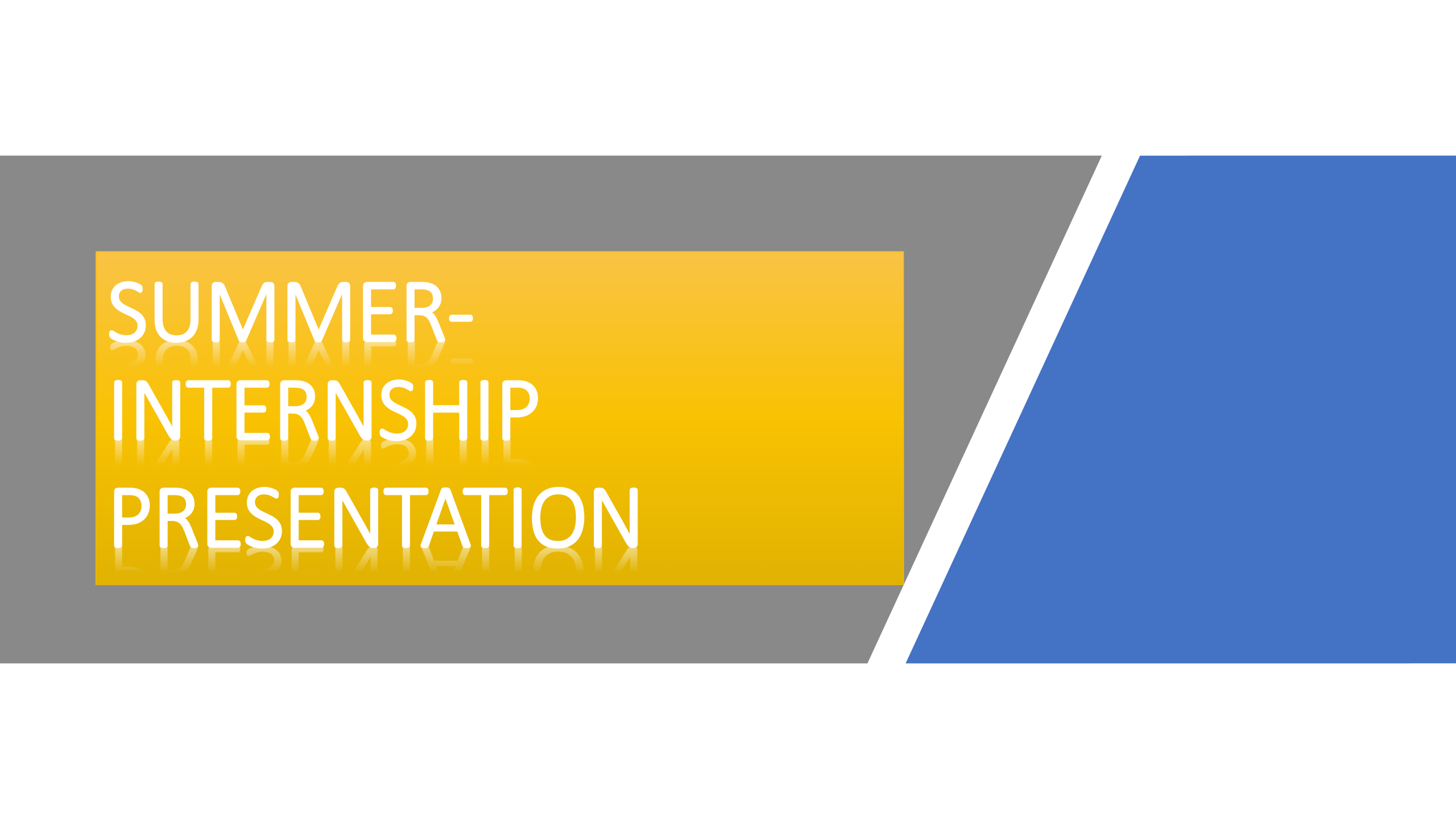


The graphic features a horizontal banner with a grey background. On the left, a yellow rectangle contains the text 'SUMMER-  
INTERNSHIP  
PRESENTATION' in white, bold, sans-serif font. The text is reflected below it. To the right of the yellow rectangle is a white diagonal line separating it from a blue trapezoidal shape on the far right.

# SUMMER- INTERNSHIP PRESENTATION

# PART-1

**WORK FROM HOME:  
ASSIGNED BY THE FACULTY**

**PREPAREDNESS AND  
RESPONSE PLAN  
OF TOP-10  
FRAGILE STATES  
IN CONTAINING COVID-19**



Cleveland  
Clinic

© 2020



Under the guidance of:

Faculty Mentor:

Dr. D.K. Mangal

# What are Fragile States?

- The Fragile State Index(FSI) is an annual ranking of 178 countries based on their different levels of pressures they face that impact their levels of fragility.
- The FSI score should be interpreted with the understanding that, lower the score the better it is.
- The index is based on the Funds for Peace proprietary Conflict Assessment Tool (CAST)- analytical approach.
- Funds for Peace is an independent, non-partisan, non-profit, research and educational and research organization.
- The comprehensive social science methodology has three primary streams of data quantitative, qualitative and expert validation and these are triangulated and subjected to critical review in order to obtain the final score.

