



United Nations
Educational, Scientific and
Cultural Organization



Mahatma Gandhi Institute
of Education for Peace
and Sustainable Development



PANDEMICS PAST PRESENT FUTURE

**CHALLENGES &
OPPORTUNITIES**

Published in 2021 by the Mahatma Gandhi Institute of Education for Peace and Sustainable Development, 35 Ferozshah Road, New Delhi 110001, India

© UNESCO MGIEP

This publication is available in Open Access under the Attribution-ShareAlike 3.0 IGO (CC-BY-SA 3.0 IGO) license (<http://creativecommons.org/licenses/by-sa/3.0/igo/>). By using the content of this publication, the users accept to be bound by the terms of use of the UNESCO Open Access Repository (<http://www.unesco.org/openaccess/terms-use-ccbysa-en>).

The designations employed and the presentation of material throughout this publication do not imply the expression of any opinion whatsoever on the part of UNESCO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The ideas and opinions expressed in this publication are those of the authors; they are not necessarily those of UNESCO and do not commit the Organization.

The publication can be cited as: Duraipapp, A. K., Singh, K., Mochizuki, Y. (Eds.) (2021). Pandemics: Past, Present and Future Challenges and Opportunities. New Delhi. UNESCO MGIEP.

Coordinating Lead Authors:

Anantha Kumar Duraipapp, Director, UNESCO MGIEP
Kriti Singh, Research Officer, UNESCO MGIEP

Lead Authors:

Nandini Chatterjee Singh, Senior Programme Officer, UNESCO MGIEP
Yoko Mochizuki, Head of Policy, UNESCO MGIEP
Shahid Jameel, Director, Trivedi School of Biosciences, Ashoka University

Contributing Authors:

Charles Perrings, Professor of Environmental Economics, Vice-Chair, Diversitas, Global Institute of Sustainability, Arizona State University
W. Ian Lipkin, John Snow Professor of Epidemiology, Mailman School of Public Health, Columbia University; Professor of Neurology and Pathology, College of Physicians and Surgeons, Columbia University
B.N. Satpathy, Senior Consultant, Office of Principal Scientific Advisor to the Government of India
Suneet Mohan, Consultant, Office of Principal Scientific Advisor to the Government of India
Devesh Kumar, Consultant, UNESCO MGIEP

Designed by Prasun Mazumdar Design, Gurgaon, India

Printed by Lustra Printing Press

Printed in India

PANDEMICS: Past, Present, Future *Challenges & Opportunities*



Coordinating Lead Authors:

ANANTHA KUMAR DURAIAPPAH
Director, UNESCO MGIEP

KRITI SINGH
Research Officer, UNESCO MGIEP

Lead Authors:

NANDINI CHATTERJEE SINGH
Senior Programme Officer, UNESCO MGIEP

YOKO MOCHIZUKI
Head of Policy, UNESCO MGIEP

SHAHID JAMEEL
Director, Trivedi School of Biosciences, Ashoka University

Contributing Authors:

CHARLES PERRINGS
Global Institute of Sustainability, Arizona State University

W. IAN LIPKIN
*John Snow Professor of Epidemiology,
Mailman School of Public Health, Columbia University;
Professor of Neurology and Pathology,
College of Physicians and Surgeons, Columbia University*

B.N. SATPATHY
*Senior Consultant,
Office of Principal Scientific Advisor to the Government of India*

SUNEET MOHAN
*Consultant,
Office of Principal Scientific Advisor to the Government of India*

DEVESH KUMAR
Consultant, UNESCO MGIEP

Preface

Please note: The research, and findings presented in this document are based on data collected until January, 2021.

As the world continues to grapple with COVID-19, this booklet comes in handy to answer and reflect upon basic questions encompassing the word “pandemic”- the what, where, when and how of it. The genesis of the book began when we were approached by the **Office of Principal Scientific Adviser to the Government of India** to produce a document that was not meant to be: (i) a compendium for training individuals on pandemic science; (ii) an exhaustive compilation of do’s and don’ts with respect to a pandemic; and iii) a commentary on global best versus worst practices to combat the pandemic.

What this booklet does aim to provide is the following: (i) basic information about key concepts associated with and procedural understanding of the term “pandemic”; (ii) a synopsis of past and present pandemics with focus on lessons learnt- primarily from COVID-19 and preparedness for future; iii) a brief overview of mitigation policies adopted by countries across the globe to combat the pandemic iv) an account of direct and indirect impacts of pandemic on various sectors of the society ranging from health, education, to economic, and v) a preliminary inference of its ramifications on progress towards Sustainable Development Goals (SDGs). Therefore, this booklet should be considered as a primer on pandemics with the main objective of familiarizing its readers with key concepts, measures, lessons and preparedness on pandemics.

The booklet took about 6 months till its completion. It was a herculean task as the goal posts kept changing, we were flooded with new information on a daily basis regarding a relatively new phenomena. However, as we sailed through uncharted waters and endured the hurdles, we believe we have a story to tell through this booklet and hope the readers find it useful primarily as an information note on pandemics in general. It also highlights some of the complexities we have to face when making decisions to combat the disease but at the same time oversee the welfare of the people across multiple domains and not just linked with the disease.

We acknowledge that an exhaustive evaluation of the current pandemic- COVID-19 and its aftermath might not be possible, given that it is still ongoing and we make no such claims. However, we do try to gauge the magnitude of its impact on the world we live in and derive preliminary inferences based on facts to enhance our understanding.

If there is one thing that the COVID-19 pandemic has revealed it is the power of oneness- power of global coordination, international scientific collaboration, and aligned action in fighting against the virus. We are all in this together. As we learn to live with the fact that COVID-19 is here to stay for a while, and continue to acclimatize to the “new normal”, our aim should be to trust scientific evidence and align our actions in a manner that maximizes “normal” living and minimizes inconveniences caused due to the pandemic. We hope this booklet will provide its audience with necessary information to help achieve this goal.

TABLE OF CONTENTS

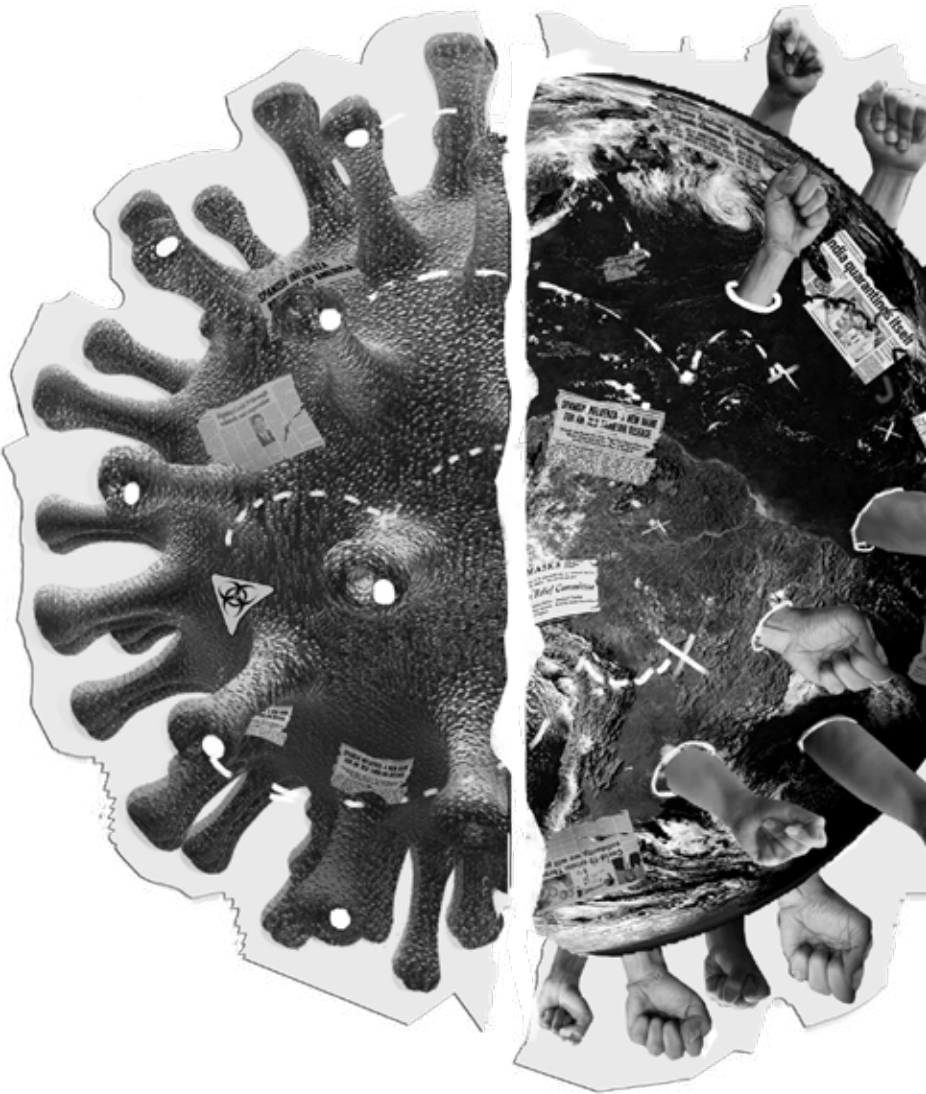
Foreword	9	Q5	38	Q10	66
Executive Summary	10	What are the causes of emerging infectious diseases?			
Introduction	16	What are the health impacts of COVID-19?			
Q1 18					
What is a pandemic and how is a pandemic declared?					
Q6 42					
Which are the main pandemic viruses and what are the key differences across them and the type of treatments used?					
Q11 74					
What health sector specific policy responses can be implemented?					
Q2 22					
What is the procedure used to declare a pandemic?					
Q7 48					
What are the main causes or drivers behind the emergence of pandemic diseases?					
Q12 78					
How has COVID-19 impacted school education?					
Q3 26					
Is it legally binding for all countries to adhere to pandemic guidelines? Can a country defy a pandemic declaration?					
Q8 52					
What are the factors affecting the spread of pandemics?					
Q13 86					
What are some key policy responses in education?					
Q4 30					
What pandemics have we witnessed over the past 100 years?					
Q9 56					
What measures were adopted by countries to combat COVID-19 and how successful have they been?					
Q14 92					
What have been the economic impacts of COVID-19?					

Q15	102
What have been the economic policies in response to COVID-19?	

Q16	106
What have been the overall effects of COVID-19 on the SDGs?	

Q17	112
What are the key lessons we can learn from the COVID-19 pandemic and opportunities to be explored in preparation for future pandemics?	

References	120
------------	-----



Foreword

COVID-19 pandemic is unprecedented in human history. It has brought to the forefront some unimaginable challenges and has highlighted the need for resilient and adaptable health, economic, and social systems. It is only through an unwavering commitment to COVID appropriate behaviour and adoption of an integrated approach towards vaccine development that we can mitigate and recover from damage caused by pandemics like COVID-19.

As the world continues to grapple with this pandemic, it is essential to understand the basic questions encompassing the word “pandemic”- the what, where, when and how of it. This is the motivation for the document.

The primary aim of this document is to provide basic information about key concepts associated with and procedural understanding of the term “pandemic”. It gives a synopsis of past and present pandemics with focus on lessons learnt primarily from COVID-19 and preparedness for future. It sheds light on the mitigation policies adopted by countries across the globe to combat the pandemic and gives an account of direct and indirect impacts of pandemic on various sectors of the society.

This document is a collation of facts and figures which are informational in nature. It highlights some of the complexities we have to face as a nation when making decisions to combat the disease but the same time oversee the welfare of the people across multiple domains and not just linked with the disease. I hope that this document will serve as a useful tool not only for policymakers who are at the forefront of devising plans to combat the spread of disease, but also for other stakeholders like educators, economists, health care personnel who are tasked with implementing the plans, and most importantly people by and large who are ultimately responsible for executing the plans, thereby deciding success or failure in curtailing the spread of the disease.

I would like to congratulate Prof Anantha Kumar Duraiappah, Director UNESCO MGIEP, his entire team and the eminent contributors in taking the initiative and bringing out this document

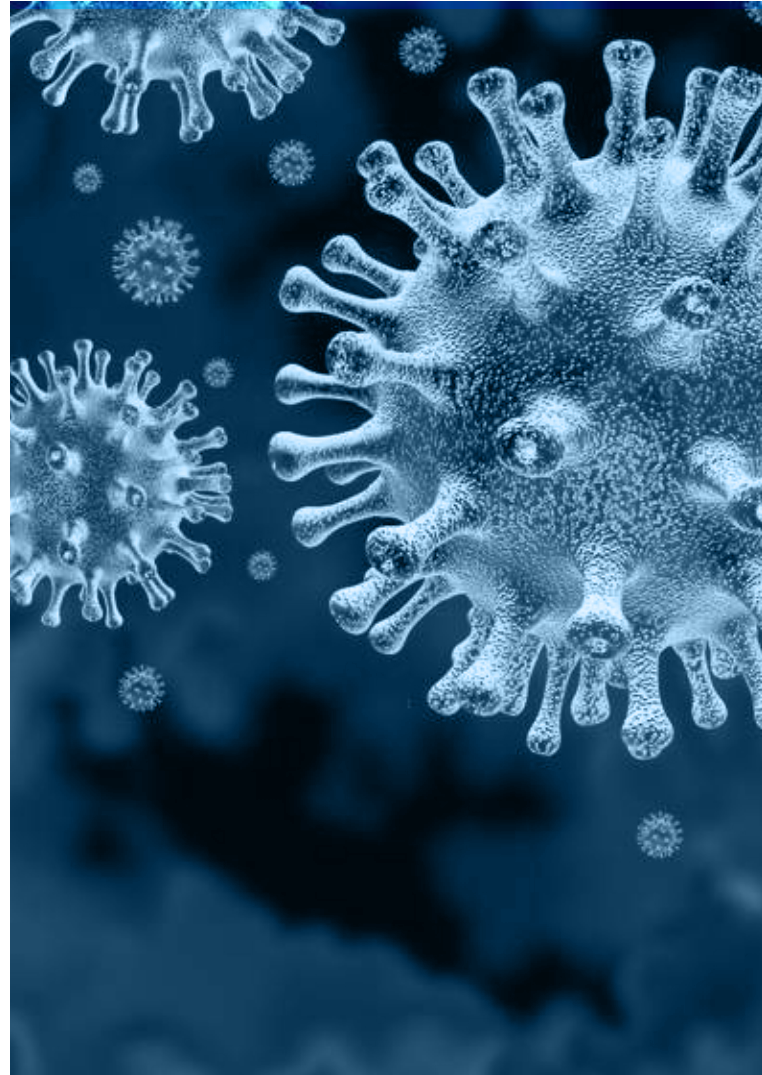
Lastly, I thank my team consisting of Shri B.N. Satpathy and Shri Suneet Mohan for coordinating and contributing towards building of this document



K. VIJAYRAGHAVAN
Principle Scientific Advisor to the Govt. of India

Executive Summary

In December 2019, first signs of a potential pandemic in the form of a new strain of pneumonia emerged in city of Wuhan in the Hubei region of China. Due to delayed reporting at local levels and before public health systems could control the localized outbreak, similar clusters of pneumonia started appearing in other parts of the world.



The pneumonia was attributed to a coronavirus. In India, the first case was reported on 30 January 2020. On 11 March 2020, the WHO declared the infectious disease a pandemic. The disease was called Coronavirus infectious disease 2019 (COVID-19), and the virus SARS coronavirus 2 (SARS-CoV-2).

On 11 March 2020, the WHO declared the infectious disease a pandemic. The disease was called Coronavirus infectious disease 2019 (COVID-19), and the virus SARS coronavirus 2 (SARS-CoV-2).

It is against this background that this document has been prepared. The objective of this document is to provide basic facts about pandemics, past, present and future. It is meant to be a primer on pandemics. It provides a brief overview of some of the key factors that might help understand and address pandemics, especially the ongoing COVID-19, and their impacts across society at the global scale. This document is not meant to provide an exhaustive explanation of pandemics. References to specific do not reflect the official views of the government.

The document is targeted primarily to policymakers tasked with handling pandemics but also to stakeholders in other sectors such as education and development who are affected by pandemics. The primary data used in this document are from recognized databases such those by the World Health Organization (WHO), John Hopkins University and the Centers for Disease Control and Prevention (CDC). Peer reviewed published literature as

well as reports from the relevant international organizations are extensively used in this document. The dates on which the data is presented range from October to December as the numbers are constantly changing as the virus works its way through the world.

The document is organized around 17 questions beginning with what is a pandemic and the international legal-institutional process to declare a pandemic. These are then followed by questions on the COVID-19 mitigation policies that have been used to date and the lessons learnt. The next set of questions focus on the direct and indirect impacts of the COVID-19 pandemic across the health, education and economic sectors and extrapolating these on the progress towards achieving the Sustainable Development Goals (SDGs). The document ends with some key lessons and recommendations on the way forward.

What is a pandemic?

At the time of finalizing this document (10 December 2020), there were 68,165,877 confirmed cases of the COVID-19 pandemic and 1,557,385 confirmed deaths across 220 countries, areas and territories.¹ The majority of the cases as of October 1st 2020 have been the United States of America (USA), India and Brazil and which are still not seeing a flattening of the curve as shown in Figure 1.

Although the WHO does not have a binding set of rules for declaring a pandemic, the organization uses the International Health Regulations (2005) (IHR) as the global legal instrument to help protect nations from international spread of disease including public health risks and public health emergencies. The IHR requires countries to report public health events and outlines criteria to determine whether or not a particular event constitutes a “public health emergency of international concern” (PHEIC). The bottom line we can learn from COVID-19 is the need to strengthen the rules and legislation within the WHO for it to declare a pandemic that is universally accepted by all Member States and are obliged to act accordingly in a collaborative manner with support from the WHO.

The COVID-19 is not a ‘Black Swan’ event as many claim it to be. A report from the Global-Preparedness-Monitoring-Board

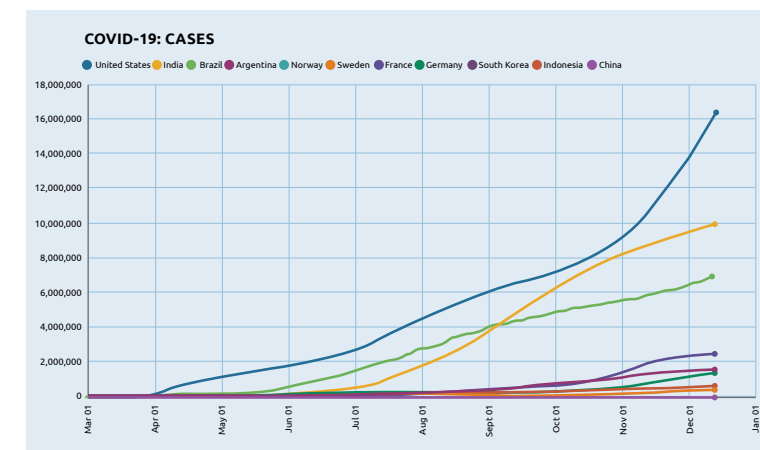


Figure 1. COVID-19 infection rates from 1 March 2020 till 15 December 2020. Source: Graph created by Devesh Kumar based on data from European Center for Disease Prevention and Control (<https://www.ecdc.europa.eu/en>)
Last updated: 15 December 2020, 08:00 IST (GMT +5:30)

¹<https://www.who.int/emergencies/diseases/novel-coronavirus-2019>

(2019)—a subsidiary body of the World Health organization—highlighted the imminent danger of a global pandemic and alerted Member States of how little or no preparations were being made to face such a pandemic (Goodwell 2020).

It is estimated that around 60% of all known human pathogens and 75% of recently emerged infectious diseases are zoonotic. Although emerging infectious disease outbreaks are most likely to occur in the large population centers of Europe, the USA, and Japan, there is growing body of evidence that those outbreaks are most likely to have their origin in forested tropical areas. The spread of newly emerged infectious diseases is very strongly tied to patterns of trade and travel. In the case of COVID-19, the outbreak prompted immediate mobility restrictions around Wuhan. These were followed by the suspension of international flights to and from China. Even then, the virus spread widely across the globe.

People’s contact choices reflect the relative costs of illness and its avoidance to them—the private cost. If the private cost of illness is low, or the private cost of illness avoidance is high, people have little incentive to avoid contact.

COVID-19 mitigation policies

Countries across the world adopted a range of measures ranging from lockdowns, containment zones, mandatory masks, social distancing and personal sanitary measures. It seems that countries which followed a rigorous Test, Track, Quarantine, Treat (TTQT)—in conjunction with strict lockdowns in the early stages of infections followed by easing of lockdowns with containment zones established when necessary—and enforced non-pharmaceutical interventions (social distancing, masks and sanitary measures) have weathered the pandemic much better (see countries with flattened case load rates in Figure 1) than those which had ad-hoc or partial measures but without strategic planning.

The differences in the effectiveness of such measures applied in different countries reflect a fundamental property of epidemics—that the contact between susceptible and infected individuals which leads to transmission depends on the choices made by individuals. People’s contact choices reflect the relative costs of illness and its avoidance to them—the private cost. If the private cost of illness is low, or the private cost of illness avoidance is high, people have little incentive to avoid contact. The essentially economic nature of contact

decisions, and the essential role of economics in epidemiological processes determines the total impact a pandemic has on societies. A key lesson emerging from this observation is for policymakers to have mechanisms that automatically kick in during times of disaster such as a pandemic to reduce the private costs of illness avoidance.

Impacts of the COVID-19 pandemic

COVID-19 has had profound impacts across all segments of society and across all countries. Nobody has been spared. Those countries with high levels of infection have seen high mortality rates while others have witnessed the indirect impacts through disruptions in the education and human development sectors. In this document, we have explored the impact the pandemic has on the economic, education and health sectors. We have also used the 17 Sustainable Development Goals (SDGs) as a relevant benchmark to assess the impacts of COVID-19. Figure 2 provides a snapshot of this across the SDGs.

Poverty, health, hunger, education, gender, unemployment, and inequalities can be expected to worsen and might take a long time to recover if targeted policies are not enforced immediately and continued post COVID-19. Areas to focus include the green sustainable economy, digitalization, social-welfare programs and governance.

Short-term Impacts of COVID-19 on the Sustainable Development Goals









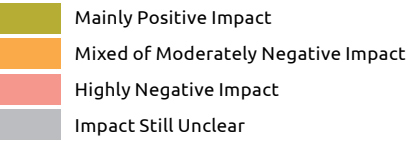
	Mainly Positive Impact	Mixed of Moderately Negative Impact	Highly Negative Impact	Impact Still Unclear
 SDG 1 NO POVERTY			Highly negative impact	
 SDG 2 ZERO HUNGER			Highly negative impact	
 SDG 3 GOOD HEALTH & WELL-BEING			Highly negative impact	
 SDG 4 QUALITY EDUCATION		Mixed or moderately negative impact		
 SDG 5 GENDER EQUALITY		Mixed or moderately negative impact		
 SDG 6 CLEAN WATER & SANITATION		Mixed or moderately negative impact		
 SDG 7 AFFORDABLE & CLEAN ENERGY		Mixed or moderately negative impact		
 SDG 8 DECENT WORK & ECONOMIC GROWTH			Highly negative impact	
 SDG 9 INDUSTRY, INNOVATION & INFRASTRUCTURE		Mixed or moderately negative impact		

Figure 2. Impacts of COVID-19 across the SDGs. Source: Adopted from Sachs et al. (2020, pp. 4-5)



 <div>SDG 10 REDUCED INEQUALITIES</div>	Highly negative impact <ul style="list-style-type: none">Disproportionate negative health and economic impacts on vulnerable groups (Including refugees and migrants) especially in countries with low safety netsLoss of jobs of lower skilled lower-wage labor
 <div>SDG 11 SUSTAINABLE CITIES AND COMMUNITIES</div>	Mixed or moderately negative impact <ul style="list-style-type: none">Rise in urban poverty and vulnerabilityShut down of public transportLower access to public/green spacesMovements of population that vary across countriesSharp short term reduction in pollution levels
 <div>SDG 12 RESPONSIBLE CONSUMPTION AND PRODUCTION</div>	Impact still Unclear <ul style="list-style-type: none">Short-term reduction in natural resource use due to reduced economic activity and consumptionPressure to loosen up regulations on circular economy and postpone the adoption of new measuresIncreased plastic pollution (eg, used to produce personal protective equipment)
 <div>SDG 13 CLIMATE ACTION</div>	Impact still Unclear <ul style="list-style-type: none">Short-term reduction in global GHG emissionsPressure to reduce environmental safeguardsLack of clarity on environmental investmentsSlowdown in economic growth contributing to reduction in energy prices (eg. oil) which might increase access to energy but reduce incentives for renewables
 <div>SDG 14 LIFE BELOW WATER</div>	Impact still Unclear <ul style="list-style-type: none">Short-term reduction in threats to marine biodiversity due to reduced global economic activity and consumptionPressure to reduce marine biodiversity and ecosystem safeguards
 <div>SDG 15 LIFE ON LAND</div>	Impact still Unclear <p>Short term reduction in threats to terrestrial and freshwater biodiversity due to reduced global economic activity and consumption</p> <p>Pressure to reduce terrestrial and freshwater biodiversity and ecosystem safeguards, including biodiversity and ecosystem regulations conventions (for instance, on deforestation)</p>
 <div>SDG 16 PEACE, JUSTICE, AND STRONG INSTITUTIONS</div>	Mixed or moderately negative impact <ul style="list-style-type: none">Increased pressure on governments to mitigate the health and economic consequences of the pandemicPressure to increase accessible health care in countries that have not yet achieved universal health coverageIncreased public deficits and debtDisruption of legislative processes and public debatesSuspension of freedom-of-information laws and transparency policies
 <div>SDG 17 PARTNERSHIPS FOR THE GOALS</div>	Mixed or moderately negative impact <ul style="list-style-type: none">Possible reduced responsiveness of international aid community to needs of the poorest countriesPossible reduction in international remittances and cross-border financingClosing of bordersSlowdown in international tradeDebt Crisis

Figure 2. Impacts of COVID-19 across the SDGs. (Source: Adopted from Sachs et al. 2020, pp. 4-5)

Key Lessons and Future Challenges:

- Emerging Infectious Diseases (EID) causing pandemics have been found to be distributed non-randomly across the globe with many dominated by pathogens emerging from land conversion, agricultural production methods, the trade in wildlife and wildlife products, and the ecological impacts of habitat depletion. Pandemics can be expected to occur more frequently in the future. Countries need to prepare themselves for this challenge.
- Differences in the effectiveness of pandemic measures applied in different countries reflect a fundamental property of pandemics—that the contact between susceptible and infected individuals, which leads to transmission depends on the choices made by individuals. People’s contact choices reflect the relative costs of illness and illness avoidance to them—the private cost. If the private cost of illness is low, or the private cost of illness avoidance is high, people have little incentive to avoid contact. The challenge is to bring down the cost of avoidance.

Countries which were able to secure the participation of their citizens—either by reducing the private cost of illness avoidance or by strict regulatory enforcement with punitive actions—were successful in stemming the rapid rise in

infection by adopting a Test, Track, Quarantine, Treat (TTQT) strategy.

- Existing mechanisms at all spatial and institutional levels are ill-equipped to address and counter the effects of pandemics. Healthcare, education, and economic systems across the globe have struggled to cope with the direct and indirect effects of the pandemic, leading to many countries witnessing a reversal in their achievements towards the SDGs. The challenge is to meet the SDG goals with renewed efforts after the pandemic.
- Transparency, effective leadership and communication, building trust, solidarity, timely action, enhanced use of digital technologies, and internationally coordinated containment efforts are essential to counter pandemics in an efficient and equitable manner.

Opportunities:

- Explore at the global level, establishing an international task force comprising of an inter-disciplinary group of experts from across the world to identify ways and means to put in place monitoring and coordinating mechanisms for more efficient and effective mitigation and adaptation pathways.
- Leveraging digital technologies—such as artificial intelligence (AI), big data and cloud computing, and blockchain—to test, track, quarantine and treat COVID-19 can curb the spread of the disease across borders. These technologies should ideally be overseen by the national

Countries which were able to secure the participation of their citizens—either by reducing the private cost of illness avoidance or by strict regulatory enforcement with punitive actions—were successful in stemming the rapid rise in infection by adopting a Test, Track, Quarantine, Treat (TTQT) strategy.

and global coordinating centers to ensure privacy of individuals while increasing efficiency.

Ministries of Education in countries supported by multilateral and bilateral agencies might explore transforming education systems to a hybrid model that combines face-to-face and digital learning systems, to be better prepared for and responsive to future pandemics and other disasters. This means investments in digital infrastructure, teacher training and access to digital learning available to all learners. Access to internet should be seen as a necessity instead of a luxury.

- Explore the design of automatic macroeconomic fiscal and monetary stabilizers to enable a faster reaction to disasters such as pandemics to reduce transaction lost accruing from political and bureaucratic processes of approvals and implementation.

Introduction

So the final lesson of 1918, a simple one yet the one most difficult to execute, is that those who occupy positions of authority must lessen the panic that can alienate the members of a society. ... Those in authority must retain the public's trust. The way to do that is to distort nothing, to put the best face on nothing, to try to manipulate no one."

JOHN M. BARRY,

The Great Influenza: The Epic Story of the Deadliest Plague in History, 2004, p.462

The ongoing COVID-19 pandemic has had far-reaching impacts across the world.

The rapid spread of the virus has practically shut down modern society as we knew it. Most economic and social activities were curtailed to different degrees. People were requested or ordered to stay at home. Empty streets in once buzzing cities like New York, London, Milan, Delhi and Paris, to name a few, became the new norm.

The WHO announced on 11 February 2020 that the new coronavirus disease will be called COVID-19. By 8 March

2020, over 100 countries had reported COVID-19 cases with over 100,000 cases worldwide. On 11 March 2020, the WHO in spite of not having any formal process to define a pandemic, officially declared the COVID-19 as a pandemic—defined as the spread of a new disease worldwide for which most people do not have immunity.

As of 10 October 2020, the SARS-CoV-2 virus—which causes COVID-19—had spread of over 213 countries with about 37 million confirmed cases, 25.9

The WHO announced on 11 February 2020 that the new coronavirus disease will be called COVID-19. By 8 March 2020, over 100 countries had reported COVID-19 cases with over 100,000 cases worldwide. On 11 March 2020, the WHO in spite of not having any formal process to define a pandemic, officially declared the COVID-19 as a pandemic—defined as the spread of a new disease worldwide for which most people do not have immunity.

million recovered and over a million deaths.² Figure 1 and 2 show the spread of disease in absolute terms and normalized across population respectively for 10 selected countries from March 2020 till early December 2020.

Some countries are still witnessing increasing rates of infection and death while some have flattened out these rates. **Strategies used by each of these selected countries differ with some imposing strict lockdowns and mandatory masking and social distancing such as China, while others adopting a policy of voluntary lockdowns, social distancing and the use of masks such as USA (See Q 8 for an overview of measures adopted by these selected countries).**

Which strategy works best? This is the quintessential question asked by policymakers all over the world. The results are mixed because of the large number of confounding variables that prevent strong correlations to be made across strategies for flattening the curve and controlling the outbreak. Answers will definitely emerge as more data is collected and analysed by researchers across the world. These might come late for this pandemic, but the answers will be valuable in preparing us for the next pandemic.

There is little doubt that pandemics pose not only serious health impacts but also have serious economic and social consequences. These impacts can be direct—caused by the health impacts from the disease in the form of mortality and/or morbidity rates. However, we now know that pandemics can cause indirect impacts to the health, economic and social sectors through the containment policies implemented by policymakers.

This report aims to provide a brief but scientific and evidence-based understanding of the COVID-19 pandemic. The report is written with the objective of providing some clarity on the following aspects of pandemics:

- what is it and how is it declared;
- what are the key variables that determine its severity;
- causes;
- impacts;
- key containment strategies and policies; and
- lessons and opportunities for the future.

