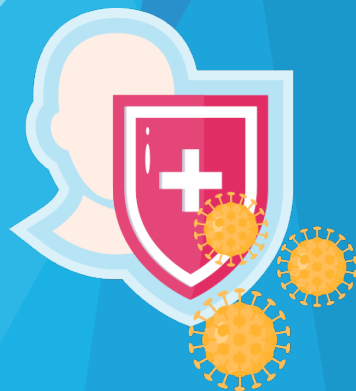
MINISTRY OF HEALTH
SINGAPORE

# Healthy Diet and Covid-19 Immunity

Analysis of food diet that affect the immunity of population against Covid-19

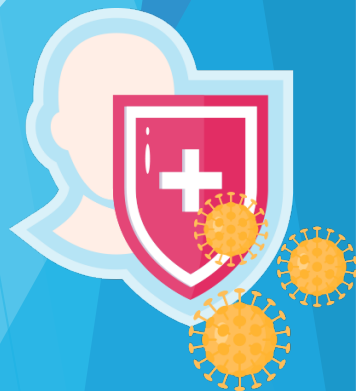
22 Jan 2021



MINISTRY OF HEALTH
SINGAPORE

# Agenda

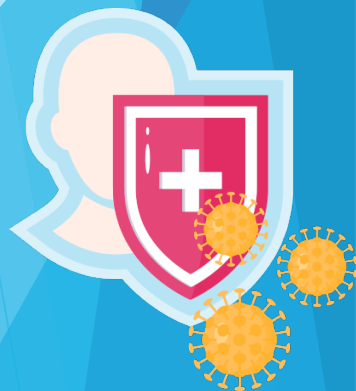
- Problem Definition
- E-R Diagram & DB Schema
- Data Collection & Preparation
- Data Visualization & Analysis
- Findings & Insights
- Conclusion
- Questions



# Problem Definition

Business Scenario

- As an organization, Ministry of Health(MOH) aims to provide medical excellence, and promotion of good health, and reduction of illness. With covid-19 pandemic situation in Singapore since 2020, MOH would like to encourage the population to adopt a healthy lifestyle and take responsibility for their own health.
- Hence, MOH wants to recommend the type of food diet to the population that they can adopt to boost a better health and build general immunity to illness.

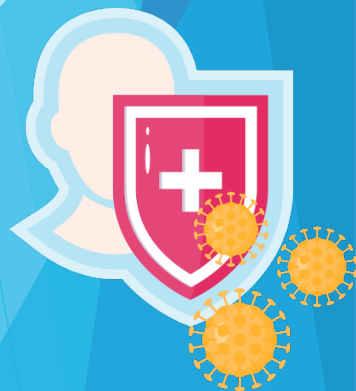


MINISTRY OF HEALTH
SINGAPORE

# Problem Definition

Hence, we will analyse the global data and derive some recommendations:

- What is the obesity rate of the top 5 countries population in the world? Which country has the most serious obesity problem?
- What is the malnutrition rate of the top 5 countries population in the world? Which country has the most serious malnutrition problem?
- What is the health issues related to immunity of corona virus?
- What kind of food to eat help in promoting better health and build immunity against corona virus?



# Data Collection & Preparation

**Data Source:** https://www.kaggle.com/mariaren/covid19-healthy-diet-dataset
(Updated version till: 1/1/2021, for year 2020, excluding data for Singapore)

- Fat_Supply_Quantity_Data.csv
- Food_Supply_Quantity_kg_Data.csv
- Food_Supply_kcal_Data.csv
- Protein_Supply_Quantity_Data.csv
- Supply_Food_Data_Description.csv

**Acknowledgements**

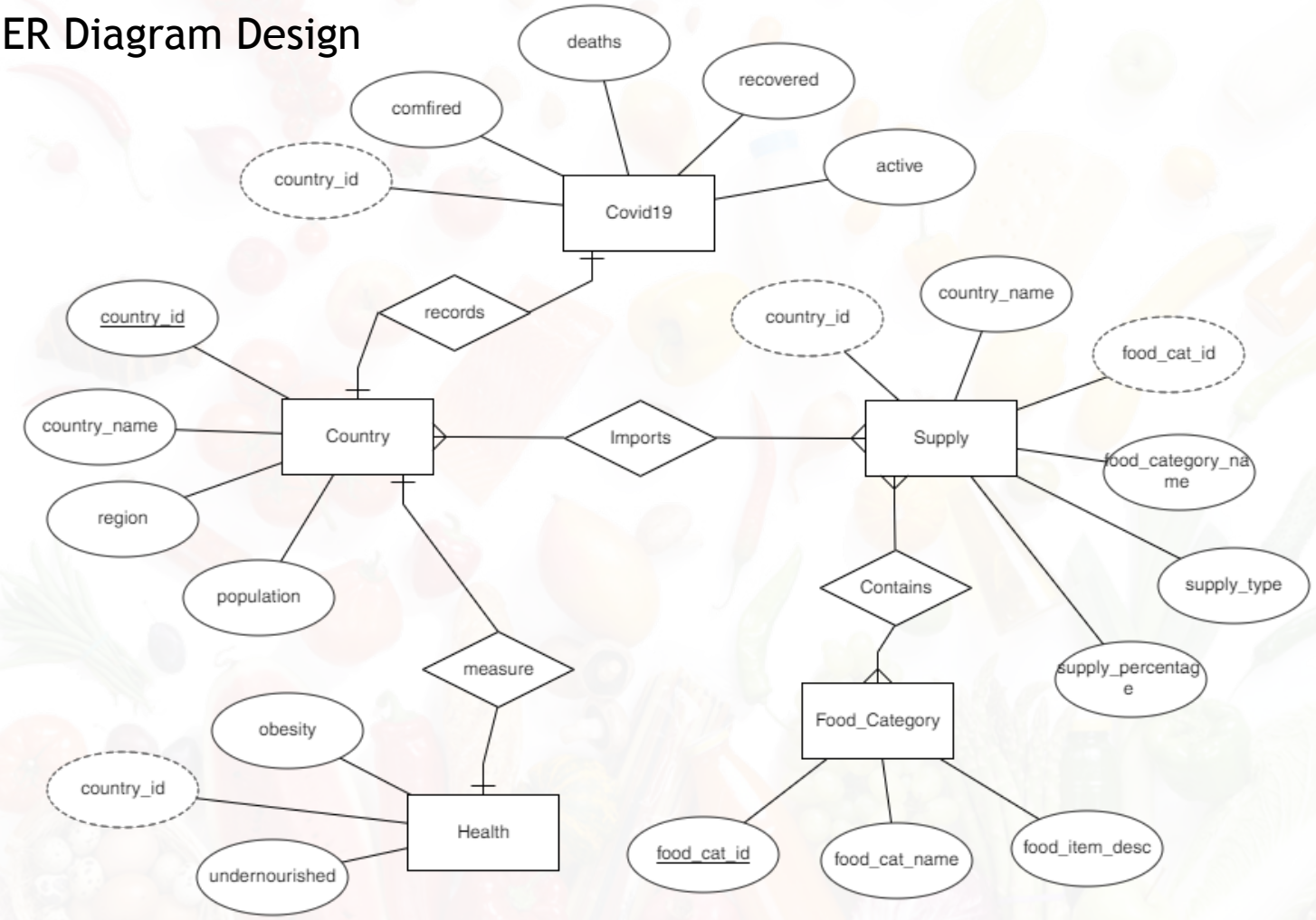
- Data for different food group supply quantities, nutrition values, obesity, and undernourished percentages are obtained from Food and Agriculture Organization of the United Nations FAO website.
- Data for population count for each country comes from Population Reference Bureau PRB website
- Data for COVID-19 confirmed, deaths, recovered and active cases are obtained from Johns Hopkins Center for Systems Science and Engineering CSSE website
- The USDA Center for Nutrition Policy and Promotion diet intake guideline information can be found in ChooseMyPlate.gov