# AGENDA

RATIONALE

LITERATURE REVIEW

AIMS AND OBJECTIVE

RESEARCH METHODOLOGY

RESULTS

CONCLUSIONS

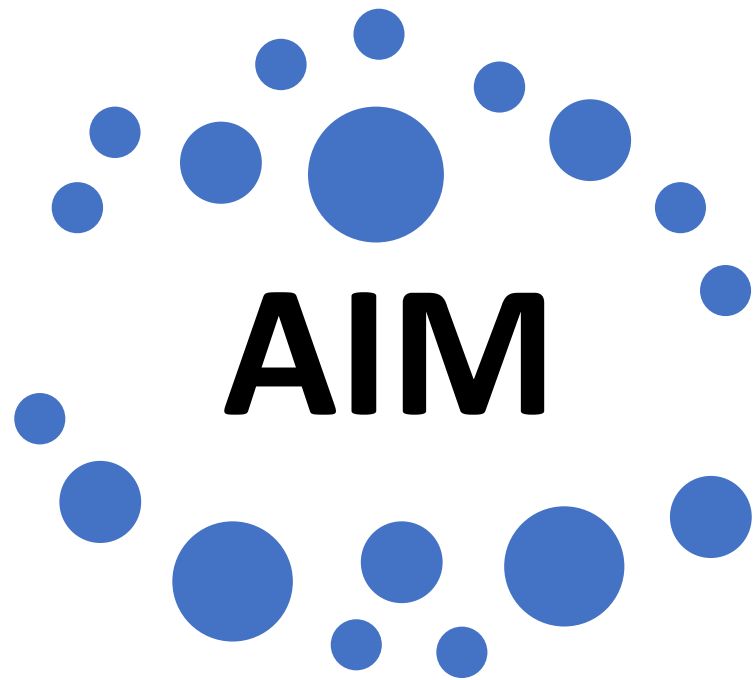
ANNEXURE

## RATIONALE

- There is urgent need for displaced people with food, water, shelter and proper sanitations in Syria.
- There is also a burden of malnutrition in the country.
- Zimbabwe need 7M people with humanitarian assistance.
- The country is also facing malarial and other communicable disease outbreak and drought conditions.
- South Sudan holds 24 ICU beds with 4 ventilators.
- Somalia holds 100 quarantine beds with 46 ventilators.
- Zimbabwe has 2 isolation facilities which are not fully equipped.

# LITERATURE REVIEW

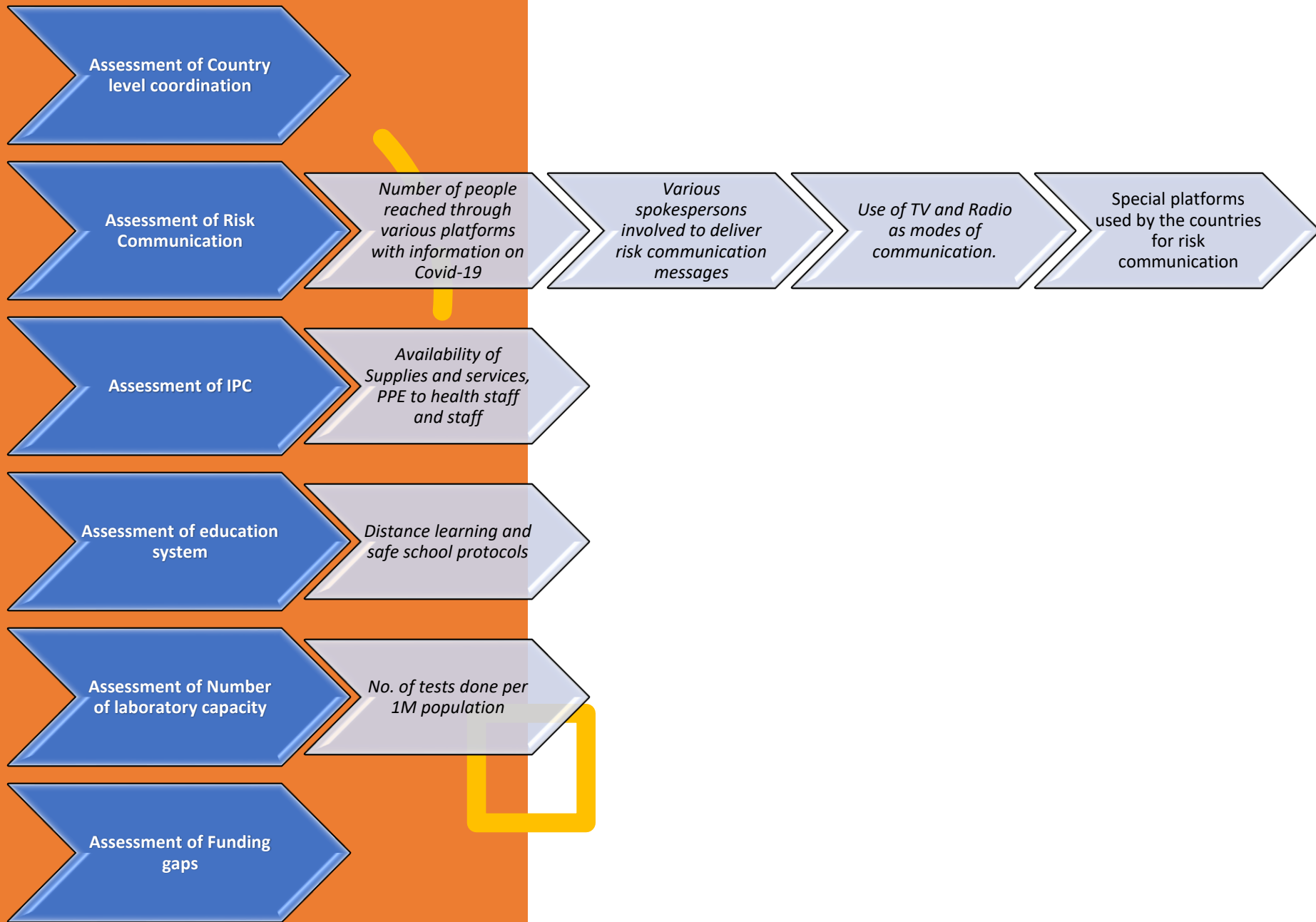
- The armed groups, intra and inter-ethnic/communal violent conflicts, epidemics, natural disasters and food insecurity are the problems faced by DRC.
- In Democratic Republic of Congo 8.4M people lack access to WASH services and 8.4M vulnerable people lack protection.
- It also holds 5M internally displaced persons(IDPs).
- (DEMOCRATIC REPUBLIC OF CONGO: COVID-19 situation report –05 (10 April 2020 to 17 April 2020 UNICEF)
- In Afghanistan, the community learning centres were requested to remain closed.
- affecting the education of 7.5million children in regular schools and 5,00,000 children.
- However, Ministry of Education initiated an alternative delivery mechanism to reach the students through television and radio. UNICEF supported the MoE to develop and implement guidelines for safe school operations and the need for WASH facilities in Community Based Education Centres.(UNICEF Afghanistan, 13<sup>th</sup> April 2020)
- In Sudan, the National Public Health Laboratory in Khartoum processes the Covid-19 tests with a capacity of 30 tests per day.
- However, it is planning to increase the test capacity up to 300 tests.(IOM, Sudan Situation Report, 17<sup>th</sup> April, 2020)
- The Government and partners developed The National Contingency Plan of Chad for Preparedness and Response to the pandemic which was supported by UNICEF. ((Situation Report No. 1 Chad, UNICEF, 1-15<sup>th</sup> April)



