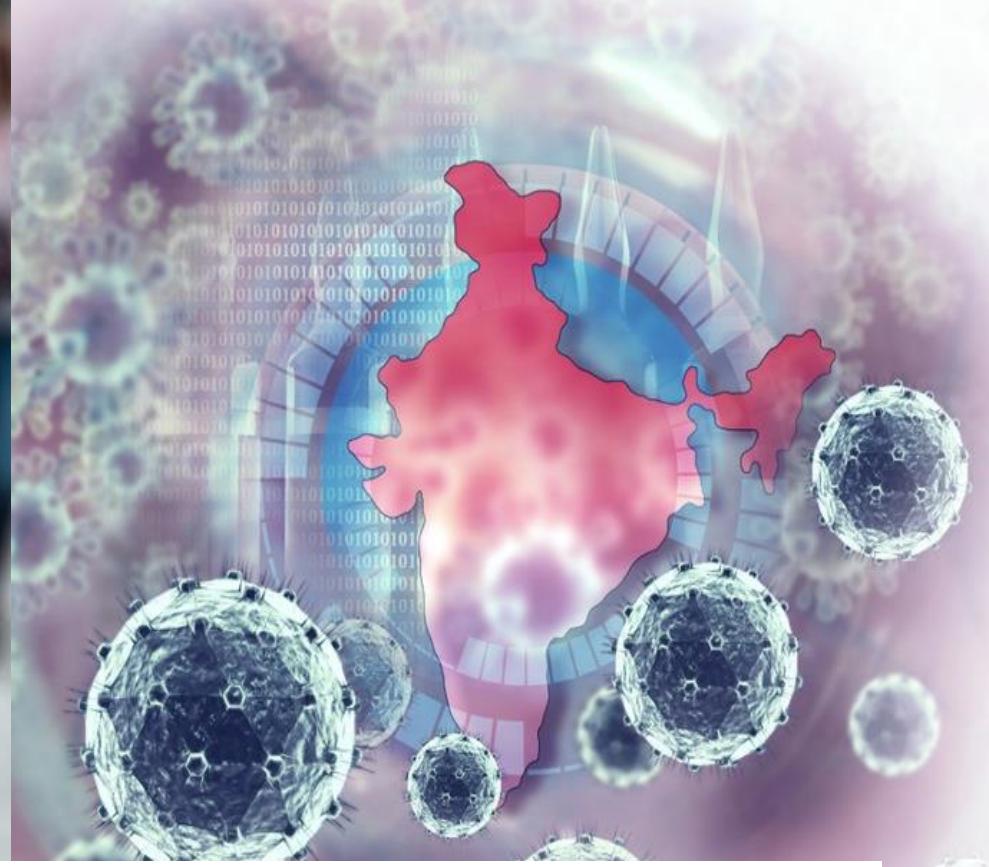

Knowledge, Attitude and Perceived Effectiveness about Social Distancing during COVID-19

- a survey based research project

Presented and Authored by:

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Guided by:

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IIHMR UNIVERSITY®

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Overview

- Social distancing has proven to be the need of hour to break the chain of transmission of the pandemic novel coronavirus.
- This research paper focused on studying the **awareness and attitude of the people pertaining to social distancing** in controlling the spread of novel coronavirus 2019 and studying the **barriers in implementing social distancing** strategies in India.
- Study design: **Observational study**
- Sampling method: **Convenience Sampling**.
- Statistical analysis and interpretation of data collected, is done using **Ms Excel and graphs**.
- The results showed a **high level of awareness and moderate level of willingness in attitude** among the participants about the novel coronavirus infection. A moderate number of respondents were facing **issues regarding their mental health**.
- In conclusion, there were **pros and cons** identified in the **preventive strategies** adopted by the government, few issues were stressed upon and certain **proposals** were made for **effective implementation of social distancing** and other preventive strategies.

Keywords: **Social distancing, COVID-19, awareness, attitude, barriers, S.W.O.T. Analysis**

Key Elements

Introduction

Materials and Methods

Key Findings

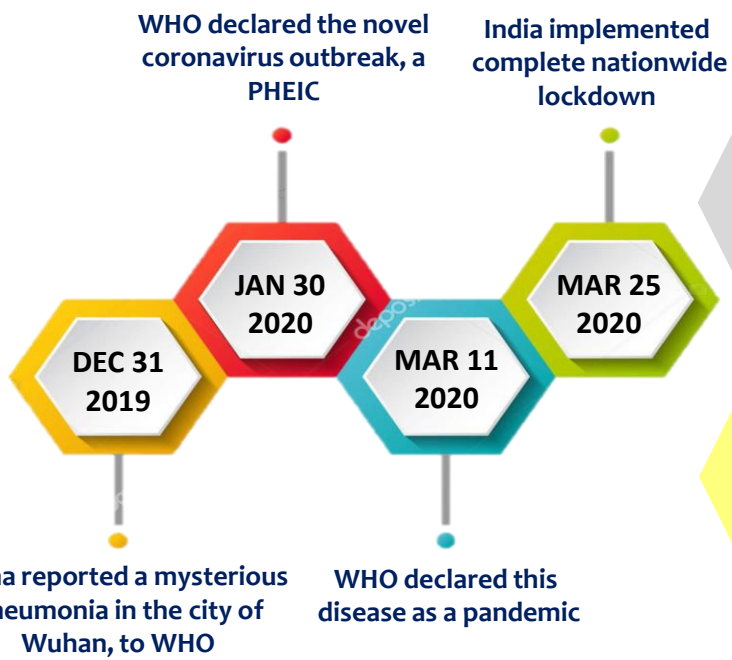
Discussion and Conclusion

References

Introduction

COVID-19 **transmits through droplets** when an infected person coughs within **1 meter** of range to another person or on any object or surface followed by touching eyes, nose or mouth by the one who touches that object.

Social distancing is the need of hour to **break the chain of transmission** of novel coronavirus. So, it is essential to understand the **awareness, perception and attitude** of the people towards this approach.



