VISVESVARAYA TECHNOLOGICAL UNIVERSITY
BELAGAVI, KARNATAKA

A Seminar Report on

"Covid-19 and its Impact on Students"

Submitted in the partial fulfillment for the requirements for the conferment of Degree of

BACHELOR OF ENGINEERING

in

INFORMATION SCIENCE AND ENGINEERING

By

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2020-2021

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CERTIFICATE

This is to certify that the Seminar (17ISS86) entitled **"Covid-19 and its Impact on Students"** is a bonafide work carried out by **SUYES SAPKOTA (1BY17IS070)** in partial fulfillment for the award of **Bachelor of Engineering Degree in Information Science and Engineering** of the Visvesvaraya Technological University, Belagavi during the year 2020-21. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in this report. The seminar report has been approved as it satisfies the academic requirements with respect to seminar work for the B.E Degree.

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Signature of the Coordinator

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ABSTRACT

The outburst of COVID-19 affected the lives of all part of community as from 24th March, 1.3 billion people were asked to self-quarantine in their residence to prevent unfold of the virus. The lockdown had serious implications on mental state, resulting in psychological problems along with frustration, stress, and depression. So, as to explore and analyze the impacts of this pandemic on the life-style of scholars, descriptive and inferential statistics measures are computed of a complete 1182 people of different age from varied educational institutions in Delhi–National Capital Region (NCR), India.

The dataset obtained recognized the following as the impact of COVID-19 on the students of divergent age groups: time spent on online class, rating of online class experience, medium for online class, time spent on self-study, time spent on fitness, preferred social media platform, time spent on TV, number of meals per day, change in your weight, health issue during lockdown, stress buster, time utilized, connections with your family members, close friends and relatives, what you miss the most during lockdown and the following effects on weight, social life, and mental state. Based on the data available under the above mentioned subheads extraction of age distribution of students, average class time that students have studied, medium used for most of the learning purpose, social media used most, students free time activities analysis, student health issue analysis, students miss, students time spent in different activities, medium with which the student are learning more, relation between student rating virtual classes and the time or medium, rating effect based on what do they miss, relation between student rating online classes, social media and class time, causes of increasing weight, association between fitness timing, over weight and meal, connection between the family, close friends, relatives and social media and time shares is being done.

This study suggests that public authorities should take all the necessary measures to enhance the learning experience by mitigating the negative impacts caused due to the COVID -19 outbreak.

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Chapter 1:

Introduction

1.1   Brief Introduction

Emergency protocols were enforced in India to manage unfold of the virus that resulted in restrictions on all non-essential public movements. It is expected that the continuing unfold of the virus, travel restrictions and also the closure of academic establishments across the country would have a major impact on the education, social life, and mental state of scholars. With the closure of academic establishments, the necessity for a fast transition from physical learning to the digital sphere of learning emerged.

However, according to a meta-analysis on e-learning, it is reported that online learning is better than nothing and similar to conventional learning .To boost the e-learning experience, the academic establishment's should adopt the measure needed to suits the rules and suggestions by government agencies, whereas keeping students inspired continued learning remotely during this tough atmosphere. There's a wide gap between the government's policy aspirations and also the implementation of those on-line education policies at the grassroots level.

Descriptive and inferential statistics measures will be adopted to investigate and analyze the potential consequences of the COVID-19 pandemic on the life of students. Further, analyses mediating roles of resilience, coping, and social support to deal with complications.

1.2 Overview on Dataset

	ID	Region of residence	Age of Subject	Time spent on Online Class	Rating of Online Class experience	Medium for online class	Time spent on self study	Time spent on fitness	Time spent on sleep	Time spent on social media	Prefered social media platform	Time spent on TV	Number of meals per day	Change in your weight	Health issue during lockdown	Stress busters
0	R1	Delhi-NCR	21	2.0	Good	Laptop/Desktop	4.0	0.0	7.0	3.0	Linkedin	1	4	Increased	NO	Cooking
1	R2	Delhi-NCR	21	0.0	Excellent	Smartphone	0.0	2.0	10.0	3.0	Youtube	0	3	Decreased	NO	Scrolling through social media
2	R3	Delhi-NCR	20	7.0	Very poor	Laptop/Desktop	3.0	0.0	6.0	2.0	Linkedin	0	3	Remain Constant	NO	Listening to music
3	R4	Delhi-NCR	20	3.0	Very poor	Smartphone	2.0	1.0	6.0	5.0	Instagram	0	3	Decreased	NO	Watching web series
4	R5	Delhi-NCR	21	3.0	Good	Laptop/Desktop	3.0	1.0	8.0	3.0	Instagram	1	4	Remain Constant	NO	Social Media
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1177	R1191	Delhi-NCR	12	3.0	Good	Smartphone	4.0	1.0	8.0	1.0	Instagram	2	3	Decreased	NO	Dancing
1178	R1192	Delhi-NCR	14	6.0	Average	Smartphone	4.0	1.0	9.0	1.0	Whatsapp	1	4	Remain Constant	NO	Listening to music
1179	R1193	Delhi-NCR	13	4.0	Average	Smartphone	0.0	0.5	8.0	3.0	Youtube	2	4	Decreased	NO	Online gaming
1180	R1194	Delhi-NCR	14	5.0	Excellent	Laptop/Desktop	3.5	1.0	8.0	0.5	Youtube	1	4	Remain Constant	NO	Reading books
1181	R1195	Delhi-NCR	13	5.0	Good	Tablet	2.0	0.5	7.0	1.0	Whatsapp	1	3	Remain Constant	NO	Talking

1182 rows × 19 columns

Table: 1.2.1

A 19-set questionnaire was developed, which included a variety of multiple-choice questions, Likert scale and for a few questions, the respondents were allowed to enter free texts. The survey was administered using the Google Forms platform, which requires subjects to be logged in to an e-mail account to participate in the survey; it restricted multiple entries from an individual account. The distribution of the questionnaire was conducted through the outreach of social media platforms, e-mail, and standard messaging services. Clear instructions with the google form were provided to ensure the respondent must be a student.

There are in total 1182 diverse group of student who responded to the survey and answered to the 19 questions (columns) and they are ID which will be automatically assigned to the respective students, rating of online class experience, medium for online class, time spent on

self-study, time spent on fitness, time spent on sleep, time spent on social media platform, preferred social media, time spent on T.V, number of meals per day, change in your weight, health issue during lock down, stress buster, time utilized, do you find yourself more connected with your family, close friends and relatives and What you miss the most.

Chapter 2:

Literature Survey

2.1   Research Papers

2.1.1 COVID-19 and online teaching in higher education: A case study of Peking University. Human Behavior and Emerging Technologies,2020

This paper highlights about five principles of high-impact teaching practice to effectively deliver large-scale online education, through the case analysis of Peking University's online education. First, the principle of appropriate relevance. The quantity, difficulty, and length of teaching content should match with the academic readiness and online learning behavior characteristics of students. Second, the principle of effective delivery. Due to students' characteristics of low concentration in online learning, it is essential to adjust the teaching speed in order to ensure the effective delivery of teaching information. Third, the principle of sufficient support. Faculty and teaching assistants need to provide students with timely feedback, including online video tutoring and email guidance after class. Fourth, the principle of high-quality participation. It is necessary to adopt some measures to improve the degree and depth of students' class participation. Last, the principle of contingency plan preparation. In view of the extraordinarily large scale of online education, it is necessary to make contingency plans in advance for addressing possible problems such as the traffic overload issue of the online education platform.

2.1.2 The impact of COVID-19 on student experiences and expectations: Evidence from a survey,2020

This paper provides the first systematic analysis of the effects of COVID-19 on higher education. To study these effects, they surveyed 1500 students at Arizona State University, and present quantitative evidence showing the negative effects of the pandemic on students' outcomes and expectations. For example, they found that 13% of students have delayed graduation due to COVID-19. Expanding upon these results, we show that the effects of the pandemic are highly heterogeneous, with lower-income students 55% more likely to delay graduation compared to their higher-income counterparts. They further showed that the

negative economic and health impacts of COVID-19 have been significantly more pronounced for less advantaged groups, and that these differences can partially explain the underlying heterogeneity that they documented. Their results suggest that by focusing on addressing the economic and health burden imposed by COVID-19, as measured by a relatively narrow set of mitigating factors, policy makers may be able to prevent COVID-19 from widening existing achievement gaps in higher education.

