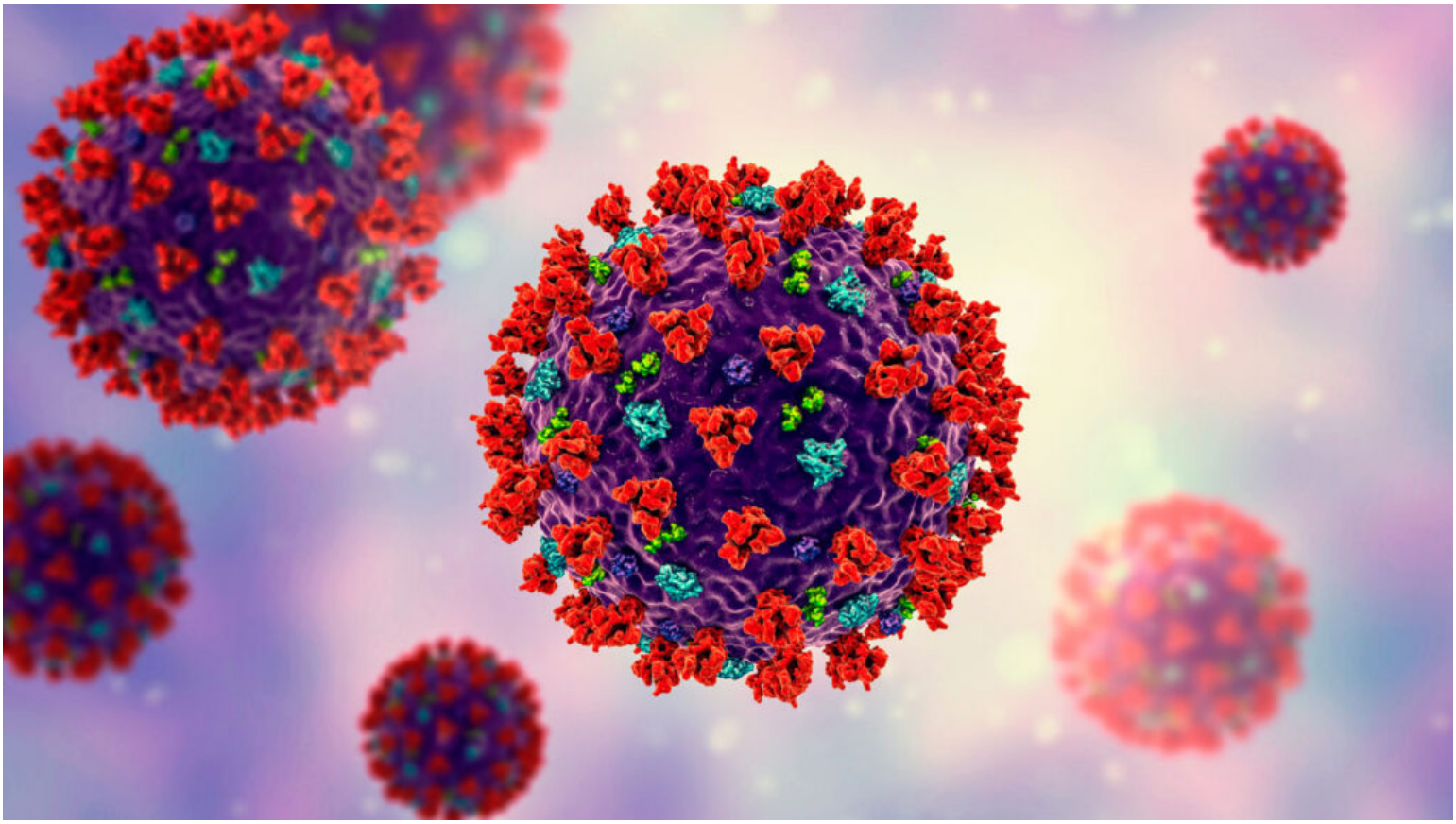
