



# FERRIS STATE UNIVERSITY

## Capstone Project

Research Analysis of Malnutrition

By

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Submitted to

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### **Abstract**

The purpose of this research is to study about the Malnutrition and its dependent variables, as always it a global challenge in low and middle level income group. Poverty is the root cause of malnutrition also there are other factors like economic growth, population, natural and unnatural disasters which contribute to the increase in malnutrition. Malnutrition as a subject taught during the undergraduate and postgraduate level, so educating very early about this is very essential. Undernutrition is due to lack of food whereas overweight is due to excessive consumption of food, where both are dangerous. Unemployment increases the chances of malnutrition as they are unable to earn to meet their basic needs. Tableau is the best solution to analyze this type of data. Through this we can conclude the variable which may or may not affect the malnutrition as there are other variables which might lead to malnutrition.

**Table of Contents**

**1. Proposal**

1.1 Overview.....5

1.2 Purpose.....5

1.3 Research Questions.....6

1.4 Limitations .....6

1.5 Contingency Plan.....7

1.6 Timeline.....7

1.7 Glossary.....7

**2. Literature Review**

2.1 Tableau.....8

2.2 History of Tableau.....10

2.3 Tableau in Future .....11

2.4 Malnutrition.....12

    2.4.1 Stunting.....12

    2.4.2 Wasting.....12

    2.4.3 Severe wasting.....13

    2.4.4 Overweight.....14

    2.4.5 Underweight.....14

2.5 Hardware requirements.....14

2.6 Technical Specifications.....14

    2.6.1 Professional Edition.....15

    2.6.2 Personal Edition.....15

2.7 Feature comparison of Tableau Vs Spotfire Vs Qlikview.....	15
<b>3. Methodology</b>	
3.1 Overview.....	16
3.2 Research Strategy.....	16
3.3 Approach.....	17
<b>4. Findings</b>	
4.1 Unemployment is affecting malnutrition.....	19
4.2 Nutrition level getting affected by education.....	22
4.3 Education change the rate of unemployment.....	24
4.4 Country's economy with the GDP.....	27
4.5 Correlation of literacy and unemployment.....	29
4.6 Malnutrition affecting the education.....	31
<b>5. Recommendations and conclusions</b>	
5.1 Recommendations.....	33
5.2 Conclusions.....	33
<b>6. References.....</b>	<b>34</b>

## **Overview**

Despite of all efforts, malnutrition is still a fundamental cause of the diseases and short life-span. There are many factors which are directly or indirectly responsible for the malnutrition including population, education, unemployment and the GDP. There are several other causes for the malnutrition, but the most important factors that are mentioned. Poverty is always an underlying factor and are interconnected to the unemployment, economy and education. The datasets considered for this project are education, unemployment, population and the GDP (Gross Domestic Product) on the education to assess the factors that are dependent on each other and how are they affecting to the cause of malnutrition.

Tools:

1. The tools that have been used is Tableau Software and
2. Microsoft Excel.

The datasets are used for the correlative purpose to analyze the data and the factors that are leading or dependent cause for the malnutrition

## **Purpose**

The main purpose of this project is to play with malnutrition data. Malnutrition is a serious health issue which can be seen around the world. To tackle this one should first know the underlying variables which are leading to malnutrition. Tableau helps in integrating and filtering the data that we fetched. It helps in designing the colourful dashboards which in turn makes it easy to analyze the data to find out the reasons behind the malnutrition. By analyzing the malnutrition facts, it will be easier to focus on the development of that sector. Creating dashboards to analyze the data is the crucial step of this project.

**Research Questions**

1. How the unemployment is affecting the world population nutrition?
2. How could nutrition level get affected by education?
3. How can education change the rate of unemployment and creating awareness of the malnutrition?
4. Analyzing the health of a country's economy with the GDP malnutrition / undernutrition and population
5. What is the correlation of literacy and unemployment causing malnutrition?
6. Is the malnutrition / under nutrition affecting the education of the population leading to the unemployment?

**Limitations**

Like all projects, this project also has its own constraints and limitations, they are as follows

- **Time:** The final presentation of this document is on April 29, 2017, the deadline for the completion of the final project documentation would be on April 22, 2017. The time duration for the project to be completed is 3 months.
- **Resources:** Finding the datasets in an open source was found to be difficult as many open source data were limited. The access to the datasets was restricted for the purchase.
- **Datasets:** Also, there were abnormalities in the datasets. The data was found to be unstructured and inconsistent as many years' values were blank. Data cleansing was very much required as Tableau is case sensitive.

## Contingency Plan

As the datasets are very important for the analysis of the dashboards. The datasets availability in the open source is very limited and sometimes are restricted. If the data could not meet the expectations for the analysis, the datasets can be purchased from the website. This could help the project to go forward without any obstacle.

## Timeline

Task/Work	Completion date	Description
Project Proposal	01.20.2017	Selection of project topic on various different topics and the tool
Status report 1	02.01.2017	Approval of the project with the precise datasets and research questions
Status report 2	03.01.2017	Overview, purpose, limitations and glossary
		Literature reviews about the topic
Status Report 3	04.01.2017	Methodology, research strategy and approach
		Findings, implementations and recommendations
Final documentation	04.22.2017	Submission of the final document
Final presentation	04.29.2017	Live presentation of the project