2.1.3 The psychological impact of the COVID-19 epidemic on college students in China,2020

The paper addresses COVID-19-related stressors that included economic stressors, effects on daily-life, and academic delays were positively associated with the level of anxiety symptoms of Chinese college students during the epidemic, whereas social support was negatively correlated with their anxiety. The mental health of college students is significantly affected when faced with public health emergencies, and they require attention, help, and support of the society, families, and colleges. It is suggested that the government and schools should collaborate to resolve this problem in order to provide high-quality, timely crisis-oriented psychological services to college students.

2.1.4 A Descriptive Study of COVID-19–Related Experiences and Perspectives of a National Sample of College Students in Spring ,2020

In this paper I found that a low proportion of college students with COVID-19 symptoms got tested and that less than half of those with symptoms stayed at home exclusively while symptomatic. Furthermore, students' hygiene behaviors in April 2020 suggest they are protecting themselves (e.g., washing their hands) but could do more to prevent transmission to others (e.g., wearing a mask). Returning to extensive in-person academic instruction will require widespread testing and contact tracing. However, contact tracing among college students will be challenging and require creative solutions because students participate in a myriad of activities with many different people and participants struggled to recall the number of the people with whom they had close contact (within 6 feet).

2.1.5 The likely impact of COVID-19 on education: Reflections based on the existing literature and recent international datasets,2020

The paper highlights on the possible impact of COVID-19 on education. First, student learning is expected, on average, to suffer a setback. Despite the widespread move to online teaching, student progress will not simply be the same as if schools were open. Although online learning has a lot of potential, it is more effective when students and teachers have had the time to prepare and get used to it and schools have had the time to test its implementation. Unfortunately, in many cases this did not happen as COVID-19 forced all educational institutions to make a sudden switch to online learning. The results of a School Education Gateway survey, which was conducted between 9 April and 10 May 2020 and attracted 4,859 respondents from more than 40 countries (of whom 86% were teachers or school heads), show that, following COVID-19, the majority of teachers (66.9%) had to teach online for the first time. Additionally, many teachers had problems in accessing technology (computers, software, reliable internet connection, etc.).

2.1.6 Impact of lockdown on learning status of undergraduate and postgraduate students during COVID-19 pandemic in West Bengal, India, 2020

The study has suggested the following recommendation to the government,   policymakers, and institutional authorities, there should be made a uniform academic plan for the universities and colleges and also initiate a proper Education Continuity Plan (ECP) to continue the learning process during this pandemic. The infrastructural facilities should be availed to the education institutions which can regulate the digital learning process during future health emergencies. There is a need to ensure adequate funding for the improvement of the education system and to provide capacity development training to the stakeholders of higher education institutions. Interventions should be initiated through a targeted approach to create a positive space for study among the students from the vulnerable section of society.

2.1.7 A study of the effectiveness of remote instruction from students' perspectives, 2020

In this paper to better understand the impact of remote instruction on the learning process and to investigate factors that may affect the effectiveness of remote instruction and serve as input to instructional process improvement in the future, the conducted surveys after the first week of remote instruction and during the last week of the spring semester. The surveys set out to measure students' perceived satisfaction and effectiveness of remote learning experience and to capture the underlying factors that contribute to the perceived satisfaction levels. The results showed students overwhelmingly prefer being in a physical classroom. Of all the factors examined, less interaction during live lecture, more distraction, less engaged in virtual classroom, and less effective in understanding lectures in remote instruction contribute the most to students' perceived satisfaction in the remote instruction setting.

2.1.8 Taxonomy of factors affecting attitudes to- wards

Educational technologies for use with technology acceptance models, 2019

Here in this paper qualitative review was conducted of the precursor behavioral, motivational and attitudinal theories that underpinned the creation of both Davis' TAM and Venkatesh's UTAUT models, as well as of more recent educational technology research. Semantic alignment of the identified constructs allowed them to be grouped according to measurement intent. Arrangement of the constructs into primary, secondary and tertiary taxonomic groups produced seven primary and twenty two secondary and tertiary taxonomic groups, which collectively organize sixty one measurement constructs. The taxonomy is larger in scope than many of the currently used acceptance models because it includes and organizes the variety of factors that the foundational behavioral theories and later empirical studies indicate are important in human decision making vis-à-vis educational technology use. It is intended that using this to operationalize measurement models could increase variance accounted for in measurement and structural models, and improve external validity of studies by introducing consistency and reducing measurement bias.

2.1.9 Social media use and mental health during COVID-19 pandemic: moderator role of disaster stressor and mediator role of negative affect, 2020.

The findings from the paper suggest that the disaster stressor may be a risk factor that amplifies the deleterious impact of social media use on depression. In addition, excessive exposure to disaster on social media may trigger negative affect, which may in turn contribute to mental health problems. Future interventions to improve mental health should consider elements of both disaster stressor and negative affect.

2.1.10 Mental health toll from the coronavirus: social media usage reveals Wuhan residents' depression and secondary trauma in the COVID-19 outbreak,2020

This study adds empirical evidence to the devastating effect of COVID-19 pandemic on people's mental health. To public health officials, a patchwork response to the unprecedented COVID-19 pandemic could complicate the overall coping strategies. At an individual level, a panic response to the infectious disease with no cure in sight could be psychologically perilous to mental health. In the face of medical uncertainty, this study finds that people relied heavily on social media for accessing health information in their own social media groups. As the virus strikes, it makes evolutionary sense for people to develop a strong sense of sharing health information in the hope of surviving the outbreak.

- **Summary**

S. N	Paper Title	Authors	Innovative Idea	Limitations
1.	COVID-19 and online teaching in higher education: A case study of Peking University. Human Behavior and Emerging Technologies, 2020	Wei Bao	Concludes with five high-impact principles for online education.	Absence of any datasets or case studies to prove the principles.
2.	The impact of COVID-19 on student experiences and expectations: Evidence from a survey,2020	Esteban M. Aucejo,Jacob French,Maria Paola Ugalde Araya,and Basit Zafarc	Surveyed approximately 1500 students using an instrument designed to recover the causal impact of the pandemic on students' current and expected outcomes.	Limited to economic and health related shocks induced by COVID-19.
3.	The psychological impact of the COVID-19 epidemic on	WenjunCao,ZiweiFang,GuoqiangHou, MeiHana,XinrongXu,JiaxinDonga	Provide a theoretical basis for psychological interventions	Indicates only the severity level of anxiety among the sampled college

	college students in China,202		with college students.	students.
4.	A Descriptive Study of COVID-19–Related Experiences and Perspectives of a National Sample of College Students in Spring ,2020	Cohen AK, Hoyt LT, Dull B	COVID-19–related experiences and perspectives, documented opportunities for transmission, and assessed COVID-19's perceived impacts to date.	Sample is restricted to only full-time college students and all topics are not deeply covered.
5.	The likely impact of COVID-19 on education: Reflections based on the existing literature and recent international datasets,2020	Di Pietro, G., Biagi, F., Dinis Mota Da Costa, P., Karpinski, Z. and Mazza, J.,	Looks at the different direct and indirect ways through which the virus and the measures adopted to contain it may impact children's achievement.	Lack of reliable data and available data are vague.
6.	Impact of lockdown on learning status of undergraduate and postgraduate students during	Nanigopal Kapasia , Pintu Paul , Avijit Roy , Jay Saha , Ankita Zaveri, Rahul Mallick, Bikash Barman ,	Study suggests targeted interventions to create a positive space for study among students	Limited access to data and issues with sample and selection.