To assess the  
preparedness and  
response plan of  
top-10 fragile  
states in  
containing Covid-  
19



# OBJECTIVES



# RESEARCH METHODOLOGY

Study  
Area

- South Sudan
- Somalia
- Yemen
- Syria
- Central African Republic
- Democratic Republic Of Congo
- Sudan
- Chad
- Afghanistan
- Zimbabwe

## Study Type

Qualitative study

## Study design

Descriptive, analytic, cross-sectional study

## Study period

60 days

## Data Collection

Secondary data is collected from the situation reports published by UNICEF, IOM, UNOCHA and WHO

# RESULTS

## Assessment of Country Level Coordination, Planning and Monitoring

| Sl No. | Name of the country | Activate multi-sectoral, multi-partner coordination mechanisms to support preparedness and response | Engage with national authorities and key partners | Conduct initial capacity assessment and risk analysis, including mapping of vulnerable populations |
|--------|---------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------|----------------------------------------------------------------------------------------------------|
| 1      | South Sudan         | Yes                                                                                                 | Yes                                               | Not mentioned                                                                                      |
| 2      | Somalia             | Yes                                                                                                 | yes                                               | Not mentioned                                                                                      |
| 3      | Yemen               | Yes                                                                                                 | Yes                                               | Not mentioned                                                                                      |
| 4      | Syria               | Yes                                                                                                 | Yes                                               | Not mentioned                                                                                      |
| 5      | CAR                 | Yes                                                                                                 | Yes                                               | Not mentioned                                                                                      |
| 6      | DRC                 | Yes                                                                                                 | Yes                                               | Yes                                                                                                |
| 7      | Sudan               | Yes                                                                                                 | Yes                                               | Not mentioned                                                                                      |
| 8      | Chad                | Yes                                                                                                 | yes                                               | Not mentioned                                                                                      |
| 9      | Afghanistan         | Yes                                                                                                 | Yes                                               | Yes                                                                                                |
| 10     | Zimbabwe            | Yes                                                                                                 | Yes                                               | Yes                                                                                                |

Assessment of Risk  
Communication and  
Community Engagement

- *Number of people reached through various platforms with information on Covid-19*

| Sl No. | Name of the country | No. of people reached       |
|--------|---------------------|-----------------------------|
| 1      | South Sudan         | 3.4M                        |
| 2      | Somalia             | 6M people targeted to reach |
| 3      | Yemen               | 16M estimated               |
| 4      | Syria               | 17.4M                       |
| 5      | CAR                 | 2M                          |
| 6      | DRC                 | 10M                         |
| 7      | Sudan               | 31M                         |
| 8      | Chad                | Not specified               |
| 9      | Afghanistan         | 472000                      |
| 10     | Zimbabwe            | Data not available          |

## *Various spokespersons involved to deliver risk communication messages*

---

| Sl No. | Name of the country | Religious leaders and opinion leaders | Community leaders/<br>Community workers |
|--------|---------------------|---------------------------------------|-----------------------------------------|
| 1      | South Sudan         | ×                                     | ×                                       |
| 2      | Somalia             | ×                                     | ×                                       |
| 3      | Yemen               | √                                     | ×                                       |
| 4      | Syria               | ×                                     | √                                       |
| 5      | CAR                 | ×                                     | √                                       |
| 6      | DRC                 | ×                                     | √                                       |
| 7      | Sudan               | ×                                     | √                                       |
| 8      | Chad                | √                                     | ×                                       |
| 9      | Afghanistan         | ×                                     | ×                                       |
| 10     | Zimbabwe            | ×                                     | ×                                       |