## Glossary

**Tableau** – It is a data visualization tool helps in creating dashboards

**Malnutrition** – Lack of proper nutrition (for both undernutrition and over nutrition)

**Undernutrition** – Lack of proper nutrition

**Stunting** – Also known as shortness, when the intake of inadequate nutrition is consumed for a longer period

**Severe wasting** – Severe acute malnutrition by low weight for height (reduced muscle mass)

**Oedema** – A fluid in the body which causes the affected area to be swollen (puffiness of the skin)

**Wasting** – Low weight for height (weight for age)

**Overweight** – More weight than what is considered to be normal

**Metabolism** – Digestive process

**Underweight** – Less weight than what is considered to be normal

**GDP** – Gross Domestic Product, primary indicators to gauge the condition of the country's health

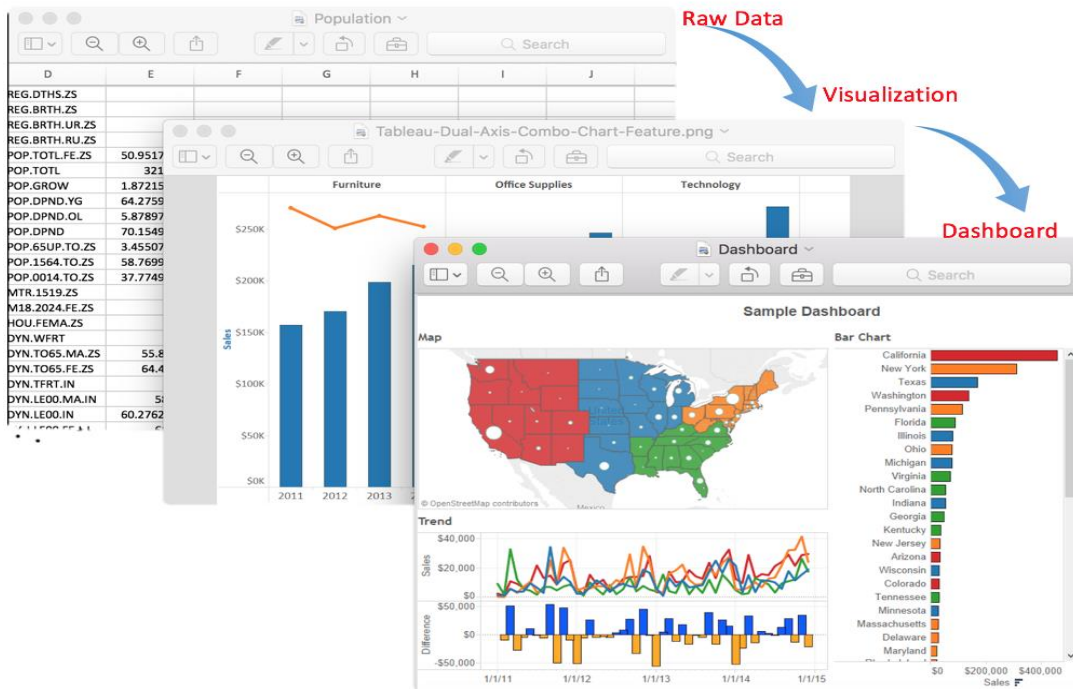
### **Literature review**

#### **Tableau**

Tableau is a data visualization software (business intelligence tool) which connects to any data source like corporate Data Warehouse, Excel data and CSV files. Tableau transforms the raw data into charts, graphs, visualizations which are called dashboards, to draw instantaneous insights. It is very fast and easy to use, as it is a drag and drop interface (Tableau, n.d.).



## Tableau Process



## Tableau Desktop Features



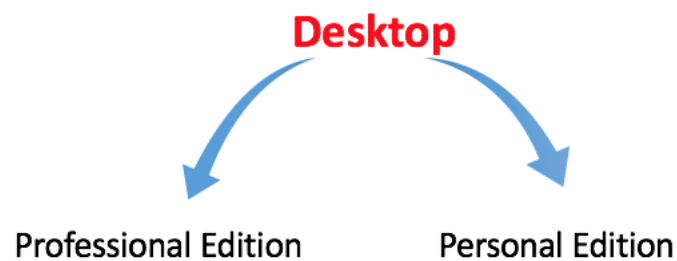
## History of Tableau

The headquarter of the Tableau software company is at Seattle, United States. Tableau software came into existence in the year 2003. This is primarily focused on the visualization products on business intelligence. The data visualizations and analytics took advantage as it found out the weaknesses in the Qlikview's data visualization.

Chris Stolte from California found this Tableau software. He had visualization skills and in analyzing databases. Based on the numerous datasets, this tool is able to generate various different types of graphs (Tableau, n.d.).

An extraordinary functionality that Tableau can perform is, mapping. It can plot the latitude and longitude by itself. There are different ways to access the Tableau products, they are

- Desktop
- Server
- Online
- Reader
- Public



## Tableau Products



### Future

Tableau software company discloses the future vision in the conference on November 8, 2016 at Texas. In the next three years Tableau has a wonderful roadmap, that users can analyze and collaborate data of any size at any scale. Some of the new features the Tableau will soon be launching for better business results, they are

- New Data Engine
- New Data preparation product
- Tableau Server for Linux
- Next leap in Analytics
- New Data Governance Capabilities

- New Collaboration Capabilities
- Smart Recommendations
- New Hybrid Data Connectivity for the Cloud (Tableau, n.d.).

## **Malnutrition**

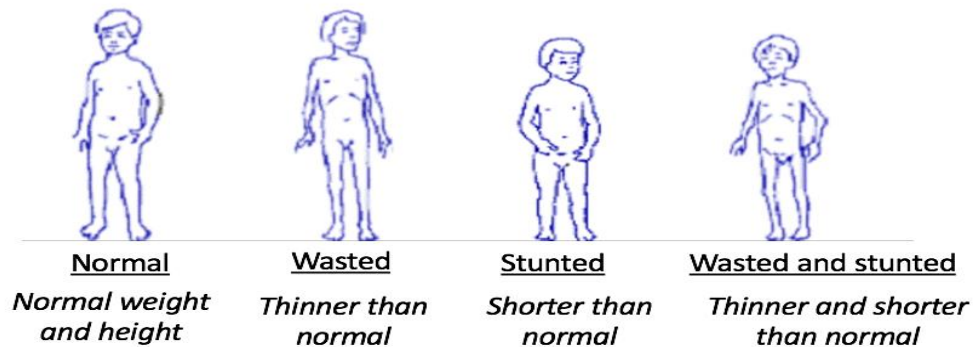
### **Stunting**

Stunting is also known as chronic malnutrition, actually it is failure of growth. A stunted child appears to be normal but is indeed shorter than normal ones of their age. Stunting starts before the birth; the reason is poor nutrition and feeding practices. Not only this, the quality of the food as well as the infections caused frequently lack the growth. Stunting is not immediate threat to life and is very common in less developed countries (WHO, n.d.).

### **Wasting**

Wasting falls under the moderate malnutrition, which is defined as weight for age, where the scores are below the median according to the WHO (World Health Organization) growth standards. A child weighing low for his/her height is considered to be wasting. Moderate malnutrition can be observed in the poor countries which increased the risk of mortality with high deaths in concern to nutrition. This is considered to be the high priority form of malnutrition in emergencies (WHO, n.d.).

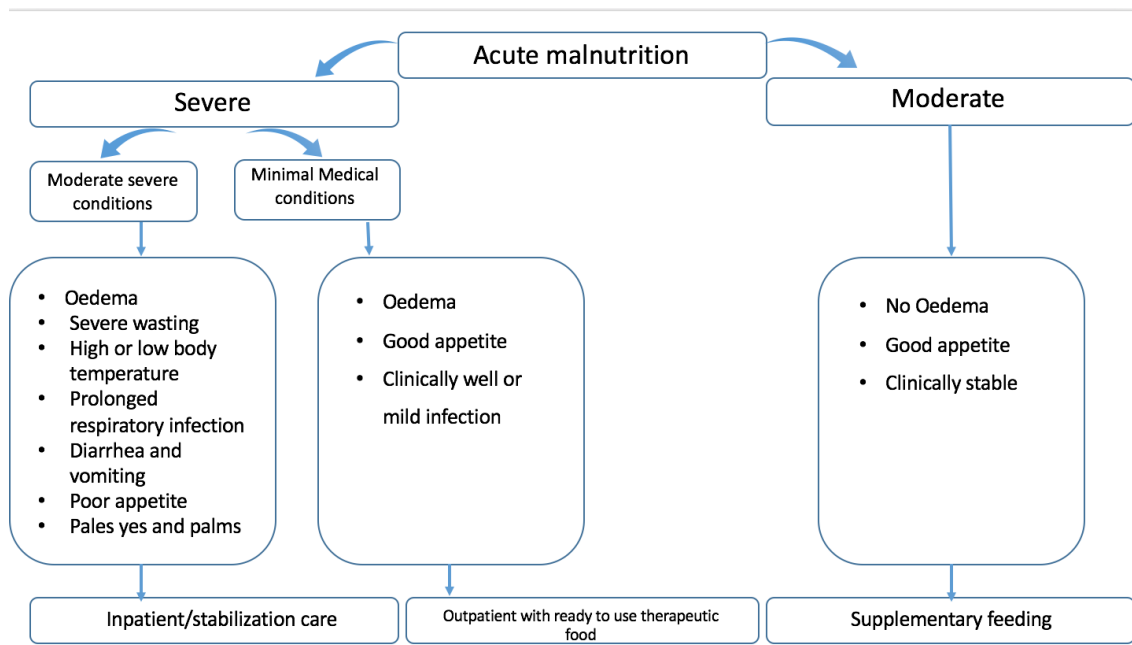
## Forms of protein-energy malnutrition



Source: London School of Hygiene and Tropical Medicine

### Severe wasting

Children who are malnourished do not get sufficient support which leads towards severe acute malnutrition. Oedema and severe wasting are life-threatening conditions according to public health. From past 30 years, the severe wasting condition is the same way, it may take time to improve effectively.