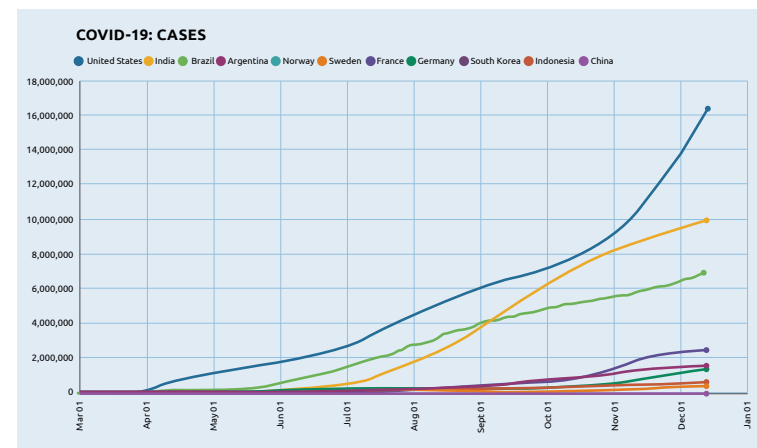


Figure 1. COVID-19 infection rates from 1 March 2020 till 15 December 2020. Source: Graph created by Devesh Kumar based on data from European Center for Disease Prevention and Control (<https://www.ecdc.europa.eu/en>) Last updated: 15 December 2020, 08:00 IST (GMT +5:30)

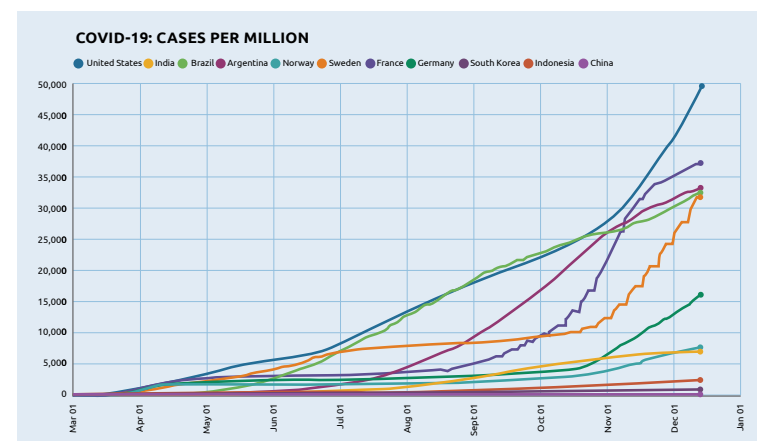
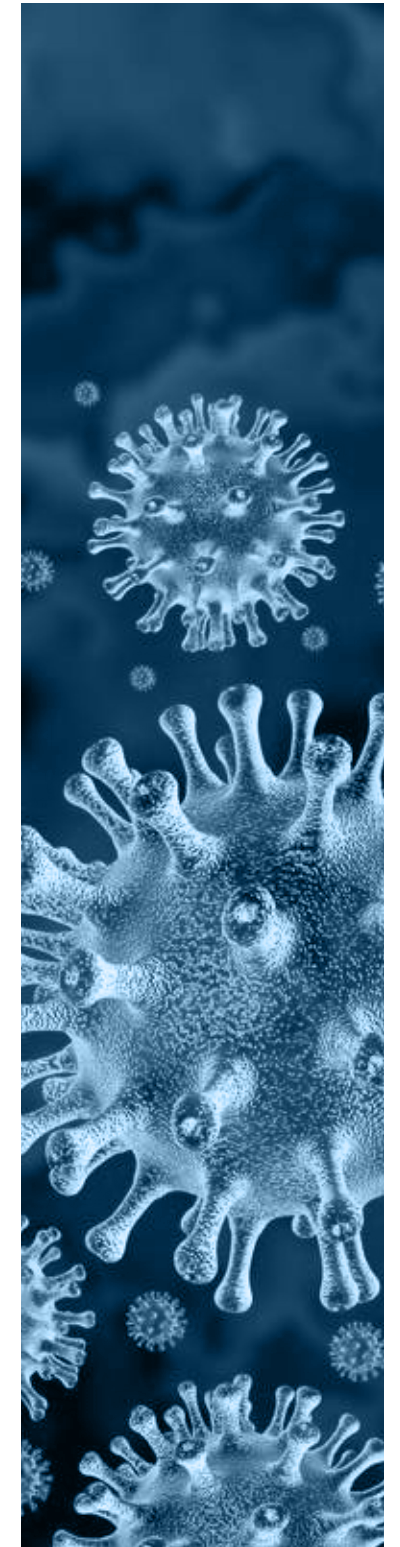


Figure 2. COVID-19 cases per million from 1 March 2020 till 15 December 2020. Source: Graph created by Devesh Kumar based on data from European Center for Disease Prevention and Control (<https://www.ecdc.europa.eu/en>) (<https://www.ecdc.europa.eu/en>) Last updated: 15 December 2020, 08:00 IST (GMT +5:30)

²<https://COVID19.who.int/>



Q1.

WHAT IS A PANDEMIC AND HOW IS A PANDEMIC DECLARED? ?

Pandemics: Past, Present and Lessons for the Future.

Question No. 1: What is a Pandemic and How is a Pandemic Declared?



ANSWER

1

According to the World Health Organization (WHO) – “A pandemic is the worldwide spread of a new disease”.³

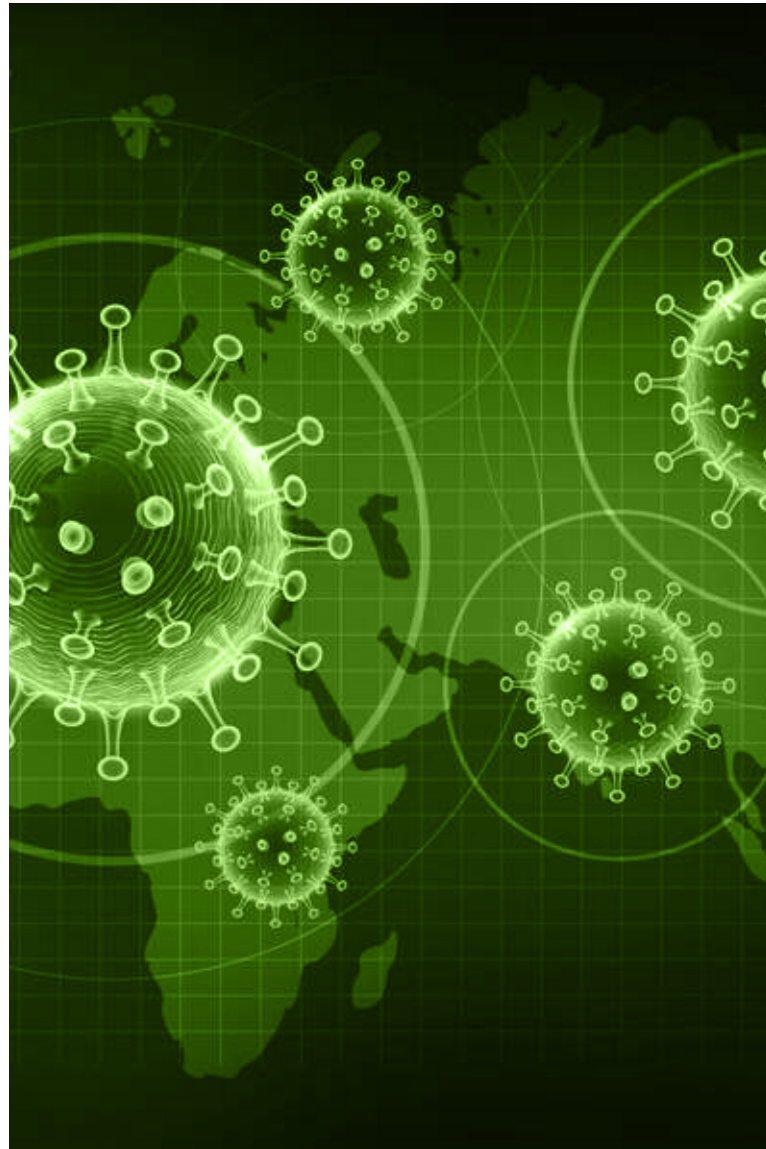
According to Centers for Disease Control and Prevention (CDC) of USA, “Pandemic refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people.”

Also, as stated in A Dictionary of Epidemiology (John, 2001) “Pandemic is an epidemic occurring worldwide or over a wide area, crossing international boundaries, and usually affecting a large number of people”.

Although there is no universally binding definition of a pandemic,

there is consensus on:

- (i) its large-scale geographical outreach;
- (ii) infecting people beyond national boundaries; and
- (iii) causing significant health damage and social, economic and political disruptions compared to a local outbreak or epidemic of an infectious disease.



The following seven key features that might be used to define a pandemic emerge from the literature:



WIDE GEOGRAPHIC EXTENSION

The term pandemic usually refers to diseases that extend over large geographic areas (Taubenberger & Morens, 2009). There were 178 countries involved during the H1N1 outbreak in 2009 (Rewar et al., 2015) while the COVID-19 has spread over 215 countries and territories.



DISEASE MOVEMENT

Disease movement includes widespread person-to-person spread of diseases caused by respiratory viruses, such as influenza and SARS. The out-of-season transmission is what characterizes an influenza pandemic.



NOVELTY

The term pandemic has been used most commonly to describe diseases that are new, or at least associated with novel variants of existing organisms.



SEVERITY

The term pandemic has been applied to severe or fatal diseases (eg, the Black Death, HIV/AIDS and SARS) much more commonly than it has been applied to mild diseases. Severity is estimated by the case fatality ratio (Donaldson et al., 2009).



HIGH ATTACK RATES AND EXPLOSIVENESS

Pandemics are characterised by high rates of attack and explosive spread. However, if the transmission is non-explosive, even if it is widespread, it is not classified as a pandemic.



MINIMAL POPULATION IMMUNITY

Although pandemics often have been described in partly immune populations, pandemics are characterised by almost zero population immunity (Fangriya, 2015; WHO, 2013).



INFECTIOUSNESS AND CONTAGIOUSNESS

Pandemic diseases are infectious, so they are transmitted from one person to another person. This transmission can be direct (person to person) or indirect (person to vector to person) (Morens et al., 2010).

³Source: Adapted from Qiu et al. 2017, pp. 4-5

³https://www.who.int/csr/disease/swineflu/frequently_asked_questions/pandemic/en/

Q2.

WHAT ^{IS THE} PROCEDURE USED TO DECLARE A PANDEMIC?

Pandemics: Past, Present and Lessons for the Future.

Question No. 2: What is the Procedure used to Declare a Pandemic?



ANSWER

2

World Health Organization (WHO), a specialised agency of the United Nations dedicated to international public health⁴, is the global body with authority to officially declare a pandemic⁵. Even though it is considered to be the primary body responsible for announcing when a global outbreak or epidemic of disease becomes a pandemic, intriguingly WHO does not have a precise definition of a pandemic in its guidelines.

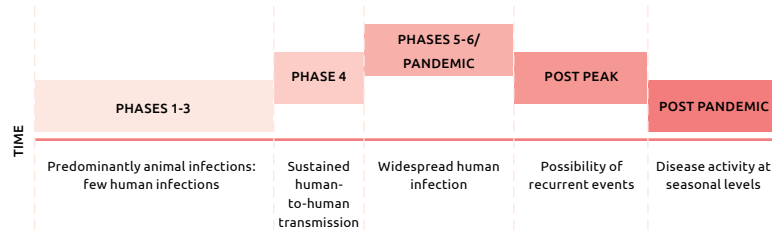


Figure 3. Pandemic Influenza Phases (2009). Source: Adopted from World Health Organization (2009, pp.24)

In the context of COVID-19 there is “no mathematical formula, no algorithm,” for making a pandemic declaration. WHO declared COVID-19 as a pandemic on 11 March 2020, at which point it had already spread to over 110 countries.⁶ WHO’s hesitance in declaring a pandemic highlights the confusion surrounding the elusive definition of the term and brings forth the recurring debate on when it is apt to call a disease outbreak a pandemic (Green 2020).

Prior to COVID-19, the most recent pandemic was the 2009 H1N1 Influenza or ‘swine flu’. During the spread of swine flu, WHO followed a six- phase procedure (see Figure 3) that was applicable worldwide and provided a global framework to facilitate preparedness and response planning among countries.

Phases 1–3 focus on preparedness, that is indulging capacity development and response planning activities, while Phases 4–6 indicate the need for response and mitigation efforts. Furthermore, periods after the first pandemic wave are elaborated to facilitate post pandemic recovery activities (WHO 2009).

This six-phase approach led to declaration of swine flu as a pandemic by the WHO in 2009. However, swine flu turned out to

be less lethal than was anticipated. WHO faced a backlash for the declaration when the disease did not have the wide spread expected impact.

Currently, WHO in accordance with the International Health Regulations (2005) (IHR) determines whether an event can be designated as Public Health Emergency of International Concern (PHEIC) or not. The IHR-Annex 2 provides a ‘decision instrument’ (see Figure 4) that guides States regarding which health events can potentially turn into PHEICs, thereby requiring reporting to WHO. The IHR also empowers the WHO Director-General to convene an Emergency Committee (EC), which provides advice on whether the current situation should be considered a PHEIC, and what provisional recommendations should be given to governments to support the response. The EC comprises international experts convened on an ad-hoc basis, and the WHO Director-General has ultimate and

The PHEIC is the highest level of alert under IHR that WHO is obliged to declare in order to warn the Member States

sole authority to declare a PHEIC (WHO 2016). **The PHEIC is the highest level of alert under IHR that WHO is obliged to declare in order to warn the Member States** about actions that need to be taken to curb the spread of disease and to mobilize resources to help low-and middle-income countries. It also obligates countries to share information with WHO.

COVID-19 was declared a PHEIC by WHO on 30 January 2020 after the second Emergency Committee meeting, at which point 7,736 cases and 179 deaths had been confirmed in mainland China, with 107 cases confirmed in 21 other countries. Even after declaration as a PHEIC, the virus continued to spread globally and was ultimately declared as a pandemic by WHO on 11 March 2020, at which point more than 118,000 cases and 4,291 deaths

were reported from 114 countries.⁷ It is suspected that WHO’s hesitance to characterize COVID-19 as pandemic earlier could be attributed to its loosely coined definition and to the fear and panic that the term induces.⁸ The literature offers limited clarity to the question of timing i.e. when it is apt to confirm a PHEIC as a pandemic and the relative effectiveness of each term in triggering combative actions by nation states.

ANNEX 2: DECISION INSTRUMENT FOR THE ASSESSMENT AND NOTIFICATION OF EVENTS THAT MAY CONSTITUTE A PUBLIC HEALTH EMERGENCY OF OF INTERNATIONAL

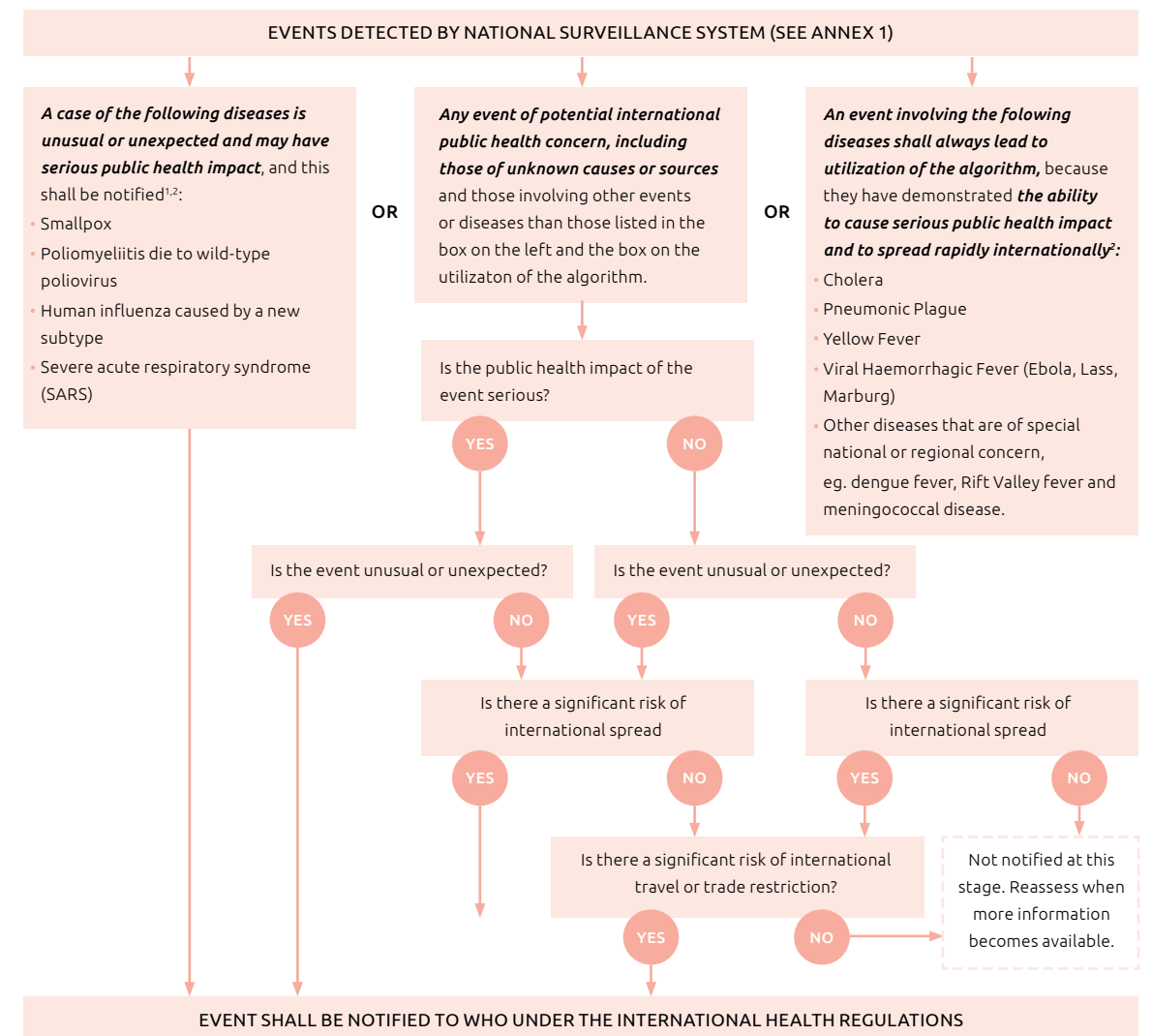


Figure 4. Decision Instrument for assessing PHEIC.

Source: Adopted from International Health Regulations (2005, Annex-2)

⁴<https://www.who.int/about/what-we-do>

⁵<https://www.washingtonpost.com/health/2020/03/11/who-declares-pandemic-coronavirus-disease-COVID-19/>

⁶<https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-COVID-19---11-march-2020>

⁷<https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>

⁸<https://www.chathamhouse.org/2020/05/coronavirus-public-health-emergency-or-pandemic-does-timing-matter>

Q3.

IS IT LEGALLY BINDING FOR ALL COUNTRIES TO ADHERE TO PANDEMIC GUIDELINES?

CAN A COUNTRY
DEFY A PANDEMIC
DECLARATION

?

Pandemics: Past, Present and Lessons for the Future.

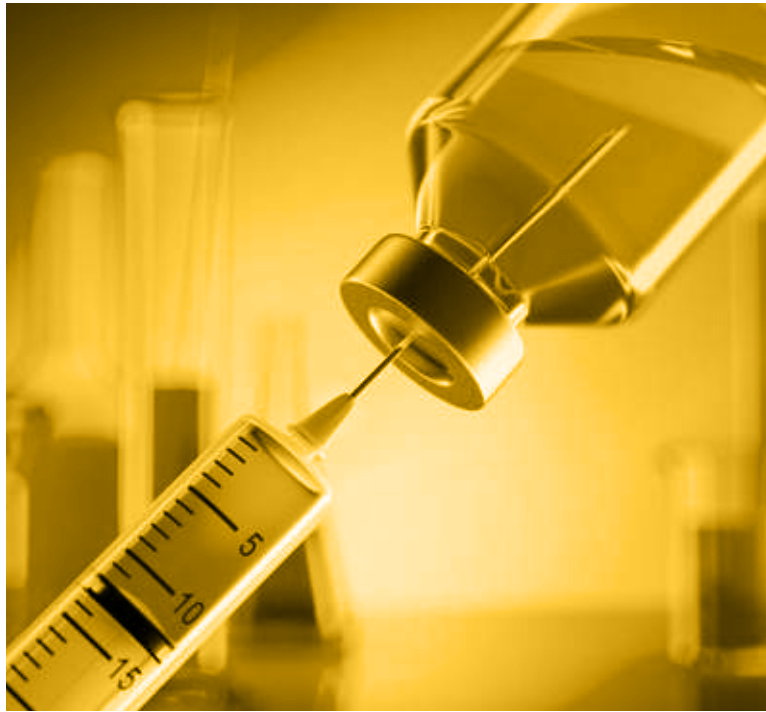
Question No. 3: Is it Legally Binding for All Countries to Adhere to Pandemic Guidelines?
Can a Country Defy a Pandemic Declaration?



ANSWER

3

International Health Regulations (2005) (IHR) is the global legal instrument designed to help protect nations from international spread of disease including public health risks and public health emergencies.



IHR came into force on 15 June 2007 as a result of increased international mobility and emergence of diseases with potential to transcend borders. The stated purpose and scope of the IHR is “to prevent, protect against, control and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade” (WHO, 2008).

IHR provides a comprehensive “legal framework that defines countries’ rights and obligations in handling public health events and emergencies that have the potential to cross borders.”⁹ **The IHR is an instrument of international law that is legally-binding across 196 countries, including the 194**

WHO member states. The IHR requires countries to report public health events and outlines criteria to determine whether or not a particular event constitutes a “public health emergency of international concern” (PHEIC). A Public Health Emergency of International Concern is defined in the IHR (2005) as, “an extraordinary event which is determined to constitute a public health risk to other States through the international spread of disease and to potentially require a coordinated international response”¹⁰. The IHR also mandates

The IHR is an instrument of international law that is legally-binding across 196 countries, including the 194 WHO member states.

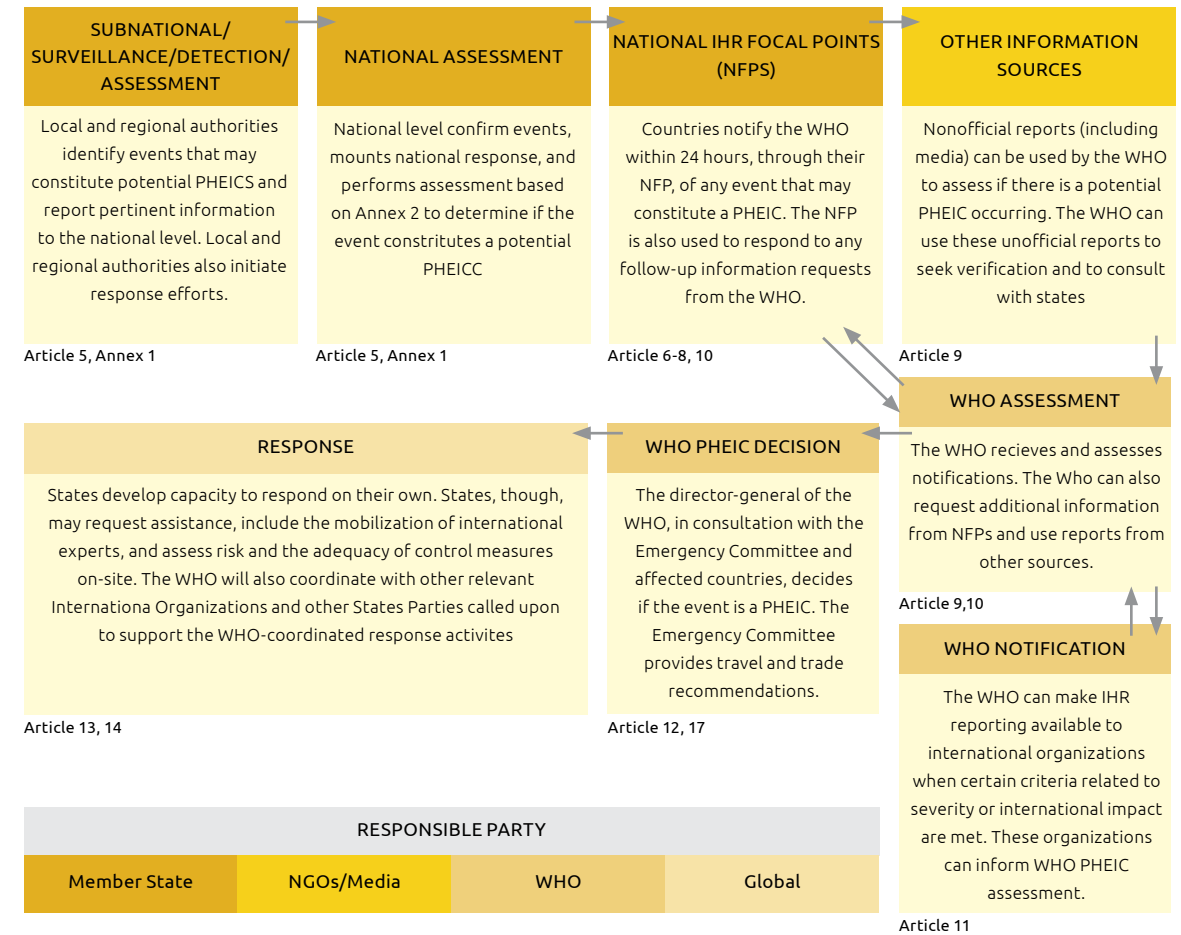


Figure 5. IHR Process for Global Governance of Disease. Source: Adopted from Gostin and Katz (2016, pp.272)

countries to devise proper focal points of communication between the nation state and the WHO to aid surveillance, international travel and transport, safeguard the rights of travelers, and ensure non-discrimination in the application of health measures under the Regulations. WHO plays the coordinating role in IHR implementation in nation states and support countries to build capacities when a Public Health Emergency of International Concern (PHEIC) occurs.¹¹

The process of global governance of the disease and established channel of communication between nation states and WHO is described in Figure 5. The articles and Annexes refer to IHR (2005) articles and Annexes.

The IHR necessitates countries ability to- detect, assess and report, and respond to public health risks and emergencies. In the event that IHR determines that a particular event constitutes a public health emergency of international concern (PHEIC), WHO develops and

recommends critical health measures for implementation by member states during such an emergency. Hence, once a PHEIC is declared by WHO, it is implicitly legally binding for member states to adhere to the IHR guidelines and for countries to implement containment measures to mitigate the spread of the disease. As acknowledged earlier, apart from the scope of spread there is little clarity on when a PHEIC is designated as a pandemic, but once WHO declares a pandemic, it is legally binding for countries to adhere to its guidelines.

⁹https://www.who.int/health-topics/international-health-regulations#tab=tab_1

¹⁰<https://www.who.int/news-room/q-a-detail/emergencies-international-health-regulations-and-emergency-committees>

¹¹<https://www.who.int/ihr/procedures/pheic/en/>

Q4.

**HOW MANY
PANDEMICS HAVE WE
WITNESSED**

**OVER THE PAST
100 YEARS**

?

Pandemics: Past, Present and Lessons for the Future.

Question No. 4: How many Pandemics have we witnessed over the last 100 years?



ANSWER

4

Infectious disease is as old as humans, but it is only in the last two centuries that we have started understanding its microbial basis and diversity. Various plagues have inflicted humans through the ages, some of the major ones shown in Figure 6. Here we will focus on the 20th and 21st centuries, to seek out common features in our understanding of disease and our response to it. Pre 20th century pandemics are briefly described in Annex 1.

Spanish Flu (1918-20) :

In the spring of 1918, a mild respiratory disease started at an army camp in Kansas, USA, attributed to a soldier who had been cleaning pig pens (Crosby 1989). The disease spread in the camp, along the railway line to other military bases and US cities, and on troopships to Europe. Though highly contagious, the first wave caused few deaths and thus received little attention, partly also due to war-time censorship.

However, in Spain, a neutral country in the War, there was extensive media coverage and the disease was soon called “Spanish influenza”. The second wave started in late August, probably in Western France, from where it spread globally. It peaked during September to November 1918, at which time about 10,000 people were dying per week in some US cities (Frost 1920). A third wave of equal ferocity struck in late 1918 or early 1919. It was not until 1999 that the virus was identified to be a novel H1N1 virus (Reid 1999).

Death rates were estimated to be even higher in Africa and Asia. An estimated 12–18 million people perished in India – equivalent to 4% of its population (as per 1911 census). The infection was brought on Allied troopships returning from the War to the ports of Bombay and Karachi in May and June 1918. This was followed by a far more lethal second wave that swept across India from September to early December 1918, in which people in the 20–40

years age group were particularly susceptible. **Most of the 12–18 million deaths in India took place in the three peak months during the second wave (Barry 2018).**

Spanish Flu revealed inequalities due to colonial rule and the social divide. In Cape Town and several other South African cities, influenza killed about 4% of the entire population in a period of four weeks – 32% of white South Africans and 46% of blacks reportedly had disease – with about 0.8% and 3% mortality, respectively (Barry 2018). In Britain the mortality was 4.7 per 1,000 people. In India it was 8.3 per 1,000 for Europeans but 20.6 per 1,000 for Indians. Even among Indians, social divisions were apparent with mortality rates of 61 and 18.9 per 1,000 among low caste and high caste Hindus (Kapoor 2020). Besides poor healthcare infrastructure, there was also a drought in India in 1918, which led to a famine in large parts of the country that exacerbated the disease and associated mortality. However, food from India continued to supply Britain’s war efforts.