## *Use of TV and Radio as modes of communication.*

---

| Sl No. | Name of the country | TV/Radio      |
|--------|---------------------|---------------|
| 1      | South Sudan         | Not mentioned |
| 2      | Somalia             | √             |
| 3      | Yemen               | Not mentioned |
| 4      | Syria               | √             |
| 5      | CAR                 | √             |
| 6      | DRC                 | √             |
| 7      | Sudan               | √             |
| 8      | Chad                | √             |
| 9      | Afghanistan         | √             |
| 10     | Zimbabwe            | Not mentioned |

## Special platforms used by the countries for risk communication

---

| Sl No. | Name of the country | Special platforms                                                 |
|--------|---------------------|-------------------------------------------------------------------|
| 1      | South Sudan         | Megaphones                                                        |
| 2      | Somalia             | ×                                                                 |
| 3      | Yemen               | discussion programs and<br>live phone-in programs                 |
| 4      | Syria               | Smart Card/Takamol application and<br>online/ interactive quizzes |
| 5      | CAR                 | ×                                                                 |
| 6      | DRC                 | U-report platform<br>quiz platform                                |
| 7      | Sudan               | Megaphones                                                        |
| 8      | Chad                | U-report platform                                                 |
| 9      | Afghanistan         | ×                                                                 |
| 10     | Zimbabwe            | ×                                                                 |

## Assessment of IPC

*Availability of Supplies and services, PPE to health staff and staff training*

| Country                   | WASH/IPC              |                     |                |
|---------------------------|-----------------------|---------------------|----------------|
|                           | Supplies and services | PPE to health staff | Staff training |
| South Sudan               | √                     | ×                   | √              |
| Somalia                   | √                     | √                   | √              |
| Yemen                     | √                     | √                   | √              |
| Syria                     | √                     | √                   | √              |
| Central African republic  | -                     | -                   | -              |
| Congo Democratic Republic | √                     | √                   | √              |
| Sudan                     | √                     | √                   | √              |
| Chad                      | √                     | √                   | √              |
| Afghanistan               |                       |                     |                |
| Zimbabwe                  | √                     | √                   | √              |

# Assessment of Education Systems

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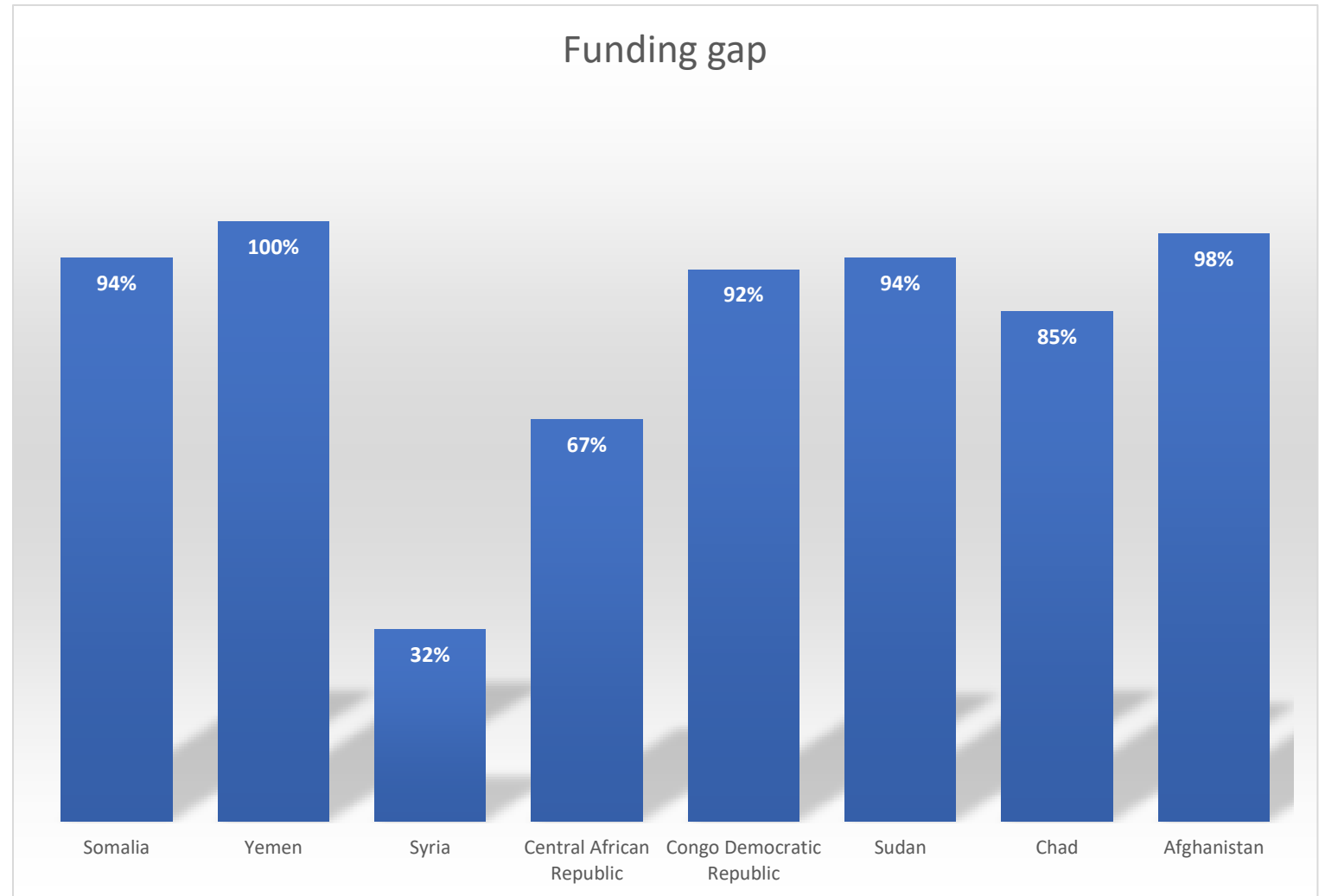
| Country                   | Education                    |                       |
|---------------------------|------------------------------|-----------------------|
|                           | Distance learning initiative | Safe school protocols |
| South Sudan               | ×                            | ×                     |
| Somalia                   | √                            | √                     |
| Yemen                     | √                            | √                     |
| Syria                     | √                            | √                     |
| Central African republic  | -                            | -                     |
| Congo Democratic Republic | √                            | ×                     |
| Sudan                     | ×                            | ×                     |
| Chad                      | √                            | √                     |
| Afghanistan               | -                            | -                     |
| Zimbabwe                  | √                            | √                     |