**Additional Data Source:** https://www.kaggle.com/andradaolteanu/country-mapping-iso-continent-region

MINISTRY OF HEALTH
SINGAPORE

# ER Diagram & DB Schema

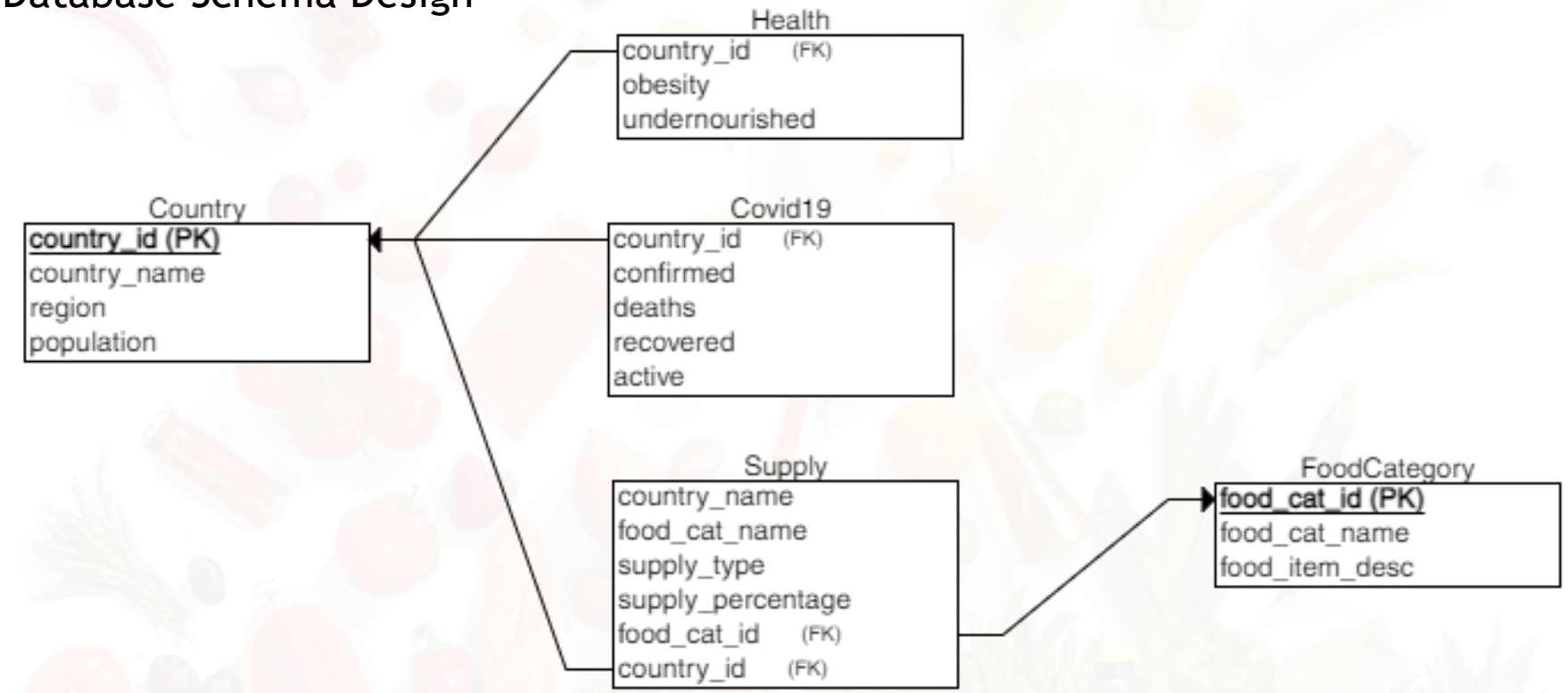
## ER Diagram Design



MINISTRY OF HEALTH
SINGAPORE

# ER Diagram & DB Schema

Database Schema Design



MINISTRY OF HEALTH
SINGAPORE

# Data Collection & Preparation

### Create tables in database

```
Create Table Country (
    country_id int IDENTITY(1,1) PRIMARY KEY,
    country_name varchar(50),
    region varchar(50),
    population int
)
Create Table FoodCategory (
    food_cat_id int IDENTITY(1,1) PRIMARY KEY,
    food_cat_name varchar(50),
    food_item_desc varchar(MAX)
)
Create Table Health (
    country_id int,
    obesity varchar(10),
    undernourished varchar(10)
)
Create Table Covid19 (
    country_id int,
    confirmed varchar(50),
    deaths varchar(50),
    recovered varchar(50),
    active varchar(50)
)
Create Table Supply(
    country_id int,
    country_name varchar(50),
    food_cat_id int,
    food_category_name varchar(50),
    supply_type varchar(50),
```