Asian Flu (1957) :

This pandemic originated in the Guizhou province in southern China in February 1957, spreading to the Hunan province, and to Hong Kong and Singapore by April. In May, the causative agent was isolated in Japan and found to be a new H2N2 influenza virus. The first wave struck USA and UK in October 1957, and was followed by

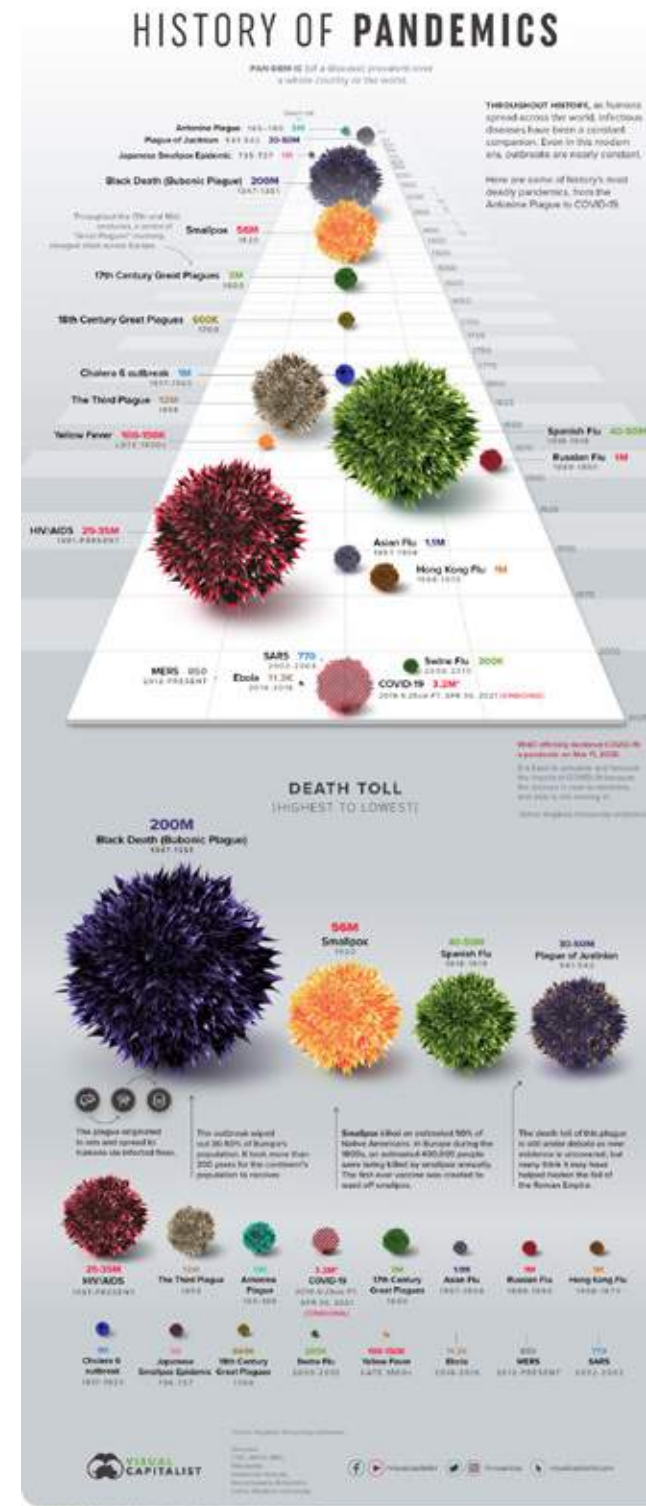
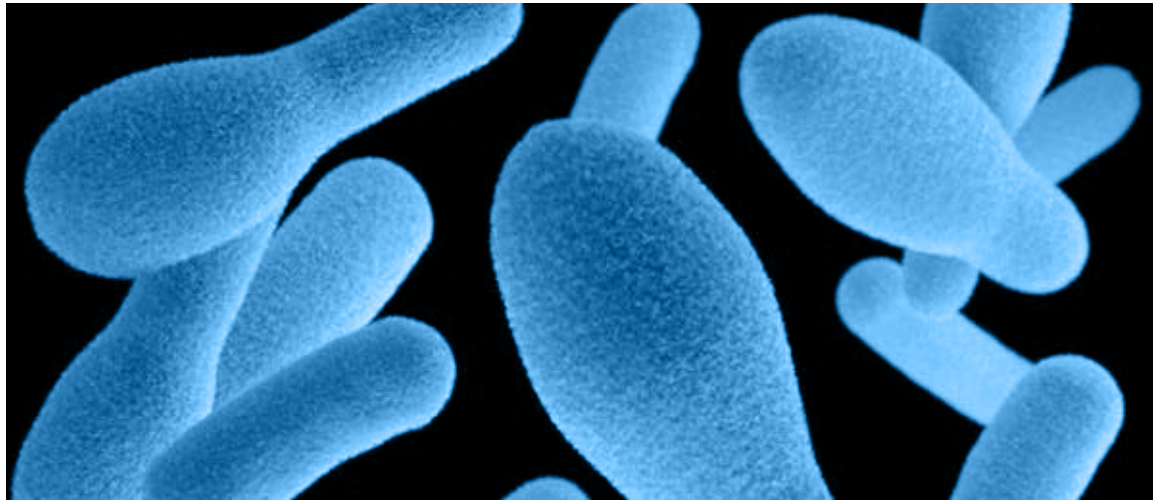


Figure 6. Pandemics through the ages. Source: Adopted from Visual Capitalist (<https://www.visualcapitalist.com/history-of-pandemics-deadliest/>)

The Asian flu first reached India via Madras in May 1957 and spread across the country within the next 12 weeks.

a second wave in January 1958. The infection rate was highest in 5- to 19-year-olds, where it exceeded 50%. Both waves showed heightened mortality, with about 116,000 deaths in the US and over 1.1 million worldwide (Stuart-Harris 1985). The first cases in UK were in late June, and by early 1958 it was estimated that at least 9 million people in Great Britain had been infected with about 14,000 deaths. Five months after the Hong Kong outbreak the virus was reckoned to have traversed the globe. As an entirely new strain there was no immunity in the populace and the first vaccines were not distributed until August in the US and October in the UK, and that too on an extremely limited basis (Jackson 2009).

The Asian flu first reached India via Madras in May 1957 and spread across the country within the next 12 weeks. Between 19 May 1957 and 8 February 1958 there were 4.45 million reported cases, with 1098 deaths. As elsewhere, the disease in India generally had a mild course, although nausea and vomiting and symptoms related to the nervous system were relatively frequently seen. Bombay was the worst hit with over 1.3 million cases and 315 deaths, but Madras with over 580,000 cases showed only 75



deaths. West Bengal had the highest levels of mortality with 445 dead among 300,000 cases. The attack-rates were highest at about 18% in children 0-10 year old, and reduced progressively with age; it was 1% or less in those older than 50 years. (IGK Menon, Bull WHO 1959). As an occupational group, healthcare personnel in India showed higher than average disease incidence. The Pasteur Institute, Coonoor, which served as the Government of India's Influenza Centre isolated and antigenically characterized the 1957 virus. However, due to rapid spread of the pandemic, it was not possible to prepare sufficient vaccine from the new strains in time for adequate field trials or mass immunization of the population.

Hong Kong Flu (1968) :

The first signs of a new pandemic emerged in the summer of 1968 in southern Asia. An influenza virus of the H3N2 subtype was isolated in Hong

Kong in July 1968, but there is the unconfirmed possibility of its emergence in mainland China prior

In India the first cases were reported in Madras on 8 September 1968, having arrived on the ship S.S. Rajula from Singapore.

to its spread in Hong Kong. By July, large outbreaks were reported from Vietnam and Singapore, and by September it had reached India, Philippines, northern Australia and Europe. It reached US via soldiers returning from the Vietnam War, and became widespread by December. In early 1969 the virus was also seen in Japan, Africa and South America (Cockburn 1969). The US Centers for Disease Control and Prevention (CDC) estimated that from its start in July 1968 until the outbreak faded in the winter of 1969-70, it killed about 1 million people worldwide, including about

100,000 in the US. Most excess deaths were in older (65+) people.

In India the first cases were reported in Madras on 8 September 1968, having arrived on the ship S.S. Rajula from Singapore. During the period 9 September to 31 October, 84,511 patients were treated in the hospitals in Madras City, which had a population of 2 million. It is estimated that an equal number of persons were treated by the private practitioners in the city. The attack rate was therefore 8.4%. The main epidemic spread through the Indian subcontinent within 20 weeks. The spread was fastest through the most crowded cities and relatively slower across villages and towns. All age-groups were involved, although the disease appeared to be more severe among children. Persons who had an attack of Asian influenza in 1957 generally escaped infection by the Hong Kong influenza virus. The data for how many people became infected or died across India in this pandemic are not available (N Veeraraghavan, Bull WHO 1969).

Swine Flu (2009) :

A new H1N1 influenza A virus that had been circulating in pigs for several months, jumped into humans sometime between June and November 2008. The outbreak was first recognized in the state of Veracruz, Mexico, and the earliest known human case was traced to 9th March 2009 in a 5-year-old boy in La Gloria, a rural town in Veracruz. By late April the virus had spread enough for WHO to declare it a PHEIC, and in June it was declared a "pandemic". It began to taper off in November 2009 with a steep decline in cases by May 2010, and WHO declared the pandemic to be over on 10th August. During this period, there were 491,382 lab-confirmed cases and 18,449 deaths reported to WHO. Some studies estimated that the actual number of cases including asymptomatic and mild cases could be 700 million to 1.4 billion people, equivalent to 11-21% of the world population at that time, and about 284,000 deaths (range 150,000 to 575,000). In comparison, it was possibly no worse than seasonal flu, which according to WHO kills an estimated 250,000 to 500,000 people annually.

In India, the first case of swine flu was reported at Hyderabad airport on 13th May in a traveler from USA. Subsequently, more confirmed cases were reported with the rate of transmission increasing in August, with the first death in Pune on 4th August. By August 2010, there were 44,987 lab-confirmed cases of swine flu and 2728 deaths reported from India.

The first confirmed case in India was on 30th January 2020 - a student from Wuhan University, who came home to Kerala.

COVID-19 (2019-continuing) :

The first clusters of the present pandemic were observed in the city of Wuhan in the Hubei region in China around December 2019. Researchers from the Chinese Academy of Sciences and the Chinese Center for Disease Control identified it as a new coronavirus. However, due to delayed reporting at local levels and the traditional large volume of Chinese New Year travel caused the early spread of the disease beyond Wuhan to the other parts of China and the World.

On 11 March 2020 the Coronavirus Infectious disease 2019 (COVID-19) pandemic was declared by the World Health Organization. The virus causing the disease was called SARS coronavirus 2 (SARS-CoV-2) in view of its genetic similarity and clinical presentation to the



one that emerged in 2003. As of 10th December 2020, there were 68,165,877 confirmed cases of the COVID-19 disease and 1,557,385 confirmed deaths across 220 countries, areas and territories.¹² This case fatality rate (CFR) of 2.28% is almost an order of magnitude higher than the seasonal flu.

The first confirmed COVID-19 case in India was on 30 January 2020—a student from Wuhan University, who came home to Kerala. Till mid-March there were only 100 confirmed cases and 2 deaths reported from India. There were 657 confirmed cases with 12 confirmed deaths when the Government of India imposed a nationwide lockdown on 25 March 2020. However, by the time the 68-day lockdown ended on 30 May, the number of infections had risen to about 190,000 with 5400 deaths. As of 6 October 2020, India had the world's second highest tally of almost 6.7 million confirmed cases and the third highest deaths at over 100,000. However, the lower CFR of 1.5% and the lower than world average of 2.28% infection per million in India is an observation which many scientists are beginning to study, understand and learn for future pandemics.

Since its emergence, COVID-19 has shut down the world and devastated the global economy unlike the 1958, 1968 and the more recent 2009 pandemics. A central question is why SARS-CoV2 moved so quickly compared in a world that is much more technologically advanced in 2020 than it was in 2003. It appears that SARS-CoV2 is much better

¹²<https://www.who.int/emergencies/diseases/novel-coronavirus-2019>

adapted for human-to-human transmission and has already shed (and transmitted) a few days before symptoms appear, unlike SARS-CoV that sheds only during the symptomatic phase. The world is also more connected in 2020 through travel and supply chains.

But COVID-19 has also shown the power of technology and collaboration. The virus was identified and its genomic sequence became available within a week of notification. This allowed the development of diagnostic tests and real-time mapping of the growth of the pandemic. It also took only 42 days from availability of the viral genomic sequence to the first vaccine to be made and 63 days to which human clinical trials were initiated. There are over 200 vaccines currently in development with about 50 already being clinically tested. The first efficacy trial results have shown the vaccines to be highly effective.

Key partnerships among the private sector, governments and academic institutions have ensured a roll out of more than one vaccine in the first quarter of 2021. Scientists all over the world have collaborated and freely shared both materials and know-how. The knowledge base on SARS-CoV2 and COVID-19 has expanded dramatically since the inception of the pandemic. For example, just in six months between the beginning of January and the end June 2020, 23,634 unique published articles on COVID-19 were indexed on Clarivate Analytics' Web of Science and Elsevier's (Teixeira da Silva et al. 2020).

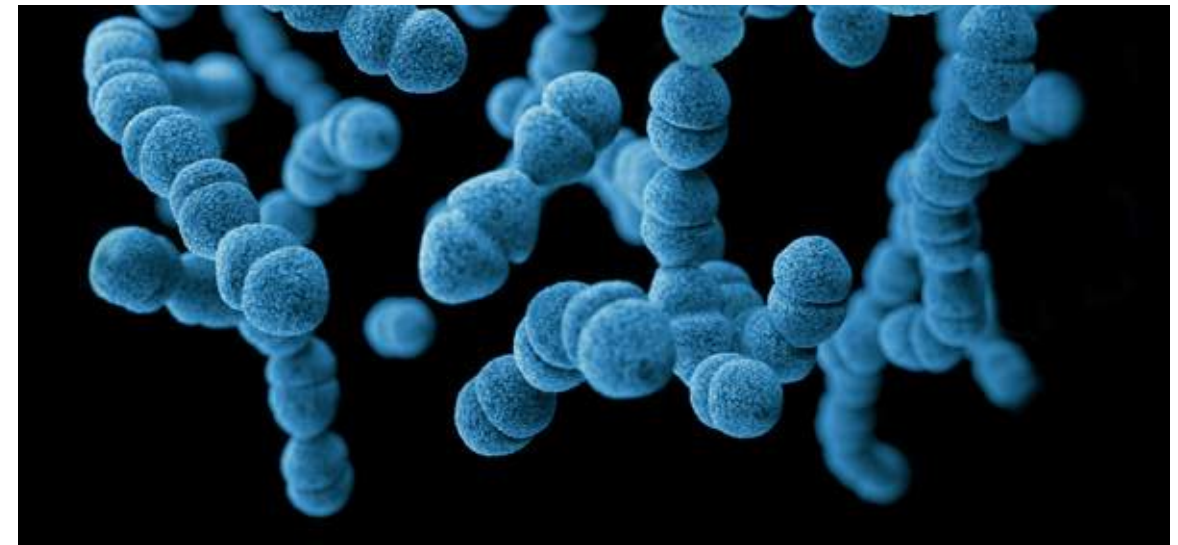
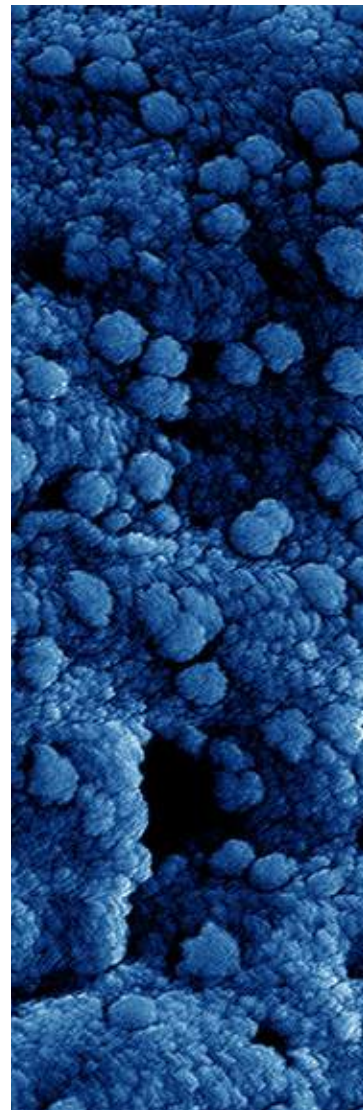
Caution: Pandemic near misses

The first two decades of the 21st century have already witnessed two pandemics – Swine Flu in 2009 and Covid-19 that started in December 2019 and is continuing. However, there have also been a few pandemic threats – SARS in 2003, Bird Flu in 2005–07, Ebola in 2014–16 and Zika in 2015–16. Why is the frequency of pandemics increasing?

Outbreaks happen in the world's most vulnerable areas – countries with few resources to stem the tide of infection before becoming regional outbreaks, public health emergencies or pandemics. With modern travel networks, a pathogen can travel from a remote village to major cities on all continents in 36 hours, which is often shorter than its incubation period, i.e. the time it takes from infection to disease. Many global challenges exist that increase the risk that outbreaks will occur and spread rapidly. With growing populations and demands on land for agriculture and housing, wild animal habitats are being destroyed, increasing the risk of infectious pathogens “spilling over” from animals to humans. There is

SARS affected older adults more severely than younger individuals, almost 50% of those infected over 65 years of age died, compared with just 1% under 24 years.

misuse of frontline drugs leading to the development of antimicrobial resistance. The world is extremely well connected by travel and trade, allowing infectious diseases to travel and spread. Moreover, a majority of the world's people live with weak public health infrastructures. This does not allow infections to be detected and curtailed in time before efficient human-to-human transmission.



SARS (2002-03)

On 12th March 2003, WHO warned of “atypical pneumonia” cases from China, Hong Kong and Vietnam. When three days later there were suspected cases in Canada, Singapore, Thailand, Indonesia and the Philippines as well, WHO decided to call this first global health threat of the 21st century as Severe Acute Respiratory Syndrome or SARS. On 24th March the cause was identified as a new coronavirus – called SARS coronavirus or SARS-CoV. It was later discovered that SARS started in November 2002, the first identified case being a 45-year old man in Foshan, a city in the Southern Chinese province of Guangdong. Studies also showed that the virus originated in bats, having infected humans most likely through animals – in this case, civet cats in China's wet animal markets. A doctor from Guangzhou,

the capital of Guangdong, took the virus to densely populated and internationally connected Hong Kong, from where SARS-CoV went global. After infecting 8039 people across 29 countries, of which 774 died, the outbreak was declared over by 5th July 2003. **SARS affected older adults more severely than younger individuals, almost 50% of those infected over 65 years of age died, compared with just 1% under 24 years.** There were only 3 lab-confirmed and 10 suspected cases of SARS, and no deaths reported from India.

It initially appeared that SARS would become a pandemic, sweep the globe and infect millions. But aggressive countermeasures by

There are over 200 vaccines currently in development with about 50 already being clinically tested.

health care workers, public health officials and scientists controlled it – not through a drug or vaccine, but simply by testing, isolating and preventing patients from infecting others. In the end, 21st century lab science had little impact on the fight against SARS; the disease was stopped using 19th century hygiene measures. But the legacy of SARS is a world better prepared to handle emerging infectious diseases that have the potential of going global. Disease surveillance has improved, and scientific advances make it easier to identify pathogens directly from clinical materials. SARS also brought about the introduction of new international rules on reporting and handling disease threats. The International Health Regulations 2005 make it mandatory to have dedicated health units at all international airports, with core capacities for undertaking routine public health measures and the surge capacity to deal with Public Health Emergencies of International Concern (PHEICs).

Q5.

**WHAT WERE THE
MAIN PATHOGENS
CAUSING THE DISEASES
AND WHAT
TREATMENTS
WERE USED?**

?

Pandemics: Past, Present and Lessons for the Future.

Question No. 5: What were the Main Pathogens Causing the Diseases and What Treatments were Used?



ANSWER

5

According to Jones (2008), emerging infectious disease (EID) events between 1940 and 2004 were dominated by pathogens that emerge in wild animals first and transfer to humans to cause disease (see Box 1 on pathogen discovery). Such events have been distributed non-randomly across the world and been increasing over time.



The CDC estimates that animal spillovers account for two-thirds of all human infectious diseases and three-fourths of newly emerging diseases, with both wild and domesticated animals being able to pass disease to humans.

Viruses comprise only 14% of known human pathogens but comprise 44% of new and emerging pathogens. Some of the biggest public health threats of the 20th century came from viruses such

as influenza and HIV, both of which spilled from animals into humans. The pace of emergence of new viruses threatening human health has continuously increased over the past 25 years. Of the 20 diseases the WHO considers having the potential to develop into future pandemics, 16 have viruses as the causative agents. Understanding the biology of viruses, especially RNA viruses, is key to both preparedness and mitigation (see Box 1).

BOX 1: PATHOGEN DISCOVERY

Nischay Mishra, Rafal Tokarz and W. Ian Lipkin

(Center for Infection and Immunity, Mailman School of Public Health of Columbia University)

Reviews in the field of pathogen discovery frequently focus on the evolution of new from the use of culture and microscopy in the early and mid-1900s to the introduction of high throughput sequencing the early 2000s. This historical perspective provides insights into the power of new platforms for detection of known and novel agents. It does not, however, acknowledge that the methods we need for microbial characterization, making links to desi, and understanding the pathogenesis, transmission, and epidemiology of infectious diseases have not much changed

Although novel microbes can be found through routine surveillance, the primary event in pathogen discovery is typically the recognition of an anomaly – a new disease, or a known disease in a new context – that leads to the collection of data and samples that, when assayed, yield a finding that was not anticipated. This underscores the importance of recognizing clinicians public health practitioners, and laboratory scientists as equal partners in the process

The identification of a novel sequence is only the first step in pathogen discovery. Implications in disease requires proof of a causal relationship. This can be achieved through fulfilment of Koch's postulates (isolation of a microbe, propagation in culture, and reproduction of disease with introduction into a naive host). However, realising this ideal is not feasible if one cannot grow the agent in culture or there is no animal model for the disease. Furthermore, some effects, such as neoplasia, neurological or neuropsychiatric damage, or autoimmune disease may not be manifest until after the agent is no longer present.

Accordingly, we have developed a more flexible strategy for investigating and establishing causal relationships that includes the consideration of biological plausibility and seroepidemiology. This approach is not required for investigation of outbreaks where a single agent is present

at high concentrations in individuals with disease. It will nonetheless become increasingly Important in chronic diseases where the relationships between infections or microbiota are less apparent

High throughput sequencing has dramatically altered the landscape of microbiology, medicine and public health. One can rapidly and efficiently identify bacteria, fungi, and viruses in clinical samples, determine their potential reservoirs and vectors for transmission, and design diagnostic assay drugs and vaccines even prior to cultivation. Sequencing has also enabled identification of host factors that contribute to pathogenesis and to susceptibility to disease, as well as to microbial evolution (especially in viruses) that may enable cross species transmission.

Serology has not advanced as rapidly largely because (i) one cannot easily display the entire range of potential epitopes recognized by antibodies and T cells, and (ii) measurements of immune responses can be confounded by cross reactivity. The use of phage expression systems and high density peptide arrays have addressed these limitations for B cells, at least for linear epitopes. However, there is no solution yet for high throughput analysis of the conformational or carbohydrate epitopes that can be critical in virus neutralization and autoimmunity.

The largest stumbling blocks in achieving the full potential of pathogen discovery in human health and global biosecurity are social and economic rather than technical. The International Health Regulations of 2005 committed United Nations member states to developing the infrastructure and expertise for surveillance, and to freely sharing data so that all nations could prepare for microbial threats.

The weaknesses in our global infrastructure became apparent with the advent of COVID-19. A better coordinated response would have saved lives and economic devastation. With advances in molecular biology, information technology and social media, we have the tools to build a global immune system. The challenge now is to equitably distribute write the tools and resources needed to ensure that we we better prepared if and when another pandemic threat emerges.

¹³<https://www.cdc.gov/onehealth/basics/zoanotic-diseases.html>

Q6.

**WHICH ARE THE
MAIN PANDEMIC VIRUSES
AND WHAT ARE THE
KEY DIFFERENCES ACROSS THEM
AND THE TYPE OF
TREATMENTS USED**
?

Pandemics: Past, Present and Lessons for the Future.

Question No. 6: Which are the Main Pandemic Viruses and What are the Key Differences Across Them and the Type of Treatments Used?



ANSWER

6

Infectious disease is as old as humans, but it is only in the last two centuries that we have started understanding its microbial basis and diversity. Various plagues have inflicted humans through the ages, some of the major ones shown in Figure 6. Here we will focus on the 20th and 21st centuries, to seek out common features in our understanding of disease and our response to it. Pre 20th century pandemics are briefly described in Annex 1.



1. Influenza Viruses

Influenza viruses have been the cause of major morbidity and mortality worldwide, and large segments of the human population are affected every year. Additionally, these viruses also infect many animal species allowing the mixture of strains and the emergence of novel viruses, sometimes with pandemic potential. **There are three genera (types) of influenza viruses—A, B and C, and viruses belonging to each of these types can undergo genetic reassortment and thus readily exchange genetic information, but reassortment between viruses belonging to different types has never been reported.** We will focus on influenza A viruses since these are most frequently associated with human disease.

Influenza A virus has a complex structure with a lipid membrane derived from the cell in which it replicated. Embedded in this envelop are three viral proteins—haemagglutinin (HA), neuraminidase (NA), and M2.

There are 17 different types of HA (H1 to H17) and 9 different types of NA (N1 to N9)—and this is how influenza viruses are named. The Spanish Flu (1918) and Swine Flu (2009) viruses were found to be H1N1, Asian Flu H2N2, Hong Kong Flu H3N2 and Bird Flu H5N1. Though 17 x 9, i.e. 153 combinations are possible, only a few combinations of H and N genes have caused disease in humans.

Viruses carrying novel HA and NA combinations can spread rapidly as most of the population is susceptible, and can lead to large outbreaks, epidemics or pandemics. Since influenza viruses circulate in many animal species, there is also an opportunity for animal and human influenza viruses to reassort their RNA segments, with the population having little or no immunity against

the new virus. Usually avian and human influenza viruses circulate within these species. But pigs can get infected by both types of viruses, and act as “mixing vessels” to produce new influenza viruses. This is illustrated in Figure 7, which shows the emergence of the 2009 swine flu pandemic virus. **Note that this virus that caused a human pandemic contains only one human and two avian flu virus genes; the rest of the genes were derived from swine flu viruses, including the HA and NA genes. This is why humans had no immunity and were highly susceptible.**

Treatment. Two types of drugs have been used for influenza—both directed at the virus multiplication

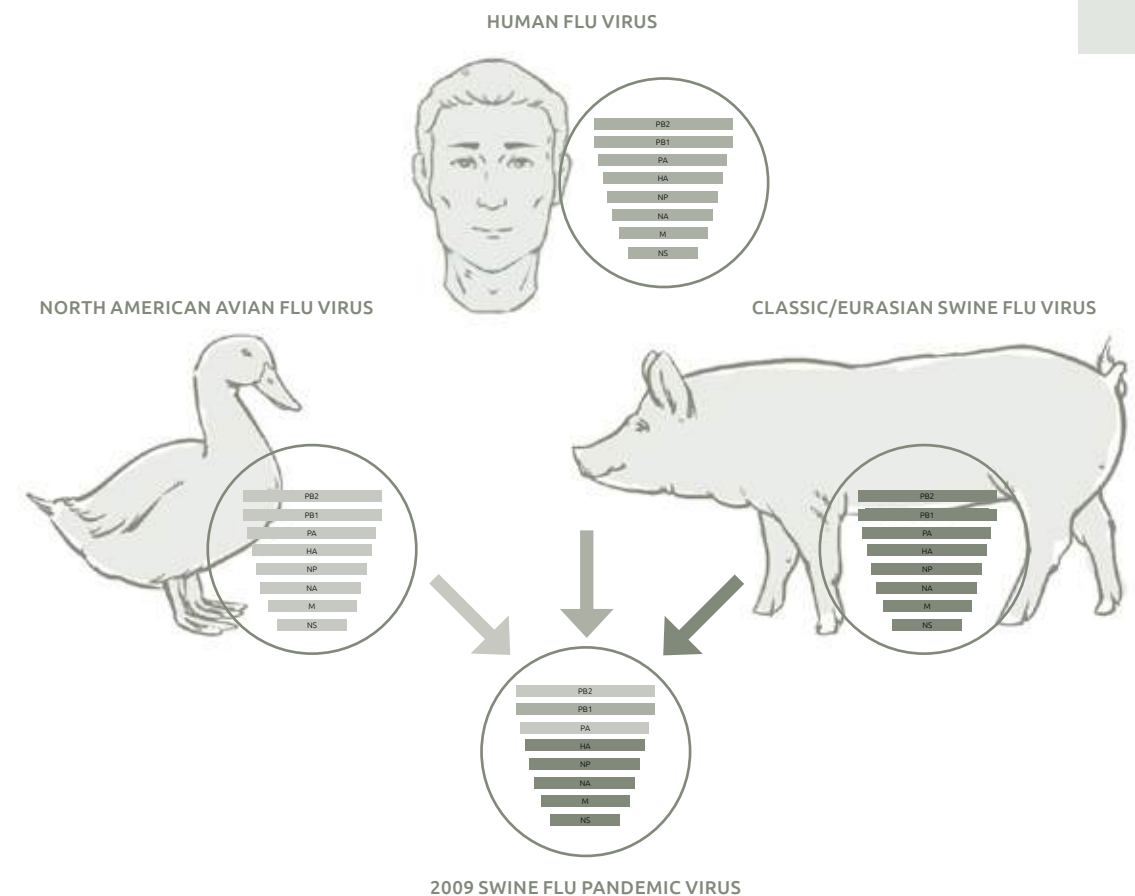


Figure 7. The 2009 swine flu pandemic virus arose by reassortment of human avian and swine influenza A viruses. Figure created by Shaheed Jamal.

Note that this virus that caused a human pandemic contains only one human and two avian flu virus genes; the rest of the genes were derived from swine flu viruses, including the HA and NA genes. This is why humans had no immunity and were highly susceptible.

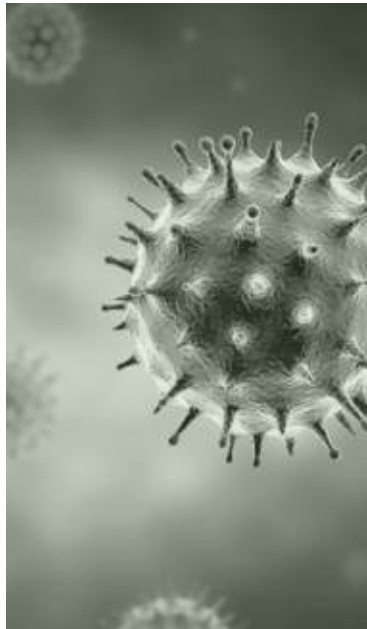
cycle. Adamantanes such as Amantadine and Rimantadine are entry inhibitors that block the

ion channel activity of the viral M2 protein; this is essential for the intracellular release of viral RNAs. These are off-patent and very inexpensive drugs. However, they have significant side effects and resistance to these drugs arises rapidly. The other class of drugs are virus egress inhibitors—these inhibit neuraminidase, which is required to release newly produced virions from the cell surface. These include Oseltamivir (Tamiflu), Zanamivir (Relenza), Peramivir (Rapivab) and Laninamivir.

Vaccines. Vaccination against seasonal influenza is carried out annually based on the major viral strains circulating that year.

Though useful for everyone to prevent disease (not infection), these are especially recommended for children aged 6 months to 4 years and adults > 50 years as also in people with chronic ailments and immunosuppression. Universal influenza A vaccines that protect against all subtypes of the virus is a highly desirable goal, and an active area of research.

Other strategies. Influenza is a respiratory disease, which is spread by coughing, sneezing and aerosols. Barrier protection with masks is desirable in the flu season, especially for those vulnerable due to age or other ailments.



2. Coronaviruses

Coronaviruses are enveloped RNA viruses that are widely distributed among humans, other mammals and birds. Members of this family of viruses were isolated in the 1930s as causative agents for infectious bronchitis in chicken, transmissible gastroenteritis in pigs and severe liver and neurologic disease in mice. In the 1960s, some human respiratory viruses were also added to this family; two of these were associated with about 20–30% of common colds. These were considered a pretty harmless family of viruses, until the emergence of severe acute respiratory syndrome (SARS), which was found to be caused by a new coronavirus, called SARS coronavirus (SARS-CoV). This was followed in 2012 by the emergence of the Middle East Respiratory Syndrome coronavirus

(MERS-CoV), also associated with respiratory disease. And in late 2019, another novel coronavirus, SARS-CoV2, emerged to cause respiratory disease and the ongoing pandemic.

The origins of all respiratory disease-causing human coronaviruses have been traced to bats, having jumped into human via other animal species—SARS-CoV through civet cats, MERS-CoV through dromedary camels, and SARS-CoV2 either directly or through pangolin. Expectedly, the highest nucleotide identity of SARS-CoV2 is to bat coronaviruses (96%) isolated in eastern China in 2018 and to a pangolin virus (91%); it has far less genetic identity to SARS-CoV (80%), MERS-CoV (55%) and the common cold coronaviruses (50%)

Treatment. There are no specific antivirals directed against human coronaviruses. During the SARS outbreak, many patients were treated with Ribavarin, steroids, alpha interferon, and protease inhibitors licensed for HIV therapy. According to a large-scale review (Stockman et al. 2006), none of these treatments showed a beneficial effect in patients. At least 21 different treatments are being tried for

The origins of all respiratory disease-causing human coronaviruses have been traced to bats, having jumped into human via other animal species...

COVID-19, of which about a dozen are used widely with promising or mixed results. Remdesivir, a RNA virus replication inhibitor initially developed for Ebola and hepatitis C has shown limited efficacy early in the disease, and so has steroid therapy late in the disease to control the ‘cytokine storm’. Plasma therapy using plasma from recovered patients was used during SARS and is being used widely in critical COVID-19 patients with mixed outcomes.

