height and weight – create standard deviation ratios and Z- score
2. Compare those values to acceptable standard deviation standards for the given indicator
3. Assign 0 or 1 based on whether a child exhibits an indicator (logistic regression)
4. Examples: stunting-100, stunting/underweight-101 etc...



RESULTS

- Stunting: 38.3%, Wasting: 10.1%, Underweight: 23.3%
- Possible to exhibit none or even all three forms:

1. 46.5% exhibit at least one form

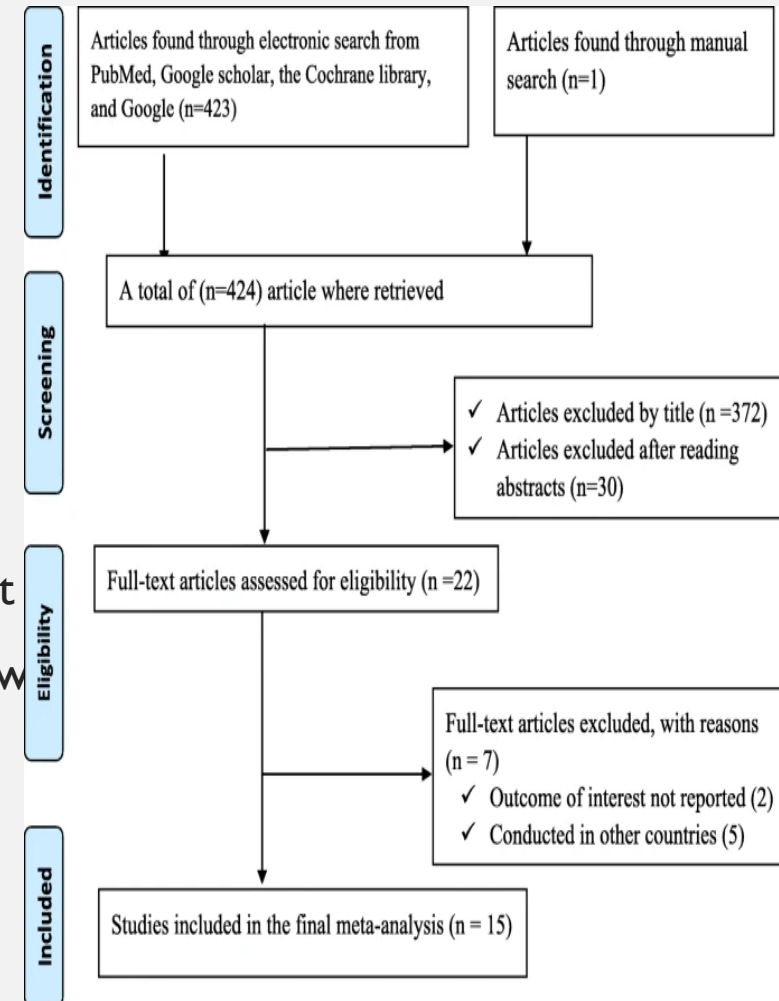
2. 3.1% exhibit at three

Types of undernutrition			Confidence interval (95%)	
	Frequency	Percent	Lower	Upper
Stunting				
No stunting	5857	61.7	59.8	63.6
Stunting	3637	38.3	36.4	40.2
Moderate stunting	1647	17.4	15.9	18.9
Severe stunting	1990	21.0	19.8	22.2
Underweight				
No underweight	7278	76.7	75.1	78.1
Underweight	2216	23.3	21.9	24.9
Moderate underweight	618	6.5	5.7	7.4
Severe underweight	1598	16.8	15.7	18.1
Wasting				
No wasting	8535	89.9	88.8	90.9
Wasting	959	10.1	9.1	11.2
Moderate wasting	282	3.0	2.4	3.6
Severe wasting	677	7.1	6.4	8.0
Stunting & Underweight	1789	18.8	17.5	20.3
Stunting & Wasting	292	3.1	2.6	3.7
Underweight & Wasting	609	6.4	5.6	7.3
All forms of undernutrition	292	3.1	2.6	3.7
At least one form of undernutrition	4414	46.5	44.6	48.4