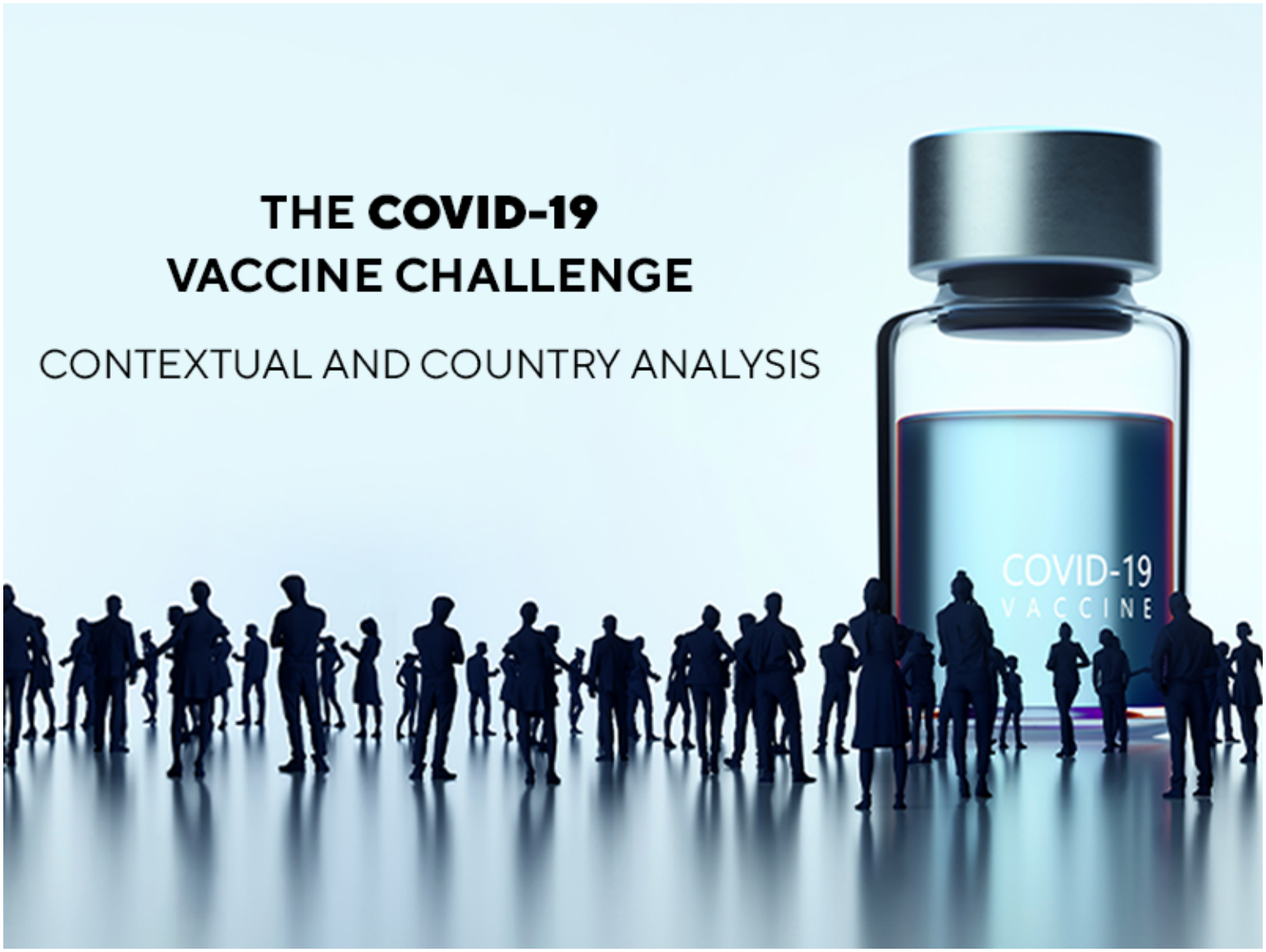


