

COVID 19 : PREDICTION OF VULNERABLE AREAS HAVING HIGH RISK OF BECOMING HOSTSPOTS AND PROVIDING NECESSARY STATISTICS DURING COVID-19 PANDEMIC

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ABSTRACT

COVID-19 Pandemic management has become the top priority of Government Institutions globally, which is justifiable seeing the high mortality of the disease which spreads mainly through droplets and aerosols¹. In India, Lockdown by National, State and Local level administrations have greatly reduced the spread of the SARS COV-2 Virus. Some areas with a greater proportion of COVID-19 patients have been declared hotspots with increased restrictions on public activities through law enforcement. But quite often delay in identification of these hotspots leads to community transmission of the Virus thus aggravating the problem. A method to identify the areas which are at risk of becoming the next hotspot for the disease is the need of the hour ². In this Research document we will find the probable risk factors and make an appropriate scale to measure the vulnerability of an area, identified by its Postal code. To help with this a Pan India survey Dataset was taken from Kaggle.com⁸ which had csv files to ease with Research, with the acquired data we will evaluate the risk factors and make appropriate scale to identify 'pre-hotspots'.

OBJECTIVES

- The primary objective is to establish a method to help the administration identify vulnerable areas, through their PIN/postal codes.
- The secondary objective will be to help local Administration find needy areas for distribution of PPE and medical equipment.

METHODOLOGY

- **Use of Google forms as a means to conduct a nationwide survey.**

Input data analyzed through spreadsheets.

- Risk factors to be evaluated and given the necessary importance.
- Example of pre-hotspot being identified through the calculation of total risk and plotted on Google maps.
- Identifying the areas with weak medical infrastructure and deficient supplies and syncing it with Government data.
- Inclusion Criteria for the survey
 1. Any Indian Citizen of any age (above 14 years) can take part In the survey.Anyone consenting to the informed consent can take part.

- Exclusion criteria for the survey
 1. **Anyone below the age of 15 years cannot take the survey.**
 2. **Anyone not completing or entering the wrong data, will have their responses nulled.**

DATA

A Google Forms derived Survey Dataset was used

[Click to View Data Sheet](#)

Total No. of Form Submissions= 1232 (Data discrepancy, Check Errors in data for more Info)

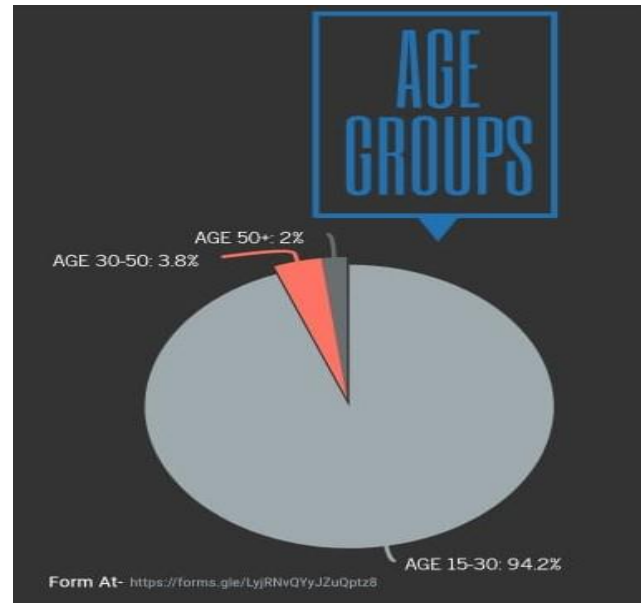
***Total No. of participants who are actively Taking care of COVID19 infected**