**Overweight**

Overweight people are overfed at the same time it is undernourished. People who are overweight are usually nutrition deficient. Vitamins are very essential for the metabolism also helps the chemical reaction to take place right to run bodies properly. The overweight has more calories but very less nutrients (minerals and vitamins). Processed foods, food with high amount of fructose corn syrup, trans fats are less nutritious food (WHO, n.d.).

**Underweight**

As the name, itself indicates, underweight people weigh less than the actual or normal person. A healthy adults BMI (Body mass index) will fall between 18.5 and 24.9, then here in case the BMI falls below 18.5 is to be considered underweight.

There are several causes for the person to be under weighed, not only insufficient calories but also genetics can lead to high metabolic rate. Other common diseases that we could observe for the weight loss is hyperthyroidism, diabetes, wasting diseases such as tuberculosis and cancer(WHO,n.d.).

**Hardware requirements**

The computer should meet minimum hardware requirements for the installation of the Tableau software, if not, the installation of the software would not be possible. The setup program uses 1GB space after the setup program is unzipped

- Minimum of two physical cores are required, where it can be the actual hardware or the Virtual machine (Tableau, n.d.).

**Technical specifications**

There are two different editions in the Tableau Software

**Professional Edition**

- It can connect to hundreds of data sources
- It is compatible with Tableau Server
- It is compatible with Tableau Online
- Updates and support is included

**Personal Edition**

- It connects to file based data sources (including Excel and CSV)
- Updates and support is included

**Tableau Vs Spotfire Vs Qlikview**

<b>Feature</b>	<b>Tableau</b>	<b>Spotfire</b>	<b>Qlikview</b>
<i>Powerful data modelling</i>	No	No	Yes
<i>Implementation speed</i>	Good	Good	Excellent
<i>Customization</i>	No	No	Yes
<i>Price</i>	High	High	Above average
<i>Dashboard support</i>	Good	Good	Excellent
<i>Database connectivity</i>	Enhanced	Good	Good
<i>Intelligence in reports</i>	Enhanced	Good	Good

<i>Visual controls</i>	Best	Very good	Very good
<i>Scripting</i>	R programming	Java script	Basic SQL
<i>Score</i>	9.2	8.8	9.7
<i>Client satisfaction</i>	93%	98%	99%

## Methodology

### Overview

This chapter will contribute to the approach of implementing this project by answering the research questions proving details. This is a correlational quantitative research as the research is based on statistical and mathematical techniques. This research is done using the data sources which are available on the internet. Quantitative research helps to analyze the data and discover the pattern relationships. The research helped me in finding out the relationships between population and unemployment, malnutrition and economy and the role of the education. All these are correlated where my research answers to the questions, education playing a vital role for the employment as well as malnutrition and under what category they do fall based on the income group and the relation between the dependent variables.

### Research Strategy

The data used in this research is gathered from online open data sources. Data cleansing and data blending is done as the data was unstructured. Statistical study method was adopted to research this data creating visualizations using Tableau software.

### Research Approach

1. How the unemployment is affecting the world population nutrition?



The dashboard has been built to address the unemployment affecting the world's population and malnutrition. This is an interactive dashboard and the user should be able to filter the data across different countries by making selections on the map as well as through the dropdown provided for the country. The map shows the population distribution where the size of the bubble defines the population size. The lollipop chart defines the unemployment over years and this can be filtered for a specific country. The line chart defines the population and the bar charts defines the malnutrition across different income groups and this can be filtered for specific countries.

2. How could nutrition level get affected by education?

This dashboard has been built to address the role of education in terms of malnutrition of the population. The Map shows the countries chosen for the research which is more interactive and however on the maps will give you different insights on the country like different malnutrition, education and population. The line graph says the expenditures made by government on education over different years. This dashboard will also show the Gender distributions for school enrollments on different years. The data is provided with two different bands over the line graph for total population where you can select the countries filter the dashboard and see the insights across the countries.

3. How can education change the rate of unemployment and creating awareness of the malnutrition?

The visualization refers to the dashboard that has been built to address how can education change the rate of unemployment and create awareness on malnutrition. This dashboard can be filtered across by countries. This dashboard shows the population educated as the population completed secondary and the population completed degree

(say Bachelors, Masters and Doctorate). Here one could be able to see the percentage distributions of different malnutrition's. Also, we can find the unemployment's across gender.

4. Analyzing the health of a country's economy with the GDP malnutrition / undernutrition and population

The dashboard that has been built to address country's/countries economy with GDP and the impact on malnutrition and population. The color band which is above the world map in the dashboard is the reference band that gives a quick insight on which country has denser malnutrition on different countries. Hover over on the band provides more details on the distribution. It shows country wise GDP ratio and malnutrition ratio based on underweight, overweight, stunning, wasting and severe wasting. Also, individual graphs that show the population vs malnutrition factors in order to show the analysis of health of countries population. The whole dashboard gives the predictive analysis over the country's GDP and malnutrition factors.

5. What is the correlation of literacy and unemployment causing malnutrition?

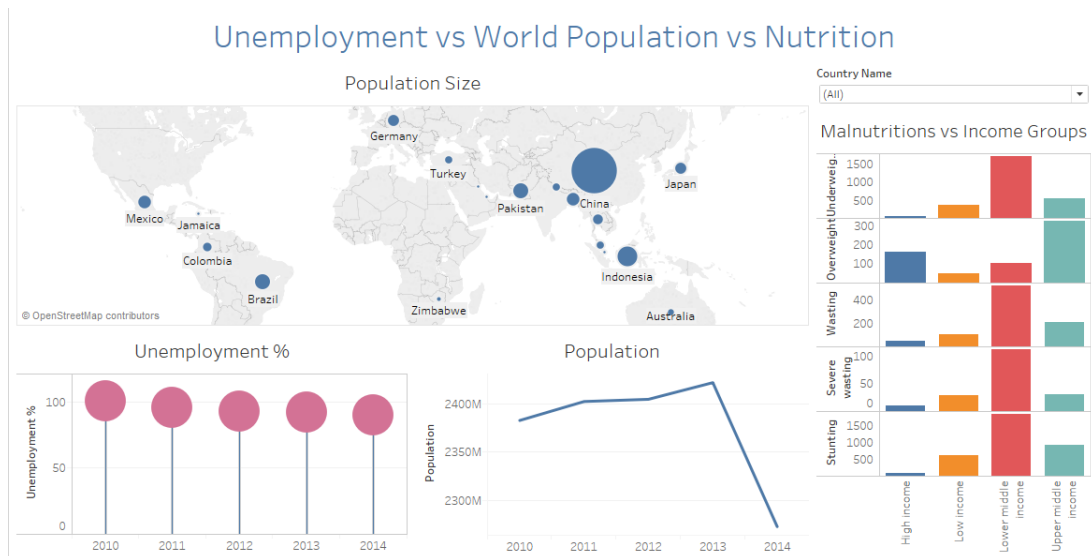
This dashboard has been built to address the Literacy and Unemployment, dashboard explain about literacy and unemployment be the reason for under nutrition. It shows multiple graphs with different statistics representing the literacy and unemployment comparison over the malnutrition. It shows the male and female literacy rate across the specified country. Literacy rate vs unemployment graph shows how unemployment affected the countries which have less literates. Finally, Malnutrition across countries graph shows the different symbols size based on literacy rate about underweight, overweight, stunning, wasting and severe wasting.