	COVID-19 pandemic in West Bengal, India,2020	Prabir Das, Pradip Chouhan .	from the vulnerable section of society.	
7.	A study of the effectiveness of remote instruction from students' perspectives,2020	Bai, X., Ala, A., Reese, S., Eyob, E., & Bazemore, S	The surveys set out to measure students' perceived satisfaction and effectiveness of remote Learning.	Surveys did not provide the student with the ability to clarify answers and the questions are too long, confusing and misleading.
8.	Taxonomy of factors affecting attitudes to- wards Educational technologies for use with technology acceptance models,2019	Kemp, A., Palmer, E., & Strelan, P.	Identifies the important factors shown to affect attitudes towards use of educational technologies by students or educators in higher education institutions and organize them into broad	Adopted only the empirical to deductive, deductive to empirical approach
9.	Social media use and mental health during COVID-19 pandemic:	Zhoa, N., & Zhou, G.	Investigate associations of COVID-19- related social	Participants were fully recruited via social media and time lag between

	moderator role of disaster stressor and mediator role of negative affect, 2020.		media use with mental health outcomes and to uncover potential mechanisms underlying the links.	the measurement of social media use and negative affect is not short enough to assess the immediate responses to disaster messages
10.	Mental health toll from the coronavirus: social media usage reveals Wuhan residents 'depression and secondary trauma in the COVID-19 outbreak.	Zhong, B., Huang, Y., & Liu, Q.	Investigates the possible association between social media usage and the mental health toll from the coronavirus at the peak of Wuhan's COVID-19 outbreak	Study was based on a one-time survey of Wuhan residents and did not address developing possible intervention strategies and health policies that mitigate mental health toll during the COVID-19 crisis and beyond.

Chapter 3:

Methodology

For analyzing the dataset of COVID-19 and its Impact on Students, descriptive and inferential statistics are being adapted. But before going to the analysis, the dataset for the null value is cleaned and the dataset used for the analysis is taken from following link:

- https://www.kaggle.com/kunal28chaturvedi/covid19-and-its-impact-on-students

The datasets is then merged together in order to get the clear and final dataset that contains all the required information for a particular range of analysis.

3.1   Descriptive Analysis

Descriptive Analysis is the type of analysis of data that helps describe, show or summarize data points in a constructive way such that patterns might emerge that fulfills every condition of the data. It is one of the most important steps for conducting statistical data analysis. It gives you a conclusion of the distribution of your data, helps you detect typos and outliers, and enables you to identify similarities among variables, thus making you ready for conducting further statistical analyses. Or we may measure a large number of people on any measure. Descriptive statistics help us to simplify large amounts of data in a sensible way. Each descriptive statistic reduces lots of data into a simpler summary.

3.1.1 Types of Descriptive Analysis

Descriptive analysis can be categorized into four types which are measures of frequency, central tendency, dispersion or variation, and position. These methods are optimal for a single variable at a time.

i.   Measures of Frequency

In descriptive analysis, it's essential to know how frequently a certain event or response is likely to occur. This is the prime purpose of measures of frequency to make like a count or percent. For example, consider a survey where 500 participants are asked about their favorite

IPL team. A list of 500 responses would be difficult to consume and accommodate, but the data can be made much more accessible by measuring how many times a certain IPL team was selected.

ii.   Measures of Central Tendency

In descriptive analysis, it's also important to find out the Central (or average) Tendency or response. Central tendency is measured with the use of three averages — mean, median, and mode. As an example, consider a survey in which the weight of 1,000 people is measured. In this case, the mean average would be an excellent descriptive metric to measure mid-values.

iii.   Measures of Dispersion

Sometimes, it is important to know how data is divided across a range. To elaborate this, consider the average weight in a sample of two people. If both individuals are 60 kilos, the average weight will be 60 kg. However, if one individual is 50 kg and the other is 70 kg, the average weight is still 60 kg. Measures of dispersion like range or standard deviation can be employed to measure this kind of distribution.

iv.   Measures of Position

Descriptive analysis also involves identifying the position of a single value or its response in relation to others. Measures like percentiles and quartiles become very useful in this area of expertise.

3.2   Inferential Analysis

Inferential statistics is the process of using data analysis to infer properties of an underlying distribution of probability. Inferential statistical analysis infers properties of a population, for example by testing hypotheses and deriving estimates. It is assumed that the observed data set is sampled from a larger population.

Inferential statistics can be contrasted with descriptive statistics. Descriptive statistics is solely concerned with properties of the observed data, and it does not rest on the assumption that the data come from a larger population. Inferential analysis makes propositions about a population, using data drawn from the population with some form of sampling. Given a hypothesis about a population, for which we wish to draw inferences, statistical inference/

inferential statistic consists of (first) selecting a statistical model of the process that generates the data and (second) deducing propositions from the model.

3.2.1 Hypothesis Testing

The main purpose of statistics is to test a hypothesis. For example, you might run an experiment and find that a certain drug is effective at treating headaches. But if you can't repeat that experiment, no one will take your results seriously. A hypothesis is an educated guess about something in the world around you. It should be testable, either by experiment or observation. For example:

- A new medicine you think might work.

$$z = \frac{\hat{p} - p}{\sqrt{p\,q/n}}$$

- A way of teaching you think might be better.

Fig: 3.2.1 (General hypothesis formula)

- A possible location of new species.
- A fairer way to administer standardized tests.

I. What is a Hypothesis Statement?

If you are going to propose a hypothesis, it's customary to write a statement. Your statement will look like this: "If I…. (Do this to an independent variable)…. then (this will happen to the dependent variable)."

For example:

- If I (decrease the amount of water given to herbs) then (the herbs will increase in size).
- If I (give patients counseling in addition to medication) then (their overall depression scale will decrease).
- If I (give exams at noon instead of 7) then (student test scores will improve).
- If I (look in this certain location) then (I am more likely to find new species).
  A good hypothesis statement should:

- Include an "if" and "then" statement (according to the University of California).
- Include both the independent and dependent variables.
- Be testable by experiment, survey or other scientifically sound technique.
- Be based on information in prior research (either yours or someone else's).
- Have design criteria (for engineering or programming projects).

Hypothesis testing in statistics is a way for you to test the results of a survey or experiment to see if you have meaningful results. You're basically testing whether your results are valid by figuring out the odds that your results have happened by chance. If your results may have happened by chance, the experiment won't be repeatable and so has little use.

Hypothesis testing can be one of the most confusing aspects for students, mostly because before you can even perform a test, you have to know what your null hypothesis is. Often, those tricky word problems that you are faced with can be difficult to decipher. But it's easier than you think; all you need to do is:

1. Figure out your null hypothesis,
2. State your null hypothesis,
3. Choose what kind of test you need to perform,
4. Either support or reject the null hypothesis.

II. What is the Null Hypothesis?

If you trace back the history of science, the null hypothesis is always the accepted fact. Simple examples of null hypotheses that are generally accepted as being true are:

1. DNA is shaped like a double helix.
2. There are 8 planets in the solar system (excluding Pluto).

III. Unequal Variance T-Test

A t-test is a type of inferential statistic used to determine if there is a significant difference between the means of two groups, which may be related in certain features. The t-test is one of many tests used for the purpose of hypothesis testing in statistics. Calculating a t-test requires three key data values. They include the difference between the mean values from each data set (called the mean difference), the standard deviation of each group, and the number of data values of each group.

There are several different types of t-test that can be performed depending on the data and type of analysis required. But among them, we will be using the unequal variance t-test.

The unequal variance t-test is used when the number of samples in each group is different, and the variance of the two data sets is also different. This test is also called the Welch's t-

test. The following formula is used for calculating t-value and degrees of freedom for an unequal variance t-test:

$$\text{T-Value} = \frac{mean1 - mean2}{\frac{var1^2}{n1} + \frac{var2^2}{n2}}$$

where:

mean1 and mean2= Average values of each of the sample sets

var1 and var2= Variance of each of the sample sets

n1 and n2= Number of records in each sample set

3.2.2 Kruskal Wallis Test

The Kruskal Wallis test is the non-parametric alternative to the One Way ANOVA. Non parametric means that the test doesn't assume your data comes from a particular distribution. The H test is used when the assumptions for ANOVA aren't met (like the assumption of normality). It is sometimes called the one-way ANOVA on ranks, as the ranks of the data values are used in the test rather than the actual data points.