THE **COVID-19** VACCINE CHALLENGE

CONTEXTUAL AND COUNTRY ANALYSIS



COVID-19

Guidelines to Plan for COVID-19 Vaccine Introduction
Version 1: 10 July 2020

Document developed by the Comprehensive Family Immunization Unit of the Family, Health Promotion and Life Course Department (FPL/IM) in the Pan American Health Organization (PAHO)

Background

COVID-19 is an infectious disease caused by a novel coronavirus that recently emerged (SARS-CoV-2).The COVID-19 pandemic was declared by the World Health Organization (WHO) on 11 March 2020, the first non-influenza pandemic to affect more than 200 countries, with more than 10 million cases to date. Approximately, half of these cases have been reported in the Region of the Americas. The world hopes to soon have COVID-19 vaccines as one of the most cost-effective measures to control the pandemic and lessen the health, economic, and social impacts.

While progress is being made in the development and production of vaccines against COVID-19, countries must simultaneously advance in planning to introduce this new vaccine and identify key components to strengthen as preparation for vaccination against this pandemic. Gained experiences in the Region of the Americas with vaccination against the H1N1 influenza pandemic in 2009, annual vaccination against seasonal influenza, vaccination campaigns against measles and rubella, polio and yellow fever, among others, should be used to develop national COVID-19 vaccination plans.

Among the main challenges expected for COVID-19 vaccination are timely, equitable, and sufficient access to vaccines, technical and logistical aspects, such as the development of vaccines with new technologies, definition of priority groups, number of doses to administer for adequate protection, as well as vaccine safety and effectiveness. Additionally, other programmatic challenges can be evident related to cold chain needs and creating demand for vaccination, among others. However, with the information currently available and with the assumption that vaccines will be available in the countries of the Region starting in 2021, it is important to start preparing the infrastructure and key components to introduce the vaccine in all countries, prioritizing components in which progress can be made.

The objective of this document is to provide guidelines to national immunization programs (NIPs) for the development of their respective COVID-19 vaccination plans. It is important to involve National Immunization Technical Advisory Groups (NITAGs) in the development of these national plans. It is also important to consider recommendations previously issued by PAHO/WHO on security measures for health care workers and the rest of the population regarding COVID-19.

This document will be updated as new evidence becomes available.

COVID-19 vaccine introduction: Insights from malaria, meningitis, and more

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December 3, 2020

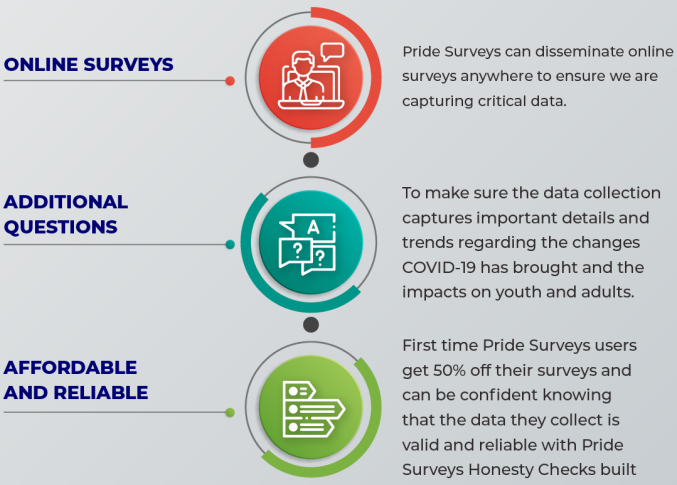
The Importance of Data Collection During A Pandemic