6. Is the malnutrition / under nutrition affecting the education of the population leading to the unemployment?

The dashboard has been built to address how Malnutrition/Under Nutrition is effecting the education of population which in turn leads to the unemployment. The dashboard has multiple charts which explains the sum of overweight, underweight, wasting, severe wasting and stunting with unemployment ratio over the years. It also has the cloud word of the different countries which provides an action on clicking over the country name gives the details of each measure based on selected country.

## Project Findings

1. How the unemployment is affecting the world population nutrition?



This dashboard represents different visualizations, where the lollipop chart defines the percentage of the unemployment over the years from 2010-2014, we can also see the graph gradually went down with a difference of 12.4% between the years 2010 and 2014. The line graph represents the population, the graph indicates the raise of 39 million between the year

2010 and 2013 whereas from the year 2013 to 2014 the graph drastically declined or depleted with 100 million population.

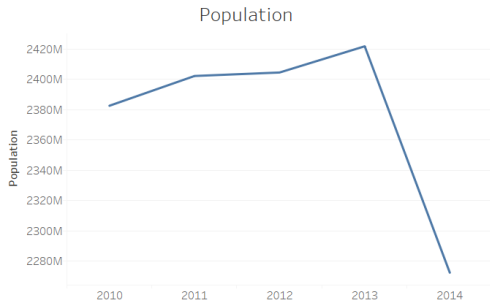
The bar graph defines the malnutrition (stunting, wasting, severe wasting, underweight and overweight) classified by income groups (high income, low income, lower middle income and upper middle income). As we can observe the graph, it clearly states that the malnutrition is high in the lower middle income whereas all other malnutrition experienced a decrease except overweight in upper middle income as well as high income. Also, wasting and underweight can be observed which is around 200 and 500.

As we can see that the population has been decreased the percentage of unemployment has also decreased, which clearly states that the population is directly proportional to the unemployment, whereas malnutrition is grouped by income level, we can observe that lower the income lower the malnutrition. The high malnutrition is observed only in the lower middle income group. So, if the rate of unemployment decreases eventually the malnutrition also experiences the decrease.



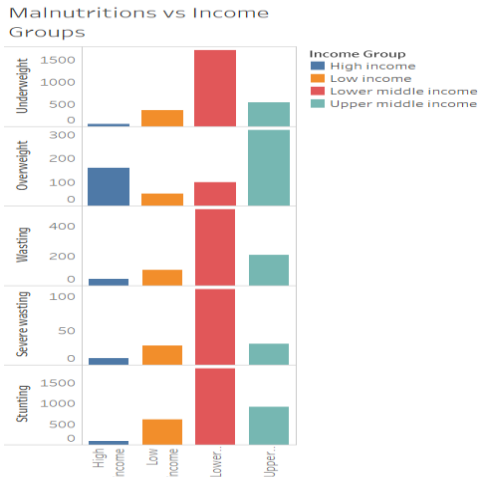
This lollipop bar graph represents the percentage of unemployment where x-axis represents years and y-axis represents unemployment, years ranging from 2010-2014. This graph shows the proportion of unemployed people across 20 countries. Overall the

unemployment has been reduced.

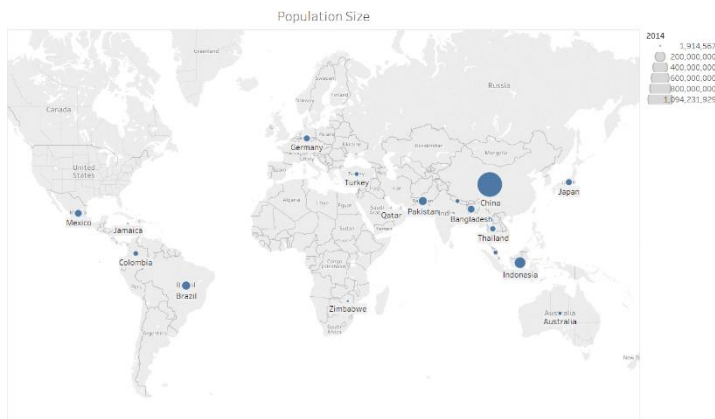


This line graph represents population in million on the y-axis and years on the x-axis between 2010-2014.

This graph shows that the population has drastically fallen down.

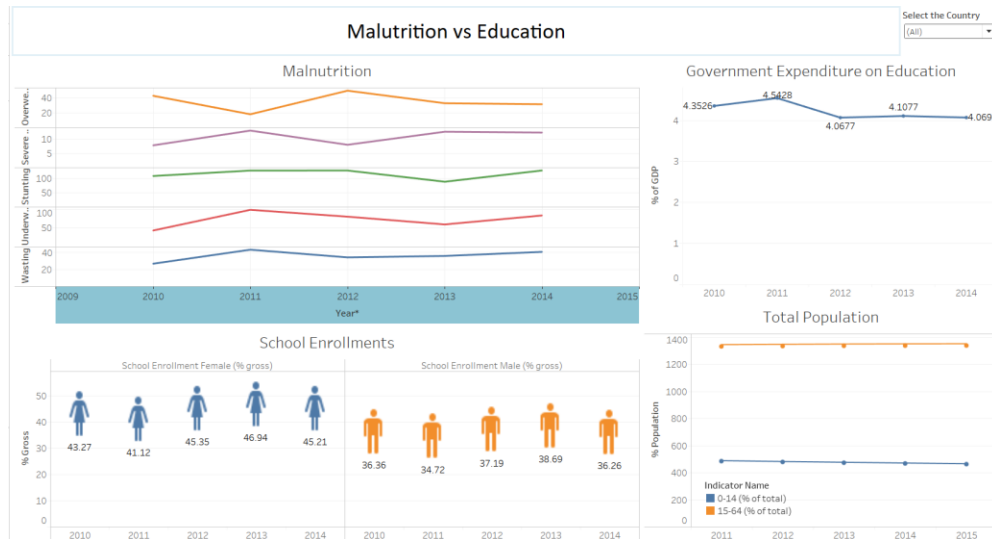


The graph shown here is representing malnutrition (y-axis) and income groups (x-axis). The color shows details about income groups. According to the graph lower middle income has group has high malnutrition.