## Assessment of Laboratory Capacity

| SI No. | Name of the country       | Total cases per 1M population | Total tests | Total tests per 1M population |
|--------|---------------------------|-------------------------------|-------------|-------------------------------|
| 1      | South Sudan               | 143                           | 3356        | 300                           |
| 2      | Somalia                   | 147                           | -           | -                             |
| 3      | Yemen                     | 16                            | 120         | 4                             |
| 4      | Syria                     | 8                             | -           | -                             |
| 5      | Central African Republic  | 339                           | 15881       | 3292                          |
| 6      | Congo Democratic Republic | -                             | -           | -                             |
| 7      | Sudan                     | 139                           | 401         | 9                             |
| 8      | Chad                      | 51                            | -           | -                             |
| 9      | Afghanistan               | 538                           | 48305       | 1243                          |
| 10     | Zimbabwe                  | 19                            | 52905       | 3563                          |

(Data as on 8/6/2020, Source: [www.worldometers.info](http://www.worldometers.info))

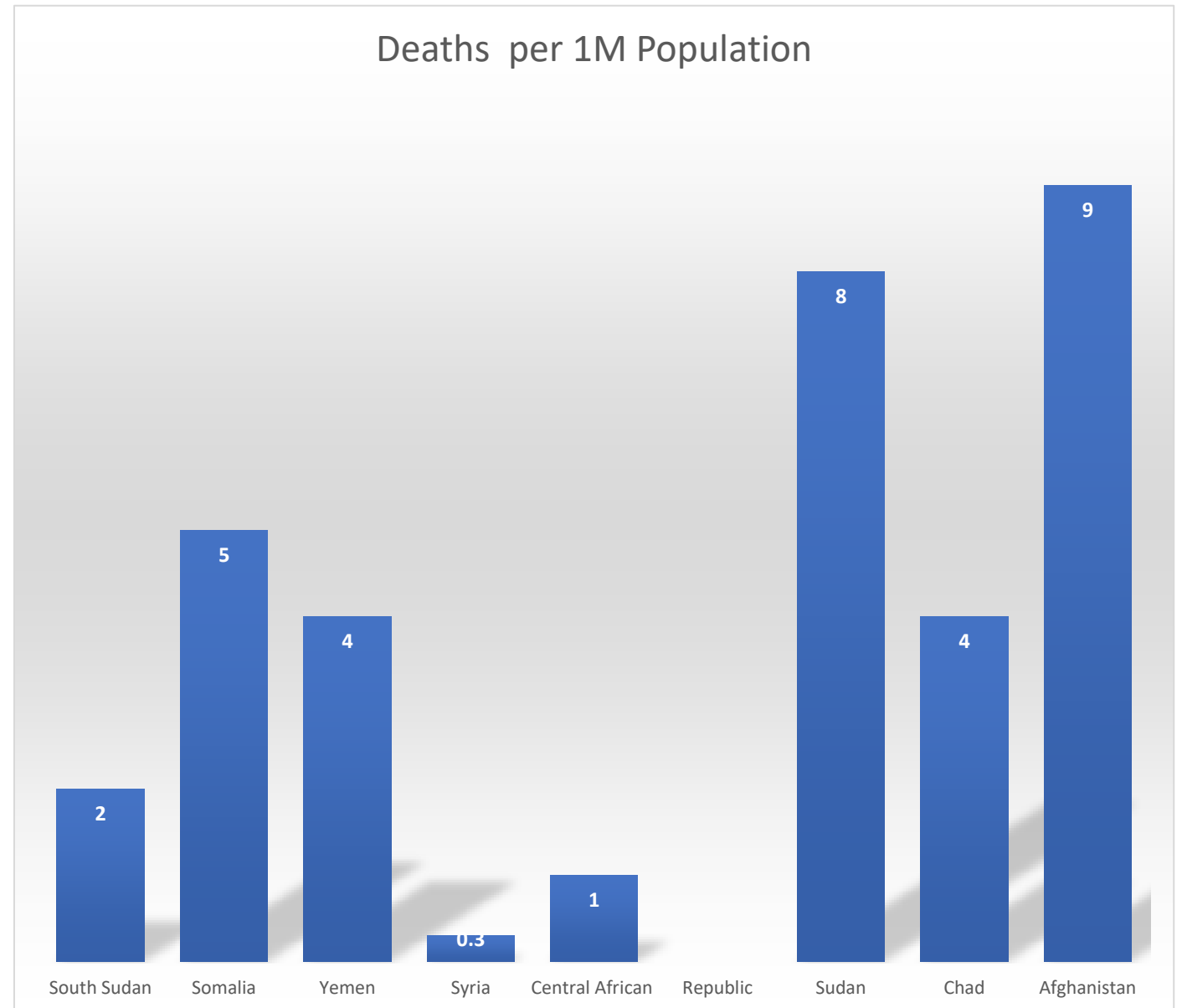
## Assessment of Funding gaps



(Note: South Sudan and Zimbabwe were excluded due to non-availability of data)