The test determines whether the medians of two or more groups are different. Like most statistical tests, you calculate a test statistic and compare it to a distribution cut-off point. The test statistic used in this test is called the H statistic. The hypotheses for the test are:

H0: population medians are equal.

H1: population medians are not equal.

The Kruskal Wallis test will tell you if there is a significant difference between groups. However, it won't tell you which groups are different. For that, you'll need to run a Post Hoc test.

$$H = \left[\frac{12}{n(n+1)} \sum_{j=1}^{c} \frac{T_j^2}{n_j} \right] - 3(n+1)$$

Where:

n = sum of sample sizes for all samples,

c = number of samples,

Tj = sum of ranks in the jth sample,

nj = size of the jth sample.

Chapter 4:

System Requirements

4.1 Functional Requirements

1. The graphs and other plots should effectively display the adequate information about the vaccination and its effectiveness to the users.
2. The visualizations and analysis should give clear idea to viewers about the trend of covid cases, death cases and recovery rate and give at least slight idea to predict the future values.

4.2 Non-Functional Requirements

1. Usability: The plots and graphs should be able predict the future scenarios of covid vaccination impact.
2. Efficiency: The analysis should clearly show the different trends of covid cases, recovery, and death cases based on the datasets provided in an efficient manner.

4.3 Hardware Requirements

- Processor (at least 2.0GHZ)
- RAM (at least 2GB) and HDD space (min. 2GB)

4.4 Software Requirements

- Jupiter Notebook/Google Collab/Spyder/Visual Studio
- Python 3.8(or above)
- Python libraries (NumPy, matplotlib, pandas, covid_daily)
- Excel

Chapter 5:

Implementation & Results

5.1 Exploratory Data Analysis

➢ Which region they belong to and age group?

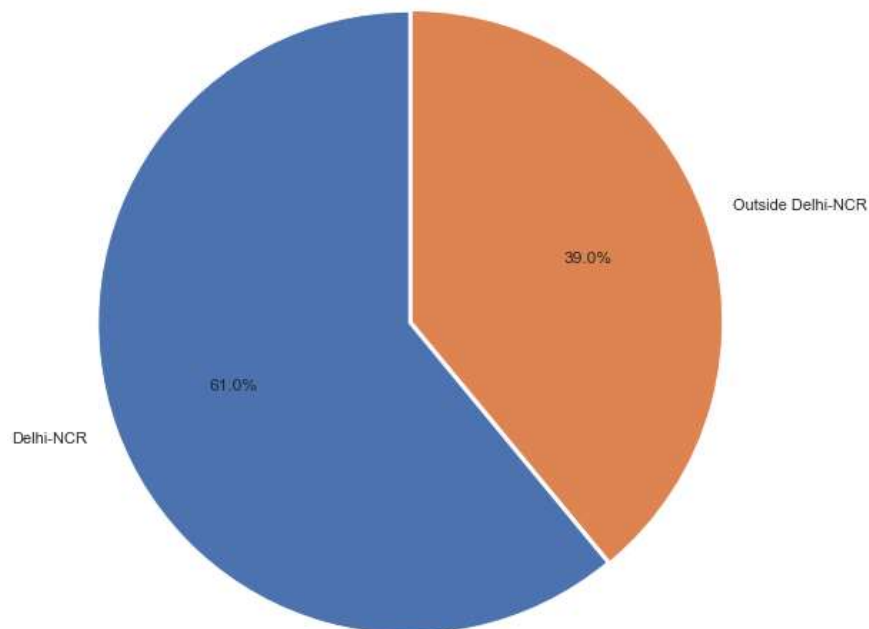| Variables	Number of Subjects (N = 1182)	Percentage (%)
Age (year)		
7-17	303	25.6
18-22	694	58.7
23-59	185	15.6
Region of residence		
Delhi-NCR	728	61.6
Outside Delhi-NCR	454	38.3

Table: 5.1.1

Figure: 5.1.1

A total of 1182 subjects from different educational institutions including schools, colleges, and universities in the Delhi-National Capital Region (NCR) participated in the online questionnaire. The demographic detail of the participants is shown in Table 5.1.1. The mean age is 20.16 years (95% confidence interval (CI), 19.8 to 20.4) (range, 7-59). The age of the participants was normally distributed ('7-17' year old, 303; '18- 22' year old, 694; '23-59' year old, 185). 728 (61.62%) of the respondents lived in Delhi-NCR and the rest were living outside of Delhi-NCR during the period of the pandemic.

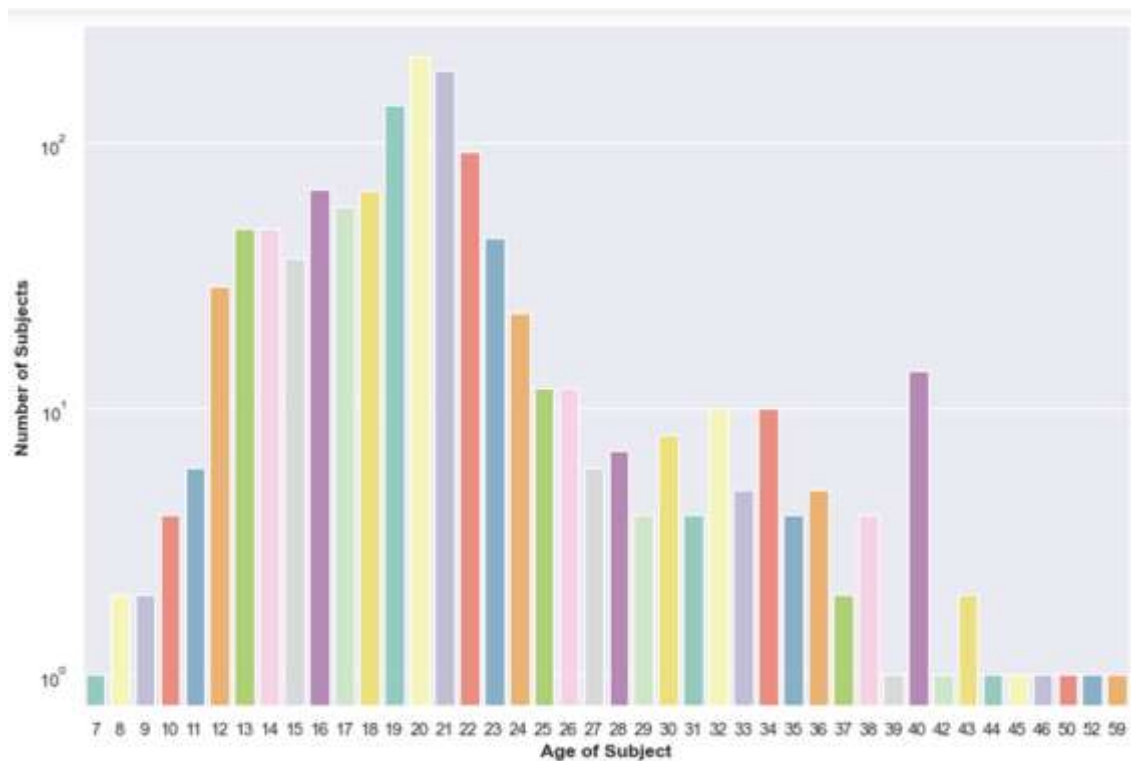➢   What is the age wise distribution?

Figure: 5.1.2

➤   What devices they use for online learning?