The world graph shows the countries considered for the project. The circle represents the population of that particular country and also indicates that bigger the circle higher the population and vice versa.

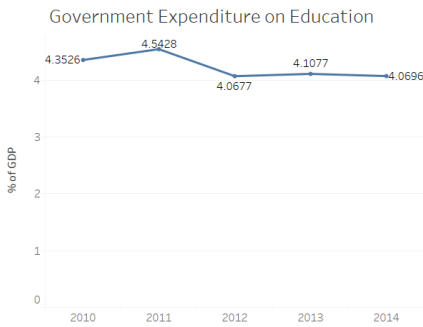
## 2. How could nutrition level get affected by education?



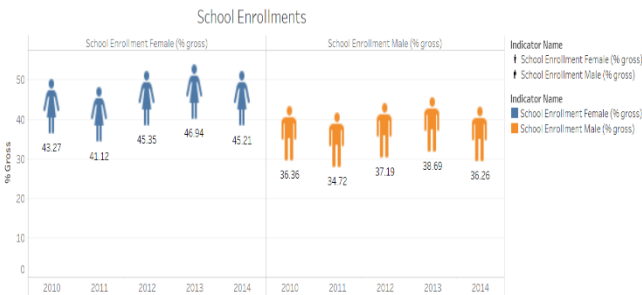
This dashboard has different visualizations like GDP, population, enrollments and malnutrition. Here the line graph represents the population which is divided into two groups, they are 0-14 and 15-64 age groups. The percentage of the 0-14 age group is very close to 500 which is much higher than the percentage of the 15-64 group where it falls close to 1300. Also, we can see that the graph is gentle on both the age groups. If we look at the line graph of government expenditure on education, it is not much fluctuated as we can see some gradual increase in the year 2011 and gradual decrease in the year 2012 changes and remained gentle.

Now, let's look at the education enrollments graph, we can observe the female enrollments increased by 3% between the years 2010 and 2013. Also, it went down by 1.7% from the year 2013-2014 whereas the male enrollments, it decreased in the year 2011 by 1.64%, increased in the year 2012 by 2.47% and increased by 1.5% in the year 2013 and levelled off in the year 2014 as it was in the year 2011.

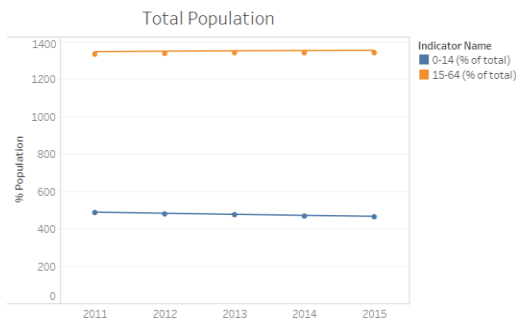
The malnutrition, when compared with the school enrollments, the graph fluctuated in the year 2012, 2013 and levelled off in the year 2014 with slight more/less changes. In the year 2011 when the enrollments went down the wasting, severe wasting, stunting, underweight increased. As the expenditure and school enrollments became gentle the malnutrition gets levelled off. So, the education is also one of the primary cause or the dependent of the malnutrition.



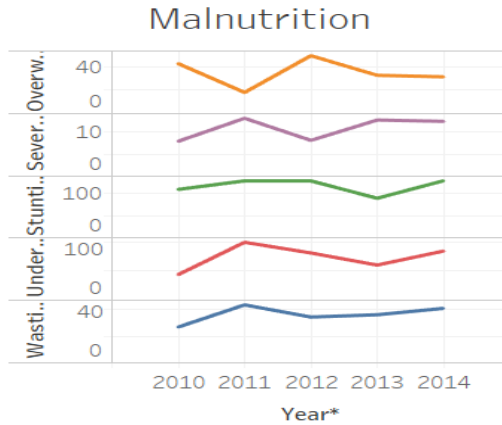
The line graph here is about the GDP (Gross domestic product) considering the expenditure on the education by the government. The graph is gentle.



This graph represents the percentage of school enrollment male and female between years 2010-2014. The blue represents female where as orange is male.

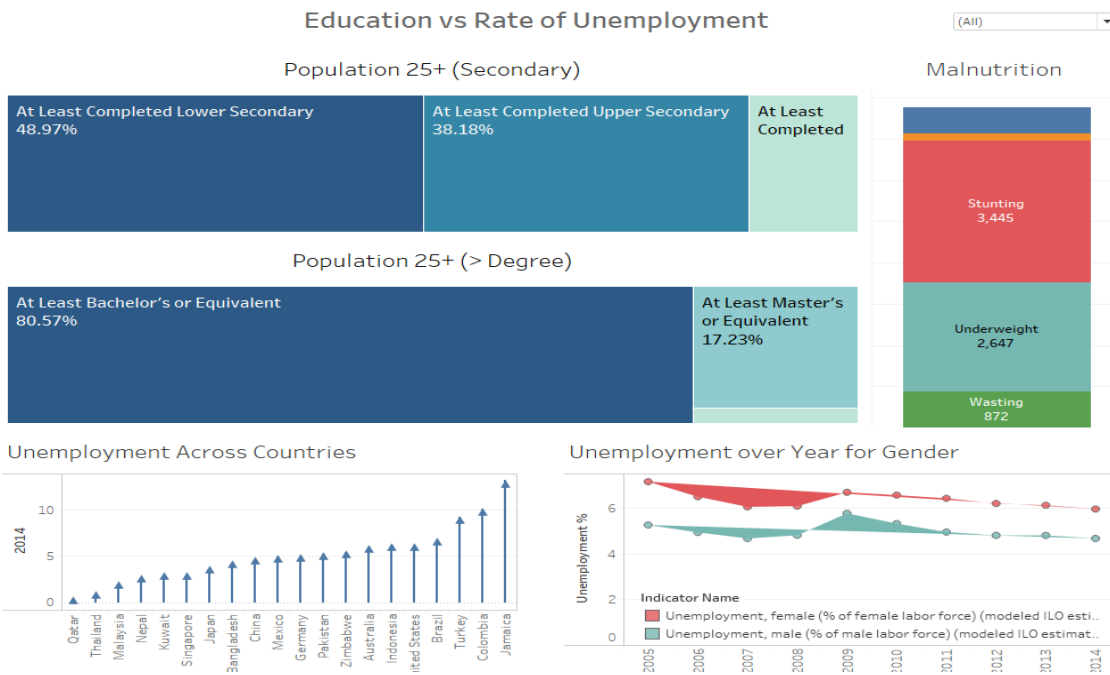


The line graph shows the total population count of the countries considered, grouping 0-14 and 15-64. Color shows the details about the indicator name where the blue represents the group 0-14 and orange represent the group 15-64.



This line graph represents the malnutrition (wasting, severe wasting, stunting, overweight and underweight) over years 2010-2014.