### Alter the data type for the rows

```
/*Convert all data with numbers to float*/
alter table Country alter column population float
alter table Health alter column obesity float
alter table Health alter column undernourished float
alter table covid19 alter column confirmed float
alter table covid19 alter column deaths float
alter table covid19 alter column recovered float
alter table covid19 alter column active float
alter table Supply alter column supply_percentage float
```

### Update values in record

```
/*cleaning of data in covid master table*/
UPDATE dbo.master_covid
SET confirmed = NULL
WHERE confirmed LIKE 'NA'

UPDATE dbo.master_covid
SET deaths = NULL
WHERE deaths LIKE 'NA'

UPDATE dbo.master_covid
SET recovered = NULL
WHERE recovered LIKE 'NA'

UPDATE dbo.master_covid
SET active = NULL
WHERE active LIKE 'NA'
```

MINISTRY OF HEALTH
SINGAPORE

# Data Collection & Preparation

```
INSERT INTO dbo.Country (country_name, region, [population])
select c.country, mc.region, h.population
from dbo.master_supply_kg c
left join dbo.master_continents mc
on c.country = mc.name
left join dbo.master_health h
on c.country = h.Country
```

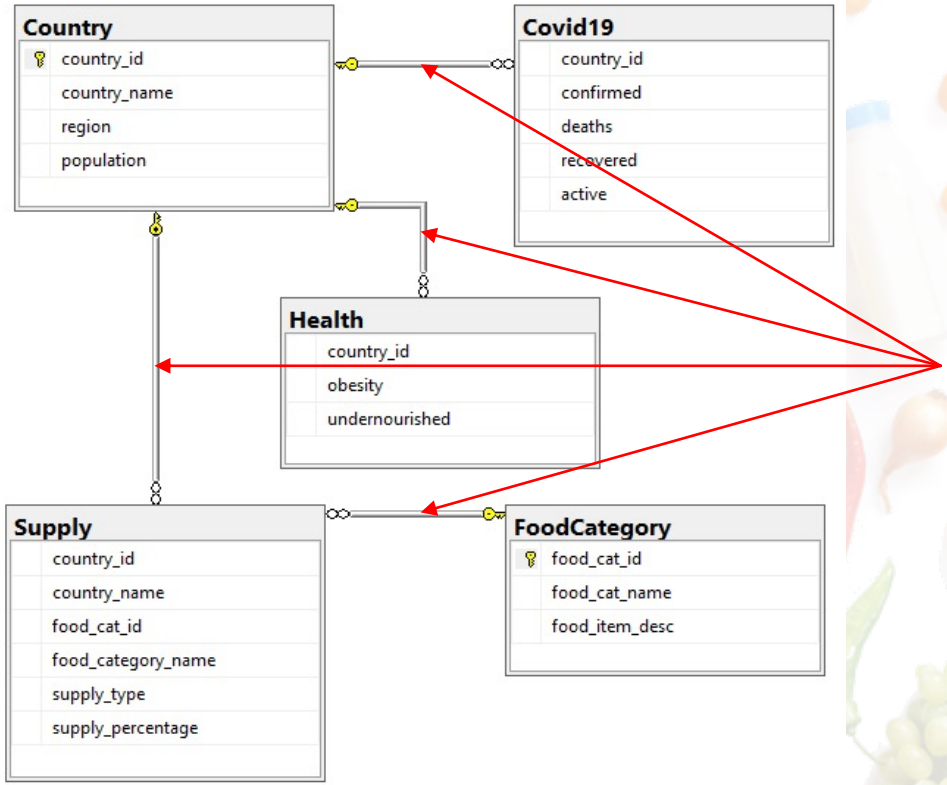
**Insert data into various tables from master database and data cleaning.**

```
--UPDATE value for region where null
UPDATE Country
SET region = 'Asia' WHERE
country_name LIKE 'Lao People%' OR
country_name LIKE 'Taiwan' OR
country_name LIKE 'Korea, North' OR
country_name LIKE 'Korea, South'

UPDATE Country
SET region = 'Europe' WHERE
country_name LIKE 'North Macedonia' OR
country_name LIKE 'Czechia' OR
country_name LIKE 'Republic of Moldova'

UPDATE Country
SET region = 'Americas' WHERE
country_name LIKE 'Venezuela%' OR
country_name LIKE 'United States of America'

UPDATE Country
SET region = 'Africa' WHERE
country_name LIKE 'Guinea-Bissau' OR
country_name LIKE 'United Republic of Tanzania'

UPDATE Country
SET region = 'Asia/Europe' WHERE
country_name LIKE 'Russian Federation'
```

```
INSERT INTO Supply (country_id, country_name, food_cat_id, food_category_name, supply_type,supply_percentage)
select c.country_id, c.country_name, f.food_cat_id,f.food_cat_name, s.supply_type, Alcoholic_Beverages
from dbo.master_supply_fat s
left join dbo.country c on c.country_name = s.country
left join dbo.FoodCategory f on f.food_cat_name = 'Alcoholic Beverages'

INSERT INTO Supply (country_id, country_name, food_cat_id, food_category_name, supply_type,supply_percentage)
select c.country_id, c.country_name, f.food_cat_id,f.food_cat_name, s.supply_type, Animal_Products
from dbo.master_supply_fat s
left join dbo.country c on c.country_name = s.country
left join dbo.FoodCategory f on f.food_cat_name = 'Animal Products'

INSERT INTO Supply (country_id, country_name, food_cat_id, food_category_name, supply_type,supply_percentage)
select c.country_id, c.country_name, f.food_cat_id,f.food_cat_name, s.supply_type, Animal_fats
from dbo.master_supply_fat s
left join dbo.country c on c.country_name = s.country
left join dbo.FoodCategory f on f.food_cat_name = 'Animal Fats'

INSERT INTO Supply (country_id, country_name, food_cat_id, food_category_name, supply_type,supply_percentage)
select c.country_id, c.country_name, f.food_cat_id,f.food_cat_name, s.supply_type, Aquatic_Products_Other
from dbo.master_supply_fat s
left join dbo.country c on c.country_name = s.country
left join dbo.FoodCategory f on f.food_cat_name = 'Aquatic Products, Other'
```