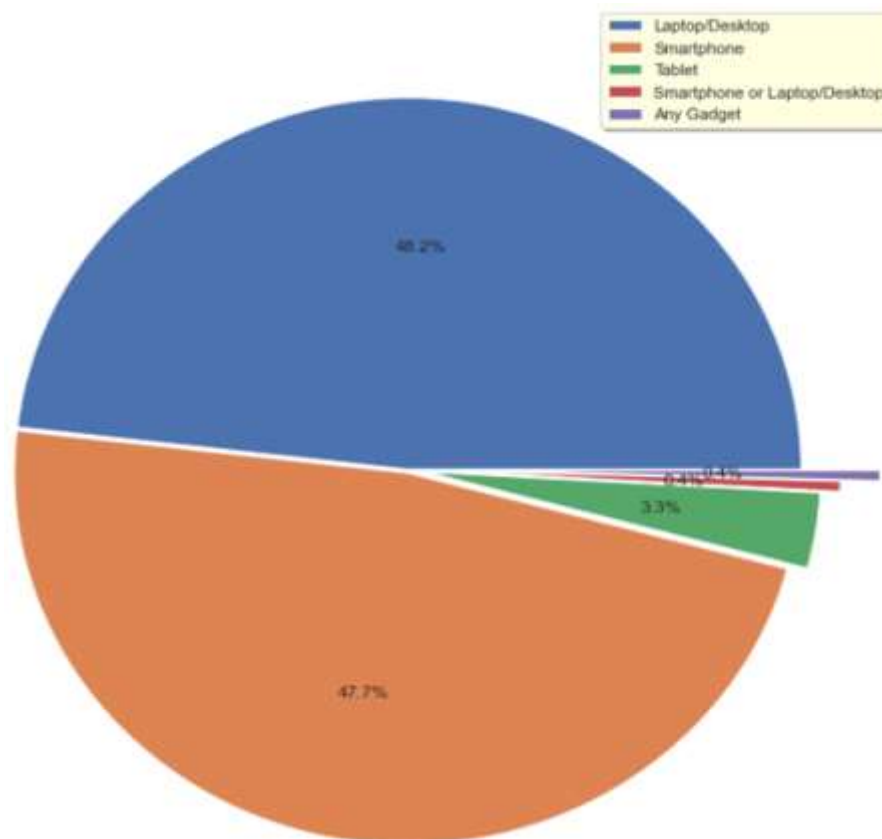| Medium Used	Number	Mean	Lower 95%	Upper 95%	P-value
Laptop/Desktop	545	3.4347706	3.2541536	3.6153877	
Smartphone	539	3.0688312	2.9007125	3.2369499	0.0002*
Tablet	37	4.2972973	3.6310902	4.9635044	

Table: 5.1.2

Figure: 5.1.3

As shown in Table 5.1.2, 57.3% in the age group '7-17' used smartphones while the majority of Students from age group '18-22' (56.4%) and age group '23-59' (57.8%) used laptop/desktop for study. However, only a small portion of the total students (3.1%,n=37)

used tablet. With regard to the time spent in online classes, there was a statistically significant difference between the various mediums used (P=0.0002). 4.29 hours/day (95% CI, 3.63-4.96) was the average time spent on Online classes using tablets, 3.43 hours/day (95% CI, 3.25-3.61) when using laptop/desktop, and 3.06 hours/day (95% CI, 2.90-3.23) when using smartphones.

➤   How they spent their time?

Age (year) Variables	Time Interval (Hours/day)	Total (N=1182)	7-17	18-24 Mean Time (95% CI, hours/day)	23-61	7-59, N=1184	P-value
Online Class	0-2	271					
	2-4	381	3.69(3.50-3.88)	2.98(2.78-3.17)	2.65(2.42-2.88)	3.20(3.08-3.32)	P<0.0001*
	4-7	458					
	7-10	72					
Self-Study	0-2	273					
	2-5	711	2.74(2.58-2.91)	3.08(2.68-3.23)	2.95(2.68-3.23)	2.91(2.78-3.03)	P=0.106
	5-9	173					
	9-12	25					
Fitness	0-0.5	483					
	0.5-2	552	0.82(0.76-0.89)	0.73(0.66-0.81)	0.69(0.62-0.77)	0.76(0.72-0.80)	P=0.039*
	2-5	147					
Sleep	4-6	51					
	6-8	436	7.91(7.77-8.11)	7.94(7.82-8.06)	7.51(7.28-7.73)	7.87(.77-7.96)	P=0.0007*
	8-11	620					
	11-15	75					
Social Media	0-0.5	46					
	0.5-1.5	380					
	1.5-3.5	519	1.68(1.52-1.85)	2.64(2.50-2.78)	2.37(2.14-2.61)	2.37(2.14-2.61)	P<0.0001*
	3.5-6	171					
	6-10	66					

Kruskal Wallis test was used to produce a P-value that analyzes significant difference between different age distributions. *Statistically significant (P<0.05).

Table: 5.1.4

According to Table 5.1.4, the Kruskal Wallis test was used to assess the difference in the time spent by different age categories for daily routine activities. The average time spent on online classes for students was 3.20 hours/day (95% confidence interval (CI), 3.08 to 3.32). However, the average time spent on online classes was significantly higher for students with age group '7-17' years (3.69 hours/day), and lower for students with age groups, '18-22' years (2.98 hours/day) and '23-59' years (2.66 hours/day) (P <0.0001*). Further, respondents were asked about the time they allot per day for self-study, however, there was no significant difference among different age group categories (P = 0.106). Overall, 2.91

hours/day (95% CI, 2.78 to 3.03) was the average time spent on self-study. According to the assessment of satisfaction level among students (see Figure 1.a), 38.3% of students had negative response towards online classes (2.6% poor and 35.7% very poor), 33.4% considered it average while 28.4% (19.9% good and 8.5% excellent) gave a positive review. Surprisingly, the in-depth analysis showed the satisfaction levels varied significantly with different age groups. There were 51.6% (48.6% very poor and 3% poor) negative online class reviews from subjects in the '18-22' age group, compared to 31.5% (29.1% very poor and 2.4% poor) negative reviews from subjects in the '7-17' age group who spent more time on online classes.
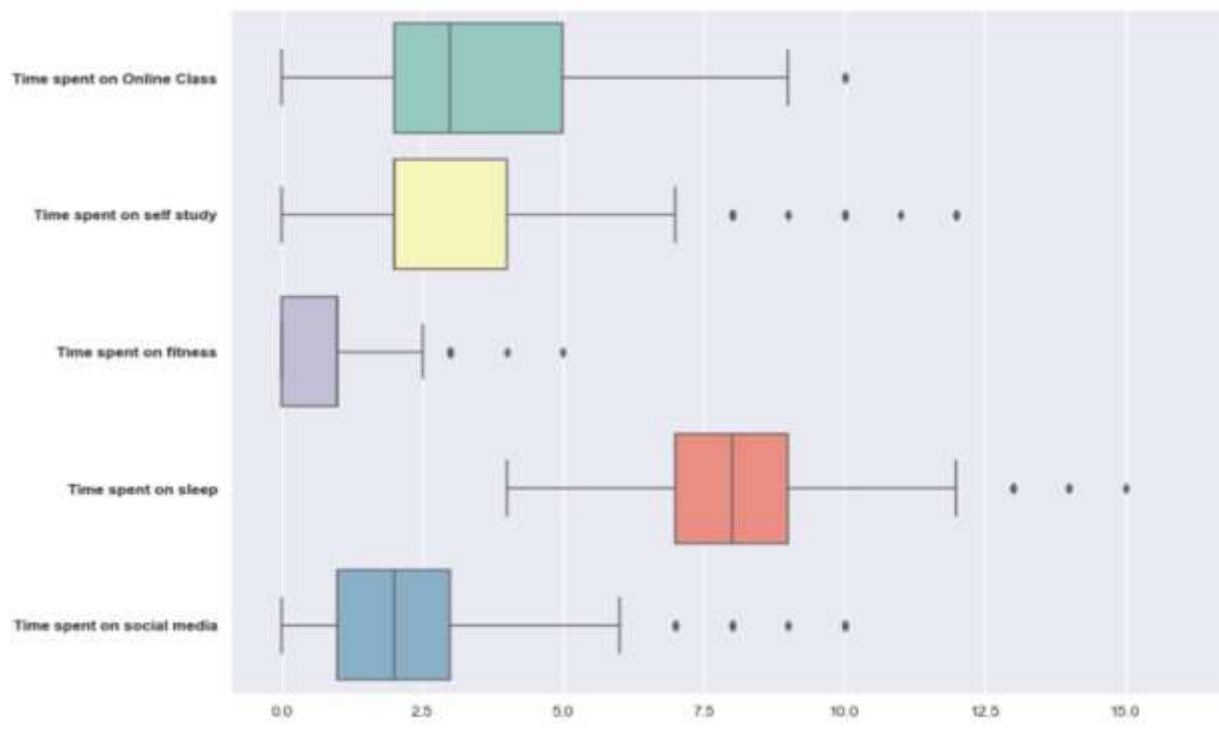