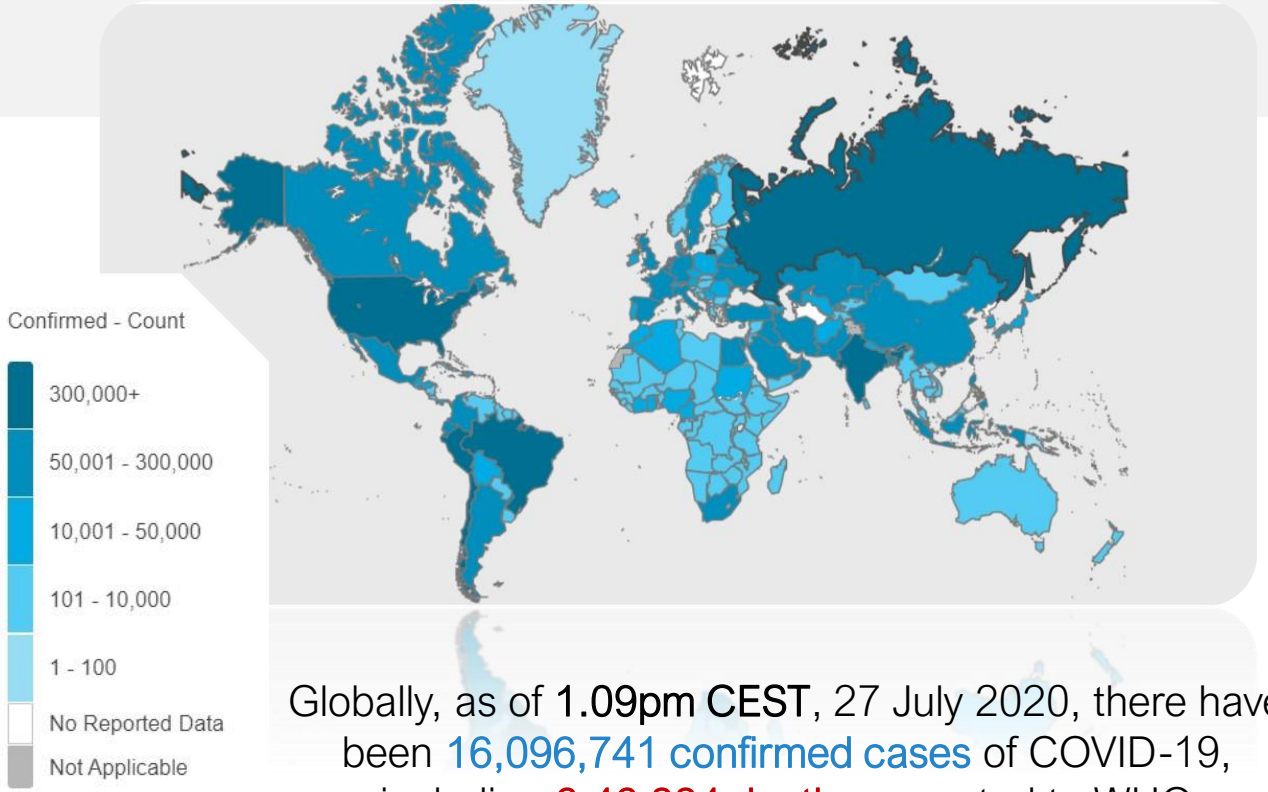
COVID-19 Synopsis

Study Objective

Study Background

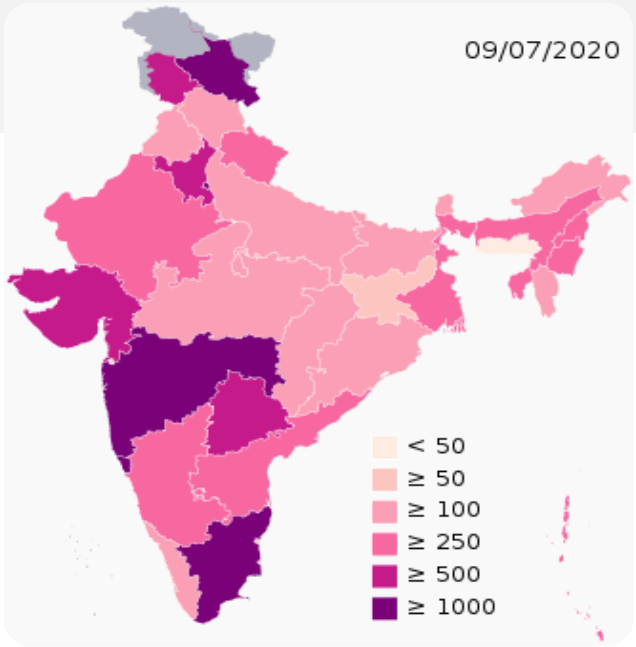
The global scenario of the infection

Cases worldwide



Globally, as of **1.09pm CEST**, 27 July 2020, there have been 16,096,741 confirmed cases of COVID-19, including 6,46,384 deaths, reported to WHO

Cases in India



As of **08:00 IST**, 27 July 2020, there have been 14,66,059 confirmed cases of COVID-19, including 33,129 deaths in India, reported to MoHFW

Study Objective

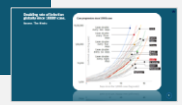
To study the awareness of people to follow social distancing in combating the spread of COVID-19

To observe the attitude of the people pertaining to social distancing in controlling the spread of novel coronavirus 2019.

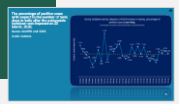
To find out the barriers in implementing social distancing strategies in an over - populated country like India.

Study Background

A report cited by The Hindu, reported that the doubling rate of infection in USA is nearly 4 days that is faster in comparison to that of India.



A report from MoHFW and ICMR suggested that the percentage of positive cases is not increasing with a 24 fold increase in the number of tests done in India after the nationwide lockdown.



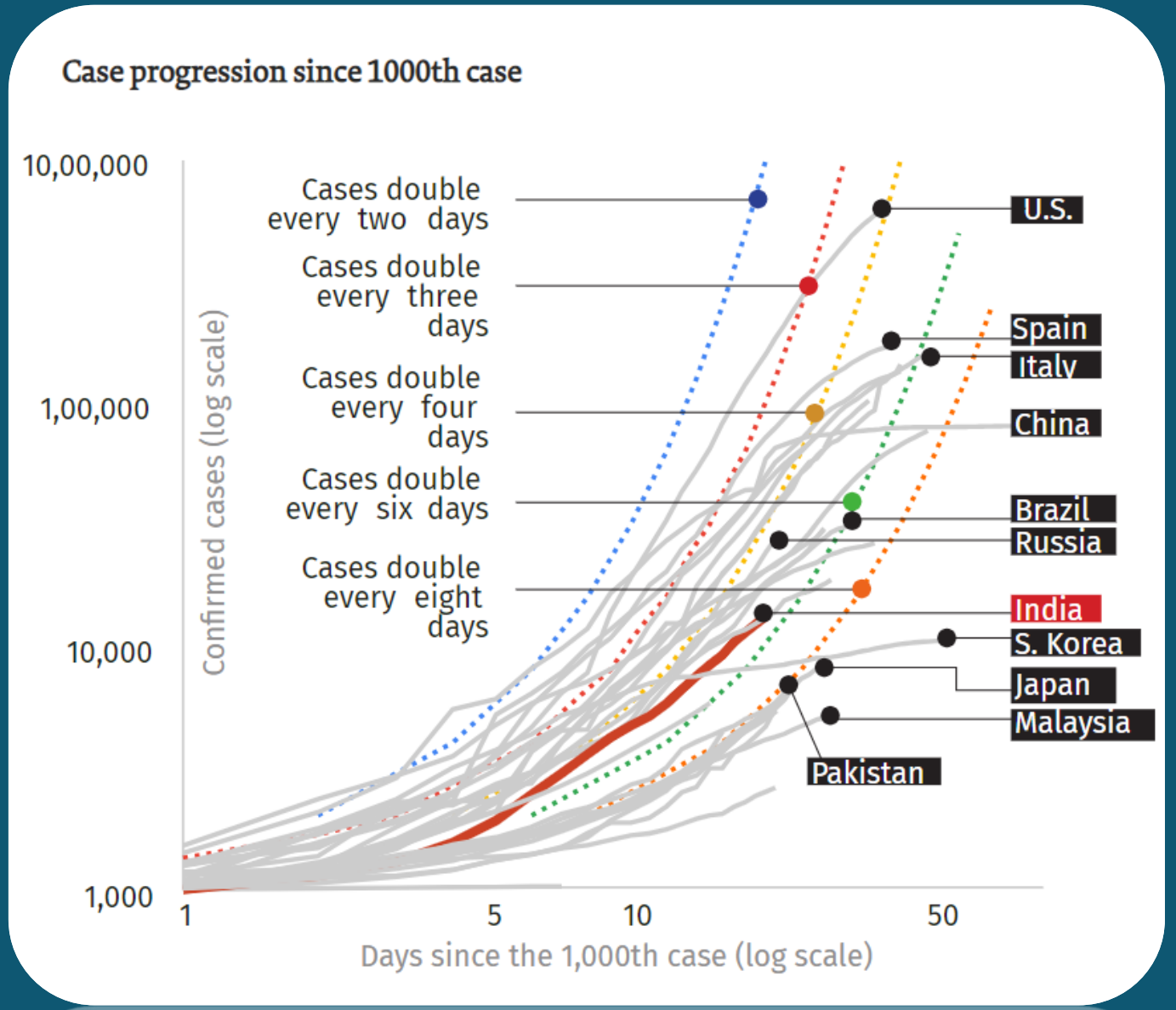
A study conducted by Rick Nunes-Vaz shows that the doubling time is more in Republic of Korea and Japan, as compared to Italy, USA, UK and Australia due to very strict isolation strategies in the former.

Indian authors Singh and Adhikari said that the peak of infection would have raised to 0.9 million in 114 days if there were no lockdown measures implemented, since March 25, 2020

A study by Joel Koo et.al suggested that quarantine, closure of schools and workplace distancing were effective to great extent to reduce the number of infections, in comparison to the scenario with no intervention.

Doubling rate of infection globally since 1000th case.