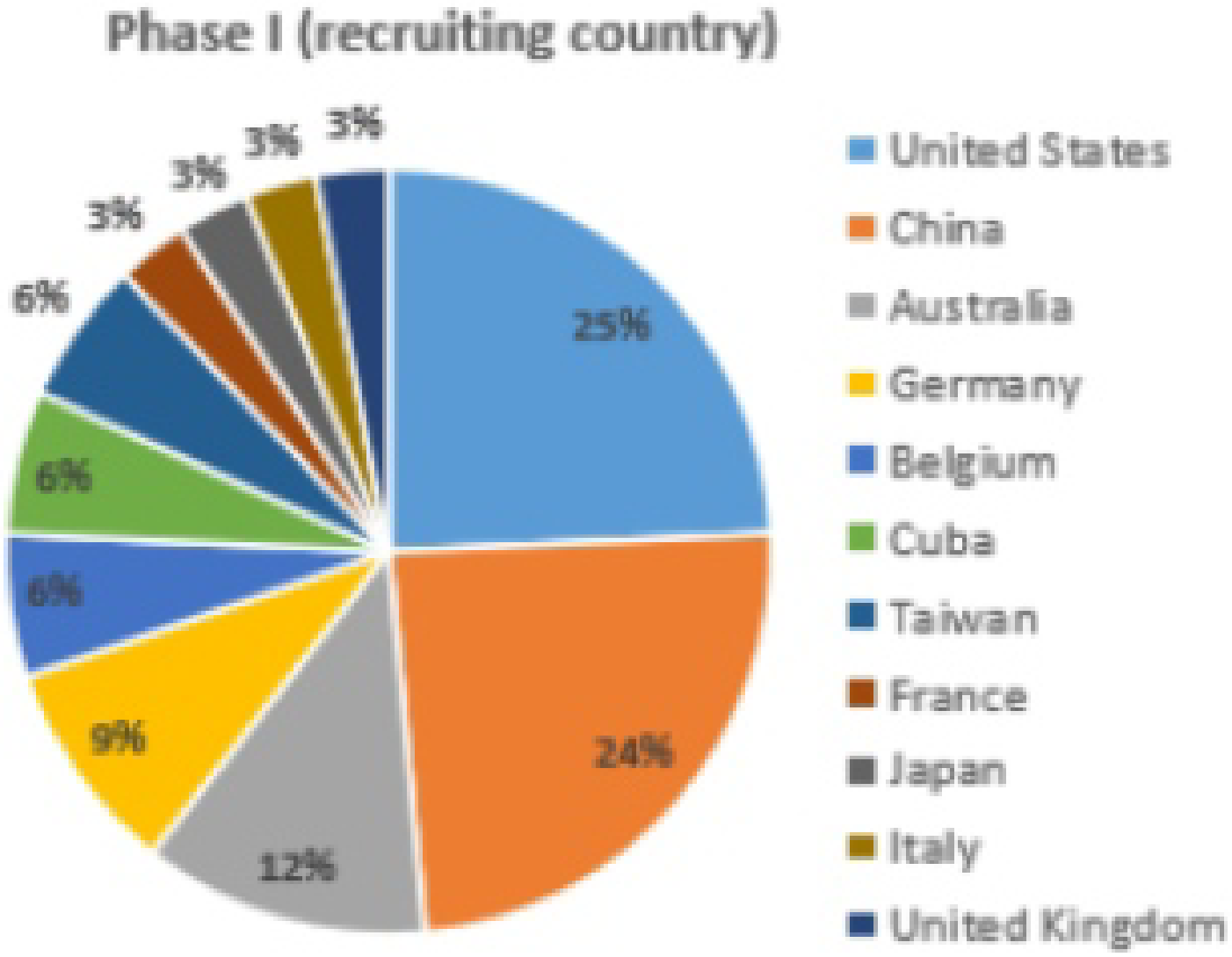
Data collection based on researched survey methodology and time-tested questions is critical for coalitions to move forward in the SPF process.

The Assessment Process May Include:

SPF Assessments During COVID-19

There are many ways Pride Surveys has worked with our school and community coalitions partners to adapt the survey process during COVID-19:




Phase I (recruiting country)
25%
24%
12%
9%
6%
6%
6%
3%
3%
3%
3%
United States
China
Australia
Germany
Belgium
Cuba
Taiwan
France
Japan
Italy
United Kingdom

An Exploratory Data Analysis of COVID-19 in India

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Abstract - The number of COVID-19 cases in India is increasing at a rapid pace. The National and local authorities are having a hard time to create a pattern, analyze and forecast the spread of COVID-19 in India. The main aim of this paper is to draw a statistical model for better understanding of COVID-19 spread in India by thoroughly studying the reported cases in the country till 22 April 2020. An Exploratory Data Analysis (EDA) technique is being implemented to study and analyze the reported COVID-19 cases in India. The result of the analysis divulge the impact of COVID-19 in India on daily and weekly manner, analogize India with abutting countries as well as with the countries who are badly affected and arrangement of India's Healthcare sector for such epidemic.

Keywords— COVID-19, exploratory data analysis technique, India's analysis, abutting countries analysis, healthcare sector analysis

I. INTRODUCTION

COVID-19 is a contagion belongs to the "Nidovirus family", or "Nidovirales" which includes "Coronaviridae", "Artieviridae" and "Roiniviridae" family, responsible for respiratory illness in humans which may cause common cold to more austere diseases such as "Middle East Respiratory Syndrome(MERS)" and "Severe Acute Respiratory Syndrome(SARS)". The most common symptoms or traits of COVID-19 are fever, tiredness, dry cough, aches and pain, nasal congestion, runny nose or sore throat. The main thing to note here is that some people get infected and don't get these symptoms or traits and doesn't feel unwell. All age group people who has a medical history of blood pressure, cardiovascular disease or diabetes are more prone to get infected and if anyone with fever, cough and breathing difficulties should immediately seek for medical attention. COVID-19 is a "communicable" disease and can be passes through the droplets from nose or mouth when an infected person coughs or exhales and this is the main reason to maintain 1m (3 feet) distance from the sick person. Studies till date indicate that COVID-19 is mainly spread through contact rather than transmitted through air. As many people only experienced mild symptoms so it is a high probability to catch COVID-19 from the person who has mild cough or doesn't feel ill.