3. How can education change the rate of unemployment and creating awareness of the malnutrition?



Here the dashboard represents the visualizations of the population who had completed their secondary education, degree and master's or equivalent to it. Here, we can see 48.97% of the population completed their lower secondary education, 38.18% completed upper secondary whereas the 80.87% completed the bachelor's degree and 17.23% has completed their master's or equivalent to it. The unemployment over year graph represents the percentage of unemployment of the population based on gender, we

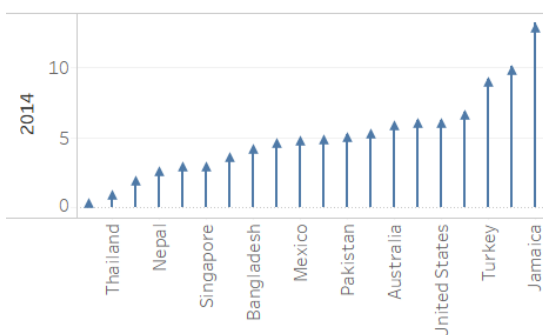


can see that the graph gradually decreased from the year 2010-2014 with the difference of 0.61% of female unemployment, whereas the male unemployment also decreased by 0.65% between the years 2010 and 2014 with respect to labor force. Considering the malnutrition graph, the severe wasting is very low (180), overweight is low (630), wasting (872) whereas underweight and stunting is high with 2647 and 3445.

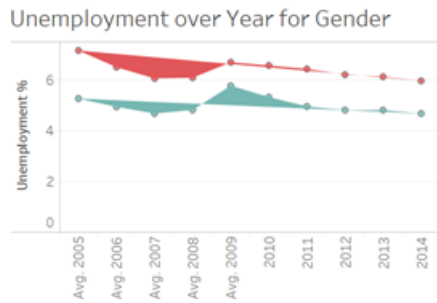
Overall, if we analyze the dashboard, 80% of the population is educated, completing their bachelor's degree by decreasing the rate of unemployment over year. As the education is inversely proportional to the unemployment. In concern to malnutrition the wasting, severe wasting, overweight has been low or average when compared to stunting and underweight. Low food intake, family size, short birth intervals, poor feeding practices or meal proportions might be the cause for the high stunting and underweight as they are dependent on one another.

Therefore, the education change the rate of unemployment but in concern to the malnutrition, education and unemployment has very less chances of dependencies because there are several other factors affecting for the cause of malnutrition.

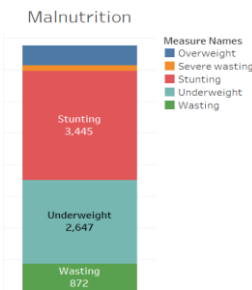
Unemployment Across Countries



This line graph shows the unemployment across countries. This graph is in the descending order.



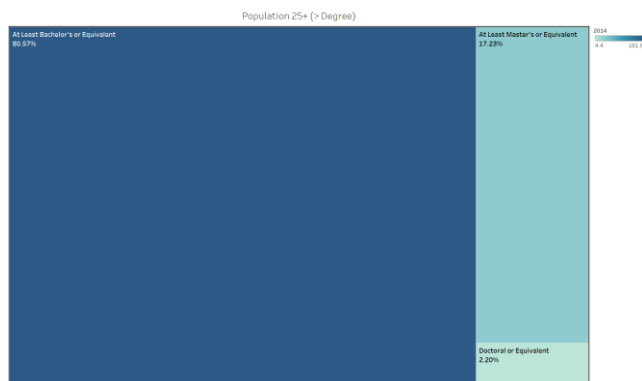
The graph represents the unemployment over years based on gender and is differentiated by colors.



This graph displays different malnutritions varying different colors.



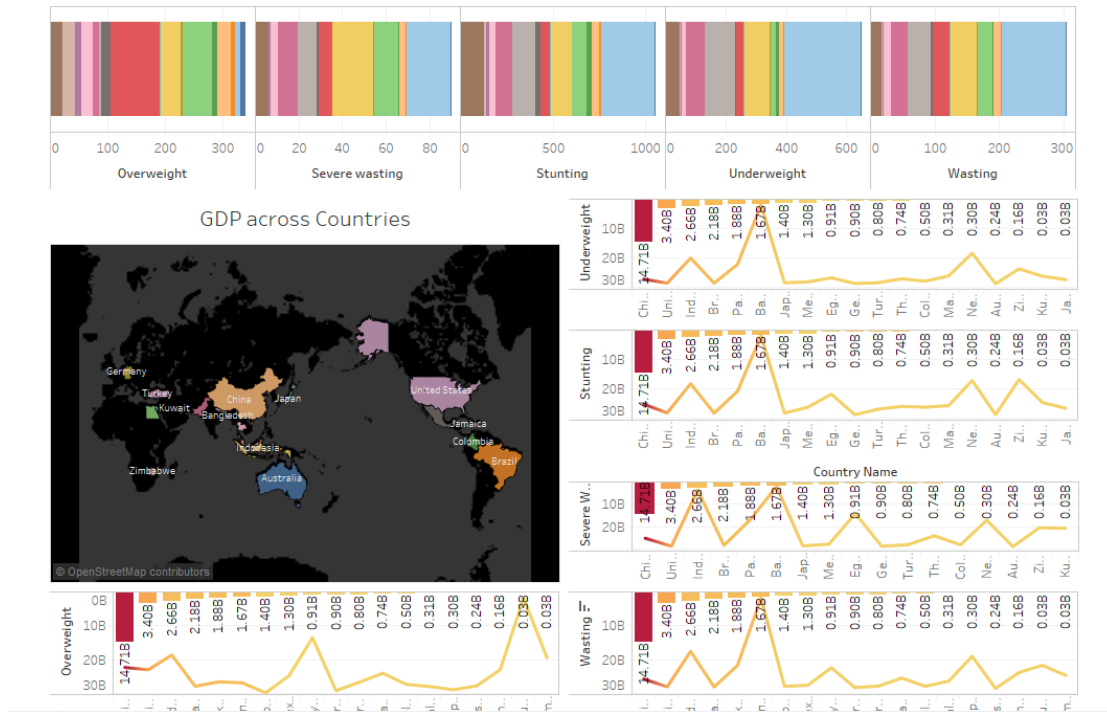
This is tree map, representing population and their secondary level of education. These levels are categorized in three different ways, they are post secondary, upper secondary and post secondary.



This tree maps shows the details of the people who are categorized into Bachelor's, Master's and Doctoral programs under degree.

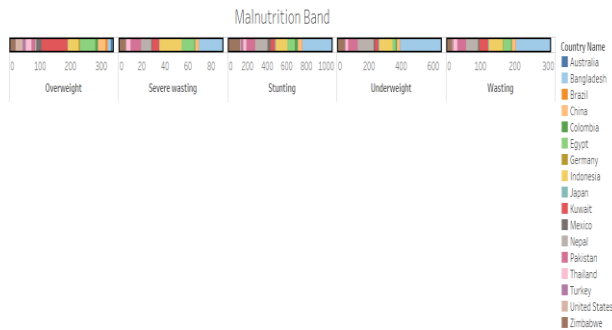
4. Analyzing the health of a country’s economy with the GDP malnutrition / undernutrition and population.

Health of a Country’s Economy with GDP, Malnutrition/Under Nutrition and Population.