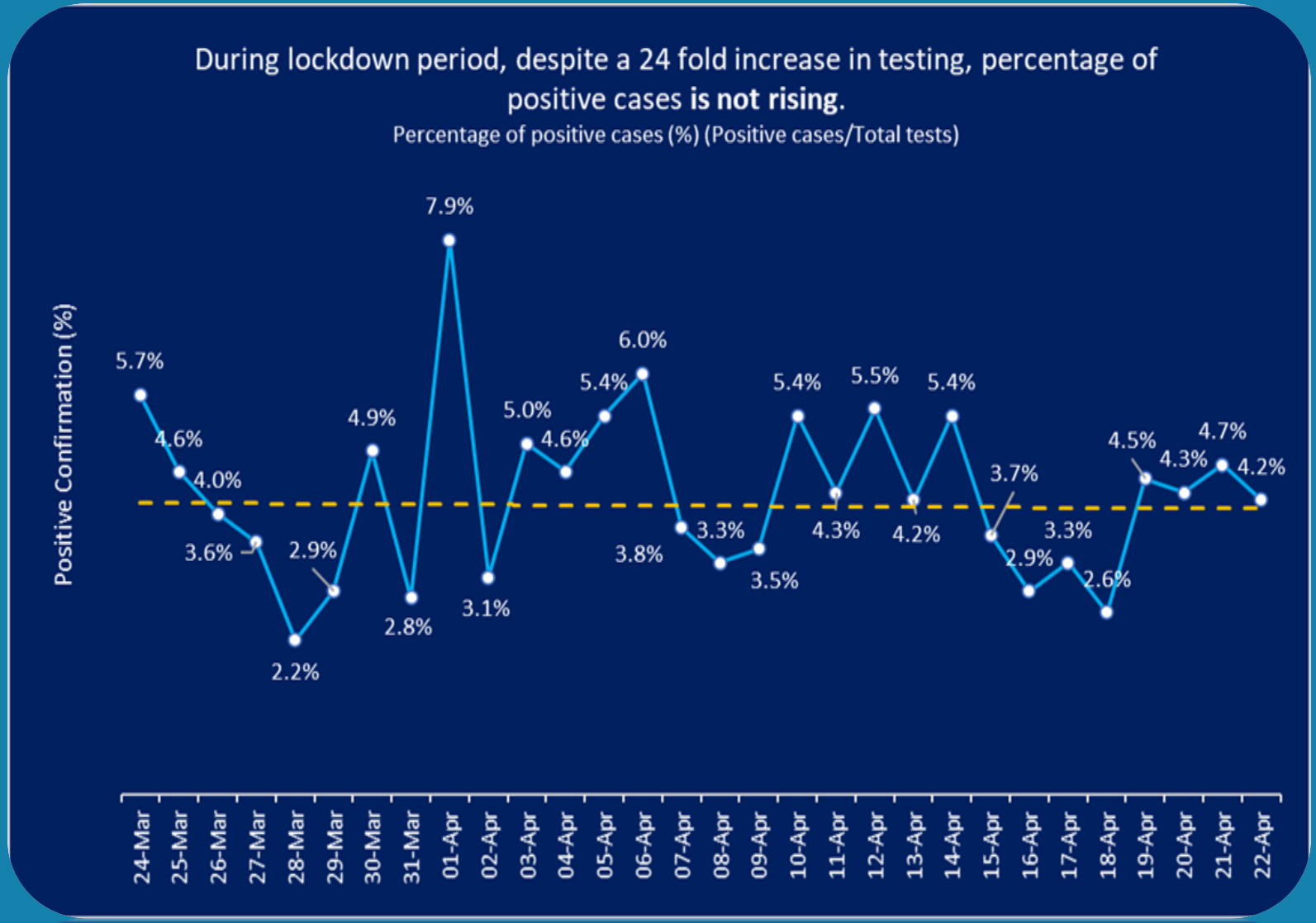
Source. The Hindu



The percentage of positive cases with respect to the number of tests done in India after the nationwide lockdown was imposed on 25 March, 2020.

Source: MoHFW and ICMR.

Credit. inshorts



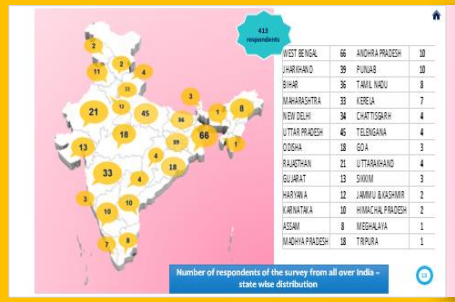
Materials and Methods

Type of study: Observational study
Study area: Population from different states of India
Study participants: Above 18 years of age who can give consent for themselves with an ability to read and write English having an active internet connection and having a basic knowledge about healthcare.
Sampling technique: Convenience sampling (Non-probability sampling)
Sample size: 384
Data collection tool: Google forms.
Mode of data collection:

- Primary data - online questionnaire survey, created using google forms
- Secondary data - PubMed, ResearchGate and Google Scholar. Websites of WHO, CDC and MoHFW

Analysis and interpretation:

- ✓ Basic statistical tools like mean, percentage distribution, and standard deviation.
- ✓ Graphical representations to represent the results.



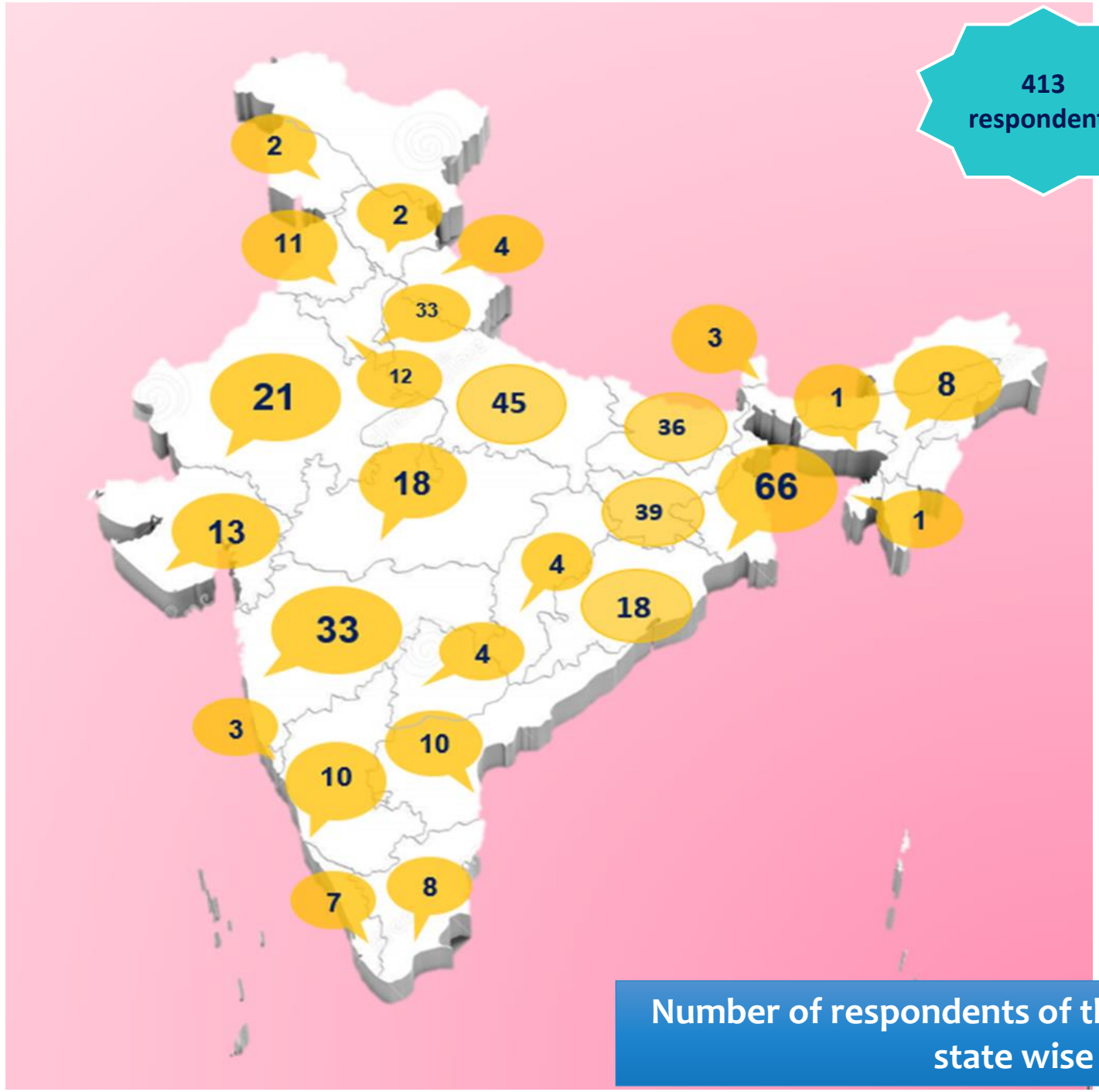
There were 413 respondents from 24 states and 2 union territories of India. 1 of them chose to exit the survey.
Out of the 412 participants, 52% were female and remaining 48% were male.
The average age of the participants was 28.26 years.

Equation 1: Shows sample size (N) calculation for a target population of more than 10,000, taking confidence interval (C.I.) as 95% i.e. Z value= 1.96; the proportion of population, p = 50% or 0.5, q = (1-p); degree of accuracy, d = 0.05.
The number of non-respondents were taken to be 10% for the calculation of final sample size (N_f).

$$N = \frac{z^2 pq}{d^2} = \frac{(1.96)^2 \, X \, 0.5 \, X \, (1-0.5)}{(0.05)^2} = \mathbf{384.14}$$

$$N_f = \frac{\text{Effective sample size}}{(1-\text{non response rate anticipated})} = \frac{384.14}{1-0.1}$$

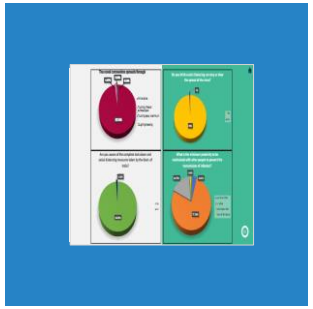
$$= \mathbf{427}$$



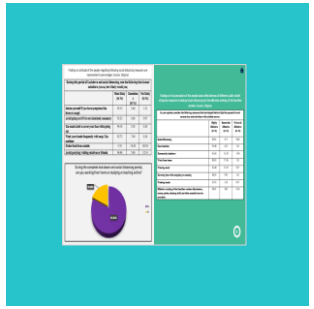
WEST BENGAL	66	ANDHRA PRADESH	10
JHARKHAND	39	PUNJAB	10
BIHAR	36	TAMIL NADU	8
MAHARASHTRA	33	KERELA	7
NEW DELHI	34	CHATTISGARH	4
UTTAR PRADESH	45	TELENGANA	4
ODISHA	18	GOA	3
RAJASTHAN	21	UTTARAKHAND	4
GUJARAT	13	SIKKIM	3
HARYANA	12	JAMMU & KASHMIR	2
KARNATAKA	10	HIMACHAL PRADESH	2
ASSAM	8	MEGHALAYA	1
MADHYA PRADESH	18	TRIPURA	1