MINISTRY OF HEALTH
SINGAPORE

# Data Collection & Preparation




**Linking up the Primary Keys and Foreign Keys Reference in the Database Diagram**

MINISTRY OF HEALTH
SINGAPORE

# Data Collection & Preparation

```
CREATE VIEW Country_Health_Covid AS
select c.country_name, c.region, c.population, cv.confirmed, cv.deaths,
cv.recovered, cv.active, h.obesity, h.undernourished
from dbo.Country c
inner join dbo.covid19 cv
on c.country_id=cv.country_id
inner join dbo.health h
on c.country_id = h.country_id

/*CREATE View Food Nutrition for Dashboard*/
CREATE VIEW Country_Food_Nutrition AS
Select c.country_name, c.region, f.food_cat_name, s.supply_type,
s.supply_percentage, c.population
from dbo.country c
inner join dbo.supply s
on c.country_id = s.country_id
inner join dbo.foodcategory f
on s.food_cat_id = f.food_cat_id
```

Create view to get results from Database for export to csv for importing into excel dashboard.

170 Records Generated

```
/*Queries for exporting to create dashboard*/
Select * from Country_Health_Covid
Select * from Country_Food_Nutrition
```

15617 Records Generated

# Data Visualization & Analysis

MINISTRY OF HEALTH
SINGAPORE

=[@Population]/100*[@Confirmed]

Using formula to calculate the numbers

| E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|
| aths | Recovered | Active | Obesity | Undernou | Confirmed | Deaths Cas | Recovered |
| 05628339 | 0.107190197 | 0 | 4.5 | 29.8 | 51526 | 2191 | 41727 |
| 41613813 | 1.185130374 | 0.828083157 | 22.3 | 6.2 | 58316 | 1181 | 33634 |
| 06226751 | 0.151937687 | 0.067046915 | 26.6 | 3.9 | 99897 | 2762 | 67395 |
| 01245311 | 0.034272185 | 0.018501322 | 6.8 | 25 | 17568 | 405 | 11146 |
| 05102041 | 0.151020408 | 0.006122449 | 19.1 | 0 | 159 | 5 | 148 |
| 95464663 | 3.144050951 | 0.351717831 | 28.5 | 4.6 | 1629594 | 43319 | 1426676 |
| 95669824 | 4.849627876 | 0.458558863 | 20.9 | 4.3 | 159738 | 2828 | 143355 |

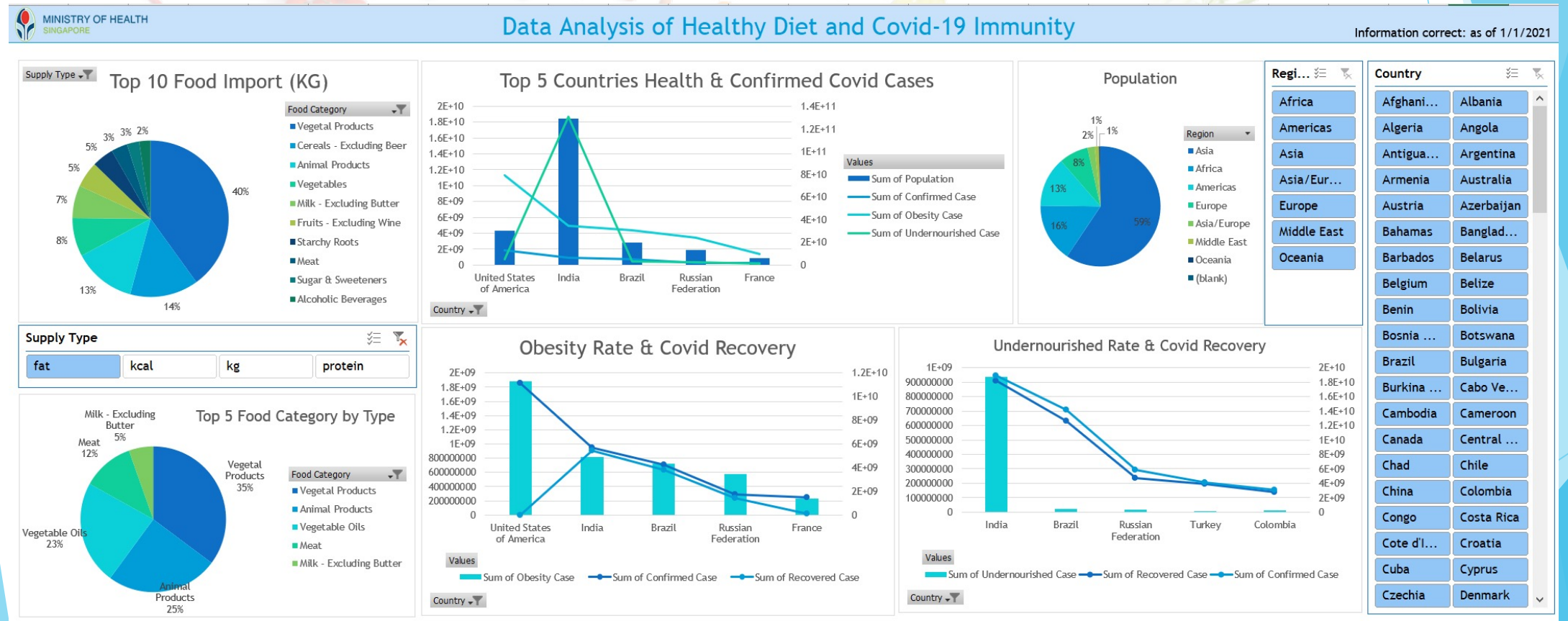
**Prepare Data for Visual Analysis**

=VLOOKUP([@Country],Master_Covid!A:O,8,FALSE)