Figure: 5.1.4

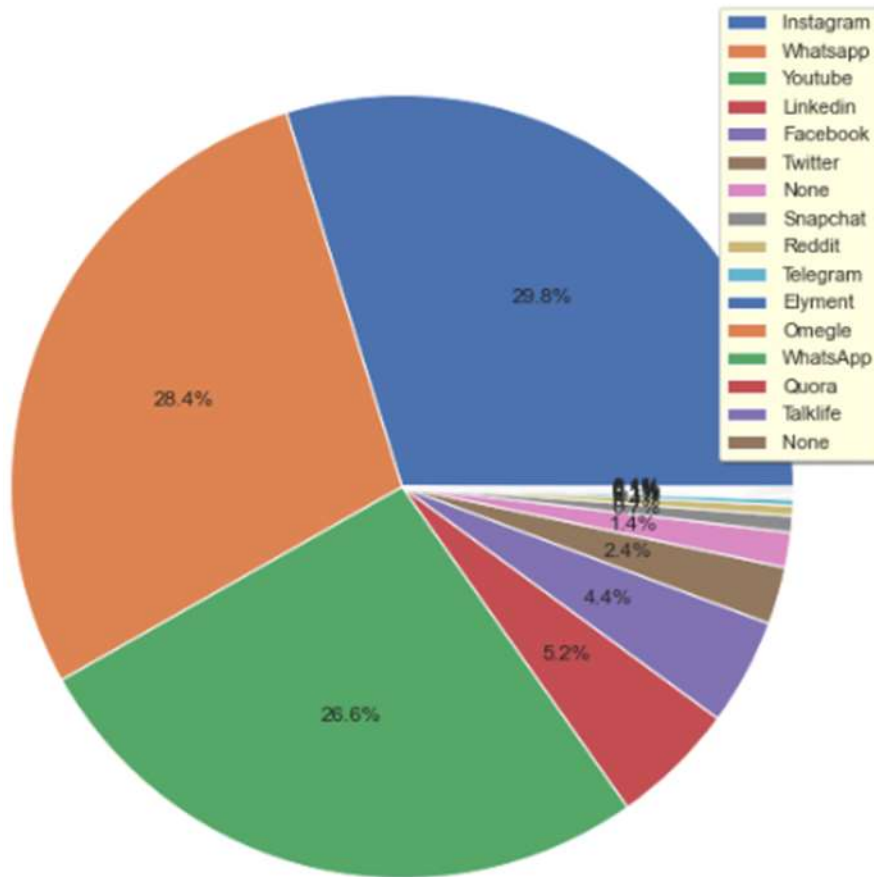➢   What is their preferred social media platform?

Figure: 5.1.5

According to Figure 5.1.5, a significant number of individuals from different age categories used social media as a medium for stress reliever. Further in figure 4. a, the findings provide the distribution of the sample for the use of different platforms. While the majority of respondents used social media, 1.44% did not have an account on any platform. Figure 5.1.5 gives the detailed distribution of platforms for age-wise groups. YouTube (39%) was the preferred platform for the age group '7-17,' followed by Whatsapp (35%) and Instagram (17%). Most of the social networking sites in India restrict individuals below 13 years of age to have an account on their platforms. However, some individuals under 13 years of age used Instagram (n=2), Whatsapp (n=16), and Snapchat (n=1). For the age group '18-22', Instagram (39%) was the most preferred networking site, and the respondents in the age-

group '23-59' preferred WhatsApp (38%). The average time spent on social media for the age group '7- 17' was 1.68 hours/day (95% Confidence Interval, 1.52 to 1.85), 2.64 hours/day (95% Confidence Interval, 2.50 to 2.78) for the age group '18-22', and for the age group '23- 59', it was 2.37 hours/day (95% Confidence Interval, 2.14 to 2.61). The difference between the groups was statistically different (P<0.0001*).

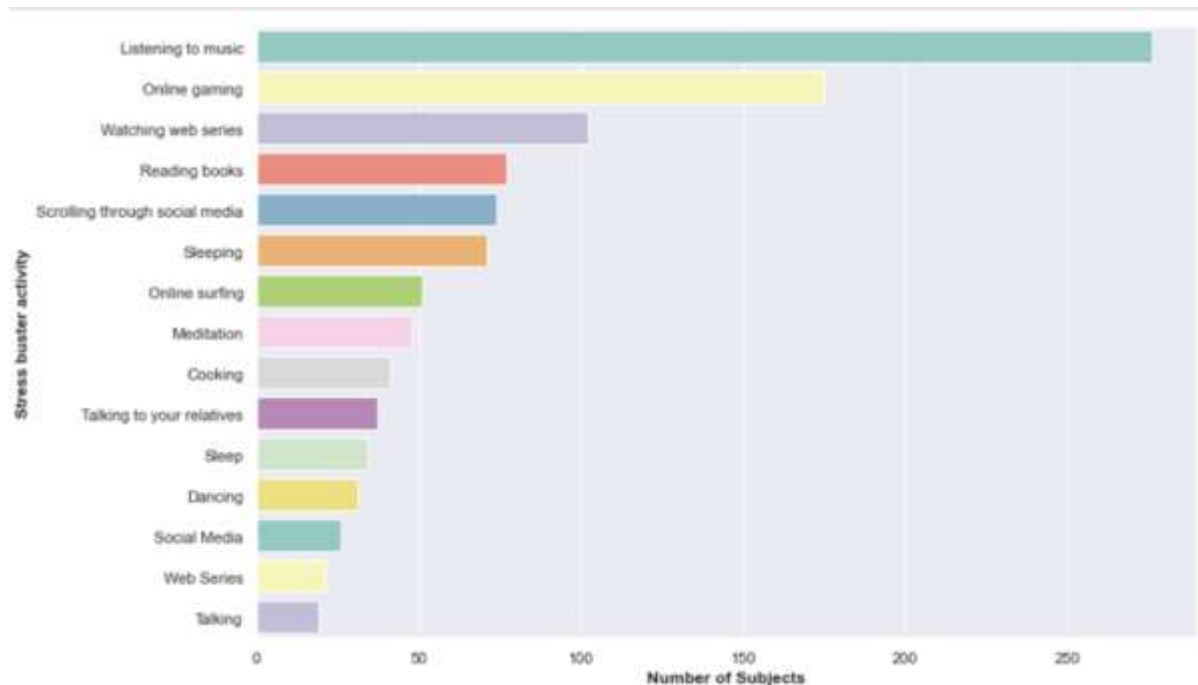➢   What is their favorite stress buster?