Number of respondents of the survey from all over India – state wise distribution

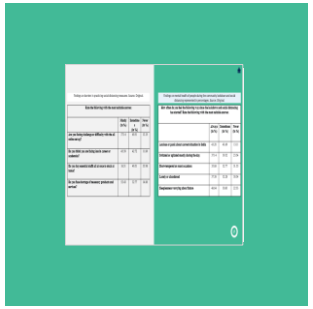
Key Findings



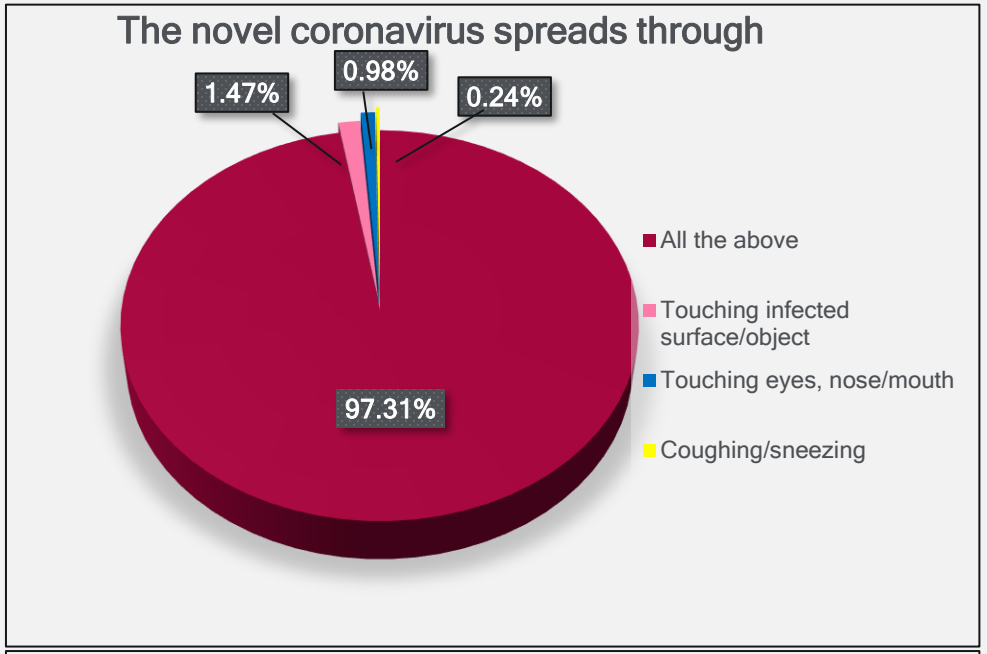
Awareness Section

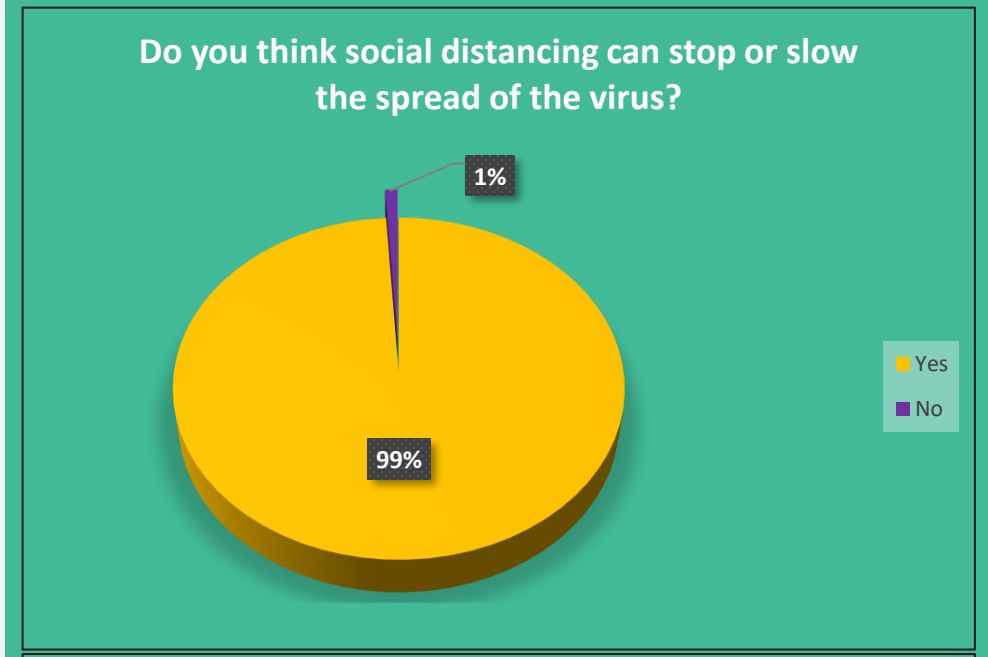


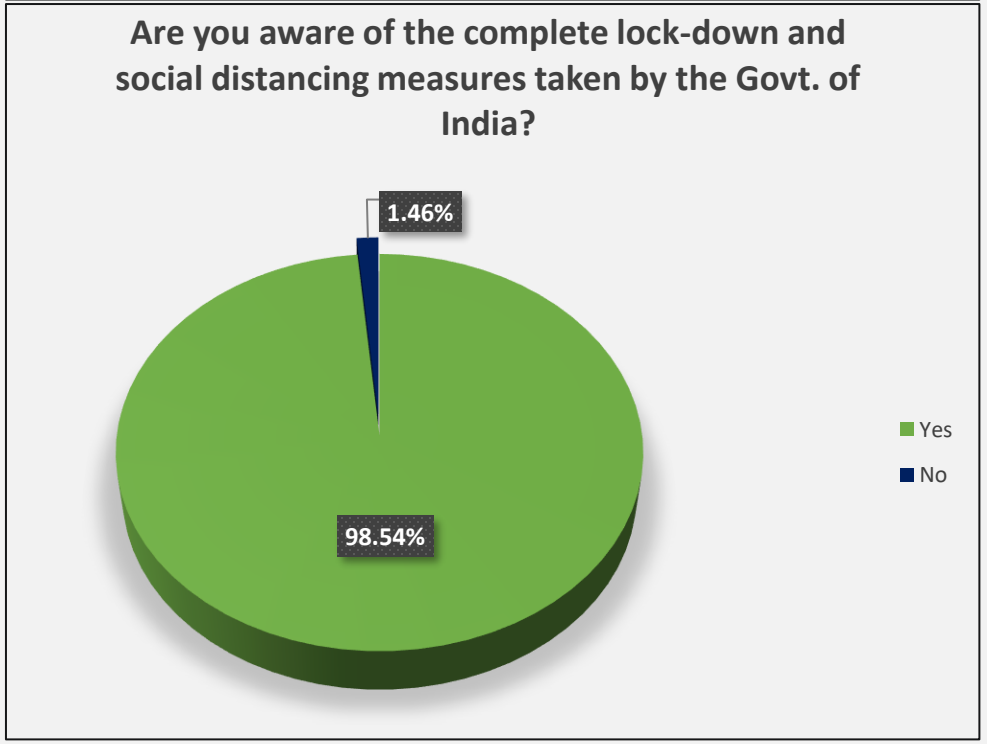
Attitude Section

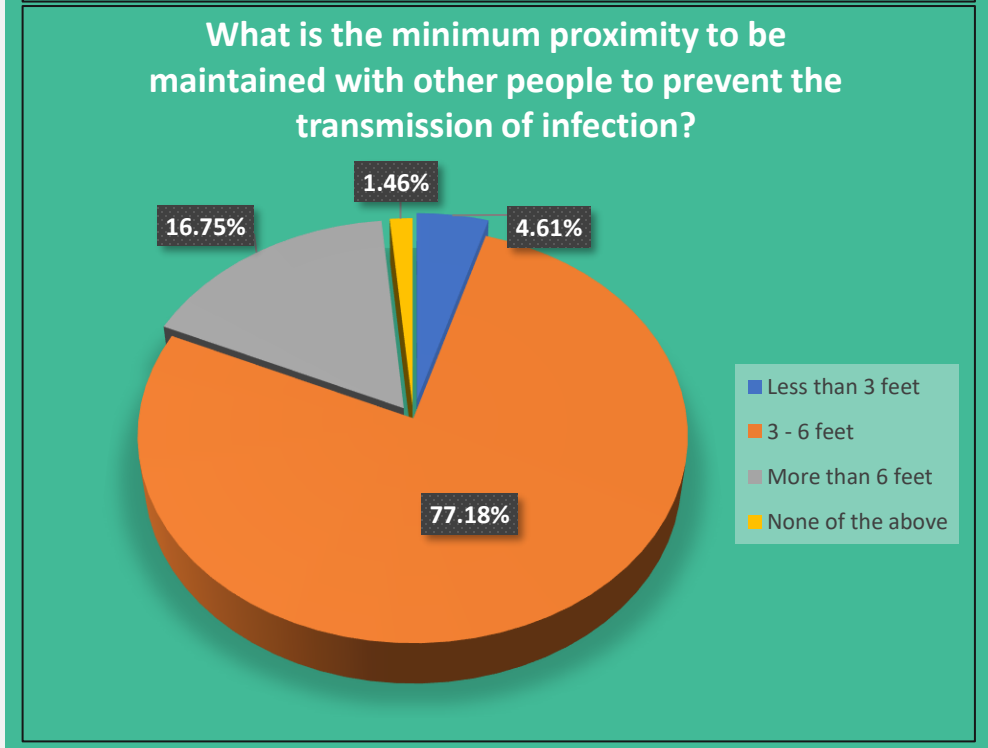


Barrier Section


The novel coronavirus spreads through
1.47%
0.98%
0.24%
97.31%
All the above
Touching infected surface/object
Touching eyes, nose/mouth
Coughing/sneezing