patients(Doctors, Nurses, Healthcare workers)=60

DEMOGRAPHIC DETAILS

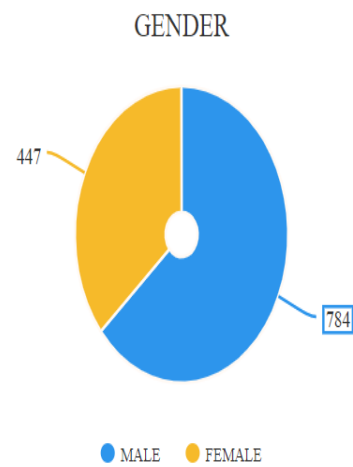
Submissions along Age Groups

- Age 15-30=1170 ~ 94.2%
- Age 30-50=50 ~ 3.8%
- Age 50+=24 ~ 2%



GENDER

MALE-784
FEMALE-447



STATE-WISE RESPONSE(INDIA)**Responses from States and Union Territories**

*U.P- 53.6%, Others- 46.4%



Responses (Data Discrepancy, for more info refer Errors in Data)

U.P. ~~ 650 (53.6%)
 Other Areas ~~ 585(46.4%)

**PRIMARY OBJECTIVE**

We will now access the data from the survey Dataset

We will ascertain the risk of each Individual submission in the form, and for that we will make a point-based scale (of range 1-10) to calculate the risk associated with each of the factors.(pts=points).

So we will first make the key of calculating the total points.

MAIN RISK FACTORS**S. No. FACTORS**

1.

**PRESENCE OF VIRUS**

Question 12 of the survey asks

- **“Are You a Doctor, Nurse ,or HealthCare worker who is actively taking care of Coronavirus Infected patients? (Next Part Of the Survey is only For Medical Professionals taking Care of Coronavirus Patients) *”**

This is an Indirect way of asking that does your area/PIN code area has an active Coronavirus infected patient?

And is a very important factor as the presence of the Virus itself is the starter for an outbreak in that area. That is Why it is assigned 2 (pts).Question 13 asks the Healthcare workers whether they have adequate PPE or not,

If no- 1.5(pts)

Question 15 asks the Healthcare workers whether the patients are cooperative or not, because being non-cooperative they could break the Quarantine in Isolation wards

So answer of “Some are Some are not” and “NO” -1.5 (pts)



Chronic disease and age

Age was already asked in the biodata section of the survey in Question 2.

- **And age groups were divided into**

15-30 age group- This age group mostly consists of Students and Young Working class population, they are almost not at risk of developing serious complications. 0 (pts)

30-50 age group- This age group basically comprises of worker class of society and many a times they have to go out for work, since Government workers are on duty in this pandemic and offices are allowed 33% of work force, they have more interaction but good immunity also. 0.5(pts)

50+ age group- They mostly consist of Working class and retirees, they have weaker immune system and high risk of developing serious complications from the virus. 2(pts)

Refer Errors in Data for more Info about the age topic.

Question 10 of the survey asks

- **Do you have any chronic illness? * eg – Diabetes, Heart Disease, Lung Disease, Hypertension, Tuberculosis, Cancer. People with chronic illnesses or those over the age of 50 are at High Risk of serious complications if**



they catch Coronavirus Disease.

People with chronic illnesses have higher risk of mortality if they contract the virus, moreover, the extra care needed for the patients, exposes health workers many times to the risk of them getting infected themselves. This group gets 1.5(pts)



PERSONAL PROTECTION

Even During this lockdown normal Citizens need basic amenities and supplies to continue living Normally, and for this Government specifies a time when people can Socialize and shop for these things, Personal protection along with social distancing plays an important role during this period to stop the spread of Viral Infection^{2,3,4,5}

Chances of getting an Infection greatly reduces by covering our face and hands, and also using Handwash and sanitizers frequently to kill microorganisms on our hands.

Question 6-Asks about Face protection.

Question 7-Asks about hand protection.

Question 8-Asks about Availability and use of Hand Sanitizers and Handwash.

Question 9-Asks about Habit of cleaning Common areas with Disinfectant.

Question 11- Asks the respondent about his/her idea about the probability of them catching the virus after assessing their surroundings.