Protection from and prevention of spreading COVID -19 can be minimized by including some of the simple and easy to adopt precautions in daily habits which include thoroughly cleaning hands with alcohol based hand rub or washing them with soap and water, avoid touching eyes, nose and mouth as hands touches several surfaces which might be contaminated and hands could act as a carrier for COVID- 19 and virus can enter our body, stay home if you feel unwell and most importantly avoid traveling as much as possible. Follow National and local authorities only as they will have the most up to date information about the situation.

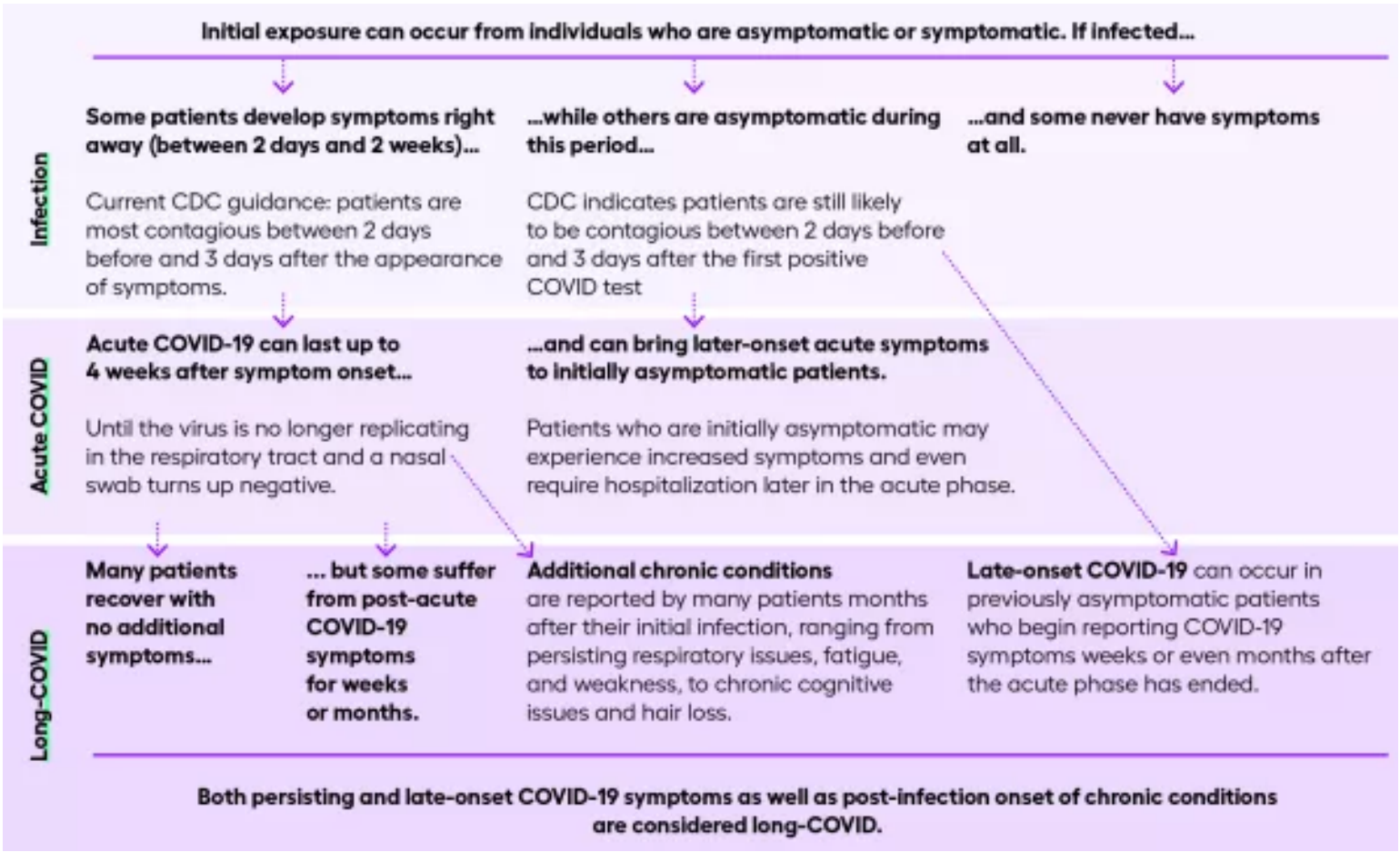
On 30 January 2020, India reported its first coronavirus case in Kerala when a student returned from Wuhan (epicenter of coronavirus) and till then the number of cases has been increasing exponentially. In recent times there is no vaccine or medicine available particularly for treatment of COVID-19 and currently are under investigation. This paper analyzes the current trend of COVID-19 based on certain criterion using "Exploratory Data Analysis". Exploratory Data Analysis (EDA) is the way to explore the data with the aim of extracting useful and actionable information from it. EDA is the revelatory step in any kind of analysis.