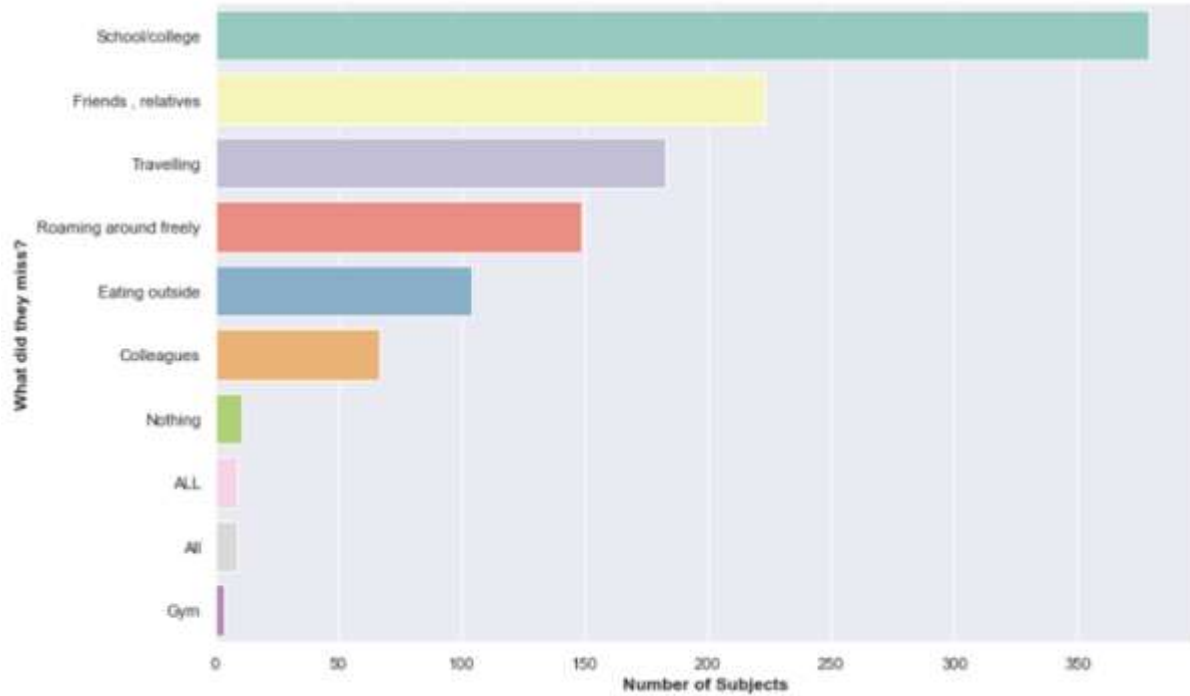Figure: 5.1.6

➢   What did they miss the most?

Figure: 5.1.7

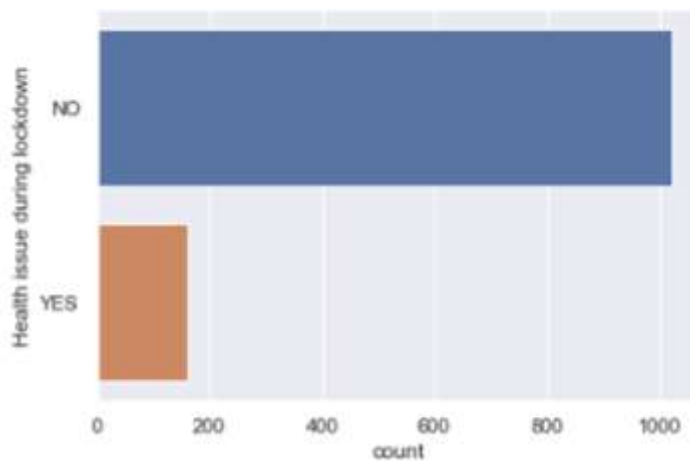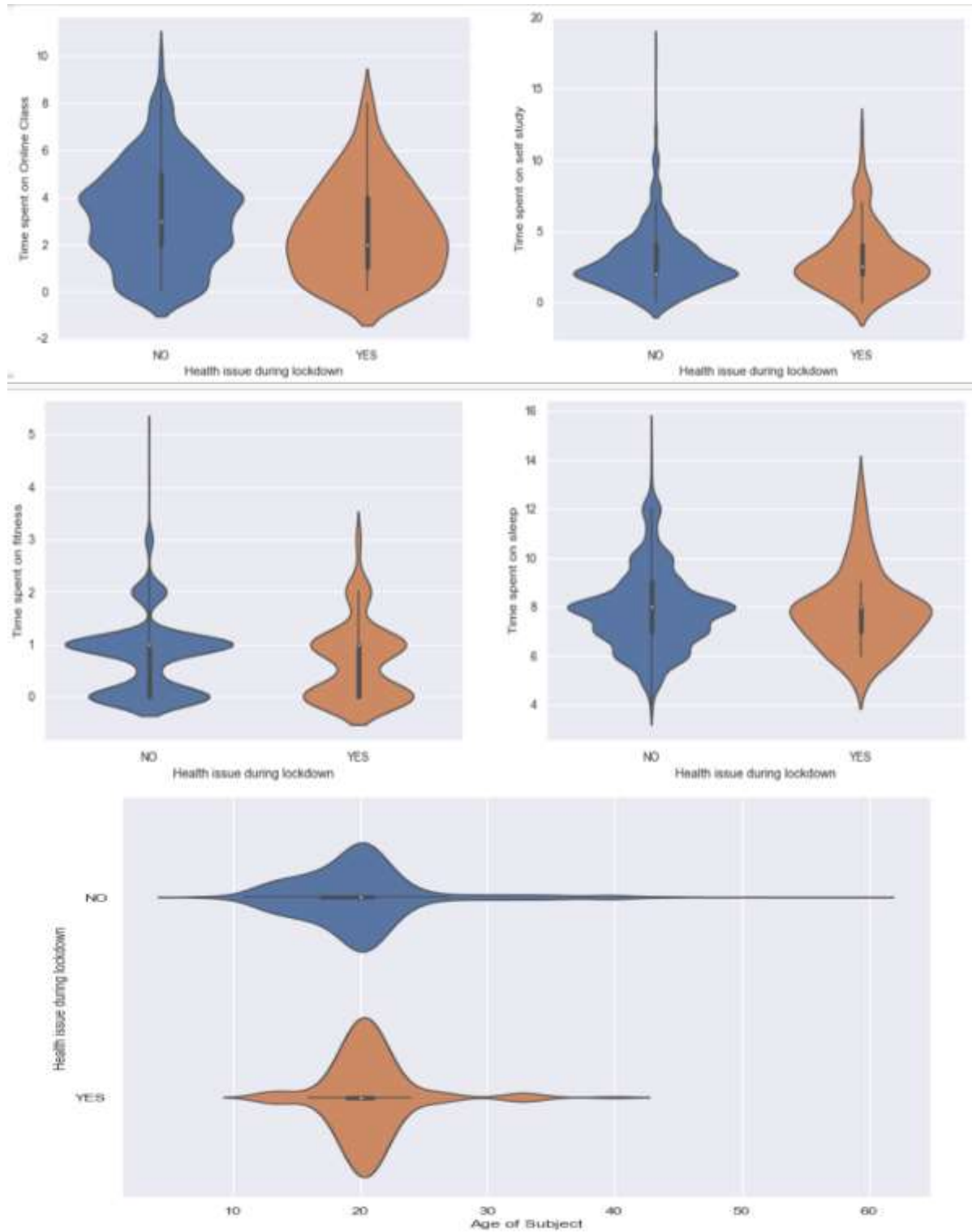➢   How many of the students got health issue during the time and their relations?
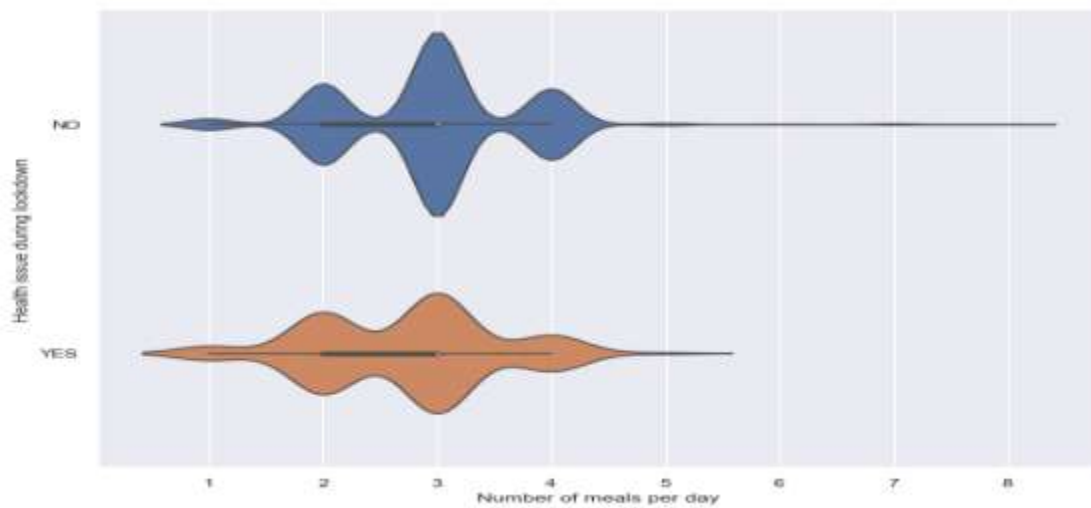

Figure: 5.1.8

Figure: 5.1.9

Among the respondents from different age groups (see figure 5.1.9), 13.6% (n=160) faced health-related issues during the period of nationwide travel restrictions. Further respondents were asked about the change in body weight within this period, 37.1% reported an increase in weight, 17.7% reported a decrease in weight, and 45.3% reported no change in weight. When asked whether they are satisfied with their utilization of time, the majority of respondents (51.4%, n=608) answered in 'NO', and the rest (n=575) answered with 'YES'. Also, 70.3% of the respondents stated that they were socially connected with their family members.