Vaccines. Till very recently there were no licensed vaccines against human coronaviruses. Various vaccines were developed against SARS-CoV, including inactivated whole virus, viral-vectored single protein, recombinant proteins and DNA vaccines. However, the disease disappeared before any of these could be tested for efficacy. For COVID-19, however, there are over 200 different vaccines in development, of which about 50 are in clinical development and six have received emergency use approval. This is remarkable speed, with at least four COVID-19 vaccines reporting efficacy data from Phase 3 trials. The earliest approvals are expected by the end of 2020, with some vaccines becoming available in early 2021.

Other strategies. Coronaviruses cause upper and lower respiratory infection, which is spread by coughing, sneezing and aerosols. The virus was shown to be viable on surface from about 4 hours to 72 hours. Barrier protection with masks, physical distance of about 6 feet and frequent hand washing with soap is recommended.



3. HIV

HIV is a complex virus with a unique virion morphology containing cylindrical or conical cores. The ~ 10 kilobase genome expresses genes found in all retroviruses—gag, pol and env that code for the viral core, polymerase and envelope proteins. Additionally, HIV also has a number of accessory genes—vif, vpr, vpu, tat, rev, and nef that are not required for virus multiplication in vitro but are essential for disease causation (Figure 7). The main targets for HIV are CD4+ T lymphocytes, CD4+ monocyte/macrophage

HIV infects key cells of the adaptive immune response, explaining the clinical manifestations of immune suppression. The time from acute infection to AIDS (defined as CD4 cell count of < 200 cells per microliter) can be as rapid as 6 months or as long as 25 years, though most people progress in 5 to 10 years.

lineage cells and some populations of dendritic cells (DCs). These are also the cells that are important for immune control of other infections; chronic HIV infections slowly lead to immunodeficiency.

HIV infects key cells of the adaptive immune response, explaining the clinical manifestations of immune suppression. The time from acute infection to AIDS (defined as CD4 cell count of < 200 cells per microliter) can be as rapid as 6 months or as long as 25 years, though most people progress in 5 to 10 years. This variable disease course depends upon early events at the time of acute infection, viral and host genetics. The establishment of latent viral reservoirs is key to the success of HIV as a pathogen. During the period of acute infection, a stable reservoir of HIV-infected rested memory CD4 cells is established. As proviruses in this reservoir are not transcriptionally active, no viral RNAs or proteins are produced and the virus stays hidden from the immune system as well as antiviral therapy.

Treatments. There are multiple drugs available to treat HIV-infected people, which has turned AIDS into a chronic disease with lifelong

therapy. The various classes of anti-HIV drugs are (1) replication inhibitors, both nucleoside and non-nucleoside reverse transcriptase (RT) inhibitors; (2) protease inhibitors that inhibit viral protein processing; (3) integrase inhibitors that prevent provirus formation; and (4) fusion inhibitors that block virus entry into host cells. Since HIV undergoes rapid mutation, use of single drugs lead to resistance. The most successful regimen is to use a combination of 3 drugs that includes a cocktail of non-nucleoside RT and protease inhibitors.

Vaccines. Despite decades of research and several clinical trials, no vaccine has so far been developed.

Other strategies. There are three major modes of HIV transmission—sexual, parenteral (via blood) and mother-to-infant. The mitigation strategies rest on behaviour change such as limiting sexual partners, using condoms, and not sharing needles (either for injections or recreational drug use). Improving the blood supply by testing donors is an effective way to reduce infections in the community. Mother to infant transmission can be reduced drastically by treating mothers during pregnancy and breastfeeding.

Q7.

WHAT ARE THE
MAIN CAUSES OR
DRIVERS BEHIND THE
EMERGENCE OF
PANDEMIC DISEASES
?

Pandemics: Past, Present and Lessons for the Future.

Question No. 7: What are the Main Causes or Drivers Behind the Emergence of Pandemic Diseases?
(Charles Perrings, Arizona State University)



ANSWER

7

It is estimated that around 60% of all known human pathogens and 75% of recently emerged infectious diseases are zoonotic (Bueno-Marí et al. 2015). There are a common set of factors involved in both the emergence and spread of zoonotic diseases. This makes it possible to identify both likely sources of new outbreaks, and likely patterns of spread.



It is helpful to distinguish between the emergence and spread of zoonoses. Currently while much effort is committed to the management of spread risk, very little effort is committed to emergence risk. Yet it has been frequently demonstrated that prevention is better than cure (Leung et al. 2002). A recent study of COVID-19 concludes that the cost of effort aimed at preventing the emergence of novel zoonoses would be significantly less than the cost of responding to novel zoonoses once they have emerged (Dobson et al. 2020).

Although emerging infectious disease outbreaks are most likely to occur in the large population centers of Europe, the USA, and Japan, there is a growing body of evidence that those outbreaks are most likely

to have their origin in forested tropical areas. Specifically, the risk of disease emergence is highest in forested areas in the tropics characterized by high levels of mammalian biodiversity (panel a in Figure 8), human population, and the conversion of forest habitat to agricultural production (panel b in Figure 8).

The management of emergence involves intervention in the processes of forest conversion. **Emergence risks are highest along the edges between forest habitats and agricultural land. The more fragmented is the pattern of conversion, the greater is the length of the forest edge, which is where transmission between infected wild animals and domesticated animals occurs.**

While most studies of the problem have argued that the way to reduce emergence risk is to reduce the rate of deforestation (Dobson et al. 2020), it is also possible to focus

Emergence risks are highest along the edges between forest habitats and agricultural land. The more fragmented is the pattern of conversion, the greater is the length of the forest edge, which is where transmission between infected wild animals and domesticated animals occurs.

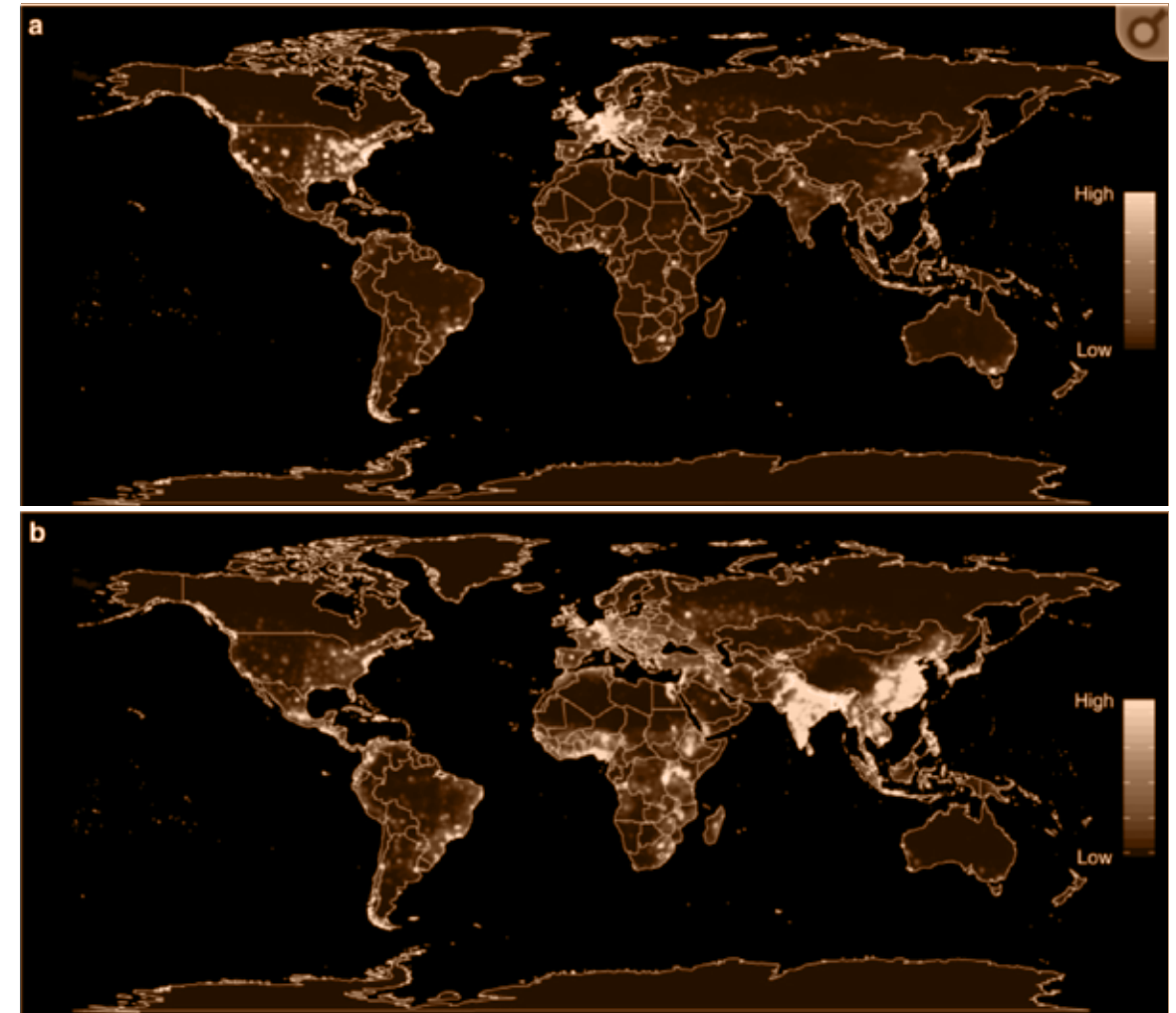


Figure 8. The predicted relative risk distribution of zoonotic EID events. a) shows the predicted distribution of new events b) shows the estimated risk of event locations after factoring out reporting bias. Source: Adopted from Allen et al. (2017, pp. 4)

on the edge directly. Risk can be reduced by focusing on the pattern of land conversion. A reduction in the length of the forest edge can be achieved by ensuring that the pattern of land conversion is more compact, and less fragmented.

China has been the source of many emerging zoonoses in recent decades, but as Figure 8 shows, countries in South and Southeast Asia, Central America, Central and West Africa are similarly a source

of risk. In all cases emergence is associated with contact between humans or their domesticates and particular wild species at forest edges.

It follows that management of emergence risks has less to do with epidemiology than with the process of land conversion, agricultural production methods, the trade in wildlife and wildlife products, and the ecological impacts of habitat depletion. The

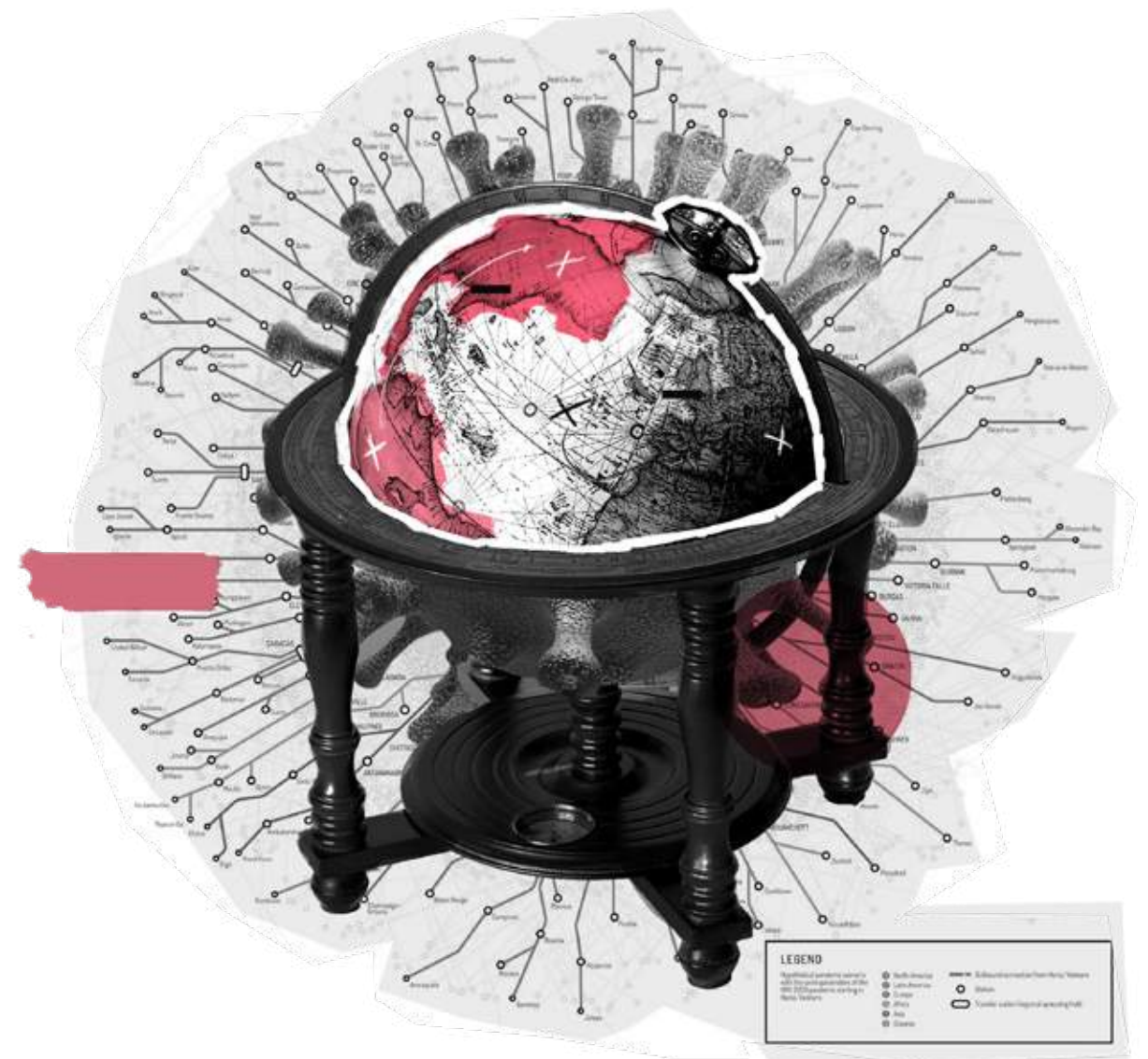
approach increasingly being taken to mitigate emergence risk is styled the 'One Health' approach. From a disciplinary perspective, it integrates virology and parasitology, ecology, epidemiology, economics, political science, and anthropology. From a policy perspective it integrates public health, veterinary medicine, animal management, and biological conservation (Cunningham et al. 2017).

Q8.

WHAT ARE THE FACTORS AFFECTING THE SPREAD OF PANDEMICS ?

Pandemics: Past, Present and Lessons for the Future.

Question No. 8: What are the Factors Affecting the Spread of Pandemics?



ANSWER

8

The spread of newly emerged infectious diseases is very strongly tied to patterns of trade and travel. Studies of the role of the air transport network in the transmission of the 2003 SARS and 2009 H1N1 pandemics show that spread rates reflect the time and distance associated with distinct routes, together with the volume of traffic along those routes (Brockmann and Helbing 2013).

In the last few decades, development of the travel network and growth in the volume of travel have been implicated in both the pattern and rate of spread of plague, cholera, HIV-AIDS, H5NI, West Nile virus, and SARS (Hufnagel et al. 2004, Tatem et al. 2006, Daszak 2012) . Interventions in the trade and travel network—restrictions on the movement of both goods and people—are a common first response to the appearance of an emerging infectious disease.

In the case of COVID-19, the outbreak prompted immediate mobility restrictions around Wuhan. These were followed by the

suspension of international flights to and from China. When it became

Differences in the effectiveness of such measures applied in different countries reflect a fundamental property of epidemics—that the contact between susceptible and infected individuals which leads to transmission depends on the choices made by individuals.



clear that the virus had already spread internationally, individual countries (individual states in the U.S.) added internal mobility restrictions together with a range of social distancing measures.

Differences in the effectiveness of such measures applied in different countries reflect a fundamental property of epidemics—that the contact between susceptible and infected individuals which leads to transmission depends on the choices made by individuals. People's contact choices reflect the relative costs of illness and illness avoidance to them—the private cost. If the private cost of illness is

low, or the private cost of illness avoidance is high, people have little incentive to avoid contact. The essentially economic nature of contact decisions, and the essential role of economics in epidemiological processes, was understood before COVID-19 (Perrings et al. 2014) .

The private costs of illness and illness avoidance depend partly on the characteristics of the disease, partly on the public health control measures implemented and the enforcement of those measures, partly on institutional conditions (the formal and informal mechanisms available to support those incapacitated by illness), and partly on outbreak-specific measures

taken to compensate those affected. More of this is discussed in the economic impacts of pandemics (see Q14).

The experience of COVID-19 has shown how widely public health control measures and the resulting costs differ between countries (Fang et al. 2020, Hale et al. 2020). It has also shown how widely the costs that national governments were implicitly willing to bear vary. The implicit 'price of life' ranges from around \$100,000 in the U.K., the U.S. and Italy to over \$1million in Denmark, Germany, New Zealand and Korea (Balmford et al. 2020) .

Q9.

**WHAT MEASURES WERE
ADOPTED BY COUNTRIES
TO COMBAT COVID-19 AND
HOW SUCCESSFUL
HAVE THEY BEEN**

?

Pandemics: Past, Present and Lessons for the Future.

Question No. 9: What Measures were Adopted by Countries to Combat COVID-19
and How Successful Have They Been?









ANSWER

9

In this section, we shall look at the efficacy of policies implemented to contain the spread of the virus. Policies relating to mitigating the economic, education and health impacts will be addressed in following sections focusing on the key impacts of the pandemic (Q10–Q16).

In Table 1, we present some of the practices adopted by 10 countries as of 10th October 2020. These countries were selected to highlight either the high case infection and death rates, type of measures undertaken, or regional

contrasts. The intention here is not to imply that these are the best responses to the pandemic but to simply enlist various practices that were adopted by these countries to address the spread of the pandemic.

COUNTRY	 USA	 INDIA
SEVERITY IMPACT*	 Cases = 7,663,293  Deaths = 213,752	 Cases = 6,906,151  Deaths = 106,490
ADOPTED MEASURES	<ul style="list-style-type: none"> Declared “State of Emergency” Promoting <i>Work-from-Home</i> Extensive Testing Containment Measures Varied by State & County Travel Bans Ban on Large Gatherings School Closures (those that reopened adopted various instruction approaches-in-person instruction, virtual or hybrid) Entertainment, Theme Parks & Convention Centers Remain Closed in Some States Phased Reopening by Most States 	<ul style="list-style-type: none"> Nationwide Lockdown Localized Lockdowns in Containment Zones Extended Travel Restrictions Imposed 14-Day Quarantine Post Travel School and College Closures Closure of Gyms, Museums, & Theatres Promoting Remote Work Ban On Mass Gatherings Covid-19 Testing Centers Created Nationwide Phased Reopening Plan in Place
GOVERNMENT RESPONSE STRINGENCY INDEX** (100 = STRICTEST)	62.50	73.61






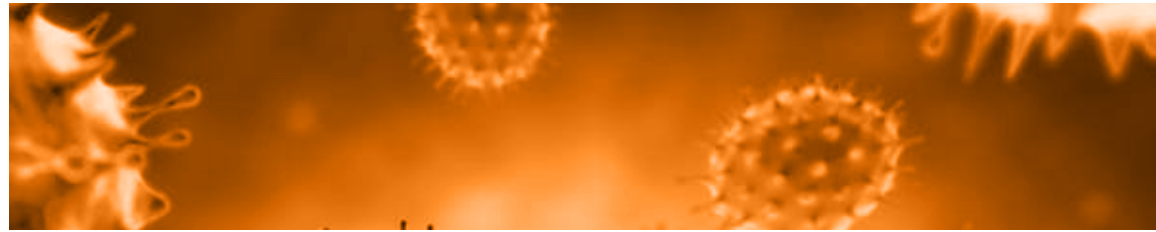












 CHINA	 SOUTH AFRICA	 KENYA	 BRAZIL
 Cases = 85,557  Deaths = 4,634	 Cases = 690,896  Deaths = 17,673	 Cases = 41,158  Deaths = 760	 Cases = 5,055,888  Deaths = 149,639
<ul style="list-style-type: none"> Lockdown of Wuhan, Hubei Province Adopted Stringent Enforcement Measures to Test, Track, Isolate, Treat (TTIT) Covid-19 TTIT was Implemented Through Elaborate Use of Digital Technologies like Artificial Intelligence (AI), Big Data, Cloud Computing, Blockchain, and 5G Large-Scale Mobility Restrictions at the National Level Social Distancing A 14-Day Quarantine Period For Returning Migrant Workers 	<ul style="list-style-type: none"> Declared a “National State of Disaster” Adopted Containment Measures Social Distancing Travel Bans on Visitors from High-Risk Countries Quarantine for Nationals Returning from High-Risk Countries Screening at Ports of Entry School Closures Testing Introduced but at Low Rates Introduction of Mobile Technology to Track And Trace Contacts of Those Infected and Inform Individuals if They Have Been in Close Proximity to a Person Diagnosed with COVID-19 	<ul style="list-style-type: none"> Nationwide Curfew from 7pm to 5am Suspension of International Flights Social Distancing Heightened Restrictions in Non-Essential Social Spaces and Gatherings Encouragement of Teleworking Where Possible School and College Closures Establishment of Isolation Facilities Limitations on Public Transportation Passenger Capacity 	<ul style="list-style-type: none"> Restricted Operation of Non-Essential Businesses Schools Closures Travel Restrictions Free Testing
52.31	39.81	64.81	63.43

Table 1. Severity impact, adopted measures and government response severity index (as of 10 October 2020).

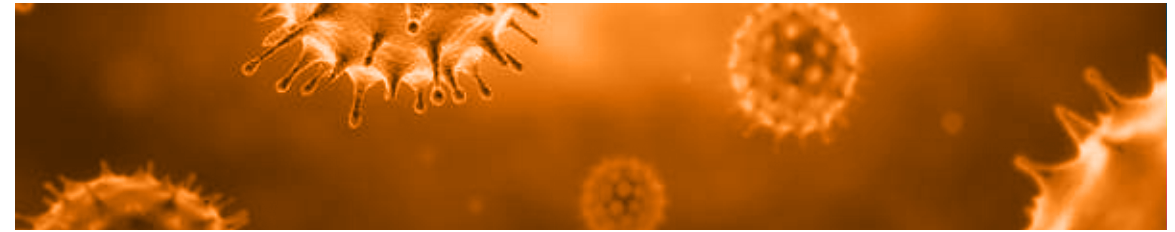
*Figures as of 10 October 2020, based on John Hopkins University, Coronavirus Research Center; World Economic Forum; International Monetary Fund.










** Figures as of 10 October 2020, adopted from Hale et al. (2020). The index ranges from 0-100 (100= strictest) and measures level of strictness with which government policies were implemented.



COUNTRY	 ARGENTINA	 NORWAY	 SWEDEN	 FRANCE
SEVERITY IMPACT*	 Cases = 15,388  Deaths = 275	 Cases = 15,388  Deaths = 275	 Cases = 6,906,151  Deaths = 106,490	 Cases = 732,434  Deaths = 32,601
ADOPTED MEASURES	<ul style="list-style-type: none"> Full Closure of Border Nation-Wide Lockdown Imposed Strict Quarantine 	<ul style="list-style-type: none"> Travel Restrictions Quarantine-After-Travel Requirement Imposed Social Distancing Measures In Place Closures Of Schools, Universities And Businesses 	<ul style="list-style-type: none"> Implemented 'Herd Immunity' Strategies No Lockdown Voluntary Compliance to Social Distancing Measures Secondary Schools and Universities Switched to Distance Learning 	<ul style="list-style-type: none"> Continuous Monitoring of Localized Clusters with Outbreaks School Closures Ban On All Non-Essential Activities, Outings, Large Gatherings And Long-Distance Travel Introduction Of Night-Time Curfews In Some Cities Abandon The Customary "Bise" Greeting—Involving Kissing Each Other On The Cheek—To Promote Social Distancing
GOVERNMENT RESPONSE STRINGENCY INDEX** (100 = STRICTEST)	82.87	28.7	37.04	43.98

*Figures as of 10 October 2020, based on John Hopkins University, Coronavirus Research Center; World Economic Forum; International Monetary Fund. ** Figures as of 10 October 2020, adopted from Hale et al. (2020). The index ranges from 0-100 (100= strictest) and measures level of strictness with which government policies were implemented.



 GERMANY	 SOUTH KOREA	 INDONESIA
 Cases = 320,495  Deaths = 9,599	 Cases = 24,548  Deaths = 430	 Cases = 324,658  Deaths = 11,677
<ul style="list-style-type: none"> Hospital Capacity Built Up Extensive Testing Awareness Campaigns (Public Communication) Transparency Border Closures Closure Of Schools And Non-Essential Businesses Social Distancing Requirements Imposed Enforcement Of Mask-Wearing Ban on Public Gatherings 	<ul style="list-style-type: none"> Continued Vigilance Extensive Testing Contact Tracing Isolation Quick Treatment Of Confirmed Cases 	<ul style="list-style-type: none"> Temporary Bans on Domestic and International Air and Sea Travel Screening at Ports of Entry School Closures Restrictions on Public Events Banned Indonesia's Traditional Annual Exodus For Muslim Holidays During Eid Al-Fitr Celebrations
46.76	56.48	68.98

In an attempt to measure a national government's response to the pandemic, Hale et al. (2020) developed an Oxford COVID-19 Government Response Tracker (OxCGRT). Their team used data from over 150 countries on 18 indicators¹⁴ and aggregated it into a set of four common indices, reporting a number between 1 and 100 to reflect the level of government action on health, education and state of economy.

The four indices are as follows:

1. OVERALL GOVERNMENT RESPONSE INDEX:

This index measures the variation in overall government response across all indicators, suggesting whether government response has increased or decreased since the outbreak.

2. CONTAINMENT AND HEALTH INDEX:

This index encapsulates school closures, mobility restriction due to lockdown and also contact tracing and testing policy to list a few.

3. ECONOMIC SUPPORT INDEX:

This index includes information regarding economic stimulus received, debt relief.

4. STRINGENCY INDEX:

This index measures how strictly the lockdown policies restricted human behavior.

¹⁴ Containment and closure: 1) School closing 2) Workplace closing 3) Cancel public events 4) Restrictions on gathering size 5) Close public transport 6) Stay at home requirements 7) Restrictions on internal movement 8) Restrictions on international travel. Economic response: 1) Income support 2) debt/contract relief for households 3) fiscal measures 4) giving international support. Health systems: 1) Public information campaign 2) testing policy 3) contact tracing 4) emergency investment in healthcare 5) investment in COVID-19 vaccines. Miscellaneous: Other responses.

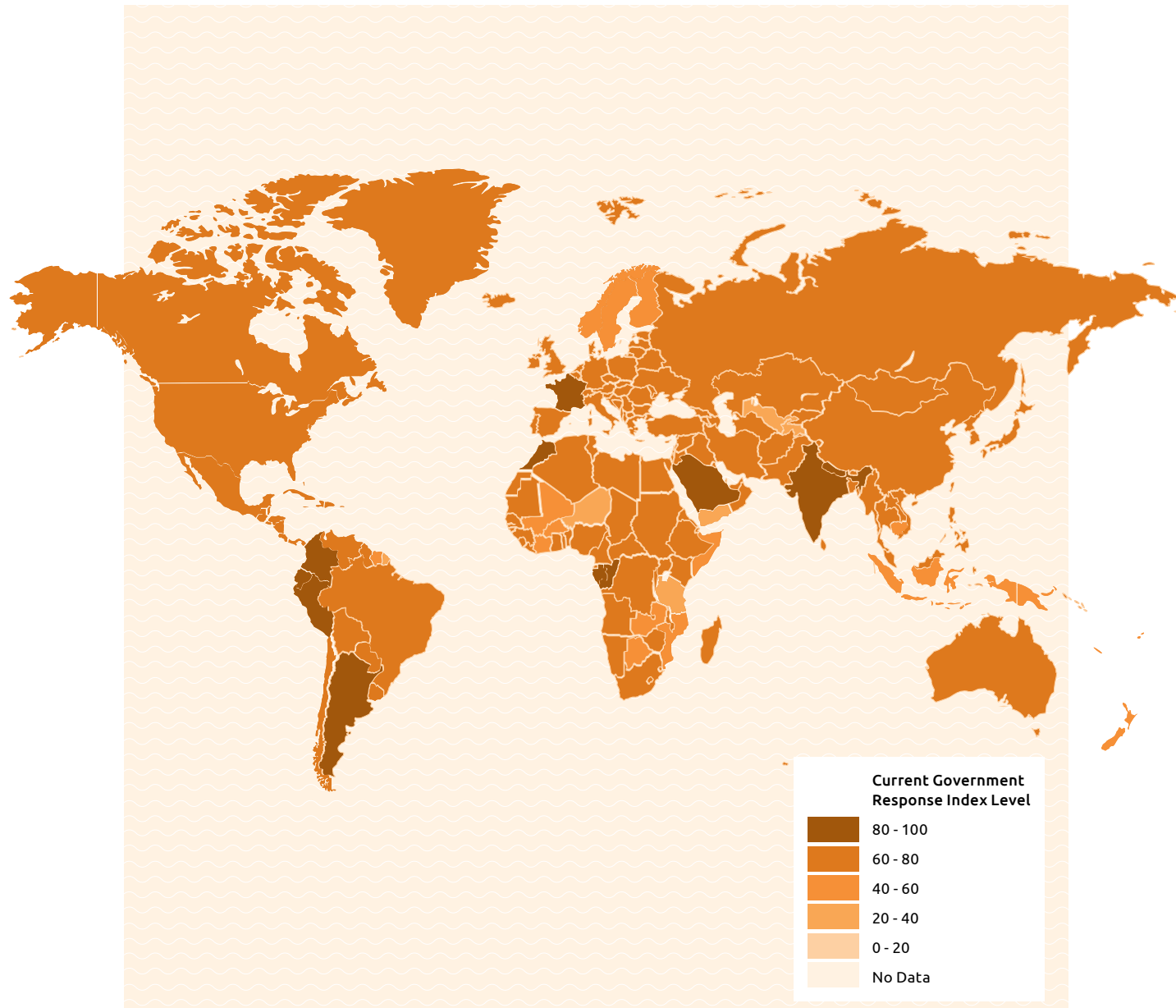


Figure 9. COVID-19 Overall Government Response Index by Country. Source: Adopted from Hale et al. (2020)

The findings from Hale et al (2020) are graphically represented in Figure 9.

While Figure 9 represents country performance in terms of overall government response to the pandemic, it might be more

insightful to evaluate the spread of the pandemic with respect to strictness in implementation of containment measures. Therefore, in Figure 10, we graphically represent the total number of COVID-19 cases (normalized per million) and the government response

stringency index calculated by Hale et al. (2020) over time for select countries. The aim is to examine whether those countries with higher stringency index were able to contain the pandemic or not.