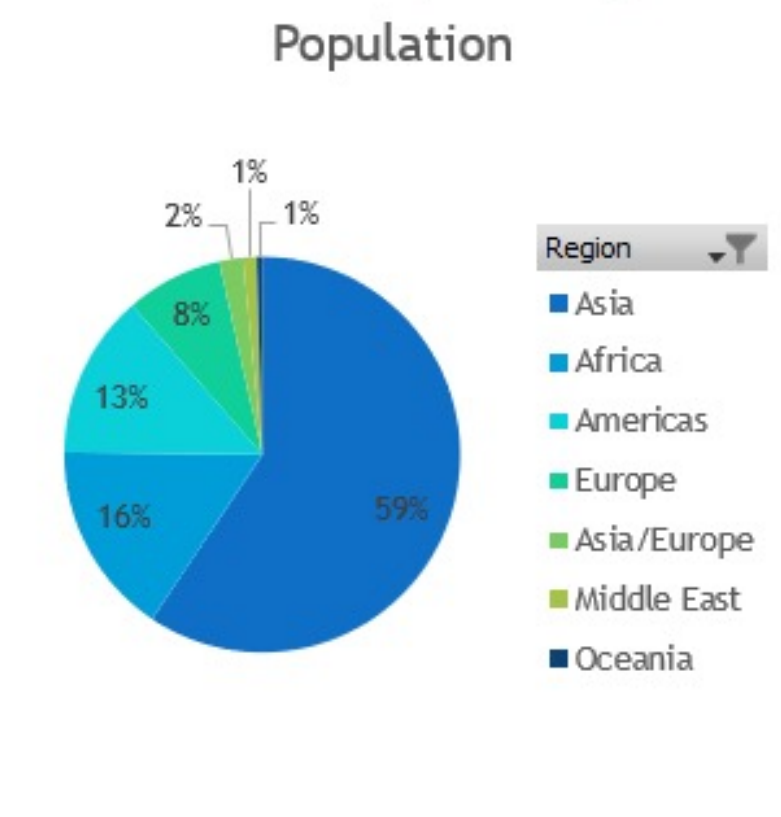
Using VLOOKUP to combine 2 worksheet into 1 worksheet

| | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Region | Food Category | Supply Ty | Supply Pe | Populatior | Supply | Confirmed | Deaths | Recove | Active | Obesity |
| | Asia | Alcoholic Beverages | fat | 0 | 38928000 | 0 | 0.13236231 | 0.1323623 | 0.1071901 | 0 | 4.5 |
| | Europe | Alcoholic Beverages | fat | 0 | 2838000 | 0 | 2.054827343 | 2.0548273 | 1.1851303 | 0.828083 | 22.3 |
| | Africa | Alcoholic Beverages | fat | 0 | 44357000 | 0 | 0.225211353 | 0.2252113 | 0.1519376 | 0.067046 | 26.6 |
| | Africa | Alcoholic Beverages | fat | 0 | 32522000 | 0 | 0.054018818 | 0.0540188 | 0.0342721 | 0.018501 | 6.8 |
| | Americas | Alcoholic Beverages | fat | 0 | 98000 | 0 | 0.162244898 | 0.1622448 | 0.1510204 | 0.006122 | 19.1 |