- Face mask^{3,4,5,6}
Protects mucous coverings on the face
 - None-0.5(pts)
 - Bandana/Scarf/Handkerchief-0.4(pts)
 - Cotton Mask-0.3(pts)^{3,4}
 - Surgical Mask- 0.1 (pts)^{3,4}
 - N95/N99 Respirators-0(pts)

- No Gloves-0.2(pts)
Gloves protect while handling hard currency, using phone, etc.

- Non-Availability of Sanitizers/Hand wash-0.6(pts)
People touch their face many times a day, so Virus can transfer from hands to mucous coverings of face, Cleaning hands with handwash and sanitizers cleans off and destroys virus particles.

- Not cleaning Common areas, door handles, tables – 0.2(pts)
Common areas can become contaminated and clearing them with disinfectants like Bleach can kill off virus particles

- Self Probability (between 6-10)- 0.5 (pts)
**Subject's probability would be based on the news that He / She consumes, Level of protection and awareness of their Neighbourhood and self assess whether they are at risk from anything.*



DATA ANALYSIS

Data was analysed using Excel Spreadsheets and Uploaded on Google Spreadsheets for Public Viewing.

DOI: 10.34740/kaggle/dsv/1155383 for Kaggle Dataset

[Click to View Data Analysis Spreadsheet on Google](#)

Points for each category were calculated and the sum total for each submission was also calculated.

The Risk factor for Designating a place/area as dangerous was set at total points of '2'.

Threshold of '2' was selected because-


- Scenario 1- If there is 'presence of virus' then threshold is easily crossed, non-withstanding other factors.
- Scenario 2- If subject is of old age and has chronic disease then threshold is easily crossed, non-withstanding other factors.
- Scenario 3 – If the subject has a **complete** lack of personal protection then the threshold is easily crossed, non-withstanding other factors.
- Scenario 4- If the availability of PPE for Medical professionals is not there, moreover the patient is not compliant then the threshold is easily crossed, non-withstanding other factors.

Data Showed the No. of Areas at Danger to be= 67.

Out of =1248 submissions

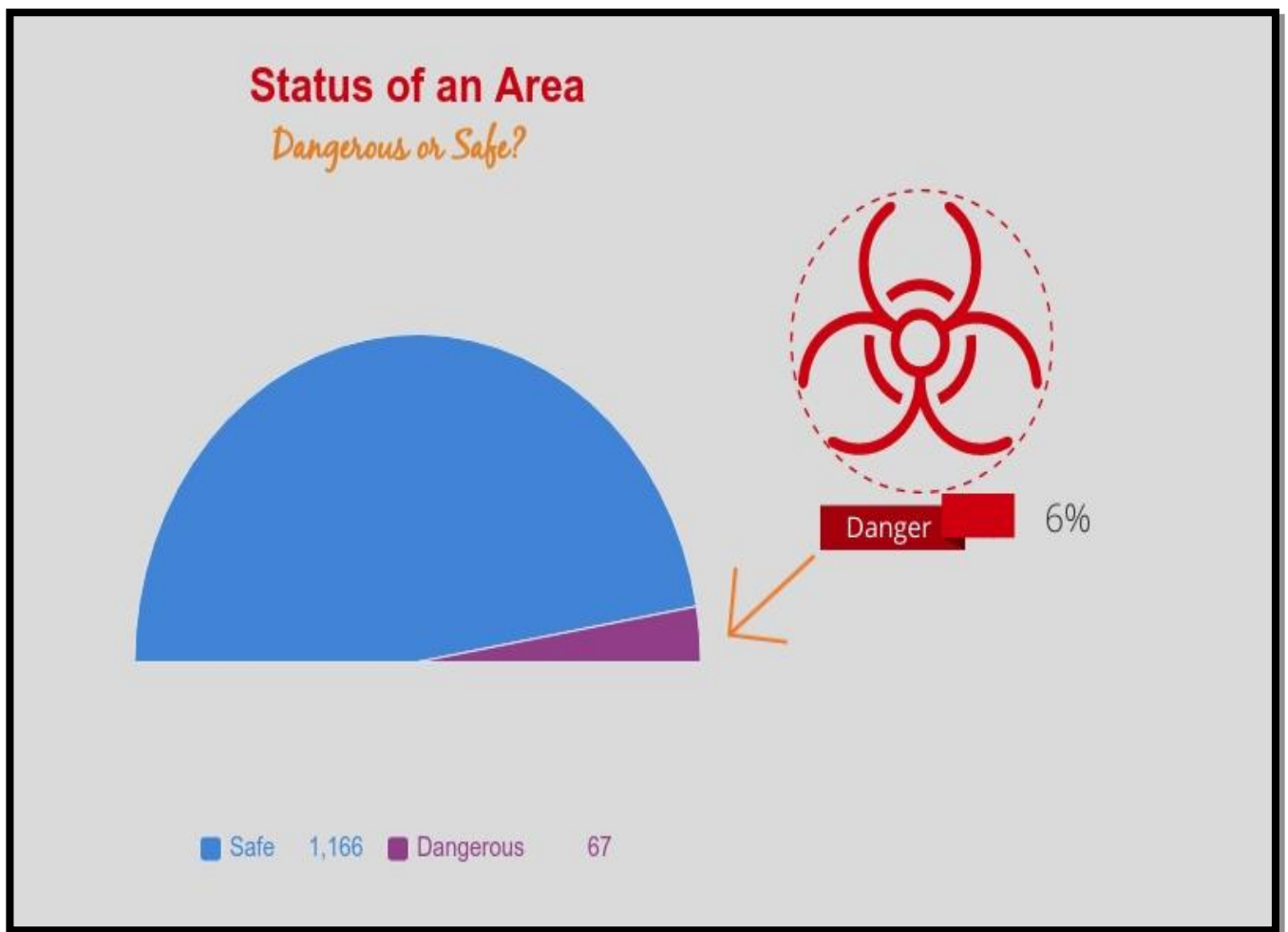
In which =15 had opted out of the survey during informed consent.