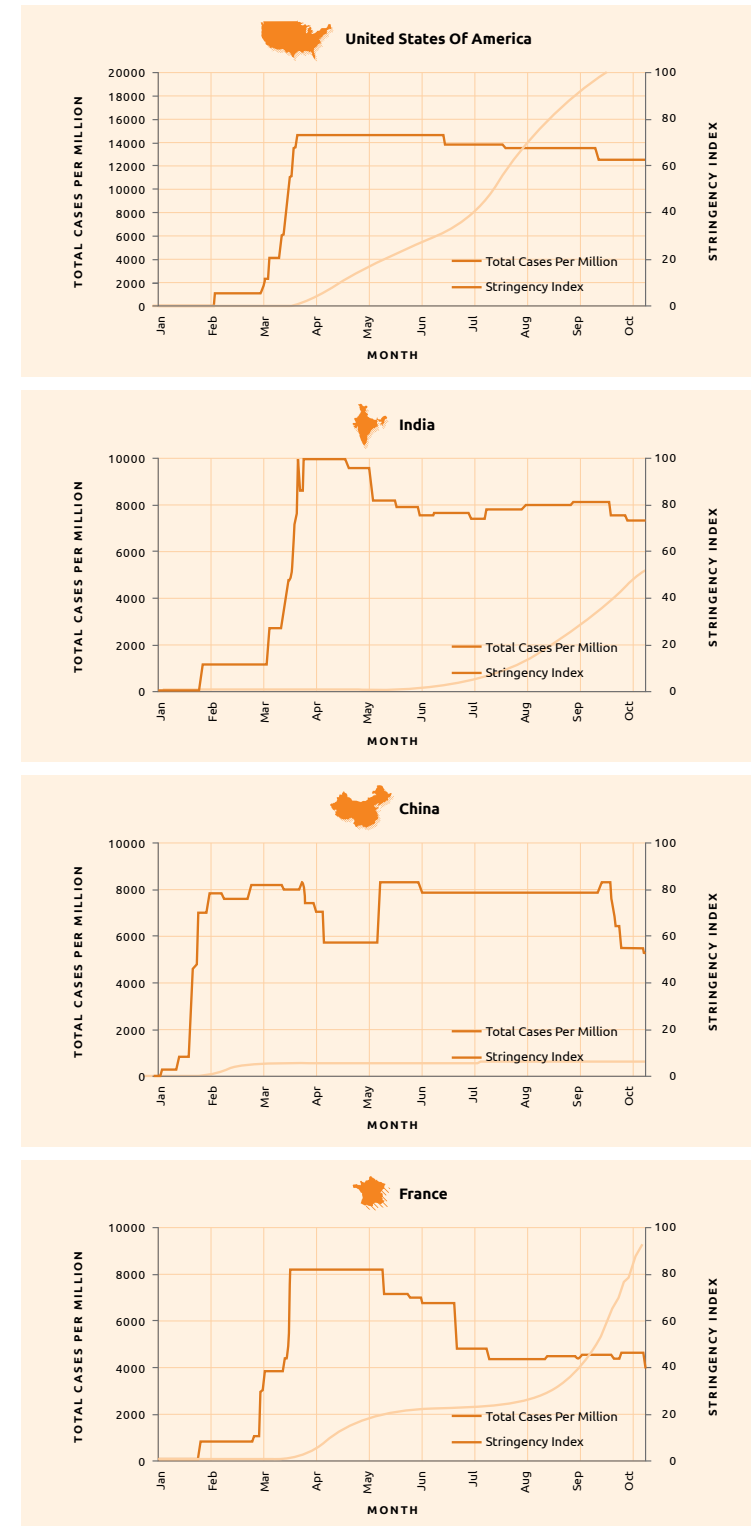


Figure 10. Total COVID-19 Cases per million and Government Response Stringency Index for selected countries from 1 January 2020 till 10 October 2020. Source: Graphs created by Kriti Singh using data from Hale et al. (2020) and Our World in Data (<https://ourworldindata.org/covid-cases>)

Figure 10 reveals that ceteris paribus a higher stringency index during initial months is instrumental in reducing the impact of the pandemic. However, a drop in the stringency index in later months, which pertains to lifting of lockdown and containment measures, seems to have contributed to the spikes experienced by those respective countries. The French graph indicates that a premature lifting of containment measures has contributed to the emergence of a second wave in France. In the case of India, the graphs show a low infection rate with a very high stringency index in the early days but as measures were relaxed, the infection rates increased exponentially. As the stringency index is composed on a range of measures that not only include the health measures but also economic support and government policy implementation, a more detailed analysis will be required to explore which particular measures were the primary reason for containment. **The graphs also reveal that timing of implementation of stringent measures is critical, the quicker these measures were implemented, for example in China, the better chance a country has in curbing the pandemic.**

Key Impacts of COVID-19

The impacts of COVID-19 go beyond just health. It affects nearly every segment of society causing

disruptions in the economic, education and health sectors (See Figure 11). A pandemic has to be seen more than just a health issue but a societal problem that transcends sectoral boundaries with its impacts affecting people on multiple fronts.

In this document we shall focus on the health, economic and education impacts and through those attempt to trace how these might affect the progress towards achieving the Sustainable Development Goals (SDGs).

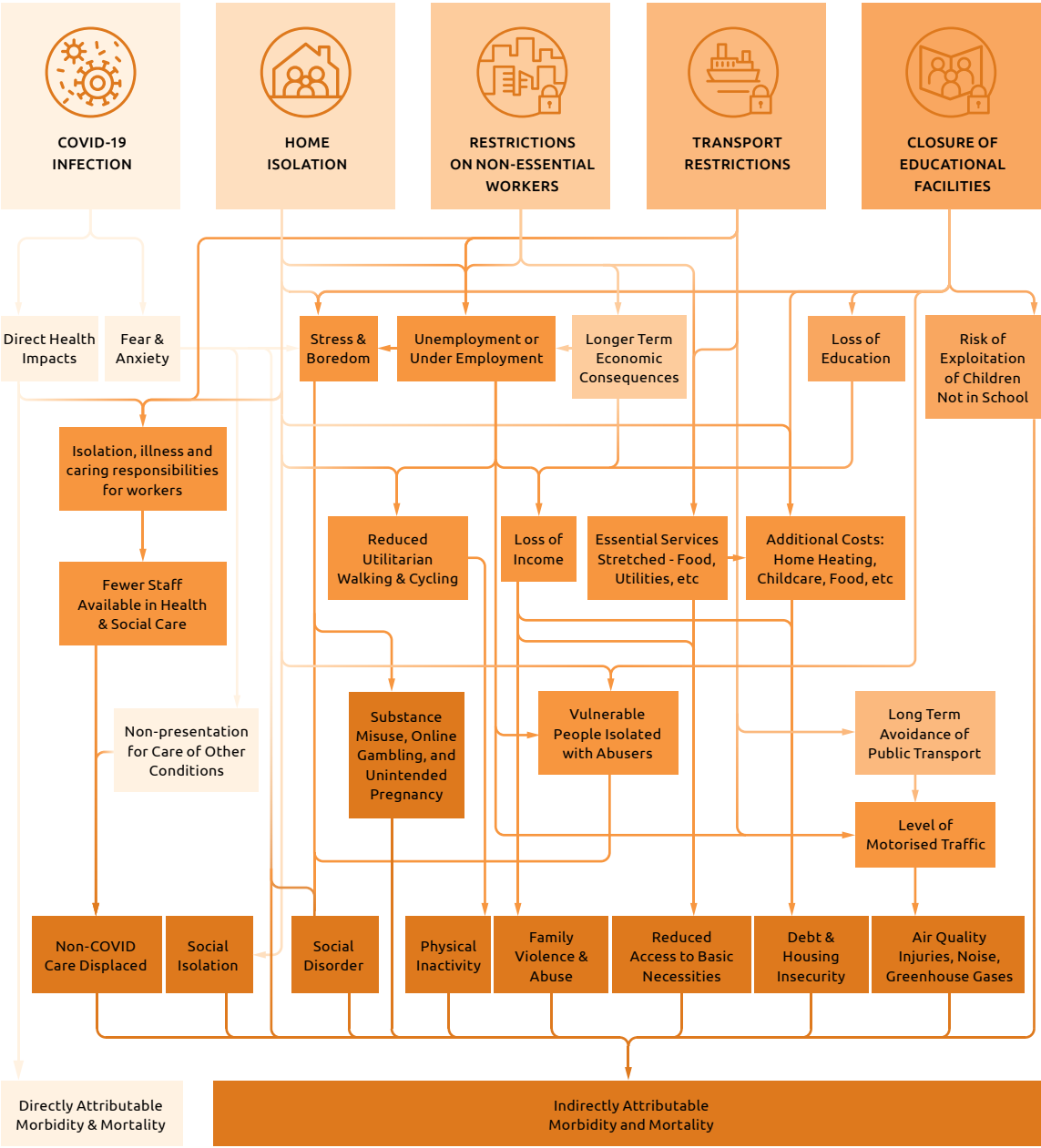


Figure 11. Impacts from COVID-19. Source: Adapted from Douglas et al. (2020)



Q10.

WHAT ARE THE HEALTH IMPACTS OF COVID-19 ?

Pandemics: Past, Present and Lessons for the Future.

Question No. 10: What are the health impacts of COVID-19?



ANSWER

10

There are basically two direct health impacts—mortality and morbidity. The former refers to the number of deaths while the latter refers to the level of health during and post illness. As of 13th December 2020 there were approximately over 1.5 million deaths globally with USA, Brazil and India with the highest levels of 297,800, 181,123 and 143,019 respectively (See Figure 12).



India as of 13th December 2020 had mortality rate of 105 per million increasing from about 75 deaths per million as of 1 October 2020. The U.S. was experiencing 910 deaths as of 13th December increasing from 625 deaths per million as of 1st October with Brazil having a death rate of 864 from approximately 675 per

The Case Fatality Rate (CFR) for India, USA and Brazil were approximately 1.5, 1.9 and 2.6 respectively as of December 13th 2020.

million. The Case Fatality Rate (CFR)¹⁵ for India, USA and Brazil were approximately 1.5, 1.9 and 2.6 respectively as of December 13th 2020.

Depending on age, health and clinical condition of the patients (Wu et al. 2020) outcomes of COVID-19 have shown dramatic variation with more severe outcomes in the elderly patients with secondary health problems like diabetes, hypertension, lung and heart diseases and cancer. Dozens of studies have also reported that many of the sickest COVID-19 patients

have been people with obesity.

In a meta-analysis published in Obesity Reviews, which included 399,000 patients, it was found that people with obesity who contracted COVID-19 were 113% more likely than people of healthy weight to land in the hospital, 74% more likely to be admitted to an ICU, and 48% more likely to die (Simonnet et al. 2020, Hamer et al. 2020). Depending on severity of infection, existing health conditions and age, recovery from COVID-19 is variable with some persons recovering easily while others experiencing longer recuperation time.

Depending on age, health and clinical condition of the patients (Wu et al. 2020) outcomes of COVID-19 have shown dramatic variation with more severe outcomes in the elderly patients with secondary health problems like diabetes, hypertension, lung and heart diseases and cancer.

As of December 2020, India was the third highest country with fatalities in absolute terms while it is ranked 83 of over 203 countries and territories when normalized for population.

Morbidity is overlooked if we focus only on death as a measure of the effect of the pandemic. While it is too early to evaluate morbidity, emerging studies report on children who developed a multisystem inflammatory syndrome after COVID-19, with potential cardiac damage (Whittaker et al. 2020). The severe pulmonary damage has been observed in some adults who recovered from severe COVID-19. It is too soon to tell whether this will have long-term respiratory implications, but the term “Long COVID” has been used to describe long-term sequelae of COVID-19. It is a situation that countries should continue to monitor as patients recover.

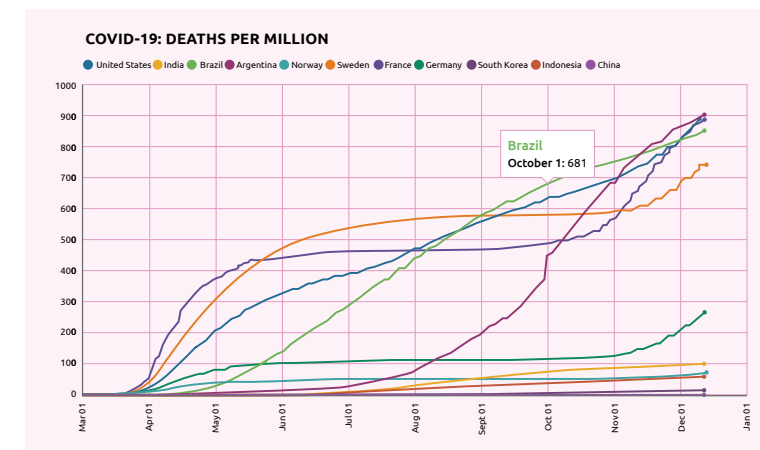
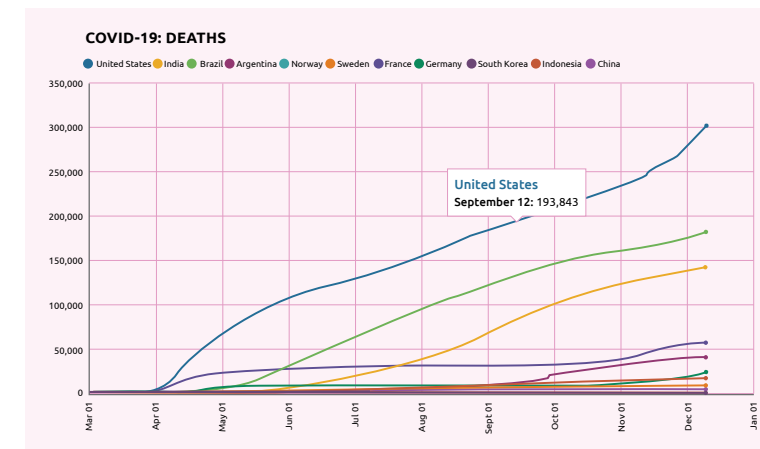


Figure 12. Deaths and deaths per million across selected countries from 1 March 2020 till 15 December 2020. Source: Graphs created by Devesh Kumar based on data from European Centre for Disease Prevention and Control (<https://www.ecdc.europa.eu/en>)
Last updated: 15 December 2020, 08:00 IST (GMT +5:30)

¹⁵The CFR is the ratio of deaths per number of cases.



Indirect Health Impacts

Two indirect impacts from COVID-19 have emerged so far in the literature. The first relates to the effects of COVID-19 on the health system and its capacity to deliver health care. The second indirect impact pertains to the psychological implications arising from the disease itself but also from the confinement and lockdown policies implemented to contain the virus.



BURDENING THE HEALTHCARE SYSTEM

The COVID-19 pandemic stretched healthcare systems worldwide and rapidly revealed the fragility of healthcare infrastructure and services, forcing countries to make

difficult choices on how to best meet the needs of people. The outbreak of the infection has necessitated the urgent increase in the number of beds and intensive care units that are localised in specifically equipped wards, with dedicated medical teams and separate routes and exits.

The speed, extent and severity of the infection exposed the lack of preparedness of healthcare systems and made clear the urgent need for countries to develop guidelines for such pandemic disasters with the objective of enhancing the resilience of health systems and integrating disaster risk reduction into all levels of healthcare.



ACCESS TO ESSENTIAL HEALTHCARE

The second rather unfortunate outcome of COVID-19 and

associated lockdowns was the negative impact on accessing essential health care. For instance, in India, public transport was barred for a long time, making it extremely difficult for individuals with pre-existing health problems to access any health care. As a consequence, there have been dramatic reductions in essential public health and clinical interventions.

Data from India's National Health Mission indicates that there was a close to 70% drop in children's vaccination for measles, mumps, and rubella, a 50% fall in attendance to clinic for acute cardiac events, an over 30% decrease in inpatient care for pulmonary conditions, and an over 20% reduction in institutional deliveries in March 2020, compared with March 2019 (Cash and Patel 2020). Other disruptions observed in other countries include curtailed access to antimalarial medicines and suspension of polio vaccination. Many people who need treatment

for cancer, cardiovascular disease and diabetes have not been receiving the health services and medicines they needed since the COVID-19 pandemic began.



PSYCHOLOGICAL IMPACT OF COVID-19

The highly infectious nature of the COVID 19 virus have demanded hard measures of physical distancing and the strict imposition of quarantine. For humans who are social beings, quarantine is a difficult and unpleasant experience. Uncertainty and anxiety about disease status, curtailed freedom, boredom and separation from family and friends can have dramatic consequences. Anger runs high, and increases in domestic violence, divorce rates and suicide have been

reported following the imposition of quarantine in previous outbreaks (Brooks et al. 2020, NZFVC 2020). The massive negative effects of mandatory mass quarantine have called for serious introspection on the use of quarantine as a public health measure (Hawryluck et al. 2004, Reynolds et al. 2008, Brooks et al. 2020).

Along similar lines a study comparing post-traumatic stress symptoms in parents and children quarantined with those not quarantined found that the mean post-traumatic stress scores were much higher (quadrupled) in children who had been quarantined, compared to those who were not (Sprang and Silman 2013). While the length of the quarantine period (10 days or more) on social and emotional health is unclear, maintaining stable social and emotional health has emerged as a key factor of psychological health in quarantine conditions.



SOCIAL STIGMA

The fear of being infected with COVID-19 has given rise to stigma in local communities. Social stigma was defined as “an attribute which is deeply discrediting” that reduces a person “from a whole and usual person to a tainted, discounted one” (Goffman 1963, p.3; Dowdy et al. 2020). Media reports from around the globe have also narrated how frontline health care workers were assaulted, spit on, denied rides, hit with rocks, sprayed with bleach and made homeless because of fears that they would transmit COVID-19 to the people living around them (Sotgiu and Dobler 2020).

Factors affecting the magnitude of direct and indirect health impacts of COVID-19

A number of factors affect the mortality and morbidity levels of the disease. In addition, the degree to which the indirect impacts will affect individuals will also be influenced by a number of external factors. The key factors are presented below.

AGE

Similar to the 2003 SARS epidemic (Anderson et al. 2004), but unlike H1N1 Swine Flu of 2009, the risk and severity of COVID-19 increased with age (Dong et al. 2020; Zhao et al. 2020) with the most severe health impact seen for adults over the age of 60—with particularly fatal results for those 80 years and older. Potential reasons behind this increment in reported number of cases with age at the onset of COVID-19 (Liu, Xing, & Xue Za, 2020) are lower vulnerability to infection among younger populations, reduced chances of tracing infection as the cause of disease among children, and prevalence of underlying health conditions present in older populations (Davies et al. 2020). Moreover, with increase in age,

the immune system gradually loses its resilience, resulting in greater susceptibility to infection of any kind, especially a new one like COVID-19 (Valiathan, Ashman & Asthana, 2015). However, this age gradient needs to be re-examined in light of a research study conducted by Laxminarayan et al. (2020) that examined COVID-19 cases from Southern India. Their study analyzed data from the Indian states of Tamil Nadu and Andhra Pradesh, and found enhanced transmission risk was apparent among children and young adults. In their study, deaths were concentrated in 50- to 64-year-olds. Their data indicated that incidence of COVID 19 did not change in older age groups and this was attributed to adherence to stay-at-home orders and social welfare programs or socioeconomic status.

PRE-EXISTING HEALTH CONDITIONS

Pre-existing health conditions like diabetes, heart disease, and other chronic illnesses lead to more intense disease symptoms and complications. While the impact of underlying medical conditions on COVID 19 continues to be investigated, emerging reports suggest that individuals with underlying health conditions might be at an increased risk for severe illness from COVID-19. Some of these include asthma, hypertension, cardiovascular disease, obesity, neurologic conditions such as dementia, liver disease, smoking, and immunocompromised conditions, to name a few.

MINORITY POPULATIONS

Racial/ethnic and minority populations experience worse health outcomes than do other groups during and after disasters. A study on racial and ethnic disparities in population level COVID-19 mortality found that only 28 states in the United States reported race and ethnicity-stratified COVID-19 mortality (Gross et al. 2020). The increased mortality risk for black compared to the white population was found to be 3.57 (95% CI: 2.84–4.48). Similarly, the Latino population displayed 1.88 (95% CI: 1.61–2.19) times higher risk of death than whites. However there is no evidence to suggest that such disparities are due to genes or how our immune system responds to viral infections. These disparities instead may be attributed to the disproportionate burden experienced by people of color regarding comorbidity, at-risk employment, unstable housing, incarceration, and decreased access to healthcare and medical resources.

GENDER

Public policy data indicate differential impact of pandemics across gender with women affected more than men. From a public health perspective, they are: (i) disadvantaged by reduced access to sexual and reproductive health services (Wenham et al. 2020); (ii) more severely affected since they bear the brunt of care responsibilities as schools close and family members fall ill (Bandiera et al. 2018); and (iii) at greater risk of domestic violence (Peterman et al. 2020, NZFVC 2020).

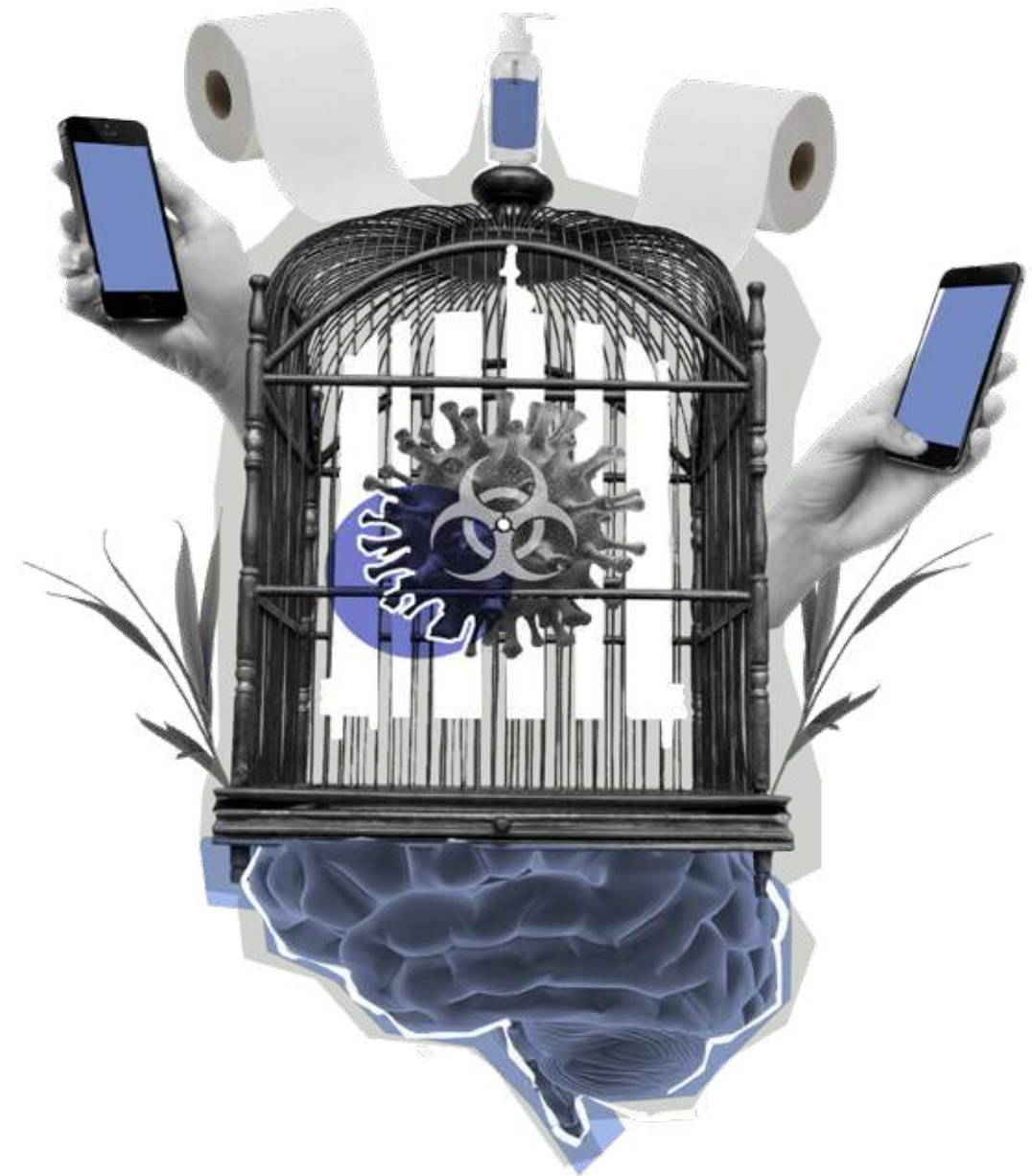


Q11.

WHAT HEALTH SECTOR SPECIFIC POLICY RESPONSES CAN BE IMPLEMENTED ?

Pandemics: Past, Present and Lessons for the Future.

Question No. 11: What Health Sector Specific Policy Responses can be Implemented?



ANSWER

11

The pandemic outbreak exposed many gaps and weaknesses in public health surveillance, preparedness and response systems of countries worldwide. An interesting feature that emerged was the existence of policies in a number of countries, following earlier epidemics and pandemics but with no follow-up action.



As a consequence, on ground medical infrastructure and trained manpower to respond to the pandemic were absent or inadequate, which left public health systems vulnerable. The impact of COVID-19 once again brought to fore the absence of public health focus on mental health and the urgent need for it. The impact on mental health as a consequence of quarantine and lockdown has reiterated once again the need for psychological support and counselling as an active component of the public health support.

Some key responses that have been observed include:

Communication

Providing scientifically accurate information to people is not only important but necessary during

The impact on mental health as a consequence of quarantine and lockdown has reiterated once again the need for psychological support and counselling as an active component of the public health support.

a pandemic. The purpose of the communication is to provide and exchange pertinent information with the general public and stakeholders so that they can make well informed decisions and take appropriate measures to protect health and safety. Communications should be based on the five principles outlined in WHO's influenza outbreak communications planning guide (World Health Organization 2008b), which are as follows:

- To maintain and build public trust in public health authorities before, during and after an influenza pandemic;
- To support coordination and the efficient use of limited resources among local, national, regional and international public health partners;
- To provide relevant public health information to the public; to support vulnerable populations having the information they need to make well-informed decisions;
- To take appropriate actions to protect their health and safety; and to minimize social and economic disruption.
- To minimize social and economic disruption.

Supplies

Insufficient supplies for daily needs was found to be one of the greatest concerns in lockdown and quarantine situations. Officials therefore need to ensure that enough supplies for daily needs which would be replenished at regular and rapid intervals and provide reassurance to the public to prevent hoarding of such supplies (Manuell et al. 2011).

Length of the Quarantine or Lockdown

Quarantine is a necessary preventive measure during pandemics. However, studies have suggested that length of quarantine can have impact on psychological health and

Quarantine is a necessary preventive measure during pandemics. However studies have suggested that length of quarantine can have impact on psychological health and economic growth.

economic growth. Two studies showed that longer quarantine is associated with poorer psychological outcomes. Research suggests that restricting the length of quarantine to what is scientifically reasonable given the known duration of incubation periods, and not adopting an overly precautionary approach to this, would minimize the effect on people (Hawryluck et al. 2004, Reynolds et al. 2008).

Psychological Support

Psychological crisis intervention should be part of the public health response to a pandemic outbreak. This is important enough to be organized at the city, municipal, and provincial levels. There is urgent need for an intervention workforce that comprises psychological outreach teams led by psychiatrists and mental health professionals and psychological support hotline teams. The European Federation of Psychologists' Association developed a set of guidelines for psychologists on how to conduct online consultations to provide support for people who experience

continuous anxiety, extended sadness, or other stressful reactions that negatively affect their work or family relationships in order to provide relief and receive professional counselling.¹⁶ In India, psychiatric social workers quickly set up counselling support for psychological counselling. In addition, social network support was found to be a great resource in managing psychological outcomes (Maunder et al, 2003).

Protecting Vulnerable Populations

In order to ensure that vulnerable populations are protected during pandemic outbreaks, it is essential that their vulnerability be highlighted to policy makers. To do so, public health professionals, emergency managers, and other stakeholders need to include representatives from racial/ minority/migrant communities to inform planning and response and where appropriate, to adapt strategies to the context of diverse minority communities. Mass health messages for the general population may need to be adapted to the cater to language, culture and health literacy. Both the private sector and community support can also provide active support in keeping themselves, their families, and others in the community protected. Co-ordinated public-private partnerships would have been very helpful and governments need to set up data banks of such organisations for future preparedness.

¹⁶<https://www.covid19healthsystem.org/mainpage.aspx>

Q12.

HOW HAS COVID-19 IMPACTED SCHOOL EDUCATION ?

Pandemics: Past, Present and Lessons for the Future.

Question No. 11: How Has COVID-19 Impacted School Education?



ANSWER

12

With the COVID-19 outbreak, the world has faced an unprecedented disruption to education systems. School closures have affected nearly all education systems around the globe. As of the middle of April 2020, over 1.5 billion children and youth—more than 90% of total enrolled learners—were affected as school and learning institution closures expanded across 200 countries.¹⁷

There is a serious risk that the COVID-19 pandemic will undo progress made in terms of achieving the ‘Education for All’ agenda in recent decades as well as in the context of the current ‘Education 2030–SDG 4’ agenda—inclusive and equitable quality education and lifelong learning opportunities for all.

The disruptions brought on by the COVID-19 pandemic are disproportionately affecting the marginalized children and youth and exacerbating educational inequality both within and across countries as illustrated in Figure 13, leading to urgent calls for investment in and transformation of education and learning systems to prevent short-term setbacks from turning into long-lasting problems (International Commission for the Futures of Education 2020; UN 2020).

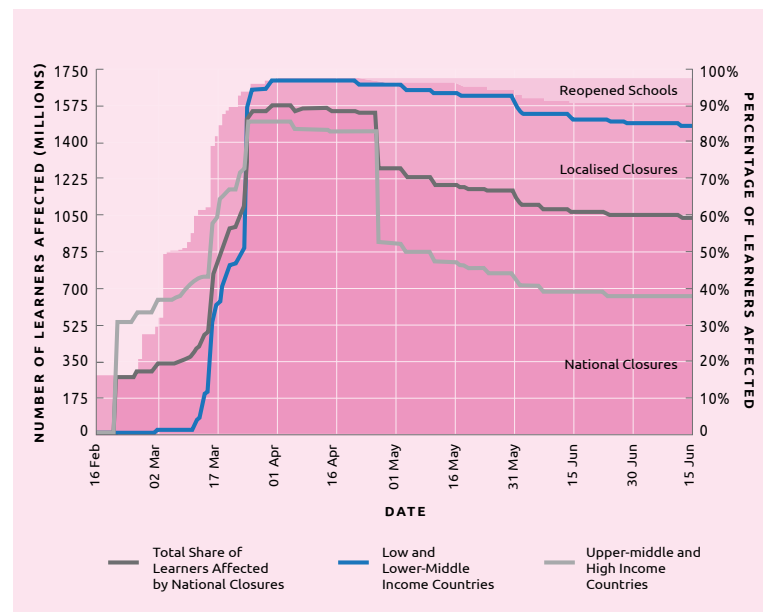


Figure 13. Number of learners affected by school and learning institution closures globally (from pre-primary to higher education). Source: Adapted from United Nations (2020, Figure 2, p.6)

Direct impact of confinement measures on education

School closures can have negative effects on learning by compromising multiple roles played by schools and magnifying the challenges of home learning (see Figure 14). Aside from the health and safety of the school population, the major impacts of a pandemic on education include disruptions not only to instructional time and exam execution but also to ancillary school-based services.

Prolonged school closures disrupt services such as school feeding, immunization, and mental health and psychosocial support. They can also cause stress and anxiety owing to disrupted routines and the loss of peer interaction.

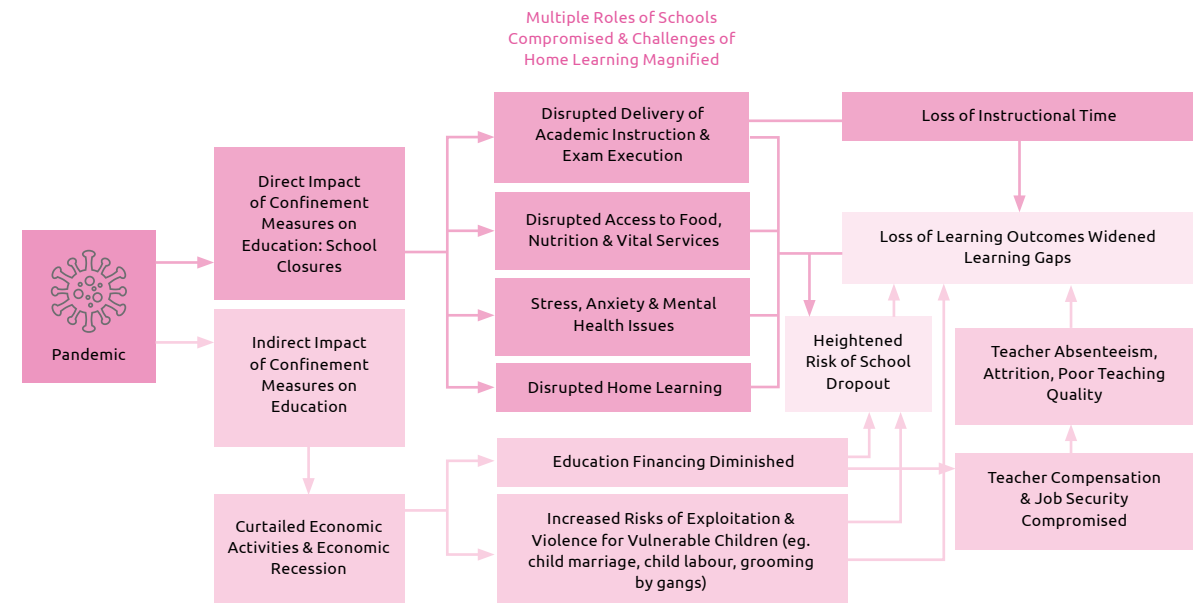


Figure 14. Impact of a pandemic on school education. Source: Figure created by Yoko Mochizuki

Further, these disruptions have disproportionately negative impacts on marginalized children, such as those from poor households, those living in conflict-affected countries, migrants, the forcibly displaced, minorities, and children with disabilities and learning differences.