# Data Visualization & Analysis



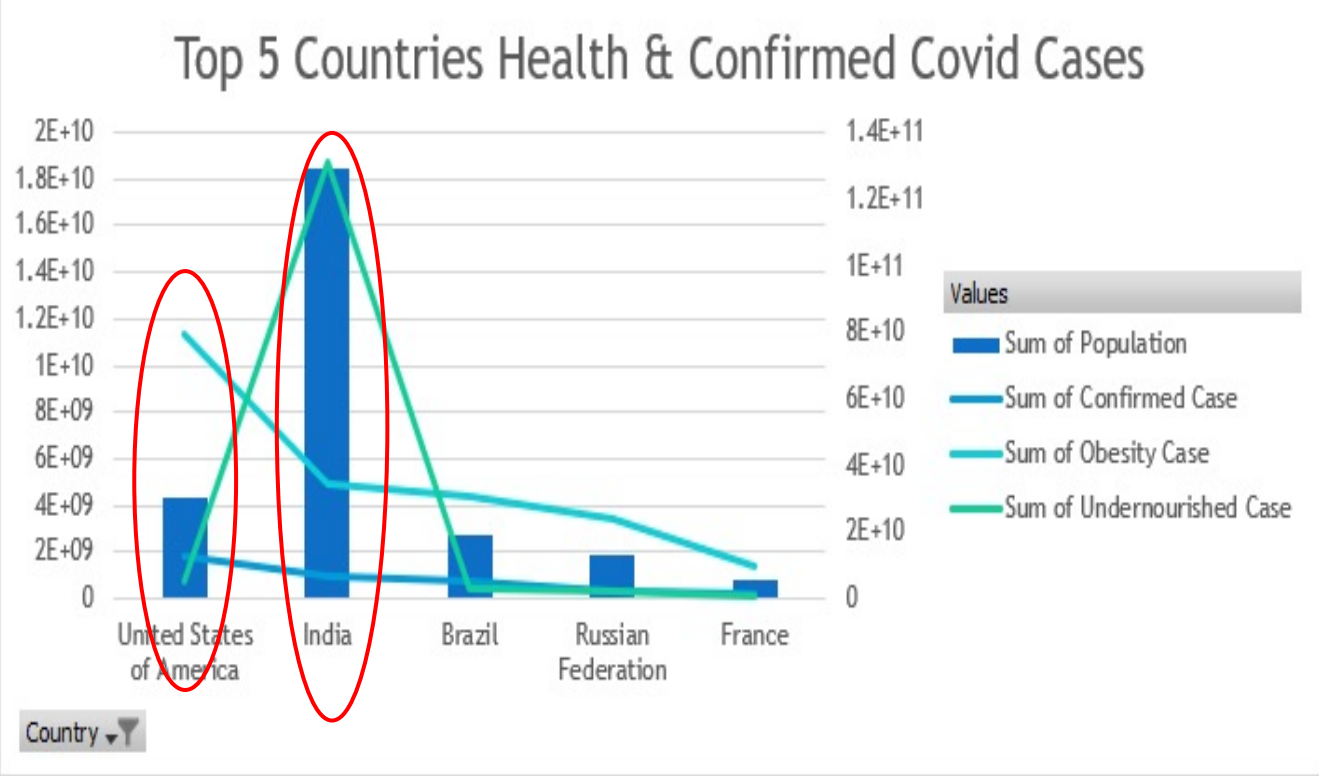
# Findings & Insights




- Most of the world population are living in the region of Asia, which Singapore is residing in.

MINISTRY OF HEALTH
SINGAPORE

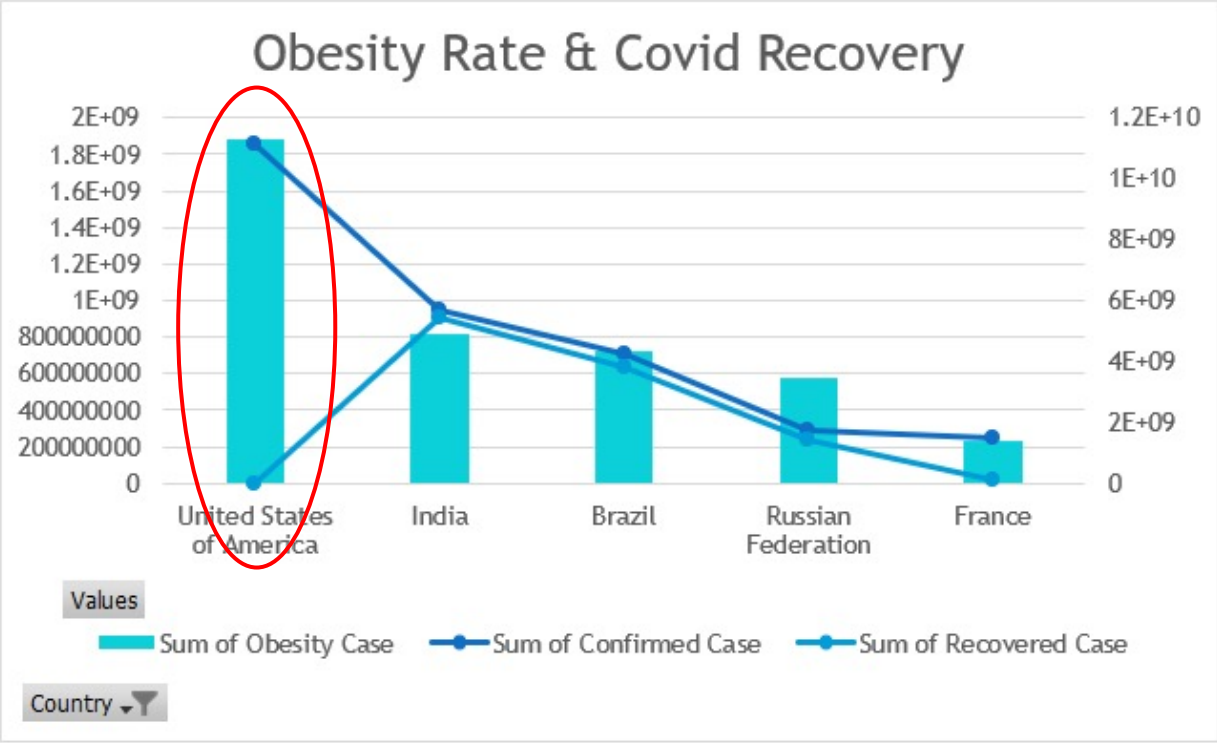
# Findings & Insights




- USA has the highest number of confirmed COVID-19 cases, and also with the highest obesity population rate.
- India has the most population in the world and most undernourished population with 2nd highest number of confirmed COVID-19 cases.