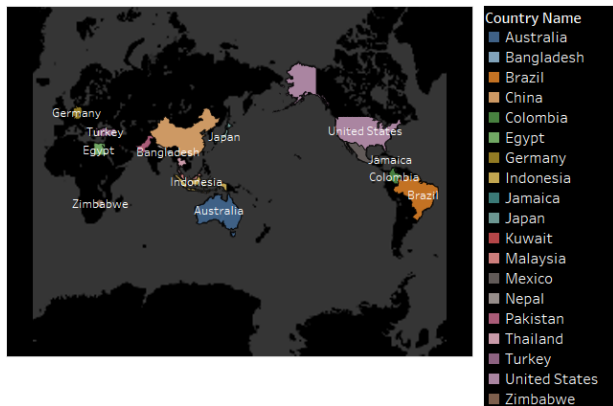
The above dashboard represents the economic condition of the country comparing with the correlative elements malnutrition and population. The above band represents the malnutrition of the country and it is assigned the color with respect to the world map assigned colors. The world map displays the GDP of the country whereas the other graphs displays the malnutrition and population with a line graph, which shows the increase and decrease in the population and the world map displaying the economic conditions. Every malnutrition has different economic conditions based on the population and every country has varied increase and decrease in the malnutrition with respect to the GDP. So, here the economic condition is a variable which supports other variables leading to the malnutrition, it may be the other way around depending

on the population and the government expenditure on the malnutrition or educating the population. Overall, the graph displays very dramatic fluctuations.

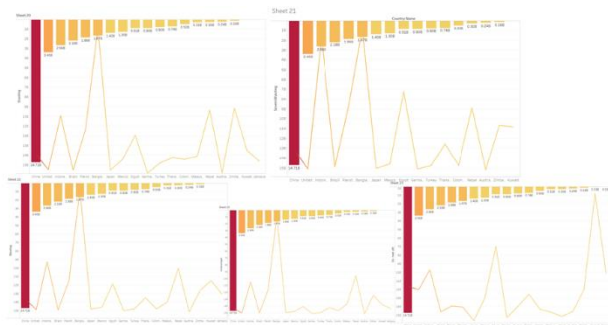


This is malnutrition band which shows the malnutrition of a country. The malnutrition has been categorized and can be observed overall based on the particular color assigned to the country.

GDP across Countries

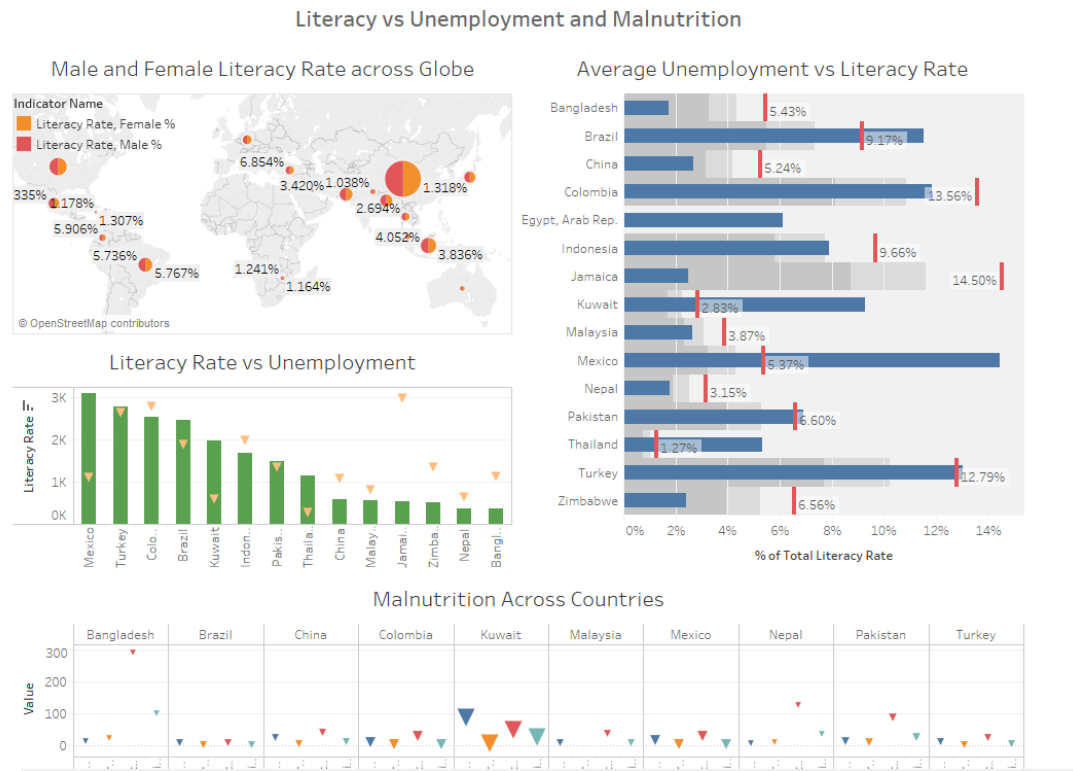


This is a world map with dark background, which represents the GDP (Gross domestic product) of various countries.



This chart has bar graph and line graph. The bar graph represents the population where as the line graph is the malnutrition. This chart has five different malnutritons. The malnutrition has dramatical flucuations.

5. What is the correlation of literacy and unemployment causing malnutrition?



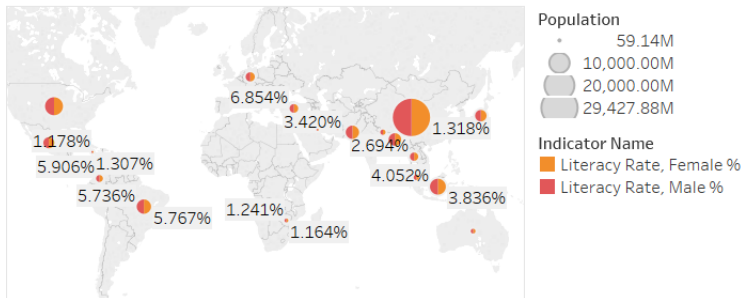
This dashboard represents the visualizations of the literacy rate, rate of unemployment and literacy rate based on gender. Average unemployment graph displays the countries literacy as a bar and unemployment. As Bangladesh was having 1.72% of literacy rate whereas the unemployment is 5.43% this means the literacy is not meeting the employment requirement. Turkey, the literacy rate is 13.01% whereas the unemployment rate is 12.79%, this means the literacy rate is more than the unemployment rate. If the literacy rate goes higher the rate of unemployment comes down.

The malnutrition across countries graph displays the malnutrition level and the literacy rate, the bigger triangle indicates more literacy and the higher the triangle indicates more malnutrition. The two variables literacy and unemployment are not

correlating, when one variable is increasing the other variable is decreasing. Increase in education there is better chance of employment. The correlation between these variables are not strong enough but have a reverse effect.