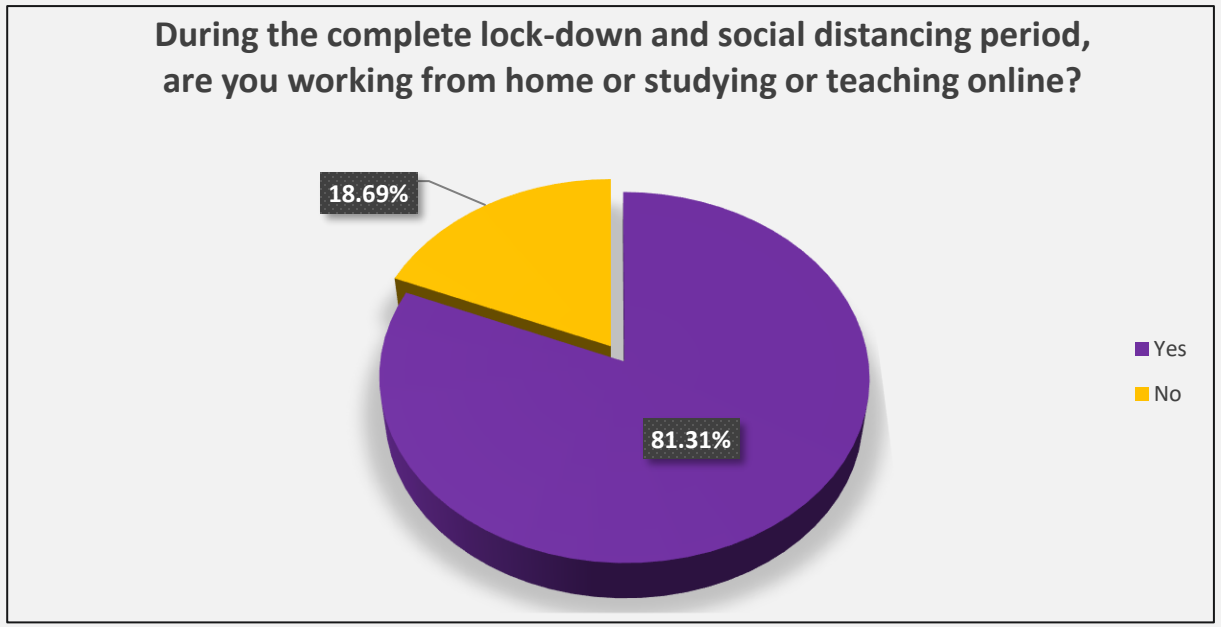

Do you think social distancing can stop or slow the spread of the virus?
1%
99%
Yes
No


Are you aware of the complete lock-down and social distancing measures taken by the Govt. of India?
1.46%
98.54%
Yes
No


What is the minimum proximity to be maintained with other people to prevent the transmission of infection?
1.46%
16.75%
4.61%
77.18%
Less than 3 feet
3 - 6 feet
More than 6 feet
None of the above

Findings on attitude of the people regarding following social distancing measures are represented in percentages. Source. Original.

During this period of Lockdown and social distancing, rate the following that is most suitable to you as, how likely would you;			
	Most likely (in %)	Sometimes (in %)	Not likely (in %)
Isolate yourself if you have symptoms like fever or cough	95.15	3.64	1.21
Avoid going out if it is not absolutely necessary	92.23	6.80	0.97
Use mask/cloth to cover your face while going out	94.18	5.58	0.24
Wash your hands frequently with soap/ Use sanitizer	92.72	7.04	0.24
Order food from outside	5.10	14.56	80.34
Avoid partying/ visiting relatives or friends	84.46	3.40	12.14



Findings on the perception of the people about effectiveness of different public health mitigation measures including Social distancing and the effective working of the frontline workers. Source. Original.

In your opinion, consider the following measures that has helped India to fight the spread of novel coronavirus and rate them with suitable answer.			
	Highly Effective (in %)	Somewhat Effective (in %)	Not at all Effective (in %)
Social Distancing	89.81	9.71	0.48
Case Isolation	92.48	6.31	1.21
Community lockdown	85.68	12.38	1.94
Work from home	80.83	17.96	1.21
Wearing mask	85.44	13.59	0.97
Covering face while coughing or sneezing	88.83	9.95	1.21
Washing hands	93.93	5.10	0.97
Effective working of the frontline workers like doctors, nurses, police, cleaning staff, and other essential service providers	94.91	4.85	0.24

Findings on barriers in practicing social distancing measures. Source. Original.

Rate the following with the most suitable answer.			
	Mostly (in %)	**Sometimes (in %)**	**Never (in %)**
Are you facing challenge or difficulty with the all online set up?	37.14	49.51	13.35
Do you think you are facing loss in career or academics?	45.39	42.72	11.89
Do you buy essential stuffs all at once to stock at home?	16.51	49.51	33.98
Do you face shortage of necessary products and services?	52.43	32.77	14.80

Findings on mental health of people during the community lockdown and social distancing represented in percentages. Source. Original.

How often do you feel the following way since the lockdown and social distancing has started? Rate the following with the most suitable answer.			
	Always (in %)	**Sometimes (in %)**	**Never (in %)**
Anxious or panic about current situation in India	43.20	43.69	13.11
Irritated or agitated mostly during the day	37.14	39.32	23.54
Short-tempered on most occasions	35.68	32.77	31.55
Lonely or abandoned	37.38	32.28	30.34
Sleeplessness worrying about future	46.84	30.83	22.33

S.W.O.T. Analysis of Social Distancing in light of COVID-19

Discussion

STRENGTHS

- **Reduced incidence rates** of cases infected with COVID-19.
- **Reduced case fatality rates** and adequate time to build herd immunity.
- Increased and **focussed action from response groups** and task forces.
- **Rapid testing** and proper surveillance in hotspot areas.
- **Adequate time for contact tracing** from confirmed cases.
- A **barrier to community transmission** by timely case isolation.
- **Adequate number of frontline workers** to give qualitative service to already infected cases.
- Healthcare and **hospital facilities available to critical patients**, which would have been a challenge to provide if there would have been a burst of new cases.

WEAKNESSES

- **Negative impact on the mental health** of the people.
- **Panic hoarding** of essential goods and products resulting in scarcity and unavailability of these to the masses.
- **Negative impact on country's economy** and share markets if continued for a prolonged period.
- Large **uncertainty regarding the relative risk of the infection** and the case fatality ratios.
- **Mild, asymptomatic** and those who are in incubation period might go **undetected**, posing a risk of community transmission.
- **Supply chains of essential products** and services like masks, PPE kits, sanitizers, rapid testing kits etc. and the response group capacity might **get exhausted** in long run.

OPPORTUNITIES

- Social distancing and lockdown measures might contain the spread of the infection, resulting in **limited transmission of the infection.**
- The limited transmission can **revive the country's economy** much faster and open doors for exports in trade.
- **Adequate time for increased surveillance and extensive research work**, provides opportunity to develop vaccines and medicines at a faster rate with a better knowledge about the novel coronavirus.