<https://doi.org/10.1371/journal.pone.0225996.t002>

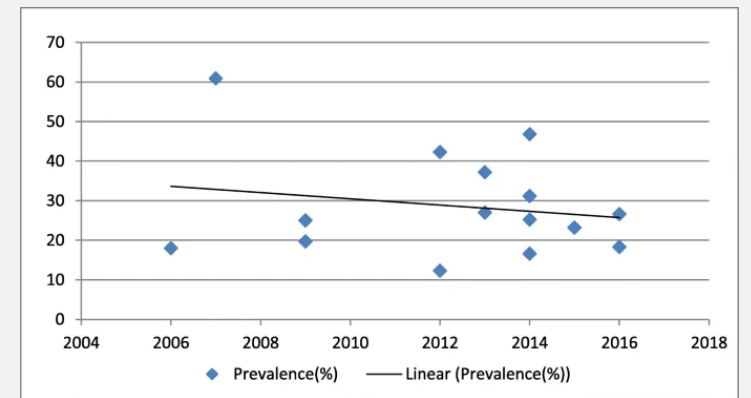
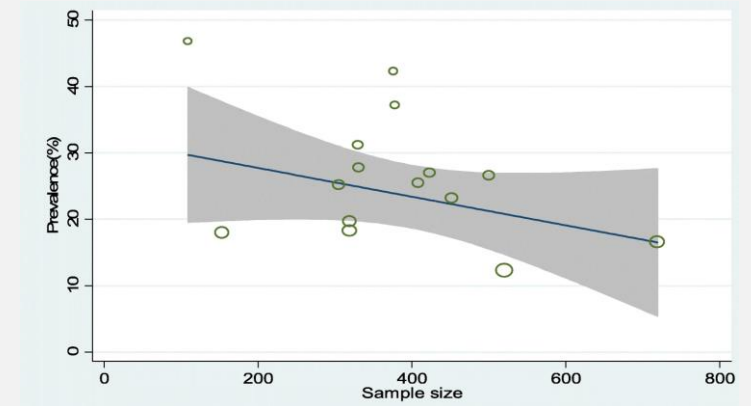
DATA SCIENCE METHOD 2: SEARCH ENGINE DATA COLLECTION

- Objective: to assess the prevalence undernutrition among HIV patients from past studies
- Data: pre-existing HIV Patients data from previous sources.
 - use popular databases such as PubMed/Google Scholar to search for sources using keywords: “Malnutrition”, “Prevalence”, “HIV-Infected”, AND/OR
 - Condense the number studies collected based on title relevancy, abstract relevancy, and study location
 - Use Newcastle-Ottwa Scale to further narrow- three step quality assessment
- Researchers condensed 424 studies into 15 used for meta-analysis, with all sources b/w 2006-2016.



RESULTS

- 15 studies in meta-analysis create a sample population of 5,642 HIV-positive adults, 65% females, with age ranging b/w 22-50 all from old data
- Linear regression revealed that from pooled population, 26% exhibited undernutrition
- Sample size trend: as sample size increases, prevalence decreases
- Time trend: as time progresses, prevalence decreases



RESEARCH GAP

- Google search posed gap in research- research studies only on Ethiopia
- Lack of research in assessing the prevalence of malnutrition in Sub-Saharan Africa, a region filled with poverty and consequently malnutrition
- Research Question: What is the extent of malnutrition in Sub-Saharan Africa and how can we help mitigate the effects of this problem in large areas

RESEARCH PROPOSAL

- Proposal involves implementing methods used in Ethiopia on a larger scale
- Measure- send out teams to gather survey data based on region
- Analysis- use data science methods to assess prevalence and factors most associated with malnutrition
- Solve- partner with WHO, US Aid, and other organizations to help improve nutritional status, prioritizing areas with higher prevalence.



USAID
FROM THE AMERICAN PEOPLE