MINISTRY OF HEALTH
SINGAPORE

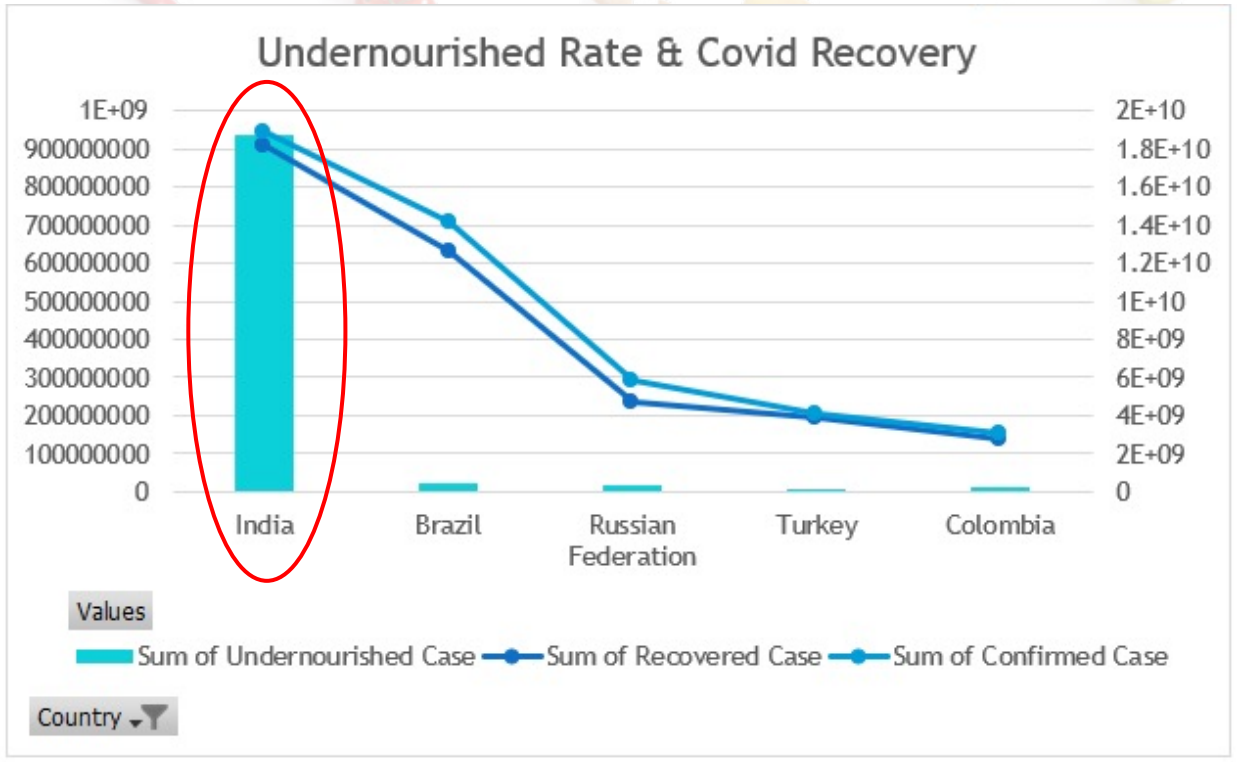
# Findings & Insights




- For USA that has the highest obesity rate, it does affect the rate of recovery.
- There is significantly little or no population recovering from the covid-10 illness in USA as compare to the other countries.
- This result may be due to lack of healthcare services to aid recovery of the population in the country or the information is not recorded for USA.

MINISTRY OF HEALTH
SINGAPORE

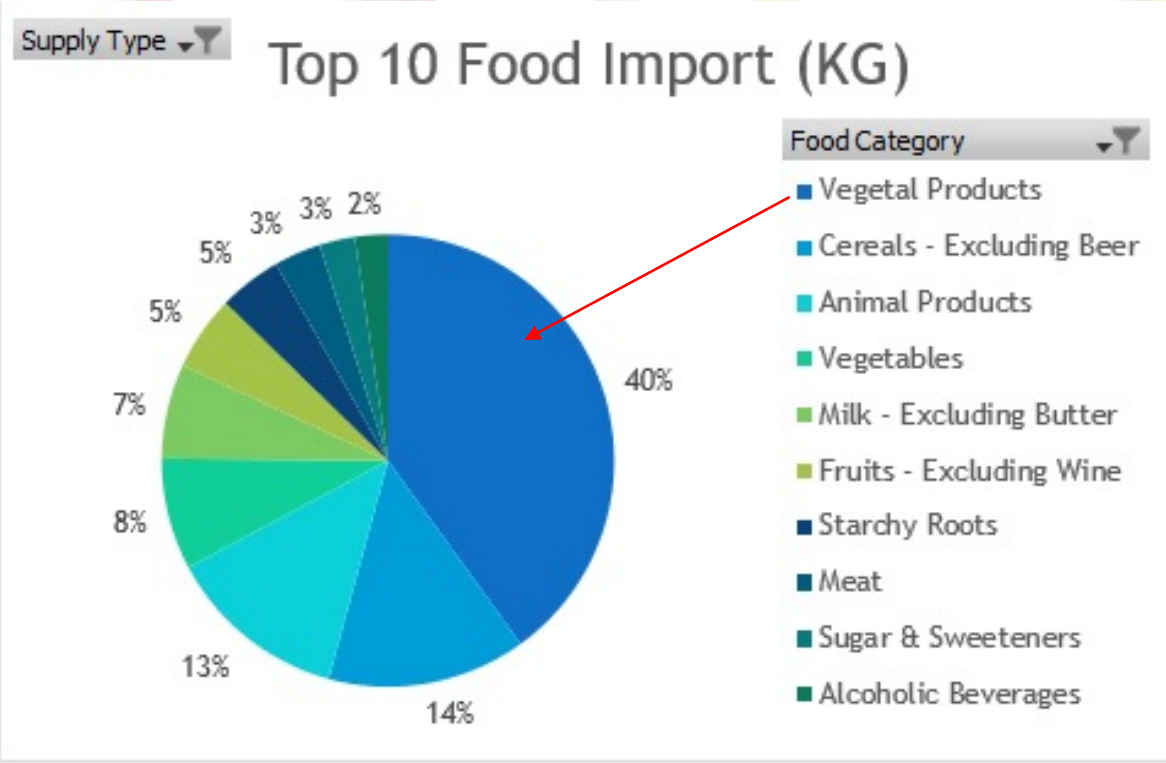
# Findings & Insights




- India has the most population that is undernourished.
- The undernourished rate affect the rate of contracting the COVID-19 virus, but it does not significantly affect the rate of recovery.
- Population recovering from the illness are quite consistent, and may due to other factors such as good healthcare system.