DISRUPTED DELIVERY OF CURRICULUM-BASED STUDIES/ACADEMIC INSTRUCTION

The pandemic has forced a massive shift away from face-to-face instruction in the physical classroom. Disruptions to instructional time in the classroom without adequate quality online learning substitutes can have a severe impact on children’s learning especially learning of disadvantaged children.

The longer disadvantaged children stay out of school, the more likely they are to drop out. Even in a non-crisis situation, children from the poorest households are almost five times more likely to be out of primary school than those from the wealthiest (UNESCO et al. 2020).

Moreover, the digital divide has made it impractical and unrealistic for many schools to transition to online classes. For example, while globally 50% of learners have computers at home and 57% have household internet connection, these figures drop to 11% and 18%, respectively, in sub-Saharan Africa (International Commission on the Futures of Education 2020). According to the most recently available data in the World Bank’s online data repository, 34.5% of population in India used the Internet

Further, these disruptions have disproportionately negative impacts on marginalized children, such as those from poor households, those living in conflict-affected countries, migrants, the forcibly displaced, minorities, and children with disabilities and learning differences.

in 2019.¹⁸ A high proportion of the world’s population, 46.4%, did not have access to the internet in 2019, with most of the offline populations residing in least-developed countries (LDCs) (See Figure 15).

¹⁷<https://en.unesco.org/covid19/educationresponse>

¹⁸<https://data.worldbank.org/indicator/IT.NET.USER.ZS>

Key constraining factors include

(i) poor or uneven quality of existing digital resources, which can be neither linguistically accessible nor culturally responsive to learner needs especially in developing countries; and

(ii) the lack of training and capacity of teachers in remote instruction or distance teaching, which often hampers the realization of flexibility, adaptability, customizability, learner-centred approaches and other promises of digital or blended learning solutions (UNESCO 2020c, UNESCO MGIEP 2019).

DISRUPTED ACCESS TO FOOD, NUTRITION AND VITAL SERVICES

School closures due to COVID-19 have an impact on the health and nutrition of many learners. The World Food Programme (WFP) estimated that, due to school closures, globally over 365 million primary school children were missing out on school meals at the end of March 2020 and 346

million in mid-August 2020.¹⁹ The loss of school meals therefore puts these children at risk of hunger and being deprived of key vitamins and micronutrients, which in turn negatively affects immunity, brain development and learning (UNESCO 2020a).

Moreover, disruptions to health and immunization services expose children in the most economically deprived households and the poorest countries to increased risks of pneumonia, diarrheal diseases, malaria, HIV and so on, leading to more child deaths from pneumonia, which already takes the lives of 800,000 children under the age of five annually or 2,200 daily, apart from COVID-19 (UN CCSA 2020).

STRESS, ANXIETY AND MENTAL HEALTH ISSUES

Infectious disease outbreaks have observed increased levels of anxiety among the population and increased rates of diagnosable mental illnesses (Brooks et al. 2020, Rubin and Wessely 2020,

also see section on health impacts).

For children and adolescents with mental health issues, social distancing measures mean a lack of access to the resources they usually have. **School routines serve as important coping mechanisms for young people with mental health issues, and school closures can therefore add to the deterioration of their mental health.**

According to Lee (2020), in a survey by the mental health charity YoungMinds, which included 2,111 participants up to age 25 years with a mental illness history in the UK, 83% responded that the pandemic had worsened their conditions, and more than a quarter reported that they were unable to access mental health support.

For children and adults living in an abusive home, social distancing measures can worsen the already difficult situation they find themselves in at home, with abuse likely aggravated at times of uncertainty, stress and anxiety. Whereas previous public health emergencies have witnessed increased reports of child abuse, we know little about the long-term mental health effects of pandemics on children and adolescents, which is an important gap for research (Lee 2020). As the COVID-19 pandemic continues, there is a need to monitor the mental health status of children and adolescents. Box 2 provides an example of a government initiative to monitor young people's mental health issues.

BOX 2: 'MANODARPAN' MENTAL HEALTH INITIATIVE IN INDIA

India's Ministry of Human Resource Development (MHRD) launched a mental health initiative called 'Manodarpan' to promote student well-being during the coronavirus pandemic in response to suggestions made by a taskforce it convened. Manodarpan provides a dedicated website, advisory guidelines, skill handbook, a national toll-free helpline, interactive online chat platform, a database of counsellors and a holistic report card.

Under this programme, schools are asked to focus on prevention by creating a safe and calm environment, teaching students about mental well-being, and reinforcing it through school activities. The programme also addresses early detection of mental health issues among children, by making mental health an integral part of health and physical education and by making these components compulsory for teacher education courses. In addition, as part of the National Education Policy 2020, report cards of students will be redesigned to reflect the "uniqueness of each learner in the cognitive, affective, socio-emotional and psychomotor domains".



NON-CONDUCTIVE HOME LEARNING ENVIRONMENT

A number of challenges hamper efforts to create an environment conducive to home learning. For children from poor households, home learning is typically a challenge due to a general lack of resources, including digital devices and connectivity, crowded conditions and poor ability of parents or caregivers to facilitate formal learning at home.

Home learning can be a source of stress for learners as well as for families, as it puts extra pressure on caregivers, sometimes with limited capacity, time or resources. Parents who do not speak the language of instruction or whose children have special educational needs are likely to face aggravated challenges (UNESCO 2020a). Box 3 gives examples of government initiatives designed to support home-based learning.

BOX 3: GOVERNMENT INITIATIVES TO SUPPORT HOME-BASED LEARNING

The French Ministry of Education, in March 2020, launched an initiative called Nation apprenante (Learning Nation), to facilitate learning at home during lockdown.²⁰ The Kyrgyz Ministry of Education and Sciences provided embedded daily instructions to parents to support their children's homework that were broadcast through TV programmes. In addition to online learning, the use of TV and radio, supported by media campaigns and guidance for parents, constitutes an effective tool to reach families during school closure. To reach out to students without connectivity or devices, Mauritania and Jamaica have provided families with take-home packages that contain learning materials, play kits and practical guidance for parents (Alam and Tiwari, 2020).

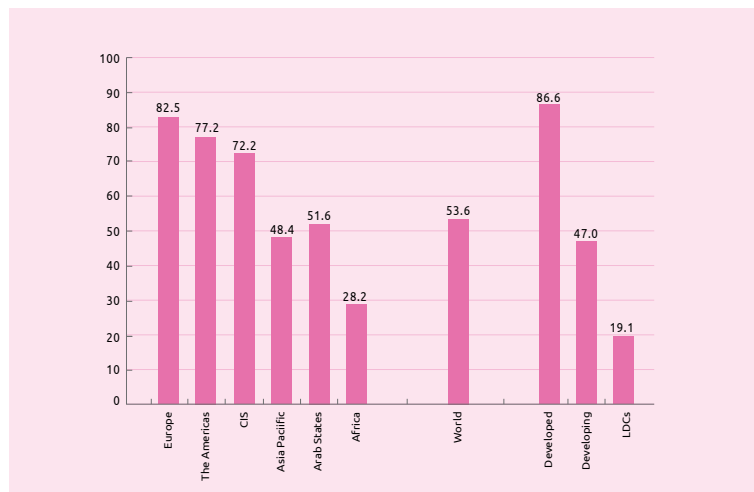


Figure 15. Percentage of individuals using the Internet, by region and development status, 2019
Source: Adopted from <https://itu.foleon.com/itu/measuring-digital-development/offline-population/>

¹⁹ World Food Program, 2020. https://cdn.wfp.org/2020/school-feeding-map/?_ga=2.175892834.1147572844.1585583851-1305129353.1538135627 (accessed 25 March 2020 and 16 August 2020)

²⁰ <https://www.education.gouv.fr/operation-nation-apprenante-303174>



Indirect Impact of Confinement Measures on Education

Major epidemics have always been followed by economic crisis and often accompanied by a period of economic recession. In times of recession, government spending across the board is cut with huge implications for the education sector. These budget cuts will have serious implications for the well-being of children and youth from the vulnerable segments of society.

IMPACT OF ECONOMIC RECESSION ON EDUCATION AT HOUSEHOLD LEVEL AND PUBLIC EXPENDITURE LEVEL

The World Bank analysis using data from 157 countries estimated that

the income shock of the COVID-19 pandemic alone will push out almost 7 million students from primary and secondary schools worldwide (Azevedo et al. 2020). Economic hardships due to the pandemic will have spillover effects on education as families take into account the monetary and opportunity costs of educating their children, especially in countries where schooling is a private good and there are limited social safety net and social protection measures.

With much uncertainty about how the current crisis unfolds, a major slowdown of the global economy is inevitable, which will consequently affect government revenues of many countries and hence the resources available for education (UNESCO 2020d, UNESCO 2020b). The domestic budget for education as well as international aid to education tend to suffer at the times of economic recession. These cuts will have an impact on:

- (i) teacher training, compensation and job security, leading to teacher absenteeism, attrition and low teaching quality;
- (ii) expenditure on digital infrastructure; and
- (iii) support services such as school meals.

The early 2020 estimate of the financing gap to achieve SDG 4 in low-income and lower-middle-income countries was \$148 billion annually, and it is estimated that the this gap will increase by more than 30% due to COVID-19 (UN 2020).²¹

INCREASED RISKS OF EXPLOITATION AND VIOLENCE FOR CHILDREN AND YOUTH

Another important consideration is increased risks of exploitation and violence for vulnerable children at the times of economic downturns. Lockdowns and other social distancing measures linked to COVID-19 have already increased reporting of violence at women and girls.²²

Confinement measures can aggravate risks affecting already 'at-risk' teenagers, from persistent absence from school. The 2020 report released by the Children's Commissioner for England warns that the 120,000 teenagers in England—one in 25 of all teens—already at risk before the COVID-19 lockdown could be joined by many more who have difficulty returning to 'normal' after six months out of school.²³

The Commissioner's report calls for re-engaging them in society so as not to let a whole generation of vulnerable teens remain at risk of educational failure and unemployment, or crime or exploitation. They are easy prey to criminal gangs and are at high risk of becoming so-called 'NEET' (Not in Education, Employment or Training). Given that the share of NEET youth in UK was 10.5% of youth population (2019), as compared to 30.4 percent in India (2018) and 30.5% in South Asia (2018)²⁴, it is all the more important to take measures to mitigate youth disengagement from education in this region, especially during and following the confinement measures.

The Gender Dimension

The unprecedented disruption to education linked to COVID-19 has immediate and longer-term effects on gender equality. According to some estimates, nearly 10 million more secondary school age girls could be out of school after the COVID-19 crisis has passed (Malala Fund 2020). Public health outbreaks have distinct gendered impacts that deserve special attention here.²⁵

In considering the indirect impacts of pandemics on education, it is important to address

- (1) the burden of unpaid care work,
- (2) female vulnerability and gender-based violence, and

(3) gendered digital gaps, which can be exacerbated during the crisis and deepen gender inequality in and through education.

A recent literature review found increases in gender-based violence (GBV) during past epidemics, including domestic violence and sexual exploitation and abuse (Fraser 2020). School closures can put adolescent girls at increased risk of early marriage and pregnancy. When schools close, learners in disadvantaged households, such as children from migrant and forcibly displaced communities, can become isolated at home and in their communities with diminishing protection. This leads to increased risk of abuse, exploitation and gender-based and sexual violence. Research conducted by UNDP on the impact of the Ebola epidemic

in Sierra Leone found that teenage pregnancy increased by 65% in some communities during the crisis partly due to school closures.²⁶

The gender divide in digital learning during this pandemic can be expected to worsen. According to the International Telecommunication Union (ITU), more men than women have access to and use the internet in all regions of the world (see Figure 16). In 2019, the proportion of women using the internet globally was 48%, compared to 58% of men. In the least developed countries (LDCs), only 13.9% of women use the internet. Moreover, the digital gender gap worldwide is widening in recent years, particularly in developing countries, although it decreased in developed countries.²⁷

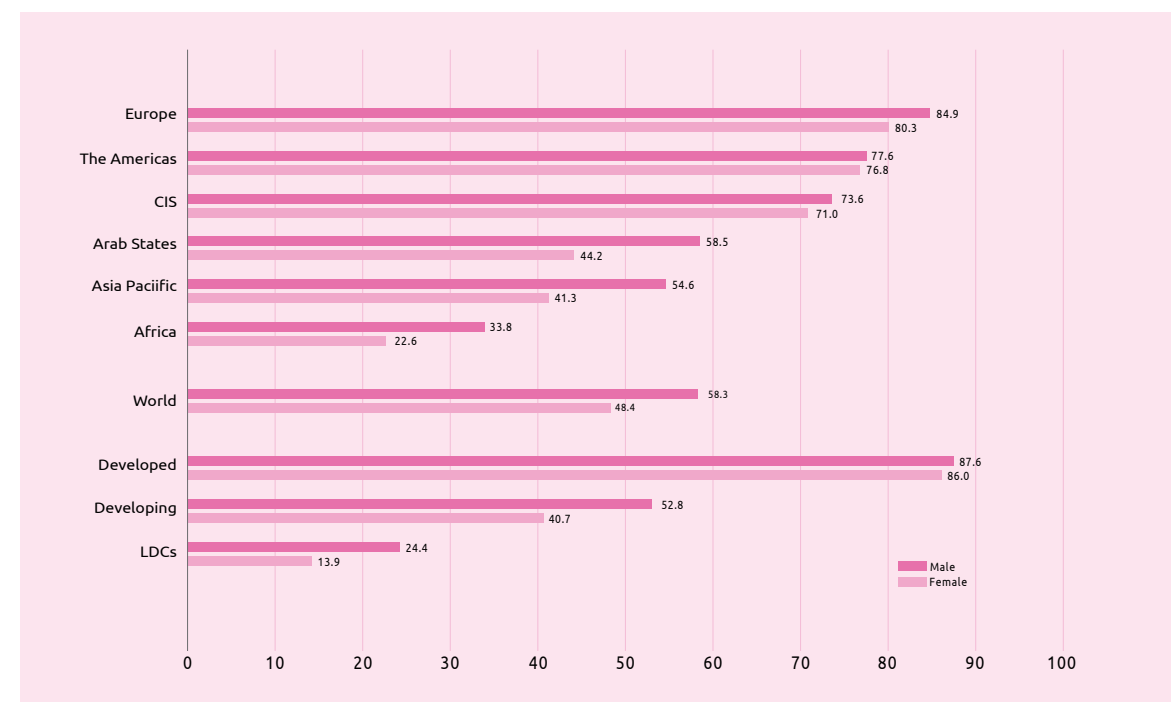


Figure 16. Internet penetration rate for men and women, 2019. Source: Adapted from <https://itu.foleon.com/itu/measuring-digital-development/gender-gap/>
Note: *ITU estimate. Penetration rates in this chart refer to the number of women/men that use the internet, as a percentage of the respective total female/male population

²⁶ https://www.sl.undp.org/content/sierraleone/en/home/library/crisis_prevention_and_recovery/assessing-sexual-and-gender-based-violence-during-the-ebola-cris.html
²⁷ According to ITU, "The gender gap represents the difference between the Internet user penetration rates for males and females relative to the Internet user penetration rate for males, expressed as a percentage". See <https://itu.foleon.com/itu/measuring-digital-development/gender-gap/>

²¹ The Incheon Declaration and the Framework of Action for Education 2030 urged countries to adhere to the international benchmark of allocating at least 4-6% of GDP to education or allocating at least 15-20% of public expenditures to education. According to the UIS data, 47 out of 141 countries with data between 2014 and 2018 do not meet either of these benchmarks (UNESCO 2020, COVID-19 issue note 7.2). ²² See <https://www.unwomen.org/en/news/stories/2020/4/statement-ed-phumzile-violence-against-women-during-pandemic> ²³ Coronavirus crisis could see a lost generation of vulnerable teenagers falling through gaps in the school and social care systems, 7 July 2020, <https://www.childrenscommissioner.gov.uk/2020/07/07/coronavirus-crisis-could-see-a-lost-generation-of-vulnerable-teenagers-falling-through-gaps-in-the-school-and-social-care-systems/> ²⁴ Share of youth not in education, employment or training, total (% of youth population) <https://data.worldbank.org/indicator/SL.UEM.NEET.ZS> ²⁵ This sub-section is based mainly on UNESCO's COVID-19 response issue note 3.1.

Q13.

WHAT ARE SOME KEY POLICY RESPONSES IN EDUCATION

?

Pandemics: Past, Present and Lessons for the Future.

Question No. 13: What are Some Key Policy Responses in Education?



ANSWER

13

School reopening amidst the pandemic involves balancing health risks against adverse impacts of school closures on children’s learning and well-being.

1. Safe Reopening of Schools: Lessons from Europe and USA

While school children and adolescents can develop COVID-19, experiences in European countries and USA show that schools implementing appropriate transmission mitigation measures (e.g. physical distancing, ventilation, masking, hand hygiene, and staying home with minimal symptoms) have not significantly contributed to spread of the virus among local communities (Lordan et al. 2020). Based on scientific understanding of SARS-CoV-2, Lordan et al. (2020) highlight three mitigation strategies for reopening:

1. To minimize the import of infections into the school, restrict in-person learning when infection in the local community is controlled.
2. To minimize the likelihood of further transmission, implement appropriate mitigation measures such as limiting room occupancy, avoiding activities such as singing and sports, and improving ventilation.
3. To minimize outbreaks in school, limit secondary transmission to the smallest possible number of persons. Cohorts should remain isolated from each other and person-to-person contact should be kept minimal to facilitate contact tracing in case outbreaks occur.

2. A Framework for Reopening Schools: With the Most Marginalized Children in Mind

Around the world, decision makers are tackling difficult trade-offs as they consider re-opening schools. UNESCO, UNICEF, WFP, UNHCR and the World Bank developed a framework to inform the decision-making process on when, where, which schools to reopen and how to ensure (1) safe operations, (2) learning, (3) wellbeing and protection of school staff, teachers, students and communities, and (4) inclusion of the most marginalized (UNESCO et al. 2020).

Some of the key questions to be asked in terms of addressing the challenges of school closures include the following.

- Is classroom instruction indispensable to attain the respective learning outcomes?
- Is high-quality remote learning (including but not limited to online learning) accessible to all students?
- Are school closures compromising student access to food, nutrition and other vital services?
- Is the current arrangement for remote learning sustainable in terms of student learning and socio-

emotional well-being, given home learning environments, burdens on caregivers and other factors?

- Do school closures expose children to increased risks of exploitation, abuse and violence?

There is also a need to consider school readiness for reopening, the level of exposure of the school





population, and various community-related risk factors. Some key questions to ask are:

- Does the school have necessary capacity to maintain safe school operations?
- Does the school population have a high level of exposure with higher-risk groups?

- How do students, teachers and other school staff travel to and from school?

- Are there community-related risk factors, given epidemiological factors, the capacity of the health system, density of population, and observance of social distancing, personal hygiene and other measures to prevent COVID-19 transmission?

TABLE NO. 2: FRAMEWORK FOR REOPENING SCHOOLS

	 SAFE OPERATIONS	 LEARNING	 WELLBEING AND PROTECTION	 INCLUSION OF THE MOST MARGINALIZED
PRIOR TO REOPENING	Develop <ul style="list-style-type: none"> i) national guidance on parameters for decision making on school openings and ii) protocols on physical distancing and hygiene measures; revise personnel and attendance policies; identify response and recovery financing for immediate investments in school water, sanitation and hygiene 	Provide teachers and school leaders with support and training on remote learning Develop alternative academic calendars	Ensure continuous and timely payment of teachers’ salaries, with attention to those on precarious contracts, to mitigate against teacher attrition and promote wellbeing	Direct education funding to schools hit hardest by the crisis Adapt school opening policies and practices to expand access to marginalized groups; Take specific measures to mitigate protection risks while girls and other marginalized groups are out of school
PART OF REOPENING PROCESS	<ul style="list-style-type: none"> Work towards ensuring all schools have access to adequate safe water, handwashing stations, cleaning supplies and sex segregated toilets Train school staff and teachers on implementing physical distancing and school hygiene practices Establish procedures if students or staff become unwell. Secure space to temporarily separate sick students and staff without creating stigma 	<ul style="list-style-type: none"> Equip teachers to deal with both learning recovery and students social and emotional and mental health needs Implement large-scale remedial programs to mitigate learning loss and prevent exacerbation of learning inequality 	<ul style="list-style-type: none"> Increase provision of mental health and psychosocial support (MHPSS) services that address stigmatization/discrimination and support children and their families in coping with the continued uncertainties of the pandemic. Conduct a risk assessment for teachers and other staff (considering age, chronic conditions and other risk factors) Re-establish regular and safe delivery of essential services. Eg. critical nutrition, WASH and health services 	<ul style="list-style-type: none"> Waive school fees and other costs (school uniforms, etc) wherever possible and eliminate other barriers to entry to maximize re-enrolment rates Take specific measures to support girls’ return to school through increased community engagement

Source: Adapted from UNESCO et al. 2020. For more detailed guidance, consult the original document.

Strengthening the resilience, responsiveness and flexibility of the education system

The COVID-19 pandemic has highlighted the importance of building resilient and responsive education systems to anticipate and cope with future crises. This section synthesizes and highlights recommendations from the two main documents published in August 2020:

(1) policy recommendations based on research evidence which were detailed in an open letter by leading US education researchers (Harris et al. 2020); and

(2) recommendations put forward in the UN Secretary-General's policy brief on "Education during COVID-19 and Beyond" (UN 2020). It also builds on recommendations included in a series of UNESCO Education Sector's COVID-19 response issue notes²⁸ and UNICEF Innocenti Research Briefs on COVID-19²⁹ published between April and August 2020.

FOCUS ON EQUITY AND CAPACITY DEVELOPMENT

An inequitable education system is vulnerable to shocks. Pandemics and other disruptions exacerbate existing inequalities and push

the most vulnerable learners out of school. Invest to build system resilience and responsiveness, focusing on equity and inclusion, as well as on reinforcing capacities for risk management and enhancing leadership, coordination, consultation and communication (see UN 2020).

STRONGER ARTICULATION BETWEEN DIFFERENT TYPES OF LEARNING

System resilience also depends greatly on its flexibility, which is partly determined by connections and linkages between levels and types of education and the capacity to mobilize alternative modes of delivery. **Hybrid learning can provide quasi-individualized learning pathways for students, taking advantage of a plethora of digital learning resources.**

Stronger articulation between formal and non-formal education is needed to allow education systems to become better equipped to serve the needs of all learners, their communities and society at large.

DIGITAL LEARNING

It is important to capitalize on the momentum of using technology to innovate teaching and learning, assessment, and school-family relationships, and keep up with innovations after the crisis. Sustainable solutions should build upon lessons learnt from the extensive use of technology—both high tech and low tech—to ensure learning continuity during the pandemic, including for the most marginalized. This is however

not a call for transitioning from face-to-face to fully online schools, which have so far a poor track record of supporting learning in prior research. Evidence from USA suggests that fully virtual schools generate much less learning than in-person schools (Harris et al. 2020).

Student experience can be severely limited in the absence of high-speed internet connectivity and computers at home. Although this cannot happen overnight, universalizing digital access for students and teachers is an essential step to make education systems prepared for, and responsive to, current and future health and other crises, including the looming climate change challenges. The United Nations (2020) has called for expanding the definition of 'the right to education' to include connectivity.

Free and open source technologies are important to ensure equity. Taking fully into account the issues of data privacy and implications of public education being dependent on digital platforms controlled by private companies, governments should support open educational resources (OERs) and open digital access (UNESCO MGIEP 2019; International Commission for the

Hybrid learning can provide quasi-individualized learning pathways for students, taking advantage of a plethora of digital learning resources.



Futures of Education 2020; UN 2020).

Although there is growing evidence that MOOCs and similar approaches to online learning tend to exacerbate inequalities in educational outcomes due to socioeconomic status (Hansen and Reich 2015; Kizilcec et al. 2017; Reich and Ito 2017), there is no doubt that well-designed online learning can be effective and it will play an increasingly

important role in schooling. For effective remote instruction, Harris et al. (2020) recommend frequent interaction combining synchronous and asynchronous instruction.

It is important to build teachers' capacities to harness pedagogical possibilities opened up by digital technology, such as ubiquitous learning, active knowledge making, recursive feedback, and collaboration

(UNESCO MGIEP 2019). It is useful to explore innovative continuous assessments using technology, such as monitoring student progress through mobile phone surveys, utilizing learning platforms or apps which track student learning, and implementing rapid learning assessments to identify learning gaps (Alam and Tiwari 2020).

²⁸ <https://en.unesco.org/covid19/educationresponse/issuenotes#:~:text=UNESCO%20Education%20Sector's%20issue%20notes,term%20impact%20of%20school%20closures>

²⁹ <https://www.unicef-irc.org/covid-children-library/?contentType=Research+brief>

Q14.

WHAT HAVE BEEN THE ECONOMIC IMPACTS OF COVID-19 ?

Pandemics: Past, Present and Lessons for the Future.

Question No. 14: How have been the Economic Impacts of COVID-19?



ANSWER

14

The COVID-19 pandemic has caused huge economic disruptions. Most countries have seen their Gross Domestic Product (GDP) growth drastically fall over the first two quarters of 2020. The contraction has been higher in advanced economics than in emerging and developing economies. Growth forecasts are being continuously revised downwards as the economic impacts of COVID-19 and the corresponding policies addressing the COVID-19 materialize.

Global GDP was expected to expand by 4 percent in 2021

but these numbers have now been revised to be 5.3 percent below the pre-pandemic projections; this translates to about 4.7 trillion USD (World Bank 2020). Global Trade is projected to contract by 9.5 percent in 2020; a drop witnessed in the 2009 global recession.

The pandemic has also caused per capita incomes to fall in more than 90 percent of Emerging Market and Developing Economies (EMDEs) forcing millions back into poverty (World Bank 2020).

This fall is expected to erase about 10 years of per capita income gains in these countries. The pandemic has no doubt erased much of the

The pandemic has also caused per capita incomes to fall in more than 90 percent of Emerging Market and Developing Economies (EMDEs) forcing millions back into poverty (World Bank 2020).

progress countries made in achieving SDG1-reducing poverty. Equally important the pandemic has no doubt played a key role in worsening the already increasing income and wealth inequality gap across most countries (Goldin and Muggah 2020). **In the United States itself,**

BOX 4. PANDEMICS: ECONOMIC IMPACTS

1. The economic impact of the Spanish Flu driven by deflation was computed to be about 6% lower GDP growth (Barro et al. 2020). The most recent estimates for the COVID-19 lie in the range from about 3% to 10%.
2. During the Spanish Flu, the real employment impact was the loss of a large portion of the working population. In the case of COVID-19, the unemployment impact seems to be similar to the Great depression (GDP fell by over 50% while unemployment rose from 3.2% to 24.9%) due to stoppage of supply chains and reduction in demand due to lockdown policies and worker layoffs.
3. The 1957 Asian Flu pandemic is estimated to have cost one to two million lives globally. The 1968 Hong Kong Flu is estimated to have caused one to four million deaths. No major policies affecting economic activity were imposed.
4. The COVID-19 policy responses have for the first time shut down the economic system across the world. The final fatality count will tell us if the social and economic costs of these policies outweigh the benefits accrued in potentially saved lives and minimizing reduction in labour productivity caused by the health-related after-effects of the virus.



CHANGE IN GDP GROWTH IN 2020 RELATIVE TO BASELINE, PERCENTAGE POINTS

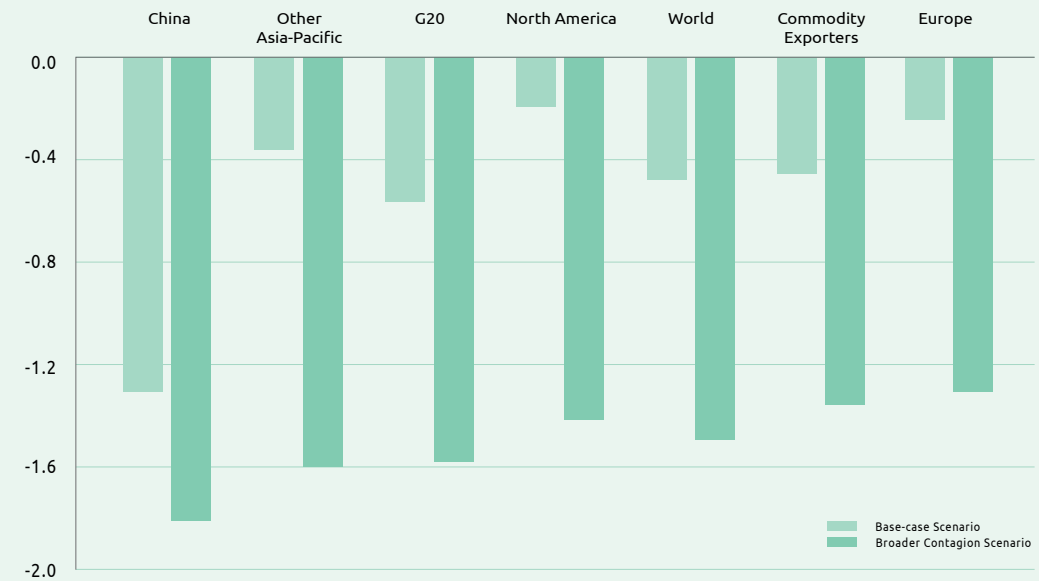


Figure 17. OECD forecasts of GDP growth as of March 2020.

Source: Adopted from OECD Economic Outlook, Interim Report March 2020. Note: Stimulated impact of weaker domestic demand, lower commodity and equity prices and higher uncertainty. Base-case scenario with the virus outbreak centred in China; broader contagion scenario with the outbreak spreading significantly in other parts of the Asia-Pacific region, Europe and North America. See Box 1 for full details of the shocks applied. Commodity exporters include Argentina, Brazil, Chile, Russia, South Africa and other non-OECD oil-producing economies.

over 44 million people lost their jobs and unemployment increased rapidly to 15% while at the same time the combined wealth of US billionaires increased by over \$637 billion resulting in a total wealth of 3.6 trillion-more than the entire wealth of over 54 African countries³⁰.

Lockdowns and confinement policies have had impacts on the supply side effecting production and consumption respectively. These have subsequently had impacts on the demand side with declining consumer confidence and spending.

The high degree of uncertainty and the manner in which COVID-19 response policies have been implemented across the globe has also had an impact on individuals' perceptions and subsequently behaviour (Baldwin and Mauro 2020).

Unlike the Spanish Flu which caused a major deflation, the COVID-19 is causing the greatest recession³¹ since the Great Depression of the 1930s. The economic dynamics of the COVID-19 pandemic is very different from the previous three pandemics of 1918, 1957 and

The economic impacts are twofold. The first coming directly from the disease itself and the second resulting from the various policies implemented to contain the virus.

1968 (see Box 4). **The economic impacts are twofold. The first coming directly from the disease itself and the second resulting from the various policies implemented to contain the virus.**

³⁰ <https://www.weforum.org/agenda/2020/10/covid-19-is-increasing-multiple-kinds-of-inequality-here-s-what-we-can-do-about-it/>

³¹ An economy is declared to be in a recession when it experiences negative real GDP growth for two consecutive quarters. However, more recent definitions for a recession include other factors such as unemployment, real income, industrial production and wholesale-retail sales (NBER 2020).