## Deaths per million population

- (note: No data were available for DRC)
- (Data as on 8/6/2020, Source: [www.worldometers.info](http://www.worldometers.info))



# CONCLUSIONS

- The countries with high funding gap are having higher number of death per million population
- The reason could be due to unavailability of resources for the treatment.
- DRC and Chad were the only two countries that used the U-report platform
- Afghanistan had the highest number of cases per million population which could be attributed to the fact that they were able to cover only 472000 people with risk communication.
- Community leaders were not involved in Afghanistan for risk communication.
- And even had the highest number of deaths per million population compared to all the countries.
- South Sudan and Sudan needs to improve in terms of laboratory capacity and education system.

# ANNEXURE

[illegible]

**Table 1: COVID-19 Preparedness and Response Status for Countries, Territories, and Areas,<sup>2</sup> as of 6 March 2020**

| Response Category         | Country Preparedness Capacity |                                                      |                            |                    |                    |                 |                                                          |
|---------------------------|-------------------------------|------------------------------------------------------|----------------------------|--------------------|--------------------|-----------------|----------------------------------------------------------|
|                           | Level 5                       |                                                      | Level 4                    |                    | Level 3            |                 | Level 2                                                  |
| 5- Community transmission | China                         |                                                      |                            |                    |                    |                 |                                                          |
| 4- $\geq 10$ cases        | Australia                     | Norway                                               | Algeria                    | Oman               | India              | Iraq            |                                                          |
|                           | Belgium                       | Republic of Korea                                    | Austria                    | San Marion         | Lebanon            |                 |                                                          |
|                           | Canada                        | Singapore                                            | Bahrain                    | Thailand           |                    |                 |                                                          |
|                           | Denmark                       | Spain                                                | France                     | Viet Nam           |                    |                 |                                                          |
|                           | Germany                       | Sweden                                               | Iran (Islamic Republic of) |                    |                    |                 |                                                          |
|                           | Iceland                       | Switzerland                                          | Kuwait                     |                    |                    |                 |                                                          |
|                           | Israel                        | United Arab Emirates                                 |                            |                    |                    |                 |                                                          |
|                           | Italy                         | United Kingdom of Great Britain and Northern Ireland |                            |                    |                    |                 |                                                          |
|                           | Japan                         |                                                      |                            |                    |                    |                 |                                                          |
|                           | Malaysia                      |                                                      |                            |                    |                    |                 |                                                          |
|                           | Netherlands                   | United States of America                             |                            |                    |                    |                 |                                                          |
| 3- $< 10$ cases           | Finland                       | Monaco                                               | Andorra                    | Latvia             | Argentina          | Jordan          | Afghanistan                                              |
|                           | Lithuania                     | New Zeland                                           | Brazil                     | Luxembourg         | Armenia            | Morocco         | Bosnia Herzegovina                                       |
|                           |                               | Portugal                                             | Chile                      | Mexico             | Azerbaijan         | Nepal           | occupied Palestinian territory, including east Jerusalem |
|                           |                               | Slovenia                                             | Croatia                    | Poland             | Belarus            | Nigeria         | Pakistan                                                 |
|                           |                               |                                                      | Czechia                    | Romania            | Cambodia           | North Macedonia | Ukraine                                                  |
|                           |                               |                                                      | Egypt                      | Russian Federation | Dominica           | Philippines     |                                                          |
|                           |                               |                                                      | Estonia                    | Saudi Arabia       | Dominican Republic | Qatar           |                                                          |
|                           |                               |                                                      | Greece                     |                    | Ecuador            | Senegal         |                                                          |
|                           |                               |                                                      | Ireland                    |                    |                    |                 |                                                          |

## Funding Status

| Sector                  | Funding requirements | Funds available  | Funding gap \$   | Gap %      |
|-------------------------|----------------------|------------------|------------------|------------|
| Communication & Hygiene | 1,098,800            | 280,000          | 818,800          | 75%        |
| WASH                    | 1,938,283            | 674,631          | 1,263,652        | 65%        |
| Nutrition               | 1,955,381            | 546,530          | 1,443,976        | 74%        |
| Health & HIV/AIDS       | 1,600,336            | 450,000          | 1,150,336        | 72%        |
| Child Protection        | 1,208,400            | 189,825          | 1,018,575        | 84%        |
| Education               | 1,098,800            | 70,000           | 479,400          | 87%        |
| Cash-based Transfers    | - (*)                | - (*)            | - (*)            | - (*)      |
| <b>Total</b>            | <b>8,900,000</b>     | <b>2,175,861</b> | <b>6,724,139</b> | <b>76%</b> |

*\*Amount to be confirmed (based on the ongoing socio-economic impact assessment and vulnerable household targeting strategy for emergency assistance)*