DATA REPRESENTATION

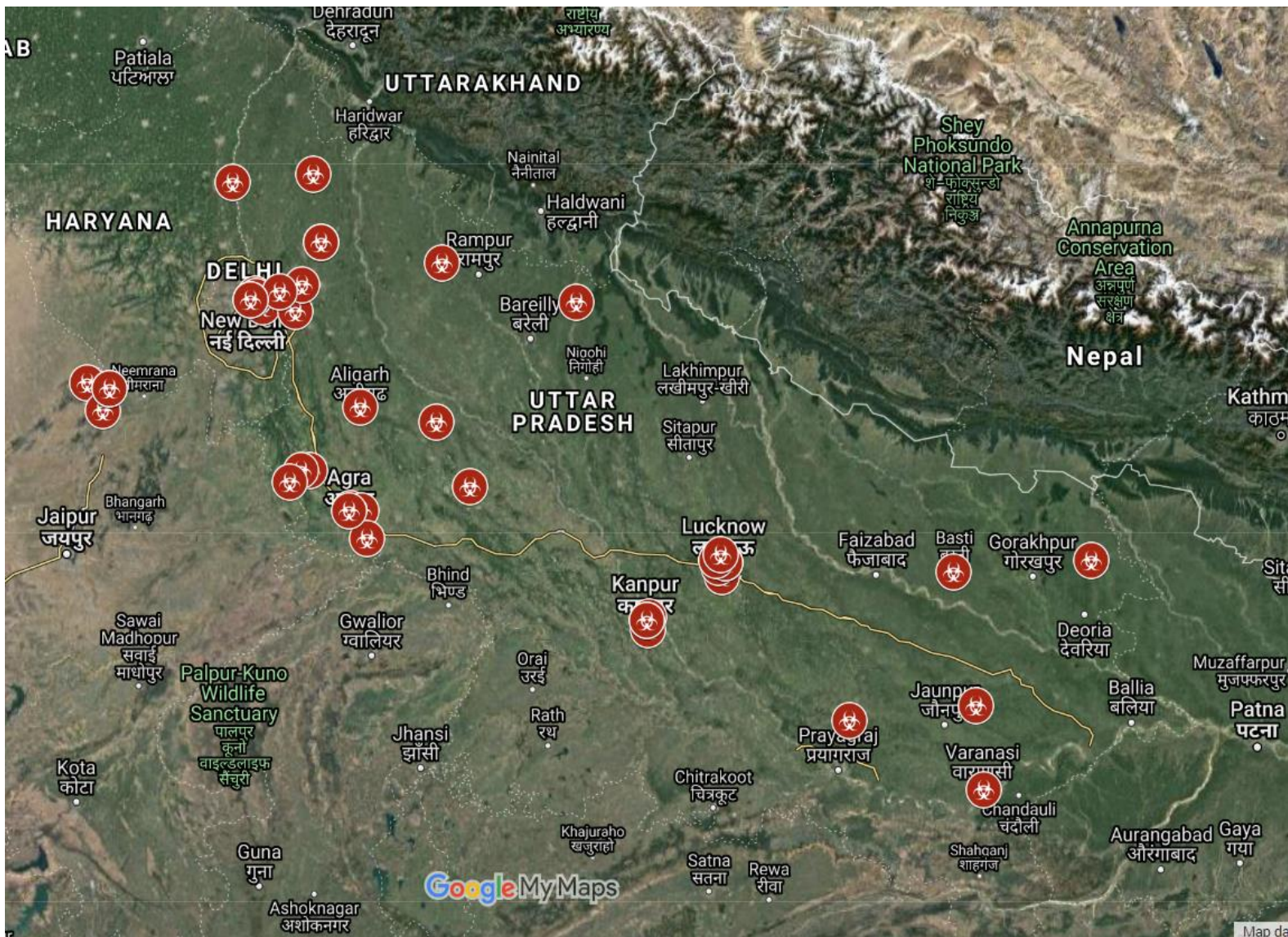


Safe Areas-1166
Dangerous Areas-67

*Though those projected on map were only 50 areas, because map data



included locations of U.P. and NCT(National Capital Territory) only.



We can also project the Pin codes on Maps, for this purpose Google Maps were used.

[View Map \(Scaled\) on Google Maps](#)