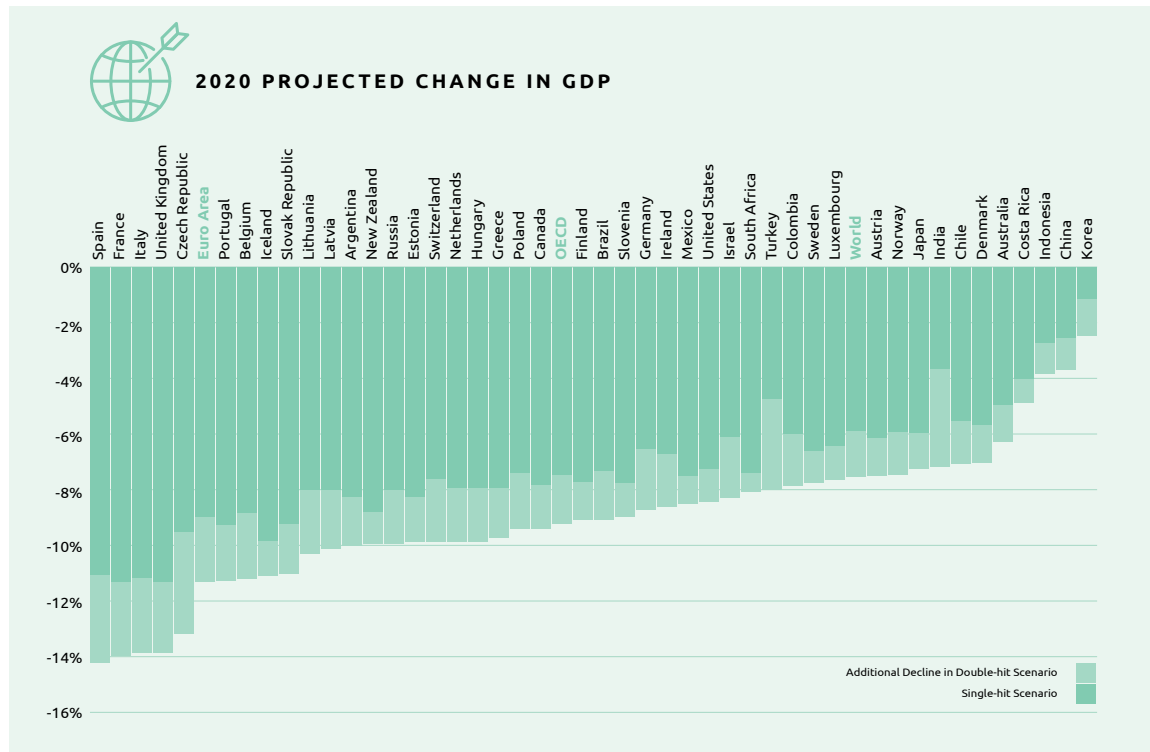


Figure 18. OECD forecast of GDP growth as of June 2020. Source: Adopted from OECD Economic Outlook (2020)

An early forecast by the OECD in March 2020 (see Figure 17) put the global change in GDP at approximately negative 1.4% in a broader contagion scenario. These figures we very quickly surpassed with outlooks now much bleaker as the second level impacts of the policies to contain the virus ripple through the economic systems across the globe. The more recent forecast by the OECD in June 2020 shown in Figure 18 puts GDP change ranging from negative 6 to negative 7.6% depending on if there is a second surge of infections in countries.

The virus has affected a total of 123 countries with some of the worst effected being also some of the most economically advanced countries. It is important to note

that previous, post-war pandemics have generally affected much less economically important nations; this is not the case for COVID-19 (Baldwin and Tomuira 2020). For example, the cluster of US, China, Japan, Germany, Britain, France and Italy—each having high infection and mortality levels account for approximately 60% of the world GDP, 65% of world manufacturing and 41% of manufacturing exports (Baldwin and Mauro 2020).

In a globalized and connected world of today, the impacts of policies in many of these major economies to minimize mortality (deaths) and morbidity (illness and inability to work) will have significant impacts on their own economies as well as the rest of the world.

The value added production chain of today's global economic system will translate to distortions in the chain having a ripple effect across the whole production chain spread across the world.

In a globalized and connected world of today, the impacts of policies in many of these major economies to minimize mortality (deaths) and morbidity (illness and inability to work) will have significant impacts on their own economies as well as the rest of the world.

The tools used to implement macroeconomic policies for addressing the downturn caused by the pandemic will differ across countries depending on the structure and maturity of the respective economies. (Hevia and Neumeyer 2020, Djankov and Panizza 2020). The most important amplifying factors include:



BOX 5. VALUE OF LIFE AND COST BENEFIT ANALYSIS.

To undertake a social cost-benefit analysis, calculations imputing the cost of life lost is inevitable. Although steeped in controversy over the use of such estimates, some ball park figures are needed to guide policymakers on making decisions based on trade-offs between cost of lives lost versus the economic costs of saving lives. Estimates understandably range over a wide spectrum, each based on a set of different assumption; an average estimate is around US\$10 million per person (Viscusi and Masterman 2017).

In addition to the statistical value of life, economists have attempted to calculate the impact of illness through the Disability Adjusted Life Years (DALY). The DALY measures the number of years lost to illnesses, disability or early death. The indicator therefore computes both mortality and morbidity into a single metric (Murray 1994).

We know that lockdowns and confinement policies can have substantial benefits by reducing the mortality rate. However, eradicating the virus through a “crush the curve” or “flattening the curve” policies can have considerable economic costs (Hsiang et al. 2020, Fang et al. 2020, Deb et al. 2020, Torrejon Perez et al. 2020). Therefore, the decision to implement any policy should ideally be guided by a Social Cost-Benefit Analysis (SCBA).

Figure 19. Three interconnected hubs in the world's supply chain for ICT goods: Germany, China and USA. Source: Adopted from Baldwin and Mauro (2020, Figure 3, pp. 15)

continue till a vaccine is found or herd immunity sets in across all countries in the globe. Countries that might be considered following a BAU could be Sweden, USA, and Brazil.

A highly regulated policy will ideally produce a R0 of below 1 for the COVID-19 virus. This would yield high benefits from the lives saved and also the benefits from an improved environment. However, the costs of a highly regulated policy would imply high production and demand costs incurred from the lockdown and confinement policies put in place. Countries in this category could be China, Germany, India, Norway, and South Korea.

Ideally, the lockdown intensity or degree of confinement should be determined by the compromise between the short-term benefits of easing the lockdown and the long-term costs of a longer duration of the pandemic or seen in another way, the compromise between the short term costs of increasing the confinement and the long term benefit of reducing the duration of the confinement (Gollier 2020).

The Impact of Behaviour, Perceptions and Attitudes

A study by Gomez and colleagues using data from the International Coronavirus Survey show distinctly three key findings with respect to individual's behaviours and perceptions towards COVID-19

(Gomez et al 2020). **First, there is less compliance with containment measures by citizens in low\middle income countries. Second, individuals from these countries feel that their governments were untrustworthy and unreliable. Third, individuals from these low\middle income countries demonstrated higher levels of anxiety and depression with females being affected the most.**

These attitudes, behaviour and perceptions will influence the success of the policy implemented and in particular policies which will rely on trust and responsibility on the part of individuals. A strict enforcement of a full lockdown and confinement as in the case of China worked well in curbing the spread of the disease. However, similar lockdowns and confinement policies have had less success. What were the main factors contributing to this difference is an area of future research.

What We Measure is What We Manage

The economic impacts of the pandemic have primarily revolved using the Gross Domestic Product (GDP)³² as the key benchmark. It is important to keep in mind what the GDP indicator tells us about the economy and more importantly what it does not. The GDP is therefore a useful indicator for measuring the productivity and efficiency of any economy.

However, it is not an indicator to be used as a welfare indicator.

Many alternate indicators have been suggested to be used if the objective of the exercise is to monitor the overall welfare of citizens (Stiglitz, Sen and Fitoussi 2007, Rogers and Duraiappah et al 2012). These range from the Gross National Happiness indicator, the Human Development Index, the Gini coefficient for inequality, the sustainability Index to the Inclusive Wealth Index. Each of these have their strengths and weaknesses. The final choice therefore might require a suite of indicators used together synergistically to provide an overall indication of the welfare of citizens and how this these have changed over time as well as changes from a stress factor such as the pandemic.

First, there is less compliance with containment measures by citizens in low\middle income countries. Second, individuals from these countries feel that their governments were untrustworthy and unreliable. Third, individuals from these low\middle income countries demonstrated higher levels of anxiety and depression with females being affected the most.



³²GDP is defined as the monetary market value of all final products and services produced in a country over any specified time period. It was developed by Simon Kuznets in 1934 and he warned against using it as a welfare indicator.

Q15.

WHAT HAVE BEEN THE **ECONOMIC** POLICIES IN RESPONSE TO **COVID-19** ?

Pandemics: Past, Present and Lessons for the Future.

Question No. 15: What have been the Economic Policies in Response to COVID-19?



ANSWER

15

Pandemic policies focus on mitigating the impacts of disease on human health. The main objective is to minimize the loss of human lives and the after effects of the disease. We know that these pandemic policies will have socioeconomic impacts as illustrated in the preceding paragraphs. The intensity of these impacts will depend on the type of pandemic policies that are implemented.

The key role of economic intervention policies would be to **maximize** the net benefit or minimize the total costs accruing from policies being implemented to address the pandemic. Therefore, using the cost-benefit framework we had discussed earlier, the following policies have emerged from the literature on the economic impacts of the pandemic.



1. INCREASE PUBLIC EXPENDITURE ON HEALTH CARE.

Emergency 20 hospital space, ventilators, protective medical equipment, medical personnel and other health related budget items with the sole purpose of reducing mortality. This will contribute to maximizing the benefits accruing from saving lives or minimizing the net costs by reducing the mortality and morbidity rates as much as possible.



2. PROVIDE INCOME SUPPORT TO PEOPLE. The provisioning of safety nets in times of crisis is one of the most effective fiscal policy tools in the hands of the government. The type of support will vary by the target group within each country. Workers in the formal economy can be supported by providing extensions of existing unemployment and leave benefits. These can be distributed through the formal tax and revenue systems. In addition, loan holidays especially house mortgages might be an option that could be negotiated with banks.

For workers in the informal and undocumented economy, distribution becomes complex and non-trivial; but this is the population group that will really need support. Options include direct cash transfers, food coupons, access to health facilities, and loan holidays for mortgages, among other measures, when necessary.



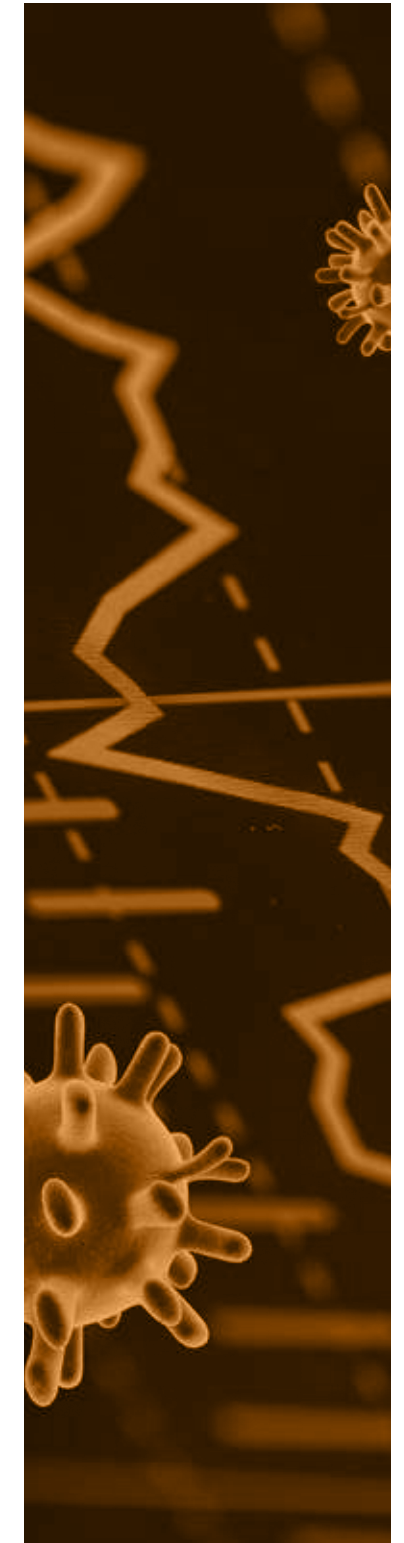
3. SUPPORT SMALL BUSINESS. Small business and enterprises form the backbone of economies of many countries. Financial support in the form of wage subsidies, tax cuts, moratoriums on debt repayments, extending credit lines are some of the key fiscal policy measures governments can implement to diminish financial burdens caused by the pandemic and the associated pandemic policies.



4. REDUCE STRESS ON FINANCIAL SYSTEM. In parallel with fiscal measures, governments also have at their disposal monetary policies such as cutting interest rate, reducing reserve requirements by banks to support investments, and adjusting the money supply to meet the needs of the economy in the short term. The release of government backed bonds and securities to support fiscal policies would need support from financial institutions and in particular authorities overseeing the country's monetary policies.

BOX 6. OECD MARCH 2020. POLICY RECOMMENDATIONS.

- First and foremost, additional fiscal support for health services is required, including sufficient resources to ensure adequate staffing and testing facilities, and all necessary prevention containment and mitigation measures
- Measures can also be taken to cushion adverse effects of the outbreak on vulnerable social groups. Short time working schemes, where available, can be utilised to enhance the flexibility of working hours while preserving jobs and take home pay, although such schemes do not protect temporary or migrant workers from lay-offs. Governments can also help households by providing temporary assistance, such as cash transfers or unemployment insurance, for workers placed on unpaid leave, and by guaranteeing to cover virus-related health costs for all, retrospectively if needed
- In the very short term, the provision of adequate liquidity in the financial system is also a key policy, allowing banks to provide help to companies with cash-flow problems, particularly small and medium-sized enterprises, and ensuring that otherwise solvent firms do not go bankrupt whilst containment measures are in force. Measures that reduce or delay tax or debt payments, or lower the costs of inputs such as energy, for firms in the most affected regions and sectors should be considered. Temporary reductions in the level of reserves banks are required to hold at the central bank could also be implemented if required. Swap lines between major central banks may also need to be utilised, particularly in widespread disruption to trade or a flight to safety by portfolio investors enhances the demand for US dollars.
- In addition to allowing the automatic fiscal stabilisers to work fully, and expanding spending on health services, targeted and temporary fiscal measures could also be implemented to support businesses in sectors particularly exposed to a sharp downturn in travel and tourism. Funds established to reintegrate workers who have lost their jobs due to globalisation could also be utilised. In the European Union, other potential options are to adapt temporarily the state aid framework, as was done at the height of the financial crisis in 2008-09, or to allow more leeway within the EU fiscal rules to affected economies, in recognition of the exceptional circumstances
- More broadly, lower policy interest rates and stronger government spending can help boost confidence and assist with the recovery of demand once the outbreak eases and travel restrictions are removed. However, such measures are less effective in dealing with the immediate supply-side disruptions that result from enforced shutdowns and travel restrictions



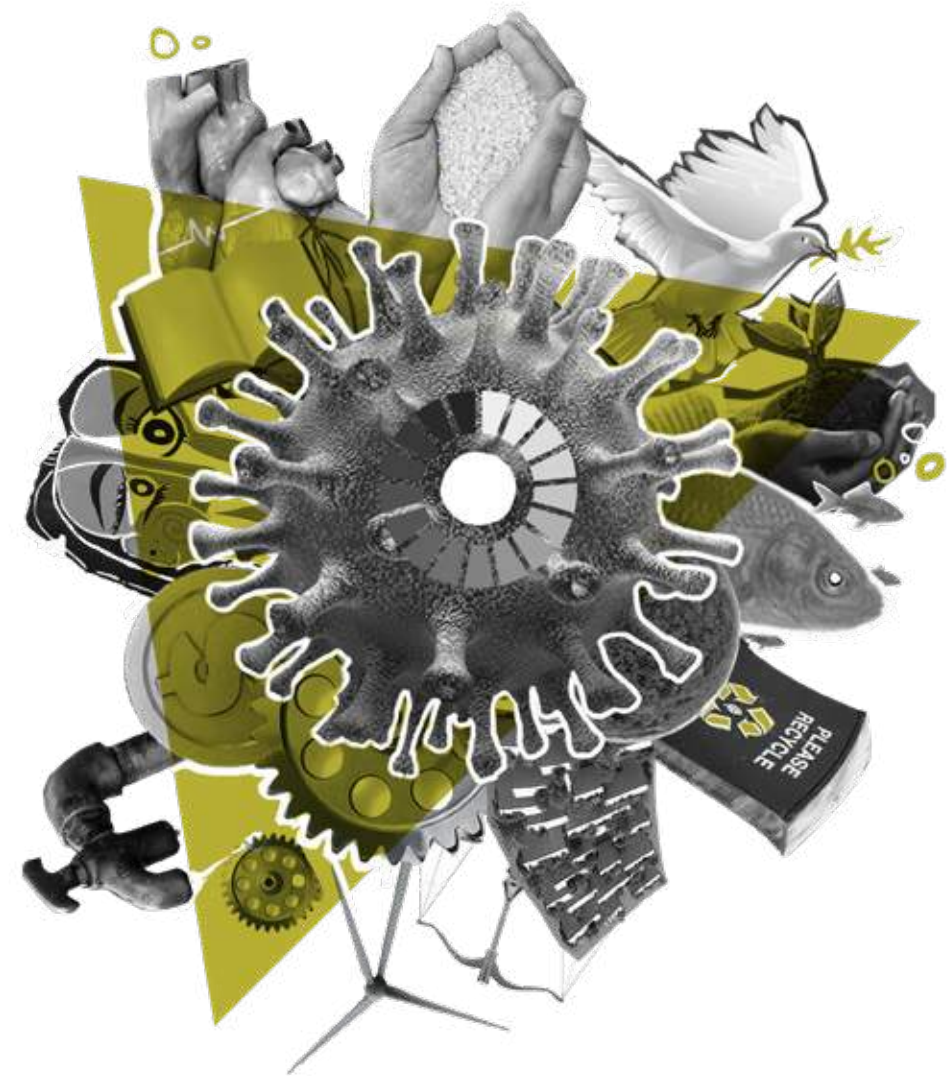
Q16.

WHAT HAVE BEEN THE OVERALL EFFECTS OF COVID-19 ON THE SDGS

?

Pandemics: Past, Present and Lessons for the Future.

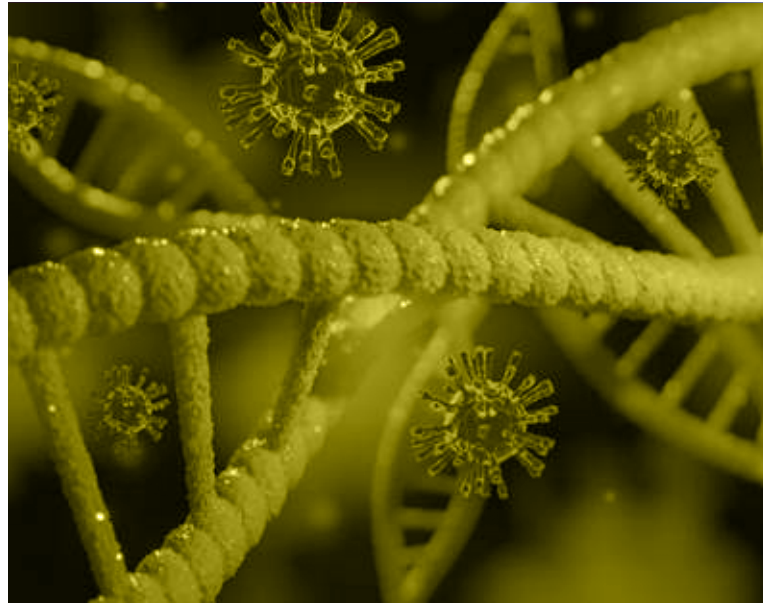
Question No. 16: What have been the Overall Effects of COVID-19 on the SDGs?



ANSWER

16

It is estimated that more than 1 billion people could be living in extreme poverty primarily caused by the COVID-19 pandemic by 2030³³. This number represents the upper limit scenario if no dedicated and integrated solutions are implemented to counter the effects of the pandemic. This implies that even if the pandemic is contained with the next year or so, the after-effects will persist for many years post pandemic.



This implies that even if the pandemic is contained with the next year or so, the after-effects will persist for many years post pandemic. Estimates from the World Bank in its Global Economic Prospects show when compared with pre-crisis forecasts that COVID-19 could push about 100 million people into extreme poverty in 2020³⁴. A study by Sumner et al. (2020) expects poverty levels to increase by 25 to 30% with about half of these in South Asia. The same bleak prospects hold for SDGs 2, 3, 4, 5, 8, 9 and 10. These estimates show the high degree of variability in projections which are understandable due to the complexity of issues and more importantly the inter-dependencies that lie across these SDGs.

At the global level, a recent study provided a snapshot of the impacts COVID-19 can be expected to have on the

progress of achieving the SDG's (UNDESA 2020). As shown in Figure 21, most of the impacts can be expected to range from mixed or moderate to highly negative impact. There are a number of SDGs where there is no data available yet to make any comment on the impact COVID-19 might have on them.

At the global level, a recent study provided a snapshot of the impacts COVID-19 can be expected to have on the progress of achieving the SDG's (UNDESA 2020). As shown in Figure 21, most of the impacts can be expected to range from mixed or moderate to highly negative impact.

Short-term Impacts of COVID-19 on the Sustainable Development Goals

■ Mainly Positive Impact
■ Mixed of Moderately Negative Impact
■ Highly Negative Impact
■ Impact Still Unclear






 SDG 1 NO POVERTY	Highly negative impact <ul style="list-style-type: none"> Increased poverty due to job losses and economic lockdown Disproportionate impact on vulnerable groups (eg. the poor)
 SDG 2 ZERO HUNGER	Highly negative impact <ul style="list-style-type: none"> Food insecurity due to reduction in global food supplies and trade Hunger due to fall in income and reduce food availability during lockdown Higher food loss and waste due to transportation challenges and reduced labor • availability Poorer nutrition due to interruption of school meals
 SDG 3 GOOD HEALTH & WELL-BEING	Highly negative impact <ul style="list-style-type: none"> Higher disease incidence and mortality from Covid 19 cases Higher mortality from other causes because of overburdening systems Slight decline in mortality due to reduced economic and social activities (eg. traffic accidents) Potential short-term health gains due to lower environmental pollution Negative impact of confinement and lockdown on mental health (eg. anxiety and depression)
 SDG 4 QUALITY EDUCATION	Mixed or moderately negative impact <ul style="list-style-type: none"> School and day-care closures Loss in the development of human capital Poorer nutrition due to interruption of school meals
 SDG 5 GENDER EQUALITY	Mixed or moderately negative impact <ul style="list-style-type: none"> Possible disproportionate economic impact on women (eg. job losses, poverty) Other social impacts on women from the lockdown of (eg. domestic violence) Higher mortality rates from the virus among men (because they suffer from more chronic respiratory diseases due to higher smoking rate)
 SDG 6 CLEAN WATER & SANITATION	Mixed or moderately negative impact <ul style="list-style-type: none"> Limited access to clean water among disadvantaged groups limits possibility of adhering to strict hygiene guidelines
 SDG 7 AFFORDABLE & CLEAN ENERGY	Mixed or moderately negative impact <ul style="list-style-type: none"> Slowdown in economic growth contributing to a reduction in energy prices (eg.oil), which might increase access to energy but reduce incentives for renewables
 SDG 8 DECENT WORK & ECONOMIC GROWTH	Highly negative impact <ul style="list-style-type: none"> Economic crisis in virtually all parts of the world Trade disruption Mass unemployment Business closures/bankruptcies Sharp decline in tourism activities Massive public deficits
 SDG 9 INDUSTRY, INNOVATION & INFRASTRUCTURE	Mixed or moderately negative impact <ul style="list-style-type: none"> Decline in industrial outputs Possible nationalization of some industries, and bankruptcies and closures of others Scientific collaboration to find treatments and vaccine Accelerated uptake of digital technologies, for e-health, e-education, e-governance, and e-payments

Figure 20. Short-term impact of COVID-19 on the SDGs.

Source: Adopted from Sachs et al. (2020, pp. 4-5)

³³ <https://sdgintegration.undp.org/accelerating-development-progressduring-covid-19>

³⁴ <https://www.worldbank.org/en/topic/poverty/brief/projected-poverty-impacts-of-COVID-19>



- Mainly Positive Impact
- Mixed of Moderately Negative Impact
- Highly Negative Impact
- Impact Still Unclear

SDG 10 REDUCED INEQUALITIES	Highly negative impact <ul style="list-style-type: none"> Disproportionate negative health and economic impacts on vulnerable groups (Including refugees and migrants) especially in countries with low safety nets Loss of jobs of lower skilled lower-wage labor
SDG 11 SUSTAINABLE CITIES AND COMMUNITIES	Mixed or moderately negative impact <ul style="list-style-type: none"> Rise in urban poverty and vulnerability Shut down of public transport Lower access to public/green spaces Movements of population that vary across countries Sharp short term reduction in pollution levels
SDG 12 RESPONSIBLE CONSUMPTION AND PRODUCTION	Impact still Unclear <ul style="list-style-type: none"> Short-term reduction in natural resource use due to reduced economic activity and consumption Pressure to loosen up regulations on circular economy and postpone the adoption of new measures Increased plastic pollution (eg, used to produce personal protective equipment)
SDG 13 CLIMATE ACTION	Impact still Unclear <ul style="list-style-type: none"> Short-term reduction in global GHG emissions Pressure to reduce environmental safeguards Lack of clarity on environmental investments Slowdown in economic growth contributing to reduction in energy prices (eg. oil) which might increase access to energy but reduce incentives for renewables
SDG 14 LIFE BELOW WATER	Impact still Unclear <ul style="list-style-type: none"> Short-term reduction in threats to marine biodiversity due to reduced global economic activity and consumption Pressure to reduce marine biodiversity and ecosystem safeguards
SDG 15 LIFE ON LAND	Impact still Unclear <p>Short term reduction in threats to terrestrial and freshwater biodiversity due to reduced global economic activity and consumption</p> <p>Pressure to reduce terrestrial and freshwater biodiversity and ecosystem safeguards, including biodiversity and ecosystem regulations conventions (for instance, on deforestation)</p>
SDG 16 PEACE, JUSTICE, AND STRONG INSTITUTIONS	Mixed or moderately negative impact <ul style="list-style-type: none"> Increased pressure on governments to mitigate the health and economic consequences of the pandemic Pressure to increxa accessible health care in countries that have not yet achieved universal health coverage Increased public deficits and debt Disruption of legislative processes and public debates Suspension of freedom-of-information laws and transparency policies
SDG 17 PARTNERSHIPS FOR THE GOALS	Mixed or moderately negative impact <ul style="list-style-type: none"> Possible reduced responsiveness of international aid community to needs of the poorest countries Possible reduction in international remittances and cross-border financing Closing of borders Slowdown in international trade Debt Crisis

UN’s Sustainable Development Goals Report (2020) states that even before the pandemic, progress towards SDGs was slow and uneven with some visible gains. The probability of achieving the targets by 2030 were grim. COVID-19 aggravated the challenges and made the SDGs even more difficult to achieve.³⁵ While the SDGs are intertwined and their achievement is inter-dependent on one another, in this report we focus on the SDGs that are closely linked to health, education, and economics (the three major domains of this report). We intend to understand the impact of COVID-19 on these SDGs and shed light on targeted interventions that could be useful in mitigating the damage caused by COVID-19.

Targeted interventions refer to “SDG push”³⁶ measures which includes focused investments in social welfare programs, green sustainable economy, interventions to strengthen governance and digitalization to recover from the impacts caused by COVID-19 and to get back on-track with achieving the SDGs. Pardee Center and UNDP (2020) study assets that “SDG push” interventions, if implemented, could uplift 146 million people out of extreme poverty, and could reduce gender poverty gap after accounting for damage caused by COVID-19.

A key point to take away from this analysis is the cross-over effects of impacts across the various sectors in society. For example, curtailed economic activities have dire impacts on employment leading to poverty and access to food, health and education. Depending on the socioeconomic strata, individuals will be differently affected with the most vulnerable suffering the most leading to growing inequalities. This is further exacerbated for women leading to greater gender inequality.

Another ripple effect occurs from confinement and mental health. Individuals confined in closed spaces for extended periods of time can suffer from depression, anxiety and stress. It has been reported that household violence has increased in particular against children and women. Many communities and countries are reporting higher levels of suicides stemming from the confinement policies implemented by authorities across countries.

HEALTH	SDG 2 ZERO HUNGER
	SDG 3 GOOD HEALTH & WELL-BEING
	SDG 6 CLEAN WATER & SANITATION
EDUCATION	SDG 4 QUALITY EDUCATION
	SDG 5 GENDER EQUALITY
ECONOMICS	SDG 1 NO POVERTY
	SDG 8 DECENT WORK & ECONOMIC GROWTH
	SDG 9 INDUSTRY, INNOVATION & INFRASTRUCTURE
	SDG 10 REDUCED INEQUALITIES

Note: SDGs are interwoven and inter-dependent across three domains

The good news is that these projections can be minimized if a focused set of SDG investments in social protection-welfare programs, governance, digitalization and a sustainable green economy are implemented. The report further goes on to stress the importance of global collaboration if the optimistic scenario whereby the immediate impacts of the pandemic are reversed and the trajectory to achieve the SDGs are back on track (Hughes et.al 2020). For example, we can predict that SDG 12, 14 and 15 to actually see improvements if a sustainable green economy strategy is implemented which mirrors the reduced environmental impact we had observed when traditional economic activities were curtailed. Another key take away is that the countries must take a system approach as opposed to a sector approach in implementing the “SDG push” measures because the SDGs are inter-linked and their achievement is inter-dependent on one another. Hence, only an integrated approach would ensure recovery from damage caused by COVID-19 and accelerate pace towards achieving SDGs.

³⁵<https://unstats.un.org/sdgs/report/2020/The-Sustainable-Development-Goals-Report-2020.pdf>

³⁶https://sdgintegration.undp.org/sites/default/files/Impact_of_COVID-19_on_the_SDGs.pdf

Q17.

WHAT ARE THE **KEY**
LESSONS WE CAN LEARN
FROM **THE COVID-19**
PANDEMIC AND OPPORTUNITIES
TO BE EXPLORED
IN **PREPARATION** FOR
FUTURE PANDEMICS
?

Pandemics: Past, Present and Lessons for the Future.

Question No. 17: What are the Key Lessons We Can Learn from the COVID-19 Pandemic and Opportunities to be Explored in Preparation for Future Pandemics?