## Pillar 1: Country-level coordination, planning, and monitoring

National public health emergency management mechanisms should be activated with engagement of relevant ministries such as health, education, travel and tourism, public works, environment, social protection, and agriculture, to provide coordinated management of COVID-19 preparedness and response. NAPHS and PIPPs, if available, should also be adapted to address COVID-19.

| Step | Actions to be taken                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <ul style="list-style-type: none"><li><input type="checkbox"/> Activate multi-sectoral, multi-partner coordination mechanisms to support preparedness and response</li><li><input type="checkbox"/> Engage with national authorities and key partners to develop a country-specific operational plan with estimated resource requirements for COVID-19 preparedness and response, or preferably adapt, where available, an existing <i>Influenza Pandemic Preparedness Plan</i></li><li><input type="checkbox"/> Conduct initial capacity assessment and risk analysis, including mapping of vulnerable populations</li><li><input type="checkbox"/> Begin establishing metrics and monitoring and evaluation systems to assess the effectiveness and impact of planned measures</li></ul> |

# Limitations of the study:

Unavailability of data of all the countries with respect to the information required.

Unavailability of published articles for reference.

# REFERENCES

- DEMOCRATIC REPUBLIC OF CONGO: COVID-19 situation report –05 (10 April 2020 to 17 April 2020 UNICEF)
- Afghanistan (13 April 2020, UNICEF )
- Somalia-covid-19 situation report no. 1(5<sup>th</sup> April 2020,UNICEF)
- Central African republic coronavirus (COVID-19) situation report(UNICEFCAR/2020/A.Frisetti)
- CHAD coronavirus (COVID-19) situation report no. 1 (reporting period: 01 to 15 April 2020, UNICEF)
- Global-covid-19 situation report no. 4 (reporting period: 16 – 30 April 2020, UNICEF)
- Middle east & north Africa region COVID-19 situation report no. 3 (15-30<sup>th</sup> April, UNICEF)
- Somalia COVID-19 situation report no. 4(16-31<sup>st</sup> May 2020,unicef)

- COVID-19 Preparedness and Response for NW-Syria-Situation report (1<sup>st</sup> April, 2020, WHO)
- Somalia-situation Report- 5 (4 -10 April, 2020, WHO)
- Covid-19 strategic preparedness and response plan
- South Sudan weekly covid-19 Situation report (01 - 07 June 2020,IOM)
  
- Somalia Preparedness and Response Plan(5<sup>th</sup> April, IOM)
  
- Zimbabwe situation report (5th June 2020, OCHA)
- Situation report no. 13- (1st May 2020,OCHA)
- Sudan-situation report 17 (April 2020,OCHA)
- ZIMBABWE -situation report (6 may 2020,OCHA)

Part-2

Online course



*Name of the course:-*

*Epidemiology: The Basic Science  
of Public Health*

Course provider: "Coursera.org"

Learning methodology used in the course:

Videos, quizzes and reading materials from various published papers and journals.

The bottom of the slide features two overlapping blue rectangular shapes. The shape on the left is a solid blue rectangle. The shape on the right is a slightly offset blue rectangle that appears to be layered behind the first one, creating a 3D effect with a dark blue shadow on its left side.

## Definition :

*“Epidemiology is the study of the distribution of health outcomes or disease within the populations and the factors that determine the spread of the health outcome and the disease”.*

## History of epidemiology:

- ⇒ **1950**- focus was on the infectious diseases and the specific conditions that are associated with them.
- ⇒ **1960**- focus was on the laws of the spread of the diseases at the community level.
- 1980**- focus was in controlling and minimizing the health problems and the diseases

# Epidemiological transitions:

Describes the changing patterns of populations, age distributions, mortality, fertility, life-expectancy and causes of death.

*First transition* was related to infectious diseases and the diseases that are associated with nutrition

- People learnt how to domesticate animals for food and this result in increased zoonotic diseases.
- The agricultural activities resulted in increased contact with disease causing vectors.

*Second transition* was where the body's immune system and disease-causing organisms both started to evolve.

- This changed the disease epidemics to endemic.
- Due to physical and genetic changes the effects of the disease got minimized

- *In Third transition* the disease pattern changed from infectious diseases to chronic and degenerative diseases due to improved nutrition, better public health and clinical medicine.
  - People started to have more sedentary lifestyles in this era which caused more Cardiovascular diseases and cancer among people.
- *The fourth transition* started in 20<sup>th</sup> century where globalization started.
  - During this time both the new disease as well as the infectious diseases occurred.
  - The infectious disease re-emerged and there was rapid spread of this infectious diseases.

# Pioneers of epidemiology:

The bottom of the slide features a decorative graphic consisting of two overlapping blue rectangular blocks. The block on the left is a solid medium blue. The block on the right is a slightly darker blue and is positioned behind the first one, creating a layered effect. The top edges of these blocks are slightly irregular, giving the impression of stacked papers or a modern architectural design.

- *Hippocrates*-A Greek physician who thought about rational explanation about disease rather than supernatural explanations.
- He described the periodicity of the malarial parasite and the malarial paroxysm.
- *Girolamo Fracastoro*(an Italian Physician) described that the disease can be transmitted through contact, air and contaminated clothing.
- *John Graunt* was the first demographer who contributed to epidemiology.
- His statistical and census methods became the basis of modern demography
- *James Lind* was a Scottish physician who took interest in the cause and treatment of scurvy.
- *Percivall Pott* was the first person who showed the relationship between environmental carcinogen and cancer
- *William Farr* took statistical data and tested social hypothesis. He demonstrated the “relationship between population density and mortality rates.
- *Edwin Chadwick* studied about the issues with sanitation in the United Kingdom.
- He supported the idea about “the association between the disease conditions and the people’s living conditions and there was a strong need for both public and social reform.”
- *John Snow* known as the Father of modern epidemiology was the first person to investigate the outbreak in London in 1854.