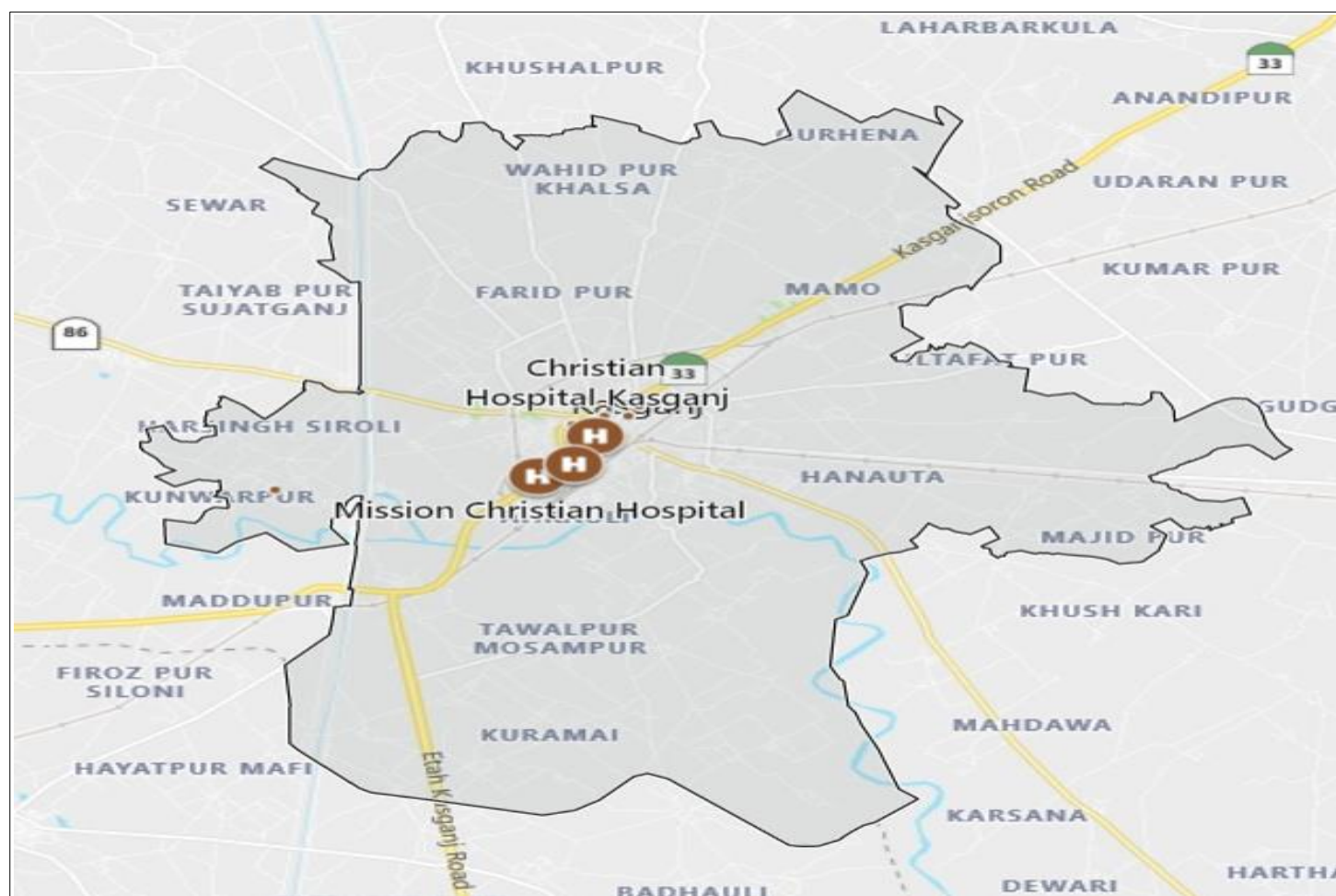
*Note- Since the Data was predominantly Delhi (NCR) and U.P. based therefore only these areas have been shown on the Map, for more we have to increase the data size.



SECONDARY OBJECTIVE

Doctors, Nurses HealthCare Professionals are the Frontline warriors who are actively treating people during this Lockdown, So naturally, they would need more Protective Equipment, also known as Personal Protective Equipment(PPE) to Keep the Virus at bay, but many healthcare professionals don't have the adequate PPE's, we can locate them By again Conducting survey as Described in the Dataset [Click to View Data Sheet](#)

Using PIN codes we can determine the Hospitals and provide Healthcare professionals in the area with adequate PPE's .As shown in the map. A PIN code of Kasganj city is shown. -Black Area PIN code of Respondent with Lack



of PPE, RED-the Nearest Government Hospital Where He/ She may be working

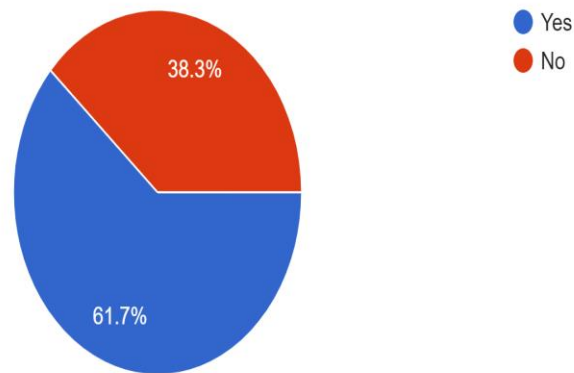
Locating needy areas in need of medical equipment and then using the data to tie up with NGO's and Local Administration for easy Distribution of Medical supplies to Healthcare personnel. Malpractices of equipment-loading, misuse of funds and corruption can also be curbed using this, as only Equipment deficient Areas will receive the required Equipment.