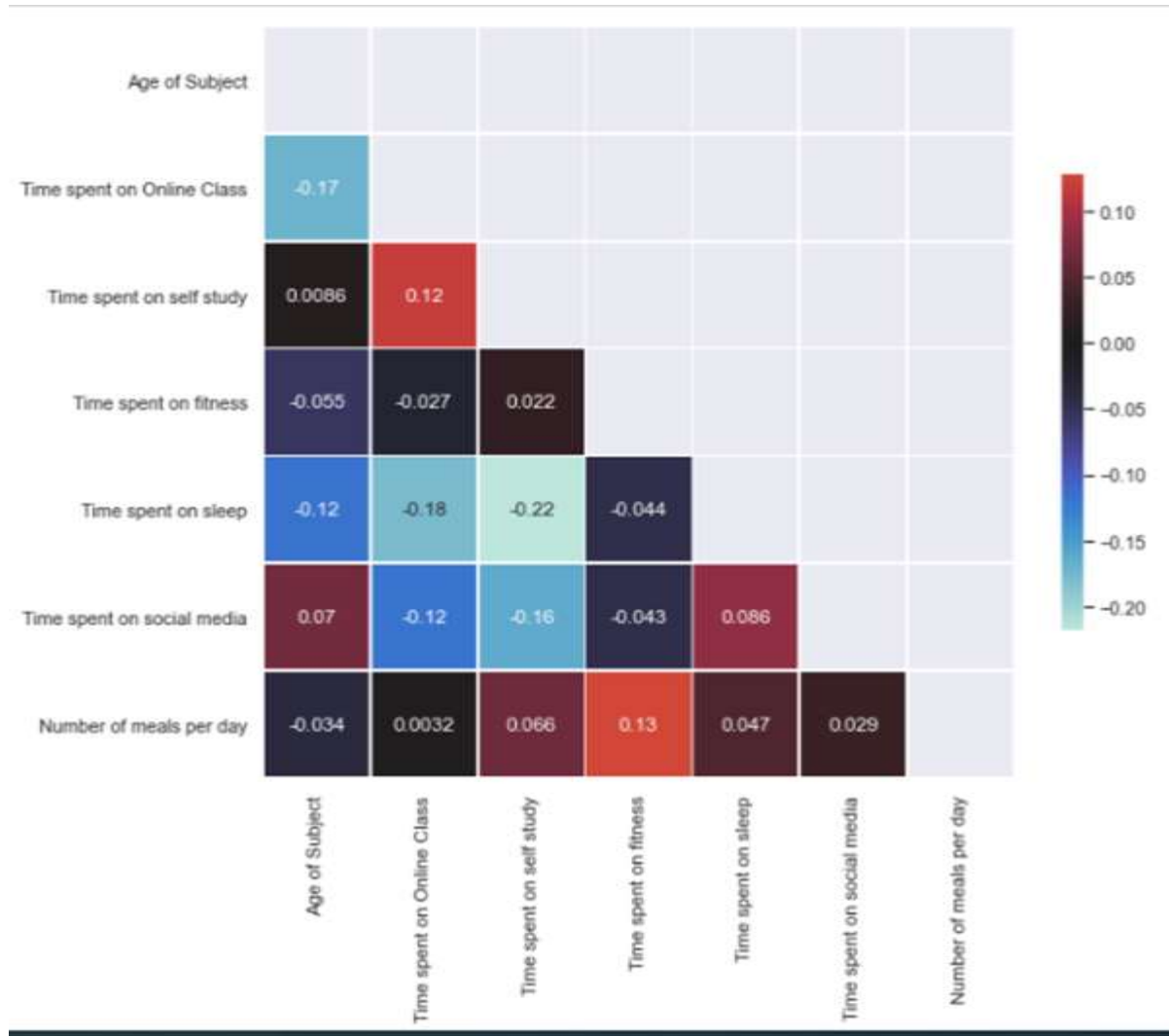➢   Heatmap (correlation) among numerical features.

Figure: 5.1.10

5.2 Hypothesis Testing

i. Hypothesis 1:

H_0 - Student spent more time on online classes than on social media.

H_1 - Student spent less time on online classes than on social media.

t-Test: Two-Sample Assuming Unequal Variances

	Time spent on Online Class	Time spent on social media
Mean	3.208840948	2.365693739
Variance	4.417379434	3.123477037
Observations	1182	1182
Hypothesized Mean Difference	0	
df	2294	
t Stat	10.55605896	
P(T<=t) one-tail	9.04406E-26	
t Critical one-tail	1.645518138	
P(T<=t) two-tail	1.81E-25	
t Critical two-tail	1.960998641	

Table: 5.2.1

If the t Stat is larger than the critical two tail value, we reject H_0.

**Since 10.556 is greater than two tail value, we would reject the H_0. So, the data supports

H_1 (Hence, student spent less time on online classes than on social media).

ii.   Hypothesis 2:

H_0 - There is no significant impact of time spent on fitness on health issue during lockdown.

H_1 - There is significant impact of time spent on fitness on health issue during lockdown.

t-Test: Two-Sample Assuming Unequal Variances

	Time spent on fitness	Health issue during lockdown
Mean	0.765820643	0.136209814
Variance	0.524829936	0.117756325
Observations	1182	1182
Hypothesized Mean Difference	0	
df	1686	
t Stat	27.00319854	
P(T<=t) one-tail	4.5971E-134	
t Critical one-tail	1.645757904	
P(T<=t) two-tail	9.1942E-134	
t Critical two-tail	1.961372019	

Table: 5.2.2

If the t Stat is larger than the critical two tail value, we reject H_0.

**Since 27.003 is greater than two tail value, we would reject the H_0. So, the data does not support H_0 (Hence, there is significant impact of time spent on fitness, on health issue during lockdown).

5.3 Opinions and Recommendations

Once the COVID-19 pandemic ends and educational institutions re-open, the concerned authorities should continue to invest in online education to enhance learning experience. They should carefully analyze the issues experienced during sudden transition to online learning and prepare for any future situations. Proper training of educators for the digital skills and improved student-teacher interaction must be conducted. For disadvantaged students, availability of digital infrastructure with proper internet availability and access to gadgets must be ensured to avoid any disruption to their study. Due to the situation in Covid-19, many students are likely to suffer from stress, anxiety, and depression, so it is necessary to provide emotional support to students. Future work in this direction could be to analyze the association of different stress busters on the mental health of the students. Moreover, guidelines should be created to anticipate the needs of the vulnerable student population. Improved healthcare management would ensure the delivery of mental health support.

5.4 Limitations

There are some limitations to our study that should be noted. The first limitation is the sampling technique used. It relies on digital infrastructure and voluntary participation that increases selection bias. The imposed travel restrictions limited the outreach to students who do not have access to online learning. Second, the study is obtained from one specific area, given the lockdown orders and the online medium of classes; we expect these results to be fairly generalizable for schools and universities nationwide. Another limitation of this study is the cross-sectional design of the survey, there was no follow-up period for the participants.

Chapter 6:

Conclusion

In this study, the findings indicated that the Covid-19 outbreak has made a significant impact on the mental health, education, and daily routine of students. The Covid-19 related interruptions highlight key challenges and provide an opportunity to further evaluate alternate measures in the education sector. The new policies and guidelines in this direction would help mitigate some of the negative effects and prepare educators and students for the future health crisis.

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