II. LITERATURE SURVEY

In [1] the researchers analyzed the transmission trend of COVID-19 from China to other countries, confirmed cases on daily basis, surveillance strategy of China, South Korea, Japan, Italy , Iran and Spain from the first day of outbreak along with the effect of government policies of the above countries in controlling the COVID-19 outbreak by finding the linear relation between outbreak condition and "case fatality rate(CFR)" by taking global daily statistics such as confirmed, death and recovered cases and making prediction with respect to China using "Linear Regression".

In [2] authors describes the research performed in the field of "coronavirology" with the overview of coronavirus replication and pathogenesis along with the evolution of coronavirus, the organ cultures and cells preparation, as well as techniques for analyzing the virus function, commonly used reverse genetic techniques of coronavirus and virus cell fusion as well as titration techniques, identification of cellular receptors and virus cell fusion along with visualization of virus replication complexes and covers the "coronavirus life cycle" in great detail.

In paper [3] researchers study and analyze the COVID-19 virus spreading statistics from the cases of different countries using "Bailey's model". High correlation coefficients (91.4%) were resulted using Pearson correlation method and determinants (83.98) were also considered for the correctness of the model. "World Health Organization's" daily report were considered were considered for analyses of 204 countries and also indicates the difficulties in correctly predicted the future spread-reduction variable of the pandemic.


Initial exposure can occur from individuals who are asymptomatic or symptomatic. If infected...
Infection
Some patients develop symptoms right away (between 2 days and 2 weeks)...
Current CDC guidance: patients are most contagious between 2 days before and 3 days after the appearance of symptoms.
...while others are asymptomatic during this period...
CDC indicates patients are still likely to be contagious between 2 days before and 3 days after the first positive COVID test
...and some never have symptoms at all.
Acute COVID
Acute COVID-19 can last up to 4 weeks after symptom onset...
Until the virus is no longer replicating in the respiratory tract and a nasal swab turns up negative.
...and can bring later-onset acute symptoms to initially asymptomatic patients.
Patients who are initially asymptomatic may experience increased symptoms and even require hospitalization later in the acute phase.
Long-COVID
Many patients recover with no additional symptoms...
... but some suffer from post-acute COVID-19 symptoms for weeks or months.
Additional chronic conditions are reported by many patients months after their initial infection, ranging from persisting respiratory issues, fatigue, and weakness, to chronic cognitive issues and hair loss.
Late-onset COVID-19 can occur in previously asymptomatic patients who begin reporting COVID-19 symptoms weeks or even months after the acute phase has ended.
Both persisting and late-onset COVID-19 symptoms as well as post-infection onset of chronic conditions are considered long-COVID.

BMJ Global Health

An in-depth statistical analysis of the COVID-19 pandemic's initial spread in the WHO African region

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Handling editor Seye Abimbola