MINISTRY OF HEALTH
SINGAPORE

# Findings & Insights



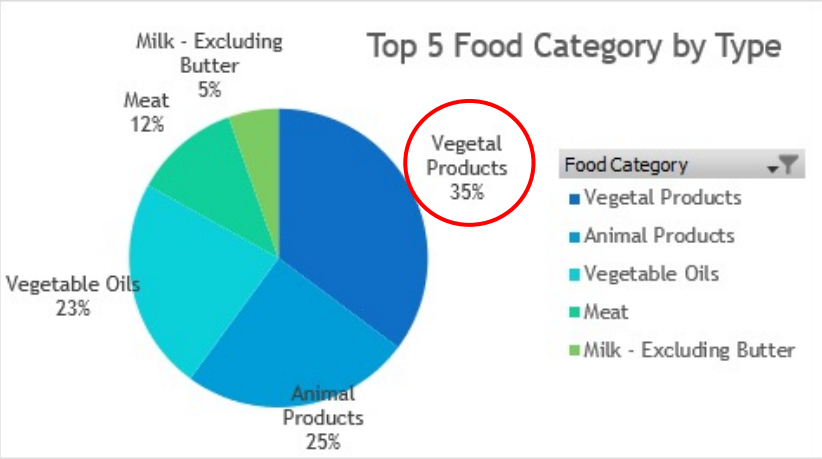

Base on the analysis, the top 10 imported food for the world are as follows:

1. **Vegetal Products (40%)**
2. Cereals
3. Animal Products
4. Vegetables
5. Milk
6. Fruits
7. Starchy Roots
8. Meat
9. Sugar and Sweetener
10. Alcoholic Beverages

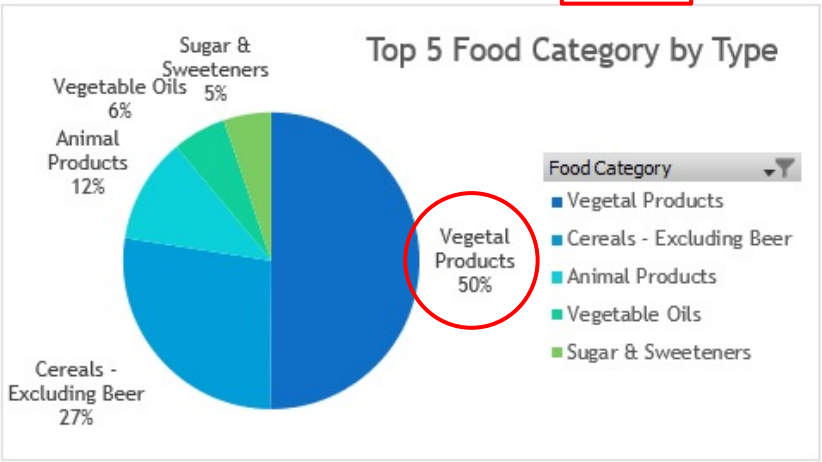
MINISTRY OF HEALTH
SINGAPORE

# Findings & Insights

## Top 5 food category(fats)

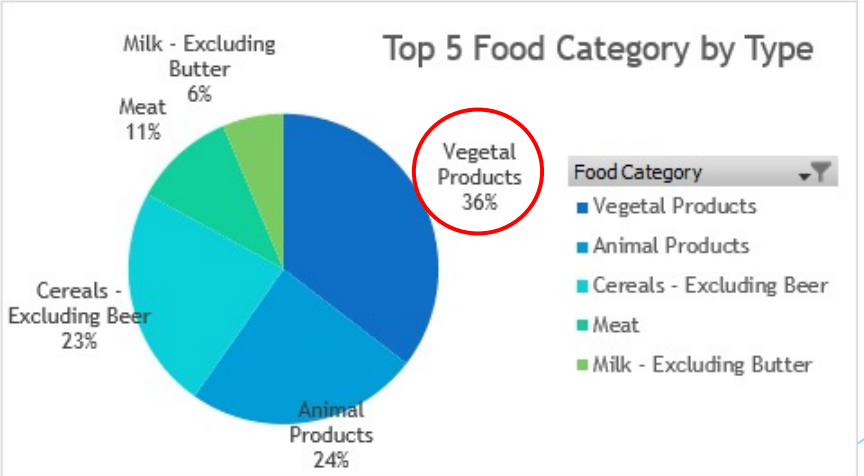



## Top 5 food category(kcal)




Top food category recommendation base on fats, kcal and protein values.

## Top 5 food category(protein)

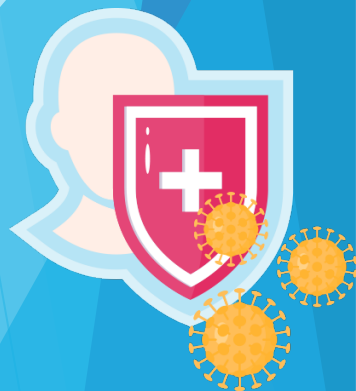


MINISTRY OF HEALTH
SINGAPORE

# Findings & Insights

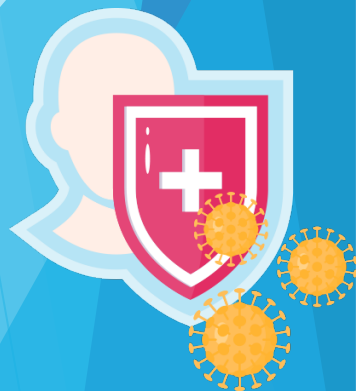
In Summary:

- USA, India, Brazil, Russia, France are the top 5 countries with the highest obesity population. **USA** has the **most serious obesity** health problem with its population.
- India, Brazil, Russia, Turkey, Colombia are the top 5 countries with the highest undernourished population. **India** has the **most serious malnutrition** health problem with its population.
- Top recommended food category are **vegetal products, cereals, meat, milk, and vegetables oils** for a balance food intake.



# Conclusion

- **Malnutrition health** issues **increase the chances of contracting** the COVID-19 illness.
- **Obesity health** issues affects the **rate of recovery** from COVID-19.
- Recommendation for Singaporean is to eat a healthy balance diet(that includes **fats, kcal and proteins**) and exercise regularly to **maintain healthy fit body**, so that to **immune selves to any virus**, and also **recover better** from any illness.



MINISTRY OF HEALTH
SINGAPORE

# Questions?