THREATS

- **Social, economic and political disruption** of country if social distancing and lockdown measures are continued for a prolonged time.
- Huge **setback to the globalised trade sector** involving several countries most of which are badly affected by the pandemic.
- **Imports from countries like China** who have not yet proved to have contained the infection can pose **a threat** by causing resurgence of new cases.
- **Increased fear** leading to **increased violence and stigmatisation** against frontline workers.
- A deteriorated economy will increase poverty, unemployment and hunger, leading to **increased crimes and violence.**

Conclusion

Key Issues

ONE:

VIOLENCE AND STIGMATIZATION

TWO:

PANIC BUYING

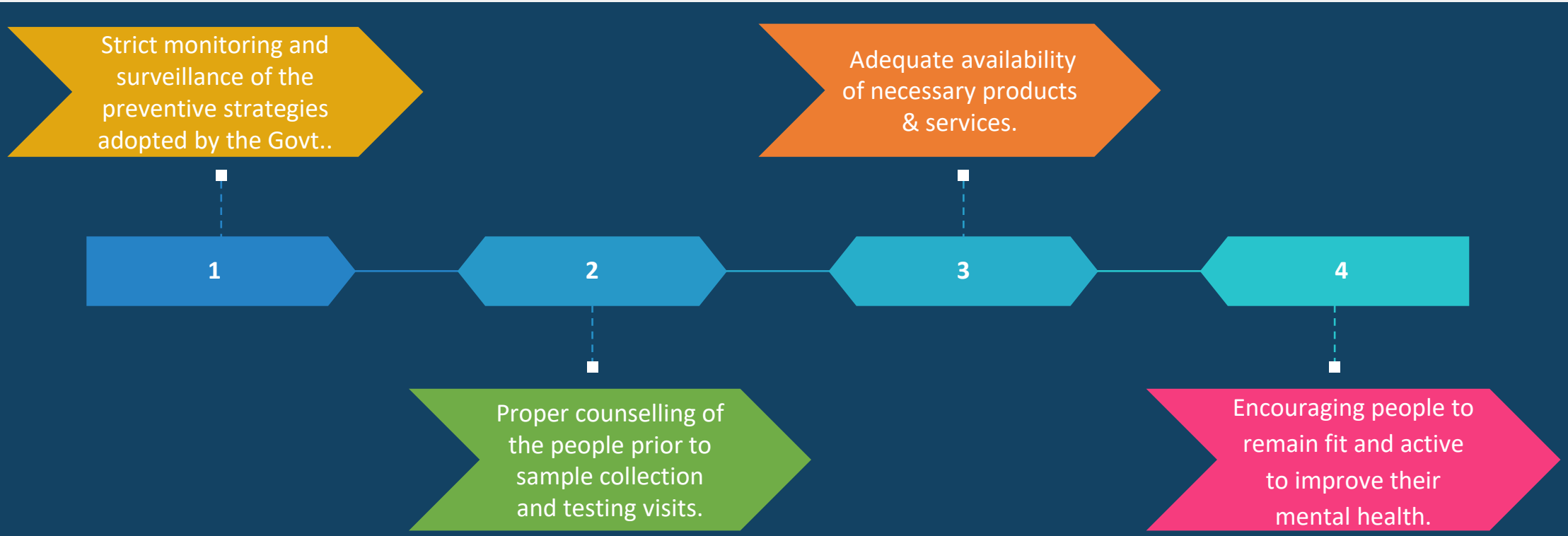
THREE:

GAPS IN MONITORING AND SURVEILLANCE

FOUR:

POOR MENTAL HEALTH STATUS

Proposals


Strict monitoring and surveillance of the preventive strategies adopted by the Govt..
Adequate availability of necessary products & services.
1
2
3
4
Proper counselling of the people prior to sample collection and testing visits.
Encouraging people to remain fit and active to improve their mental health.

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7. (n.d.). Retrieved from https://en.wikipedia.org/wiki/Template:2019percentE2percent80percent9320_coronavirus_pandemic_data

Questions are welcome.

Thank You

HYPOTHESIS TESTING IN PUBLIC HEALTH

An online course based report

Offered by: JOHN HOPKINS UNIVERSITY (Coursera)

Instructed by: JOHN MCGREADY
PHD, MS(BIOSTATISTICS)
BLOOMBERG SCHOOL OF PUBLIC HEALTH

Presented and Authored by:
Dr. NABANITA MUKHERJEE
Guided by:
Mr. ARINDAM DAS (Mentor)

IIHMR UNIVERSITY

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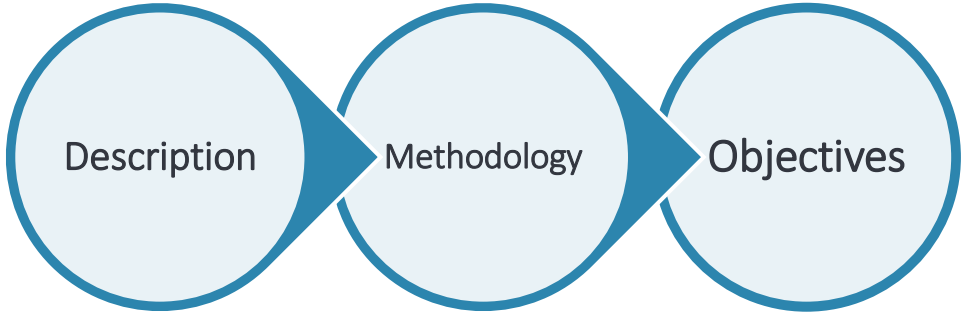
Introduction



Description

- Biostatistics is an essential skill for every public health researcher because it provides a set of precise methods for extracting meaningful conclusions from data.
- Value addition to skill set in performing different kinds of research in field of healthcare.
- In this course of Hypothesis testing, I have learnt to evaluate sample variability and apply statistical testing methods.
- Along the journey of this course, I have performed calculations and interpretation of real-world data from the published scientific literature.

Methodology

Duration:

The course is of total 19 hours duration.

Learning methodology:

Lectures,
PPTs,
Videos,
Assignments, and
Graded quizzes.

Objectives

- To learn about sample statistics, sampling distribution and central limit theorem.
- To learn about confidence intervals, the need for ample size of data, and ways to get around the need for ample size of data.
- To learn statistical hypothesis test, confidence intervals and, p-values.
- To learn about comparing proportions and incidence rates between two populations.

COURSE CONTENTS

WEEK 1

- Sampling distribution definition.
- Examples of Sampling Distribution with Single mean
- Examples of Sampling Distribution for a Single Proportion, Incidence rate.
- Estimating Sampling Distribution characteristics from single samples of data.

WEEK 2

- Confidence Intervals for single Population parameters.
- Confidence Intervals for Population Proportions and Incidence Rates
- Computing and interpreting confidence intervals for binary comparisons - Odds Ratio
- Confidence interval for population quantities of small sample.

WEEK 3

- Hypothesis Testing: The General Concept, and for Comparing Means Between Two Populations
- Hypothesis Testing: The paired approach
- Hypothesis Testing: The unpaired approach
- Brief note on p-value and types of errors

WEEK 4

- Hypothesis Testing: The z-test approach
- Hypothesis Testing: Chi-Square and Fisher's Exact Test Approaches
- Hypothesis Tests for Comparing Incidence Rates of more than Two Populations - ANOVA, chi-square and log scale tests.

Definitions

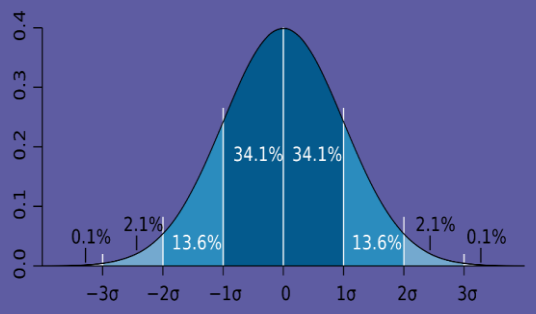
Sampling distribution

$$\bar{X} \sim \mathrm{N}\left(\mu, \frac{\sigma^2}{n}\right)$$

The distribution of a sample statistic "$\bar{X}$" derived from a random sample of sample size "n" from a sample population of "N" mean "μ" and variance "σ^2", is referred to as the sampling distribution of that sample statistic.

Standard deviation

The standard deviation "σ " in a statistic is the measure of deviation from the predetermined set of values.



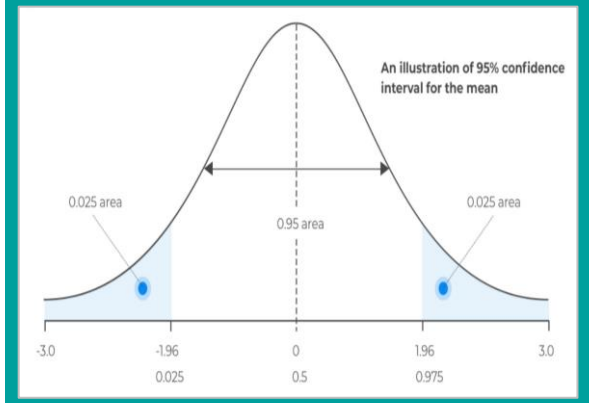
Standard error

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

The standard deviation measured for a sampling distribution, is referred to as the standard error of that distribution, taking arithmetic mean for each sample as " $\bar{x}$ "

Confidence Interval

A confidence interval refers to the probability that a population parameter will fall between two set values for a certain proportion of times. Confidence intervals measure the degree of uncertainty or certainty in a sampling method.