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ABSTRACT

During the first wave of the COVID-19 pandemic, sub-Saharan African countries experienced comparatively lower rates of SARS-CoV-2 infections and related deaths than in other parts of the world, the reasons for which remain unclear. Yet, there was also considerable variation between countries. Here, we explored potential drivers of this variation among 46 of the 47 WHO African region Member States in a cross-sectional study. We described five indicators of early COVID-19 spread and severity for each country as of 29 November 2020: delay in detection of the first case, length of the early epidemic growth period, cumulative and peak attack rates and crude case fatality ratio (CFR). We tested the influence of 13 pre-pandemic and pandemic response predictor variables on the country-level variation in the spread and severity indicators using multivariate statistics and regression analysis. We found that wealthier African countries, with larger tourism industries and older populations, had higher peak ($p<0.001$) and cumulative ($p<0.001$) attack rates, and lower CFRs ($p=0.021$). More urbanised countries also had higher attack rates ($p<0.001$ for both indicators). Countries applying more stringent early control policies experienced greater delay in detection of the first case ($p<0.001$), but the initial propagation of the virus was slower in relatively wealthy, touristic African countries ($p=0.023$). Careful and early implementation of strict government policies were likely pivotal to delaying the initial phase of the pandemic, but did not have much impact on other indicators of spread and severity. An over-reliance on disruptive containment measures in more resource-limited contexts is neither effective nor sustainable. We thus urge decision-makers to prioritise the reduction of resource-based health disparities, and surveillance and response capacities in particular, to ensure global resilience against future threats to public health and economic stability.

WHAT IS ALREADY KNOWN?

⇒ The emergence of COVID-19 varied widely across the world, with sub-Saharan African countries in particular appearing relatively unaffected.

WHAT THIS STUDY ADDS?

⇒ Here, we examined variation in early COVID-19 trajectories across the WHO African region for less biased insight into how these countries were impacted. We found that countries with greater resources and pandemic preparedness reported significantly higher case numbers but were able to limit early spread and mortality, despite older and more urbanised populations exposed to international travel for tourism. Countries with fewer resources and lower surveillance capacity and preparedness scores actually saw faster initial epidemic growth rates, despite modest delays in epidemic onset due to the enacting of more stringent response policies with large socioeconomic implications.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY?

⇒ Careful implementation of strict government policies can aid in delaying an epidemic, but investments in public health infrastructure and pandemic preparedness are needed to better mitigate its impact on the population as a whole.

INTRODUCTION

The first confirmation of a COVID-19 case in the African continent occurred in Egypt on 14 February 2020.[1] Following that introduction, along with others that would go on to occur one-by-one in the rest of the continent, COVID-19 cases and related fatalities rose exponentially, eventually reaching all African countries by 13 May 2020. Countries on the continent appear to have fared better during the initial wave of the pandemic than elsewhere in the world, with lower attack rates and many orders of magnitude fewer deaths. There are various theories about the drivers of this phenomenon, including