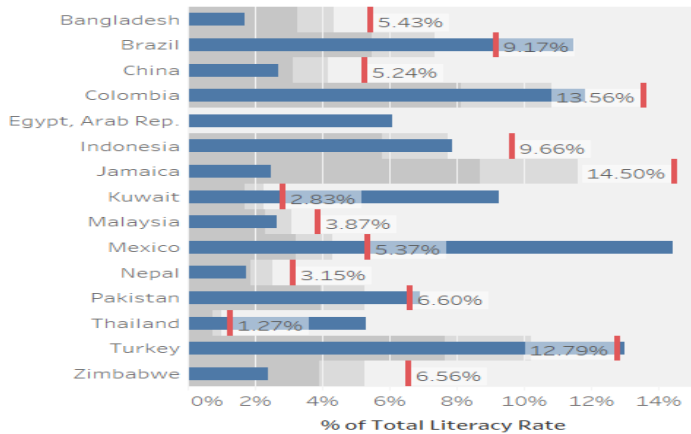
On a whole, the graphs states that, wherever the literacy is high it must lead to the employment, so they fall under overweight. Wherever the literacy is low, with less unemployment will lead to stunting, underweight.

Male and Female Literacy Rate across Globe



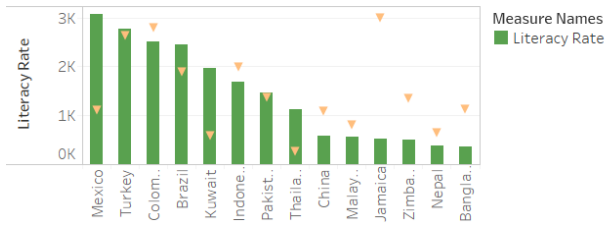
The world map displays the literacy rate across countries by male and female literacy rate. Bigger the circle higher the population and represented by two different colors to identify male and female.

Average Unemployment vs Literacy Rate



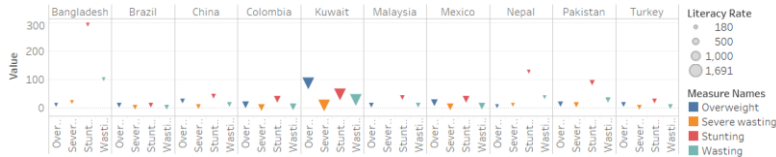
This chart represent the average unemployment and literacy rate as well as the minimum target according to the country's population.

Literacy Rate vs Unemployment



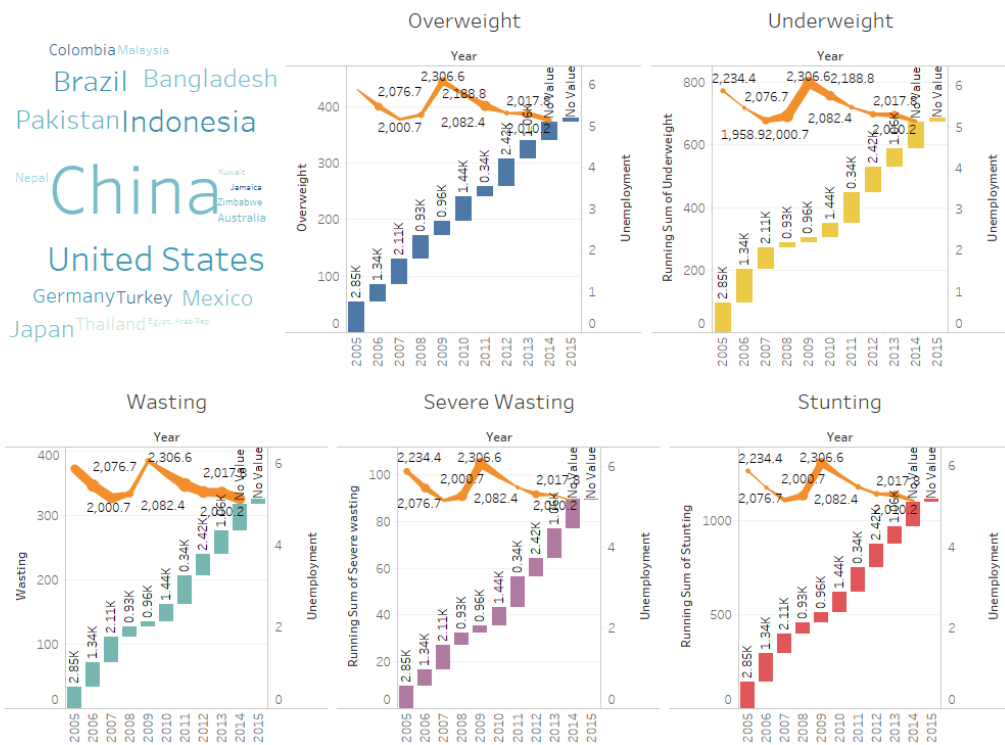
This graph is about literacy rate and unemployment.

Malnutrition Across Countries



This graph is about malnutrition across countries.

6. Is the malnutrition/under nutrition affecting the education of the population lead to the unemployment.

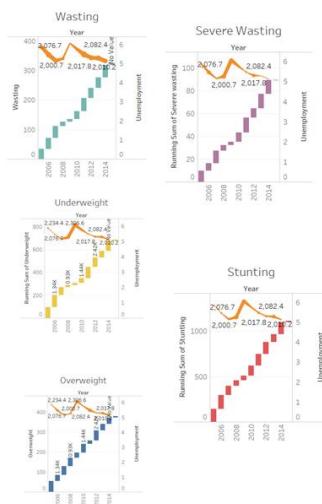


The above dashboard addresses the malnutrition affecting the education leading to the unemployment. Considering the overweight, the unemployment the year 2012, unemployment is 2017.8, overweight is 307.7 and education is 2.42 million whereas in the year 2013 unemployment is 2010, overweight is 340.5 and education is 1.06 million. This states that the increase in malnutrition will decrease the education.

In concern to the underweight in the year 2011, the underweight is 447.9 and the education is 0.34 and unemployment is 5.48, in the year 2012, underweight is 528.6, education is 2.42 million and unemployment is 5.31 whereas in the year 2013, the underweight is 588.6, education is 1.06 million and the unemployment is 5.29 which clearly states that the malnutrition is affecting the education also leading to the decrease unemployment.

Before the year 2010, from 2007-2010 the malnutrition affected more on education which led to the unemployment that is higher the malnutrition, lower the education and higher the unemployment whereas after the year 2010 the increase in malnutrition the decrease in education which means the malnutrition had affected the education.

This chart has unemployment comparing with different malnutritions that affecting.





## **Recommendations and Conclusions**

### **Recommendations**

After completing my research over this topic, I feel that this type of projects will give more information about the real-life scenario like how the malnutrition and other dependent variables are interlinked. This project would develop more interest on working with the new data and could learn about the malnutrition creating awareness in their surroundings. The available data is more but not accurate as many years' data were blank, if the data was fully fledged it would have been more helpful to analyze considering for more years. Future more study could be required in concern to this project.

### **Conclusion**

The project took a lot of research and time consuming, even then further study is required. Population, education, unemployment is interrelated and are dependent variables to the malnutrition. To be aware or to avoid malnutrition, population should be literate and further continue to be educated, if not it would lead back to the malnutrition. The population again is dependent on the two factors education and unemployment, this means if the population is not educated it would just come under literates with unemployment or could be grouped under lower income, it once again will lead back to the malnutrition. At the same time, government spending on the education, treating malnutrition and creating awareness is also very vital. Therefore, creating awareness about the malnutrition is very much dependent on the dependent variables.

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