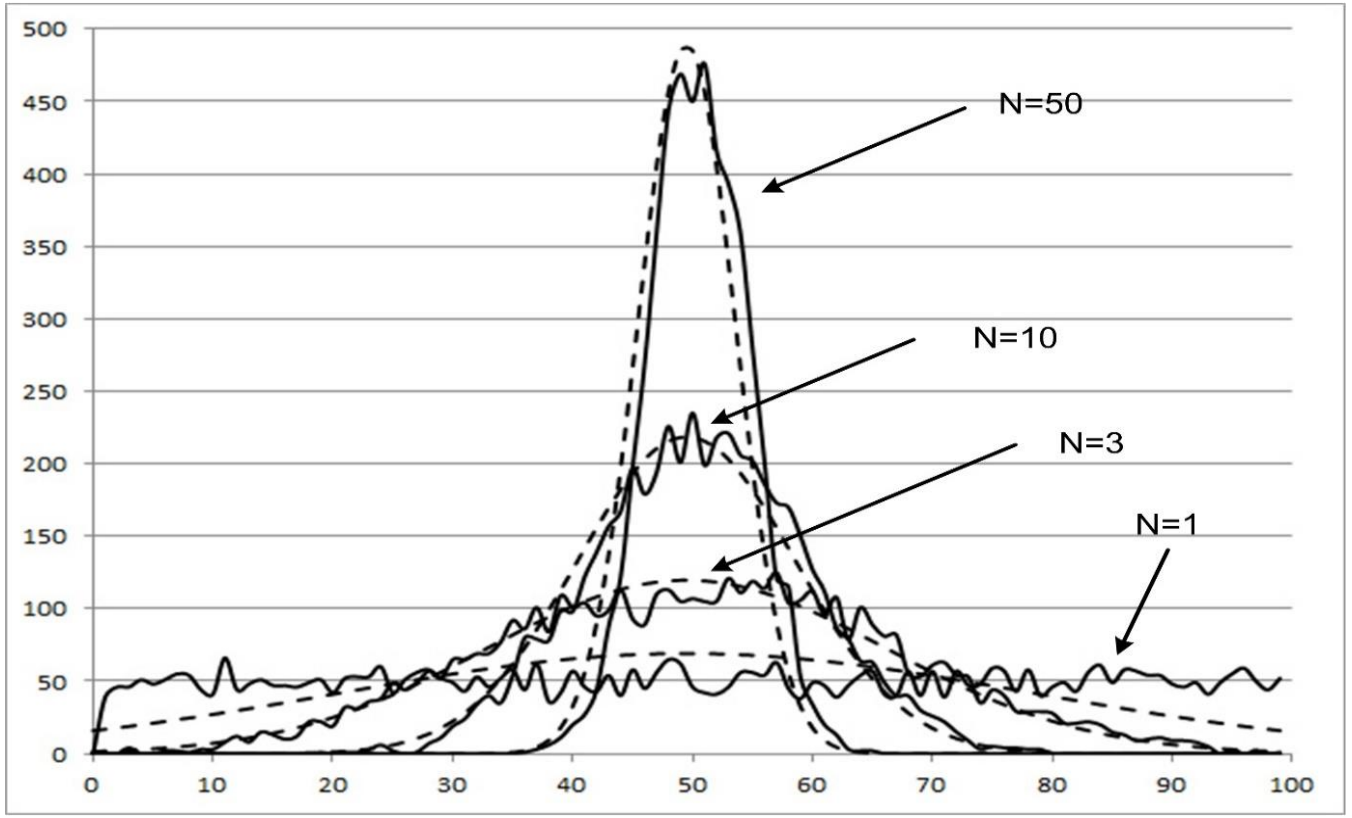


Sampling Distribution characteristics of a single sample of data

Central Limit Theorem

If there is a population with mean μ and standard deviation σ and infinite number of random samples of different sizes are taken from the population, then the theoretical sampling distribution of the sample means will be approximately normally distributed.

The variability in sample statistics across multiple samples of the same size is called the standard error of the statistic.



Hypothesis testing

- Hypothesis testing is used to analyze the plausibility of a hypothesis with the help of a sample data.
- The test recognizes the uncertainty between two comparison groups.
- Statistical analysts test a hypothesis by measuring and examining a random sample of the population being analyzed.

There are two competing truths that are often called the null hypothesis and the alternative hypothesis.

- Null hypothesis (H_0)- There's no difference in between the two populations.
- Alternative hypothesis (H_A) - There is a difference between the two populations.

Hypothesis testing starts by assuming that H_0 is truth.

If H_0 is truth then the estimated difference between samples is expected to be close to zero and within plus or minus two standard errors of zero again with large samples, using the result for the central limit theorem.

Hypothesis Testing – The Paired Approach

Paired t- test

The method of calculating the p-value for a hypothesis test of mean difference between two populations, is referred to as **paired t-test**.

- "paired" because of the study design.
- "t-test" because the sampling distribution is a t-distribution.

If two competing hypotheses are set up about unknown population means, a third hypothesis can be formed assuming the difference between the other two.

This is translated into p-value.

If p-value < 0.05 → the null hypothesis (H0) is rejected

If p-value ≥ 0.05 → the null hypothesis (H0) is accepted.

Hypothesis 1	Hypothesis 2	Hypothesis 3
$H_0: \mu_1 = \mu_2$	$H_0: \mu_1 - \mu_2 = 0$	$H_0: \mu_{diff} = 0$
$H_A: \mu_1 \neq \mu_2$	$H_A: \mu_1 - \mu_2 \neq 0$	$H_A: \mu_{diff} \neq 0$

$$t = \frac{\bar{x}_{diff} - 0}{\widehat{SE}(\bar{x}_{diff})} = \frac{\bar{x}_{diff}}{\widehat{SE}(\bar{x}_{diff})}$$

Hypothesis Testing – The Un-Paired Approach

Unpaired t- test

The method of calculating the p-value for a hypothesis test of mean difference between two independent populations, is referred to as **unpaired t-test**.

- "unpaired" because of the study design.
- "t-test" because the sampling distribution is a t-distribution.

If two competing hypotheses are set up about unknown population means, a third hypothesis can be formed assuming the difference between the other two.

This is translated into p-value.

If p-value < 0.05 → the null hypothesis (H0) is rejected

If p-value ≥ 0.05 → the null hypothesis (H0) is accepted.

Hypothesis 1	Hypothesis 2	Hypothesis 3
$H_0: \mu_1 = \mu_2$	$H_0: \mu_1 - \mu_2 = 0$	$H_0: \mu_{diff} = 0$
$H_A: \mu_1 \neq \mu_2$	$H_A: \mu_1 - \mu_2 \neq 0$	$H_A: \mu_{diff} \neq 0$

$$t = \frac{\bar{x}_{diff} - 0}{\widehat{SE}(\bar{x}_{diff})} = \frac{\bar{x}_{diff}}{\widehat{SE}(\bar{x}_{diff})}$$

where, $\widehat{SE}(\bar{x}_{diff}) = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$

P-value and the Types of Errors

- The probability of accepting a true null hypothesis, is called the confidence level.
- The probability of rejecting a false null hypothesis, is called the power of the test, and is determined by significance level, alternative hypothesis, sample size and nature of the test.
- Type I error occurs when one rejects the true null hypothesis. The probability of making Type I error is α and can be minimized by decreasing α (the significance level).
- Type II error occurs when one fails to reject the false null hypothesis. The probability of making Type II error is β can be minimized by increasing difference of alternative hypothesis, increasing sample size, increasing α, or by choosing a different test.

DECISION TAKEN IN HYPOTHESIS TESTING

THE TRUE STATE OF NULL HYPOTHESIS	ACCEPT	REJECT
TRUE	Correct Decision $(1 - \alpha)$ ☺	TYPE I ERROR (α)
FALSE	TYPE II ERROR (β)	Correct Decision $(1 - \beta)$ ☺

Hypothesis Testing – Comparing proportions of two populations

z- test

The two-sample z-test provides a method for getting a p-value for testing two competing hypotheses about the true proportions of a binary outcome.

$H_O: p_O = p_E$

$H_A: p_O \neq p_E$

These two hypotheses can be equivalently expressed in terms of Risk Difference (RD), Relative Risk (RR) and Odds Ratio (OR).

The test is performed using observed difference in proportions (risk difference: $\widehat{p_1} - \widehat{p_2}$) and its estimated standard error ($\widehat{SE}(\widehat{p_1} - \widehat{p_2})$).

Risk Difference	Relative Risk	Odds Ratio	$\ln(Relative\ Risk)$	$\ln(Odds\ Ratio)$
H_0: RD = 0	H_0: RR = 0	H_0: OR = 0	$H_0: \ln(RR) = 0$	$H_0: \ln(OR) = 0$
H_A: RD ≠ 0	H_A: RR ≠ 0	H_A: OR ≠ 0	$H_A: \ln(RR) \neq 0$	$H_A: \ln(OR) \neq 0$

$$z = \frac{(\widehat{p_1} - \widehat{p_2}) - 0}{\widehat{SE}(\widehat{p_1} - \widehat{p_2})}$$

Hypothesis Testing – Comparing proportions of two populations

Chi-square test

- The chi- square test is a general test for comparing binary (or categorical) outcomes across two or more populations.
- The chi- square test can be extended to more comparisons in one test.
- The two competing hypotheses (observed and expected):

$H_O: p_O = p_E$

$H_A: p_O \neq p_E$

- These two hypotheses can be equivalently expressed in terms of Risk Difference (RD), Relative Risk (RR) and Odds Ratio (OR).