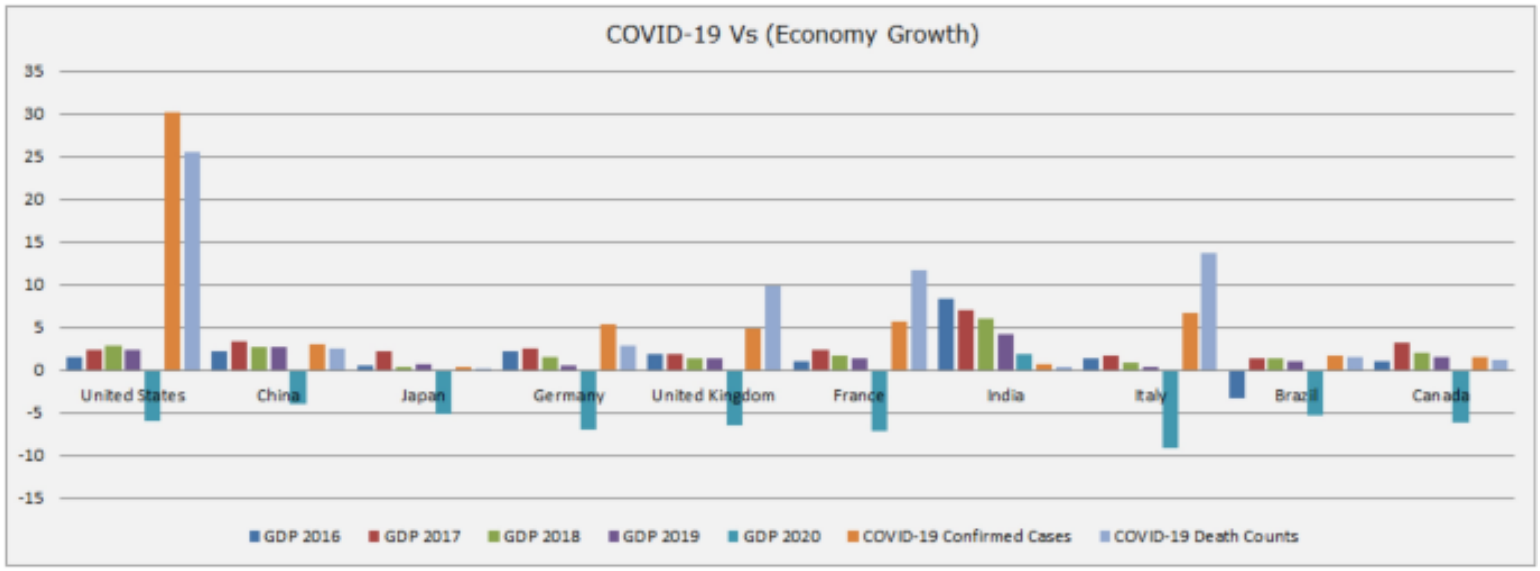
Nonlinear Regression Analysis

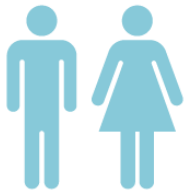
Iteration History[b]

Iteration Number[a]	Residual Sum of Squares	Parameter b0	Parameter b1
1.0	1.181E+13	.100	1.200
1.1	3.857E+10	.007	1.199
2.0	3.857E+10	.007	1.199
2.1	3.778E+9	.008	1.188
3.0	3.778E+9	.008	1.188
3.1	86647958.8	.014	1.170
4.0	86647958.8	.014	1.170
4.1	242141521	.027	1.157
4.2	80701896.3	.017	1.167
5.0	80701896.3	.017	1.167
5.1	105489449	.026	1.160
5.2	79493338.9	.018	1.166
6.0	79493338.9	.018	1.166
6.1	79164540.7	.020	1.165
7.0	79164540.7	.020	1.165
7.1	79588683.9	.024	1.162
7.2	78899291.3	.022	1.164
8.0	78899291.3	.022	1.164
8.1	78788895.2	.025	1.162
9.0	78788895.2	.025	1.162
9.1	78675596.9	.028	1.160
10.0	78675596.9	.028	1.160
10.1	78446388.3	.030	1.159
11.0	78446388.3	.030	1.159
11.1	78427724.6	.030	1.160
12.0	78427724.6	.030	1.160
12.1	78427625.7	.030	1.159
13.0	78427625.7	.030	1.159
13.1	78427620.8	.030	1.159
14.0	78427620.8	.030	1.159
14.1	78427620.4	.030	1.159

Derivatives are calculated numerically.

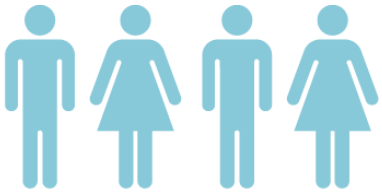
a. Major iteration number is displayed to the left of the decimal, and minor iteration number is to the right of the decimal.


COVID-19 Vs (Economy Growth)
35
30
25
20
15
10
5
0
-5
-10
-15
United States
China
Japan
Germany
United Kingdom
France
India
Italy
Brazil
Canada
GDP 2016
GDP 2017
GDP 2018
GDP 2019
GDP 2020
COVID-19 Confirmed Cases
COVID-19 Death Counts



Host factors

- Old age
- Previous infection
- Immune compromise
- Genetic polymorphisms
- Underlying health conditions



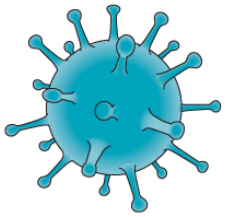
Demographic factors

- High levels of circulating virus
- Close proximity of people living together
- High levels of vaccine uptake
- High levels of herd immunity

Vaccine access factors

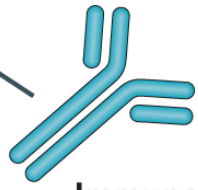
- Which vaccine used
- Number of doses
- Timing between doses
- Heterologous prime–boost
- Cost–benefit decisions by national vaccine bodies
- Limited access to vaccines

Vaccine effectiveness



Viral variant factors

- Antigenic mismatch with vaccine
- Increased transmissibility



Immune factors

- High antibody titres
- Quality of antibody (neutralization)
- T cells

- Positive effect on VE
- Negative effect on VE
- Unknown effect on VE