- *Primary prevention*: It is the prevention done before the occurrence of the disease or health outcome
- *Secondary prevention*: It is done after the occurrence of a disease but before the symptoms are noticed by the person.
- *Tertiary prevention*: It happens after the person has already contracted the disease and with the symptoms.
- Tertiary prevention aims to prevent further damage and reduce pain from the disease.

## Three levels of public health preventions

## **Descriptive vs Analytic epidemiology**

- Descriptive epidemiology simply refers to the distribution of the pattern of disease or health outcome in a population.
- Analytic epidemiology aims to study research and risk factors and preventive factors of the disease.

| <b>Descriptive Epidemiology</b>                                  | <b>Analytic Epidemiology</b>                                         |
|------------------------------------------------------------------|----------------------------------------------------------------------|
| Generate Hypothesis                                              | Test Hypothesis                                                      |
| Answer what, who, where and when                                 | Answer why and how                                                   |
| Types: Aggregate and individual                                  | Experimental and observational                                       |
| e.g. ecological, case report, case series, cross-sectional study | e.g. Randomized control trial, cohort, case control, cross-sectional |

# Measures of disease frequency

## **Prevalence**

- Prevalent cases are existing cases of a disease.
- Prevalence is a *proportion*.

## **Risk**

- Risk measures the new and the incident cases of the health outcome
- that is developed among the people in a population at risk over a specified time period.

## **Rates**

- Rate is not a proportion because it does not have a fixed *denominator*.
- Can be used for a *dynamic population*.
- Risk population change *due to birth, death or migration*

## **Odds**

- It is the ratio of probability that the disease will occur to the probability the disease will not occur.
- Odds are easy to calculate and interpret.



# EXPERIMENTAL STUDY DESIGNS

- Randomized control trials:
  - Randomization gives the strongest evidence for causal inference.
  - Randomization is done by chance and helps to reduce biases.
- Clinical crossover
  - Switching of subjects from one treatment to another after a period of time is called clinical crossover.

# Observational designs

- **Case-control**

- Case control studies are efficient, and the most common study design used to study rare diseases.
- *Cases* are the diseased individuals or individuals with the health outcome that we are interested in.
- *Controls* are the individuals without the diseases. Case-control proceeds from effect to outcome

- **Cohort**

- In cohort study, researchers follow the population at risk over a period of time and evaluate the exposure and finds out the risk or rate of disease or health outcome.
- A cohort study can be done for rare exposure because it is not convenient to identify and assemble group of persons who have an uncommon exposure

- **Ecological**

- In ecologic study exposure and health outcome data are collected at a group level.
- Group level data averages the exposure of the group and not individual.
- In this study we know only know the health outcome of the group and not individuals

- **Cross-sectional**

- Exposure and outcome are assessed at the same point in time within the specific study population.
- In cross sectional study we include all the prevalent cases in the numerator while in the denominator we include both the prevalent and non-cases.

# Measures of association

| Risk ratio                                                           | Rate ratio                                                                                                 | Odds ratio | Prevalence ratio                                                                      |
|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|------------|---------------------------------------------------------------------------------------|
| Quantifies a population's risk of disease from a particular exposure | Compares the rates of disease in two groups that differ by demographic characteristics or exposure history |            | PR= Prevalence of disease in exposed group / Prevalence of disease in unexposed group |
| Risk in the exposed group / Risk in the unexposed group              | Rate for group of primary interest / Rate for comparison group                                             |            | PR= $a/(a+b) / c/(c+d)$                                                               |
|                                                                      |                                                                                                            |            |                                                                                       |

# INTRODUCTION TO CAUSALITY

Given by Rothman and Greenland in American Journal of Public Health  
2005- “an event, condition or characteristics that preceded the outcome  
or disease event and without which the event either would have not  
occurred at all or would have not occurred until some later time.”

# Bradford Hill Criteria

- Sir Austin Bradford Hill, an epidemiologist and statistician identified nine factors that determine causality.
- Hill's Criteria is not a checklist for causality but should only be used as a guideline
- The first criterion is "*strength of association*" between the exposure and outcome of interest.
- The strength of association is measured via risk ratios, rate ratios and odds ratios
- Strong associations occur when exposure is a strong risk factor and there are other risk factors for the disease.
- "*Consistency*" refers to the situation where the study results of various populations and situations can be reproduced

- “*Specificity of association*” is when one risk factor is related consistently to a single effect, then it is likely to be play the causal role
- “*Temporality*” is the weakest guideline among all.
- For an exposure to be causal its presence must preceed the development of the outcome.
- The “*Biological gradient*” criterion is dose depended.
- It suggests that higher the dose higher is the risk of diseases.
- “*Coherence*” is providing evidence against causality. In coherence there should not be any new data that could oppose the evidence

- *Experimental evidences* are the outcomes which are collected from various areas such as laboratory, epidemiologic studies, preventive and clinical trials
- *Analogy* is when a factor is suspected of causing an effect.
- We should also consider the other factors which are similar or analogous to the suspected cause.
- It should either be considered as a possible cause or otherwise should be eliminated from the study



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Submitted by

DIBYALOSON  
RABHA

MBA-Hospital and  
Health  
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Roll No.: -0909

Batch-24(2019-21)