Risk Difference	Relative Risk	Odds Ratio	$\ln(Relative\ Risk)$	$\ln(Odds\ Ratio)$
H_0: RD = 0	H_0: RR = 0	H_0: OR = 0	$H_0: \ln(RR) = 0$	$H_0: \ln(OR) = 0$
H_A: RD ≠ 0	H_A: RR ≠ 0	H_A: OR ≠ 0	$H_A: \ln(RR) \neq 0$	$H_A: \ln(OR) \neq 0$

$$x^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$$

Hypothesis Testing – Comparing proportions of two populations

Fischer's Exact test

- This can be used regardless of sample size.
- The results for the p-value from the Fisher's exact test will be very similar in values of that from the two-sample or Chi-Square test.
- But it is computationally intensive in cases of large sample sizes.
- The hypothesis testing procedure is similar to that of chi- square test, but it differs in the calculation for p-value.

Example: Let us consider a table with studying and not studying men and women.

	Men	Women	Total
Studying	a	b	a+b
Not Studying	c	d	c+d
Total	a+c	b+d	a+b+c+d = n

$$p = \frac{\binom{a+b}{a}\binom{c+d}{c}}{\binom{n}{a+c}} = \frac{\binom{a+b}{b}\binom{c+d}{d}}{\binom{n}{b+d}} = \frac{(a+b)!\ (c+d)!\ (a+c)!\ (b+d)!}{a!\ b!\ c!\ d!\ n!}$$

Hypothesis Testing – Comparing more than two populations with one test

The Analysis of Variance (ANOVA)

- To interpret a p-value from a hypothesis test testing for any mean differences between more than two populations, the method used, is called Analysis of Variance or ANOVA.
- The competing hypotheses are;

$H_{0:}\ \mu_1 = \mu_2 = \ldots\ldots\ldots\ldots\ \mu_k$

H_A: at least two populations have different μs.

- Assuming that the null hypothesis is true, and computing to some measure of discrepancy between what was observed in the sample compared to the expected sample means to be under the null hypothesis.
- ANOVA, this measure of discrepancy is sometimes called the F-statistic., that is compared to an F-distribution for getting a p-value.
- The measurement for the F-statistic can be done using one-way ANOVA or the regression analysis.

Chi-Square test for comparing proportions

- Chi-squared test can be used to test for population level differences in proportions between two or more populations with one test.
- The two competing hypotheses;
  - $H_{0:}\ p_1 = p_2 = \ldots\ldots\ldots\ldots\ p_k$
- H_A: at least two populations have different ps
- .
- The degrees of freedom for this test depend on how many populations are being compared.
- A significant p value when that less than 0.05 means that at least two populations have different underlying proportions.

The log rank test

- The method of interpreting a p-value for the hypothesis test comparing survival curves (S(t)) and incidence rates between more than two populations, is referred to as log rank test.
- The two competing hypotheses;

H0: $S_1(t) = S_2(t) = \ldots\ldots\ldots\ldots\ S_k(t)$

HA: at least two populations have different S(t)s.

- It can be used to test for population-level differences in survival curves and hence, the underlying incidence rates between two or more populations.
- For this a significant p-value, something less than 0.05, means that at least two populations have different underlying population level survival curves.

Key Learnings

Sampling distribution

Standard errors

Fischer's exact test

Log rank rest

Central limit theorem

t - test

Paired Hypothesis testing

Types of errors

Analysis of Variance (ANOVA)

Odds ratio

Relative risk

Confidence Intervals

Unpaired Hypothesis testing

Z – test approach

Chi-square test

P - value

Binary population comparison

Multiple population comparison

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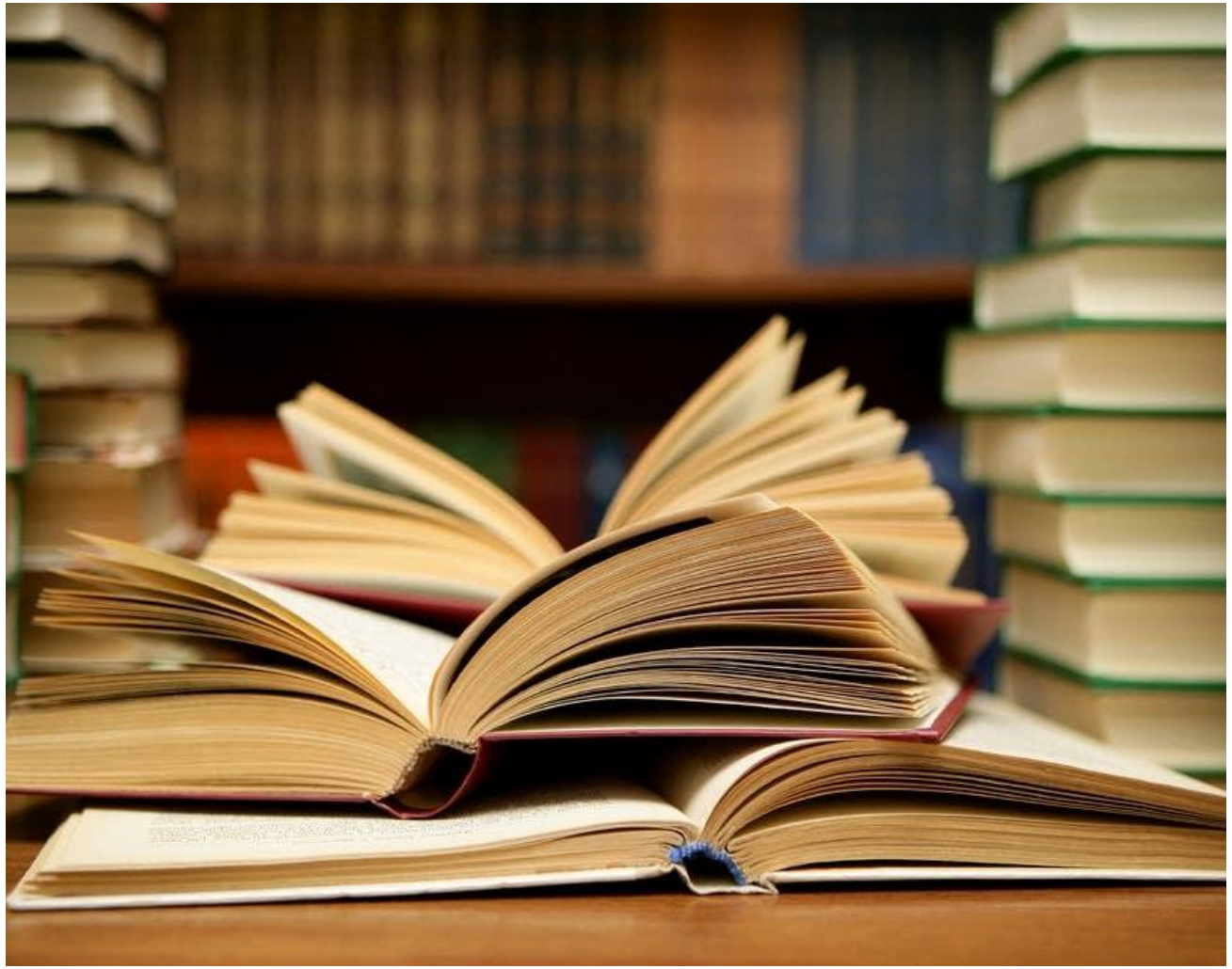

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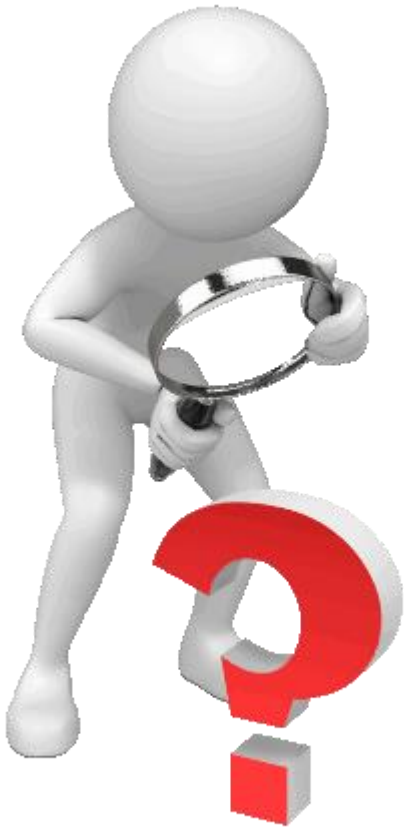

Thank You