Also in the survey Question 14 asks about the Availability of Medical Equipment for Healthcare personnel and a depressing 38.3 % of 60 Health care Personnel treating Covid19 patients did not have adequate medical equipment to do so , this will in turn

increase the mortality rate. Sourcing of Medical Equipment from elsewhere is therefore important?

Do you have adequate amount of Medical Equipment at your place of work?

60 responses



Increased Mortality Rate affects the morale of front line workers.

CONCLUSIONS

- Governments around the world need new ways to control the outbreak of the Coronavirus, Preventing an outbreak is of significant importance. Above Scale showed us how a comprehensive Survey can help Identifying the Pre Hotspot areas, Authorities should use Such surveys and Scaling method to Find out the Vulnerable pre hotspot areas, Governments around the world have the tools to incorporate such methods, and during crises like these people are ready

to help the Government even when their privacy won't be ensured^{8,9}.

example-

- 1. 'Covidsafe' app launched by Australian government takes Postal code based Geolocation in the beginning only, and appropriate surveys can be conducted through it.**
- 2. 'The Arogya Setu' app launched by the Indian Government can easily distribute these suveys among the population and collect their information with Geotags.**
 - Stressing on Hygiene, Social Distancing^{10,11}, Disinfection^{12,13} and Providing Healthcare workers with protective equipment should be the standard procedure to Fortify an area against an outbreak, above model can indicate areas with deficient healthcare facilities and provide help through local administrations.
 - People after getting the feedback of being in a pre hotspot area can take necessary steps to improve their personal protection.

ERRORS IN DATA

1. Contrary to the belief of the reader, if they think that, "How can an area based on Postal Boundaries be designated as pre hotspot on personal practices of an individual?"

The individual in this is given a way lesser score points, total lack of any protection of an individual personally would account for only 1.5(pts) which will not pass threshold of '2' unless other factors are at play.

More points Almost '7' are given on the basis of presence of virus, age, and chronic diseases.

2. Form submissions often have Wrong Data filled, and so far 20 entries have been identified to be wrong out of 1248 entries, so error is small almost $\pm 1.6\%$.
3. For accurate readings and data analysis 1248 form submissions were adequate, but a sample size of 3000 would have provided more accuracy, moreover, young people are more active on Mobile phones than people of old age, that's why there is low response rate from people of old age, nevertheless old people's response rate was significant in the referred survey.
4. If a person develops serious complications, then he/she needs more critical care and has more chance of exposing critical care staff to the virus¹⁴, losing medical professionals to the viral infection cripples medical infrastructure as there is lack of medical staff during this crisis. More over Gender differences have not been considered in risk because there is not much proof and only preliminary studies¹⁵of it till now of a big disparity in gender in context of spreading the virus.

KEY

PPE	Personal Protective/Protection Equipment
pts	points
'Pre-	Hypothetical area where there is high probability of an outbreak happening, it does not depend on the fact whether an area has been declared Red, Orange or Green Zone. Even Red zones

hotspot'	can have outbreaks where number of Covid 19 patients increases exponentially.
PIN	Postal Index Number
NGO	Non- Governmental Organisation
NCR/NCT	National Capital Region/Territory, includes Delhi and surrounding Regions

ETHICAL

Ethical Approval not needed⁸ as Data taken from already published Dataset on Kaggle.com

DOI: <https://10.34740/kaggle/dsv/1155383>

Informed consent was asked from Each participant of the survey, which I quote here,

“The information submitted by participants will be confidential. This survey will ask for you for your PIN/Postal/ZIP code as a Geographical indicator only. if you wish to continue then click 'YES', * the Surveyor has the right to publish your input Data and Findings.”

FUNDING

No Funding of any kind was required, nor was any taken.

CONFLICT OF INTEREST

This research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Research Guide

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