ANSWER

17

Key lessons emerging from the ongoing COVID19 pandemic include:

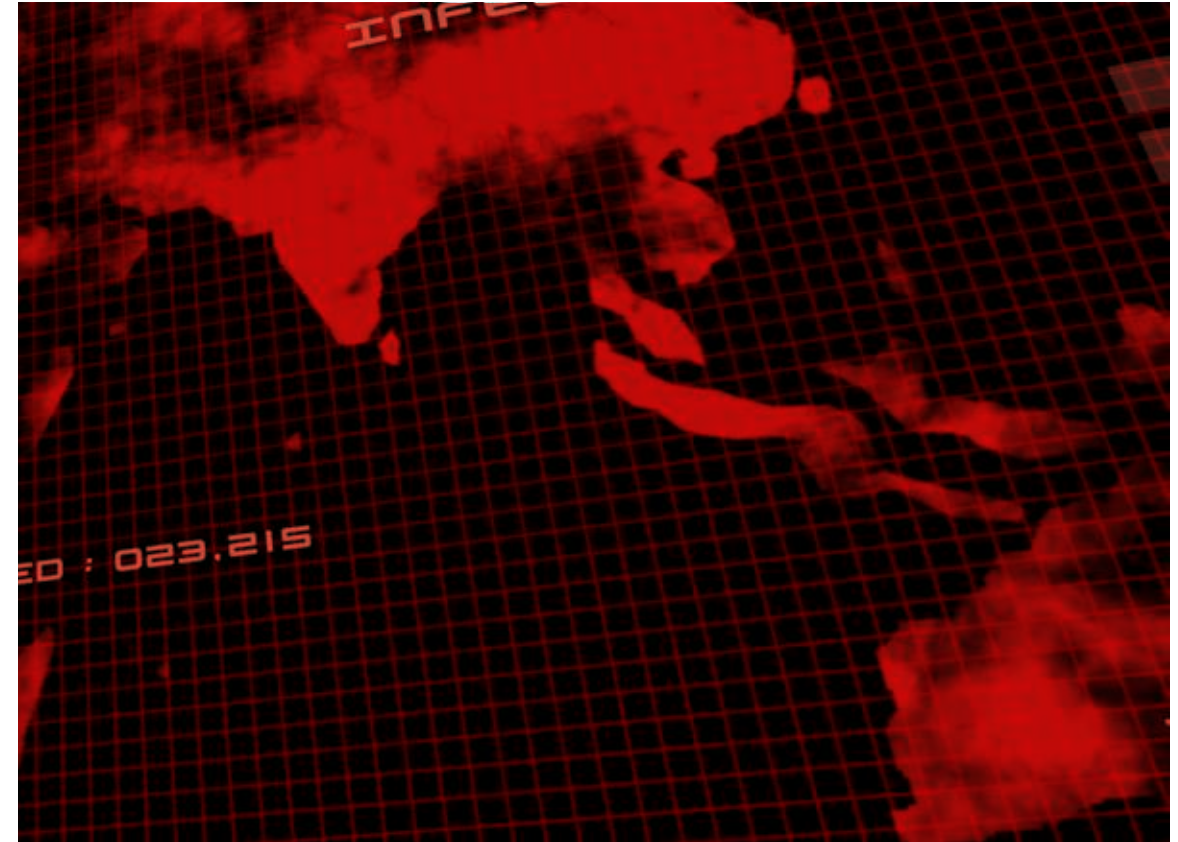


- **Emerging Infectious Diseases (EID) causing pandemics have been found to be distributed non-randomly across the globe with many dominated by pathogens emerging from land conversion, agricultural production methods, the trade in wildlife and wildlife products, and the ecological impacts of habitat depletion.** Pandemics can be expected to occur at more frequent rates in the future.

- Differences in the effectiveness of pandemic measures applied in different countries reflect a fundamental property of pandemics—that the contact between susceptible and infected

individuals which leads to transmission depends on the choices made by individuals. People's contact choices reflect the relative costs of illness and illness avoidance to them—the private cost. If the private cost of illness is low, or the private cost of illness avoidance is high, people have little incentive to avoid contact.

- **Countries that were able to secure the participation of their citizens—either by reducing the private cost of illness avoidance or by strict regulatory enforcement with punitive punishments—had successfully stemmed the rapid rise in infection by adopting a**



Countries that were able to secure the participation of their citizens—either by reducing the private cost of illness avoidance or by strict regulatory enforcement with punitive punishments—had successfully stemmed the rapid rise in infection by adopting a Test, Track, Quarantine, Treat (TTQT) strategy.

Test, Track, Quarantine, Treat (TTQT) strategy.

- Existing mechanisms at all spatial and institutional levels are ill-equipped to address and counter the effects of pandemics. Healthcare systems, education, and economics systems across the globe have struggled to cope with the direct and indirect effects of the pandemic leading to many countries witnessing a reversal in their achievements towards the Sustainable Development Goals (SDGs).
- **Transparency, effective leadership, effective communication, building trust and solidarity, timely action, enhanced use of digital technologies, and**

internationally coordinated containment efforts are essential to counter pandemics in an efficient and equitable manner.

- Stringency in implementation of containment measures such as lockdowns, school and college closures could prove to be instrumental in reducing the spread of the pandemic. Timing at which these measures are implemented is also crucial— the quicker the better.
- International coordination and cooperation may yet prevent the worst effects of the COVID-19 pandemic.



Opportunities to be Explored

HEALTH

- Explore at the global level, establishing an international task force comprising of an interdisciplinary group of experts from across the world to identify ways and means to put in place monitoring and coordinating mechanisms for more efficient and effective mitigation and adaptation pathways. This mechanism under the leadership of the WHO but in collaboration with other UN agencies such as UNESCO, UNDP, UNICEF, WFP and others will
 - strengthen the global coordination and sharing of information to declare, contain and eradicate future pandemics in an efficient and equitable manner.. An international Collaborating mechanism that might provide:
 - A systematic approach to confinement and lockdowns
 - Standardized operating protocols for Testing, Tracing, Quarantine and Treatment (TTQT)
 - Scientific research and data to be shared openly to develop treatment protocols, drugs and vaccines more effectively, efficiently and equitably.
 - Explore at the national level, establishing a central disease control

mechanism that oversees the management of a pandemic. This body should be overseen again by a multidisciplinary group of experts that include not only health experts but also experts from all relevant economic, education and social sectors.

- Explore leveraging digital technologies such as artificial intelligence (AI), big data and cloud computing, and blockchain to test, track, quarantine and treat COVID-19 to support curbing the spread of the disease across borders. These technologies should ideally be overseen by the national and global coordinating centers to ensure privacy of individuals while increasing efficiency.



EDUCATION

- Explore the transformation of education systems to a hybrid model combining face-to-face and digital learning systems, to be prepared for, and responsive to, future pandemics and other crises. This means investment in digital infrastructure, teacher training and making access to digital learning available to all learners. Access to internet should be seen as a necessity like electricity rather than a luxury.

Explore developing global, multi-lingual and AI-powered open repositories of publicly-funded or public-held digital education resources, Open Education Resources (OERs), and other digital content made available by diverse entities for free for educational purposes. Such repositories can build on inspiring examples such as Éduthèque³⁷ by the French Government and the Horizon 2020 project X5GON³⁸ (Cross Modal, Cross Cultural, Cross Lingual, Cross Domain, and Cross Site Global OER Network) funded by the European Union.

Explore the transformation of education systems to a hybrid model combining face-to-face and digital learning systems, to be prepared for, and responsive to, future pandemics and other crises.

³⁷ Éduthèque (<https://www.edutheque.fr/accueil.html>) is a web portal created by the French Ministry of Education, free for all teachers and their students, at primary and secondary school level. Based on a partnership with major cultural and scientific public institutions, Éduthèque gathers the partners' resources of high scientific quality. More than 80,000 digital educational resources are available on the portal, such as videos, movies, 3D models, documentaries and maps, and their rights are cleared for educational purposes by the government, and they are also accessible to people with disabilities and special needs. ³⁸ X5GON (<https://www.x5gon.org/>) is developing Artificial Intelligence methods to enable both learners and teachers to identify resources that match their learning goals. For example, a teacher in Africa might be able to easily find MOOCs or lectures that present a topic based on local and indigenous knowledge that is appropriate for the specific local context. A learner from France interested in understanding specific African challenges might be directed to relevant African content translated from a local language into French.



ECONOMICS

Explore the design of automatic macroeconomic fiscal and monetary stabilizers to enable a faster reaction to disasters such as pandemics to reduce transaction lost accruing from political and bureaucratic processes of approvals and implementation.

Explore using or establishing a new international mechanism to coordinate transport protocols to minimize travel and supply chain disruptions across countries

Explore advances in digital technology in the financial sector which could be leveraged to offer

more efficient and transparent access to finance especially in the poorest countries.

Explore the establishment of unemployment benefit guarantee reserves. This process would involve a partnership between government and private sector to identify how a negotiated amount of the employment cost can be put aside as reserves in the case of a pandemic or any other unseen catastrophic event to avoid staff layoffs.

Conclusion

Limiting the spread of the virus, providing relief to the population in particular to vulnerable and

marginalized populations and the provisioning of a safe vaccine in the most efficient, effective and equitable manner will always be the key priorities for every government.

Short term solutions that are necessary and which require significant immediate financial resources might have to be accommodated. However, distribution of these resources will need to be equitable and efficient to ensure that the inequality gap is not further widened and transaction costs minimized respectively. This will require major institutional revisions in many countries.

In addition, as the crisis abates, efforts must be directed towards ensuring that fiscal and monetary policies are designed in a manner that goes towards supporting the achievement of the SDGs. **In addition, the lessons from this pandemic suggest building resiliency within the various institutions overseeing the economic, education, health and development sectors. The pandemic also shown us how important digital technology will be for building this resiliency.**

Last but not least, global cooperation will be key in addressing many of the challenges thrown at humanity when events such as pandemics and other catastrophes like climate change which transcend national borders happen. The COVID-19 Pandemic has reminded humanity once again the essential role multilateralism can and must play in finding solutions to global problems.



References

Acemoglu, D., Chernozhukov, V., Werning, I. and Whinston, M.D., 2020. A multi-risk SIR model with optimally targeted lockdown (No. w27102). National Bureau of Economic Research.

Akpan, N., 1 May 2020. How to measure your nation’s response to coronavirus. <https://www.nationalgeographic.com/science/2020/05/coronavirus-how-to-measure-your-nation-response-cvd/>

Alam, A. and Tiwari, P., 2020. Putting the ‘learning’ back in remote learning: Policies to uphold effective continuity of learning through COVID-19, Issue brief, June 2020, Office of Global Insight and Policy. Available at <https://www.unicef.org/globalinsight/sites/unicef.org/globalinsight/files/2020-06/UNICEF-Global-Insight-remote-learning-issue-brief-2020.pdf>

Allen, T., Murray, K.A., Zambrana-Torrelío, C., Morse, S.S., Rondinini, C., Di Marco, M., Breit, N., Olival, K.J. and Daszak, P., 2017. Global hotspots and correlates of emerging zoonotic diseases. *Nature communications*, 8(1), pp.1-10.

Alvarez, F.E., Argente, D. and Lippi, F., 2020. “A simple planning problem for COVID-19 lockdown” (No. w26981). National Bureau of Economic Research.

Anderson, R.M., Fraser, C., Ghani, A.C., Donnelly, C.A., Riley, S., Ferguson, N.M., Leung, G.M., Lam, T.H. and Hedley, A.J., 2004. Epidemiology, transmission dynamics and control of SARS: the 2002–2003 epidemic. *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences*, 359(1447), pp.1091-1105.

Arnold, D., 2019. Death And The Modern Empire: The 1918–19 Influenza Epidemic In India. *Transactions of the Royal Historical Society*, 29, pp.181-200.

Assenza, T, F Collard, M Dupaigne, P Fève, C Hellwig, S Kankanamge and N Werquin (2020), “The hammer and the dance: Health and economic objectives are not mutually exclusive after all!”, VoxEU.org, 15 May.

Azevedo, J. P., Hasan, A., Goldemberg, D., Iqbal, S.A., and Geven, K., 2020. Simulating the Potential Impacts of COVID-19 School Closures on Schooling and Learning Outcomes: A Set of Global Estimates. Policy Research Working Paper No. 9284. World Bank, Washington, DC. <https://openknowledge.worldbank.org/handle/10986/33945>

Azzi-Huck, K. and Shmi, T., 18 March 2020. Managing the impact of COVID-19 on education systems around the world: How countries are preparing, coping, and planning for recovery. <https://blogs.worldbank.org/education/managing-impact-covid-19-education-systems-around-world-how-countries-are-preparing>

Bai, Y., Lin, C.C., Lin, C.Y., Chen, J.Y., Chue, C.M. and Chou, P., 2004. Survey of stress reactions among health care workers involved with the SARS outbreak. *Psychiatric Services*, 55(9), pp.1055-1057.

Baker, S., Bloom, N., Davis, S. and Terry, S., 2020. COVID-induced economic uncertainty and its consequences. VoxEU. org, 13. Retrieved from: <https://voxeu.org/article/covid-induced-economic-uncertainty-and-its-consequences>

Baldwin, R. and Tomiura, E., 2020. Thinking ahead about the trade impact of COVID-19. *Economics in the Time of COVID-19*, 59.

Baldwin, R. and Weder di Mauro, B., 2020.“Economics in the Time of COVID-19”, VoxEU.org, 6 March. <https://cepr.org/sites/default/files/news/COVID-19.pdf>

Balmford, B., Annan, J.D., Hargreaves, J.C., Altoè, M. and Bateman, I.J., 2020. Cross-country comparisons of covid-19: policy, politics and the price of life. *Environmental and Resource Economics*, 76(4), pp.525–551.

Barro, R., Ursua, J. and Weng, J., 2020. Coronavirus Meets the Great Influenza Pandemic. VoxEU. org, 20.

Barry, J.M., 2004. The great influenza: the epic story of the deadliest plague in history. Viking Press, New York.

Bethune, Z. and Korinek, A., 2020. “COVID-19 infection externalities: Herd immunity versus containment strategies”, VoxEU.org.

Bhardwaj, A., 8 April 2020. The coronavirus crisis: How the world is dealing with the pandemic. https://www.business-standard.com/article/economy-policy/the-coronavirus-crisis-how-the-world-is-dealing-with-the-pandemic-120040800819_1.html

Bootsma, Martin C. J.; Ferguson, Neil M., 6 April 2007. “The effect of public health measures on the 1918 influenza pandemic in U.S. cities”. *Proceedings of the National Academy of Sciences*. 104 (18): 7588–7593.

Brockmann, D. and Helbing, D., 2013. The hidden geometry of complex, network-driven contagion phenomena. *science*, 342(6164), pp.1337-1342.

Brooks, S.K., Webster, R., K., Smith, L.E., Woodland, L., Wessely, S., Greenberg, N., Rubin, J. G., 2020. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet*; 395: 912–20.

Bueno-Marí, R., Almeida, A. and Navarro, J.C., 2015. Emerging zoonoses: eco-epidemiology, involved mechanisms, and public health implications. *Frontiers in public health*, 3, p.157.

Cameron, E.E., Nuzzo, J.B. and Bell, J.A., 2019. Global health security index: Building collective action and accountability. Nuclear Threat Initiative and Johns Hopkins Bloomberg School of Public Health. <https://www.ghsindex.org/report-model/>

Cash, R. and Patel, V., 2020. Has COVID 19 subverted global health? *The Lancet*. VOLUME 395, ISSUE 10238, P1687-1688.

Cecchetti, S.G. and Schoenholtz, K.L., 2020. 7 Contagion: Bank runs and COVID-19. *Economics in the Time of COVID-19*.

Chase, M., 2004. The Barbary Plague: The Black Death in Victorian San Francisco. Random House Trade Paperbacks.

Cheung, H., 21 March 2020. Coronavirus: What could the West learn from Asia? <https://www.bbc.com/news/world-asia-51970379>

Choudhari, R., 2020. COVID 19 pandemic: mental health challenges of internal migrant workers of India. *Asian journal of psychiatry*, 54, p.102254.

Cockburn, W.C., Delon, P.J. and Ferreira, W., 1969. Origin and progress of the 1968-69 Hong Kong influenza epidemic. *Bulletin of the World Health Organization*, 41(3-4-5), p.343.

Cohen J Enserink M. Swine flu. After delays, WHO agrees: the 2009 pandemic has begun. *Science*. 2009; 324: 1496-1497

Corliss, J.O., 2002. A salute to Antony van Leeuwenhoek of Delft, most versatile 17th century founding father of protistology. *Protist*, 153(2), p.177.

Crosby, A.W., 2003. America’s forgotten pandemic: the influenza of 1918. Cambridge University Press.

Cunningham, A.A., Daszak, P. and Wood, J.L., 2017. One Health, emerging infectious diseases and wildlife: two decades of progress?. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 372(1725), p.20160167.

Davies, N.G., Klepac, P., Liu, Y., Prem, K., Jit, M., Eggo, R.M. and CMMID COVID-19 working group, 2020. Age-dependent effects in the transmission and control of COVID-19 epidemics. *MedRxiv*.

Deya, K.N., 2020. The enduring legacy of Ibn Sina’s work on contagions, *The Business Standard*, April 26, 2020, Accessed on August 30, 2020. <https://tbsnews.net/panorama/enduring-legacy-ibn-sinas-work-contagions-73987>

Djankov, S. and Panizza, U., 2020. COVID-19 in Developing Economies. A VoxEU.org eBook, Centre for Economic Policy Research, London. Retrieved from: <https://voxeu.org/content/covid-19-developing-economies>

Dobson, A.P., Pimm, S.L., Hannah, L., Kaufman, L., Ahumada, J.A., Ando, A.W., Bernstein, A., Busch, J., Daszak, P., Engelmann, J. and Kinnaird, M.F., 2020. Ecology and economics for pandemic prevention. *Science*, 369(6502), pp.379-381.

Donaldson, L. J., Rutter, P. D., Ellis, B. M., Greaves, F. E., Mytton, O. T., Pebody, R. G., & Yardley, I. E., 2009. Mortality from pandemic A/H1N1 2009 influenza in England: public health surveillance study. *BMJ*, 339, b5213.

Dong, Y., Mo, X., Hu, Y., Qi, X., Jiang, F., Jiang, Z. and Tong, S., 2020. Epidemiological characteristics of 2143 pediatric patients with 2019 coronavirus disease in China. *Pediatrics*.

Doshi, P., 2011. The elusive definition of pandemic influenza. *Bulletin of the World Health Organization*, 89, pp.532-538. <https://www.scielosp.org/article/bwho/2011.v89n7/532-538/en/>

Douglas, M., Katikireddi, S.V., Taulbut, M., McKee, M. and McCartney, G., 2020. Mitigating the wider health effects of covid-19 pandemic response. *Bmj*, 369. <https://www.bmj.com/content/bmj/369/bmj.m1557.full.pdf>

Dowdy, D.W., Zwerling, A.A., Stennett, A., Searle, A., Dukhanin, V., Taylor, H.A. and Merritt, M.W., 2020. Measuring Stigma to Assess the Social Justice Implications of Health-Related Policy Decisions: Application to Novel Treatment Regimens for Multidrug-Resistant Tuberculosis. *MDM Policy & Practice*, 5(1), p.2381468320915239.

Dutt, A.K., Akhtar, R. and McVeigh, M., 2006. Surat plague of 1994 re-examined. *Southeast Asian journal of tropical medicine and public health*, 37(4), p.755.

Eisinger, R.W. and Fauci, A.S., 2018. Ending the HIV/AIDS pandemic. *Emerging infectious diseases*, 24(3), p.413.

Examples of Pandemic Influenza Preparedness Plans from the Pacific Island Countries & Territories 2010. <https://www.pphsn.net/Outbreak/Influenza/Pand-Preparedness-plans-Pacific-countries.htm>

Fang, H., Wang, L. and Yang, Y., 2020. Human mobility restrictions and the spread of the novel coronavirus (2019-ncov) in china (No. w26906). National Bureau of Economic Research.

Fangriya, R., 2015. Pandemic Influenza Threat. *World Scientific News*, 11, 120-137.

Fenner, F., Henderson, D.A., Arita, I., Jezek, Z. and Ladnyi, I.D., 2004. Smallpox and its eradication. Geneva: World Health Organization, 1988.

Flynn, P., 2010. The Handling of the H1N1 Pandemic: More Transparency Needed. Strasbourg: Council of Europe Parliamentary Assembly.

Forman, R., Atun, R., McKee, M. and Mossialos, E., 2020. 12 Lessons learned from the management of the coronavirus pandemic. *Health Policy*.

Fouchier, R. A., & Osterhaus, A. D., 2004. Canadian Medical Association Journal, 170(1), 63-64.

Fraser, E., 2020. Impact of COVID-19 Pandemic on Violence against Women and Girls, VAWG Helpdesk Research Report No. 284. London, UK: VAWG Helpdesk. <https://gbvguidelines.org/wp/wp-content/uploads/2020/03/vawg-helpdesk-284-covid-19-and-vawg.pdf>

Frost, W.H., 1920. Statistics of influenza morbidity: with special reference to certain factors in case incidence and case fatality. *Public Health Reports (1896-1970)*, pp.584-597.

Garrett, L., 1994. The coming plague: newly emerging diseases in a world out of balance. Macmillan.	Gostin LO., 13 August 2020. The Great Coronavirus Pandemic of 2020—7 Critical Lessons. JAMA Health Forum. Published online. doi: 10.1001/jamahealthforum.2020.1043	Hansen, J.D. and Reich, J., 2015. ‘Democratizing education? Examining access and usage patterns in Massive Open Online Courses’, Science, 350 (6265), pp. 1245–1248.	Hufnagel, L., Brockmann, D. and Geisel, T., 2004. Forecast and control of epidemics in a globalized world. Proceedings of the National Academy of Sciences, 101(42), pp.15124–15129.	Jones, K.E., Patel, N.G., Levy, M.A., Storeygard, A., Balk, D., Gittleman, J.L. and Daszak, P., 2008. Global trends in emerging infectious diseases. Nature, 451(7181), pp.990–993. doi: 10.1038/nature06536	health expert. https://www.thehindu.com/sci-tech/health/policymakers-in-india-must-understand-that-the-pandemic-is-still-quite-early-in-the-country-global-health-expert/article32024494.ece
Gensini, G.F. and Conti, A.A., 2004. The evolution of the concept of ‘fever’ in the history of medicine: from pathological picture per se to clinical epiphenomenon (and vice versa). Journal of Infection, 49(2), pp.85–87.	Gostin, L. O., & Katz, R. (2016). The International Health Regulations: The Governing Framework for Global Health Security. The Milbank quarterly, 94(2), 264–313. https://doi.org/10.1111/1468-0009.12186	Harris, D., Strunk, K.O., Chingos, M., Darling–Hammond, L., Gándara, P. et al., 2020. How Schools Can Help Children Recover from COVID School Closures: A Letter from Education Researchers. August 3, 2020. https://docs.google.com/document/d/1Pi-u7TJVIMVPIaGZ9QhJuT9VJ6URuvW3ki8diELwf7o/edit	Hughes, Barry B. et.al. https://sdgintegration.undp.org/sites/default/files/Impact_of_COVID-19_on_the_SDGs.pdf .	Kamradt–Scott, A., 2018. What Went Wrong? The World Health Organization from Swine Flu to Ebola. In Political Mistakes and Policy Failures in International Relations (pp. 193–215). Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-68173-3_9	Laxminarayan, R., Wahl, B., Dudala, S.R., Gopal, K., Neelima, S., Reddy, K.J., Radhakrishnan, J. and Lewnard, J.A., 2020. Epidemiology and transmission dynamics of COVID-19 in two Indian states. Science, 370(6517), pp.691–697.
Gibney, E., 2020. Whose coronavirus strategy worked best? Scientists hunt most effective policies. Nature. https://www.nature.com/articles/d41586-020-01248-1	Greber, J., 30 April 2020. Australia, NZ have ‘world’s best’ COVID health and economic response. https://www.afr.com/policy/economy/australia-nz-have-world-s-best-covid-health-and-economic-response-20200430-p54ofs	Hawryluck L, Gold WL, Robinson S, Pogorski S, Galea S, Styra R., 2004. SARS control and psychological effects of quarantine, Toronto, Canada. Emerg Infect Disorders; 10: 1206–12.	IA Khan., 2004. Plague: the dreadful visitation occupying the human mind for centuries. Transactions of The Royal Society of Tropical Medicine and Hygiene, Volume 98, Issue 5, Pages 270–277, https://doi.org/10.1016/S0035-9203(03)00059-2	Kant, A., 22 June 2020. Managing Coronavirus: Learning from Global Best Practices. https://niti.gov.in/managing-coronavirus-learning-global-best-practices	Le Quéré, C., Jackson, R.B., Jones, M.W., Smith, A.J., Abernethy, S., Andrew, R.M., De–Gol, A.J., Willis, D.R., Shan, Y., Canadell, J.G. and Friedlingstein, P., 2020. Temporary reduction in daily global CO2 emissions during the COVID-19 forced confinement. Nature Climate Change, pp.1–7. https://doi.org/10.1038/s41558-020-0797-x
Glezen, W. P., 1996. Emerging infections: pandemic influenza. Epidemiol Rev. 18(1):64–76.	Green, M.S., 2020. Did the hesitancy in declaring COVID-19 a pandemic reflect a need to redefine the term?. The Lancet, 395(10229), pp.1034–1035. https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30630-9/fulltext	Hevia, C. and Neumeyer, A., 2020. A conceptual framework for analyzing the economic impact of covid-19 and its policy implications. UNDP LAC COVID-19 Policy Documents Series, 1, p.29.	IFPRI (International Food Policy Research Institute)., 2011. Food-for-education programmes: Lessons for Uganda. Available at: https://www.ifpri.org/publication/food-education-programs [Accessed 13 May 2020].	Kapoor, A., 2020. Economic Times. https://economictimes.indiatimes.com/news/politics-and-nation/an-unwanted-shipment-the-indian-experience-of-the-1918-spanish-flu/articleshow/74963051.cms	Lee, J., 2020. Mental health effects of school closures during COVID-19. Lancet Child and Adolescent Health, 4 (6), p.421. DOI: https://doi.org/10.1016/S2352-4642(20)30109-7
Global Preparedness Monitoring Board, 2019. A world at risk: annual report on global preparedness for health emergencies. Geneva: World Health Organization and the World Bank. Retrieved from: https://apps.who.int/gpmb/assets/annual_report/GPMB_annualreport_2019.pdf	Gross, C. P., Essien, U. R., Pasha, S., Gross, J. R., Wang, S. Y., & Nunez-Smith, M., 2020. Racial and Ethnic Disparities in Population–Level Covid-19 Mortality. Journal of general internal medicine, 35(10), 3097–3099. https://doi.org/10.1007/s11606-020-06081-	Honigsbaum, M., 2019. The Pandemic Century: One Hundred Years of Panic, Hysteria and Hubris. Oxford University Press.	Impact of the Covid-19 Pandemic on Early Childhood Care and Education, 2020. Early Childhood Education Journal, 1–4. Advance online publication. https://doi.org/10.1007/s10643-020-01082-0	Kilbourne, E. D., 2006.Influenza pandemics of the 20th century. Emerging Infectious Diseases. 12(1), 9–14.	
Goffman E., 1963. Stigma: Notes on the Management of Spoiled Identity. Englewood Cliffs, NJ, Prentice Hall, 1963.	Hale, T., Petherick, A., Phillips, T. and Webster, S., 2020. Variation in government responses to COVID-19. Blavatnik school of government working paper, 31. https://www.bsg.ox.ac.uk/sites/default/files/2020-05/BSG-WP-2020-032-v6.0.pdf	How Countries Reopened Schools Amid a Pandemic. https://www.usnews.com/news/best-countries/articles/2020-07-22/how-countries-reopened-schools-amid-the-coronavirus-pandemic	International Commission on the Futures of Education, 2020. Education in a post-COVID world: Nine ideas for public action. Paris: UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000373717	Kizilcec, R.F., Saltarelli, A.J., Reich, J. and Cohen, G.L., 2017. ‘Closing global achievement gaps in MOOCs’, Science, 355(6322), pp. 251–252.	Leung, B., Lodge, D.M., Finnoff, D., Shogren, J.F., Lewis, M.A. and Lamberti, G., 2002. An ounce of prevention or a pound of cure: bioeconomic risk analysis of invasive species. Proceedings of the Royal Society of London. Series B: Biological Sciences, 269(1508), pp.2407–2413.
Goldin,I.,&Muggah,R. 2020. Terra Incognito: 100 maps to survive the next 100 Years. Century.	Hamer, M., Kivimäki, M., Gale, C. R., & Batty, G. D., 2020. Lifestyle risk factors, inflammatory mechanisms, and COVID-19 hospitalization: A community-based cohort study of 387,109 adults in UK. Brain, behavior, and immunity, 87, 184–187. https://doi.org/10.1016/j.bbi.2020.05.059	Hsiang, S., Allen, D., Annan–Phan, S., Bell, K., Bolliger, I., Chong, T., Druckenmiller, H., Huang, L.Y., Hultgren, A., Krasovich, E. and Lau, P., 2020. The effect of large-scale anti-contagion policies on the COVID-19 pandemic. Nature, 584(7820), pp.262–267.	International Labour Organization, & UNICEF, 2020. COVID-19 and child labour: A time of crisis, a time to act. International Organization for Migration–UN. World Migration Report 2020, IOM, Geneva.	Klein Goldewijk, K., Beusen, A. and Janssen, P., 2010. Long-term dynamic modeling of global population and built-up area in a spatially explicit way: HYDE 3.1. The Holocene, 20(4), pp.565–573.	Li, P., Pei, A., Chen, B., Song, Y., Zhang, T., Yang, W., Shaman, J., 2020. Substantial undocumented infection facilitates the rapid dissemination of novel coronavirus (SARS–CoV-2), Science, 368 (6490), 489–493.
Gollier, C., 2020. Pandemic Economics: Optimal dynamic confinement under uncertainty and learning. Covid Economics: Vetted and Real time Papers. Centre for Economic Policy and Research, no.34,pp.1–14. Retrieved from: https://cepr.org/sites/default/files/CovidEconomics34.pdf	Hankla, C., 15 May 2020. Why Some Countries Have Responded More Effectively to COVID-19 Than Others. https://www.yesmagazine.org/democracy/2020/05/15/coronavirus-countries-success/	Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., Zhang, L., Fan, G.,Xu, J., Gu, X., Cheng, Z., Yu, T., Xia, J., Wei, Y., Wu, W., Xie, X., Yin, W., Li, H., Liu, M., Xiao, Y., Gao, H., Guo, L., Xie, J., Wang, G., Jiang, R., Gao, Z., Jin, Q., Wang, J., Cao, B., 2020. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet; 395: 497–506	International Task Force on Teachers for Education 2030 and ILO, 2020. Supporting teachers in back-to-school efforts: Guidance for policy-makers. Paris: UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000373479	Lafortune, G., 2020. How much do we know about countries preparedness to respond to pandemics? Insights from two country-level indices. Sustainable Development Network Solutions. Available online: https://www.unsdn.org/how-much-do-we-know-about-countries-preparedness-to-respond-to-pandemics-insights-from-two-country-level-indices	Liu, Z., Xing, B. & Xue Za, Z., 2020. The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19) in China. Chin. J. Epidemiol. 41, 145–151. https://doi.org/10.3760/cma.j.isn.0254-6450.2020.02.003 .
Gómez, M., Ivchenko, A., Reutskaja, E. and Soto-Mota, P., 2020. Behaviours, perceptions and mental wellbeing in high-income and low/middle-income countries at the beginning of COVID-19 pandemic. Vox eBook Chapters, 1, pp.128–146.			Jackson, C., 2009. History lessons: the Asian Flu pandemic. British Journal of General Practice, 59(565), pp.622–623. doi: 10.3399/bjgp09X453882	Langmuir, A.D., 1961. Epidemiology of Asian influenza: with special emphasis on the United States. American Review of Respiratory Disease, 83(2P2), pp.2–14.	Livingstone, S., Nandi, A., Banaji, S. and Stoilova, M., 2017. Young adolescents and digital media: uses, risks and opportunities in low-and middle-income countries: a rapid evidence review. Retrieved from: http://eprints.lse.ac.uk/83753/
Goodell, J.W., 2020. COVID-19 and finance: Agendas for future research. Finance Research Letters, p.101512. Retrieved from: https://doi.org/10.1016/j.frl.2020.101512			John, M.L., 2001. A dictionary of epidemiology. Oxford university press.	Laxman, N., 8 July 2020. Policymakers in India must understand that the pandemic is still quite early in the country: Global	

Lordan, R, FitzGerald. G.A., and Grosser, T., 2020. Reopening schools during COVID–19. <i>Science</i> 369 (6508), 1146. DOI: 10.1126/science.abe5765	McCarthy, N., 26 March 2020. COVID–19’s staggering impact on global education. https://www.weforum.org/agenda/2020/03/infographic-covid19-coronavirus-impact-global-education-health-schools/	OECD Interim Economic Assessment Coronavirus: The world economy at risk March 2020. https://doi.org/10.1787/7969896b-en	Pramling Samuelsson, I., Wagner, J.T. & Eriksen Ødegaard, E., 2020. The Coronavirus Pandemic and Lessons Learned in Preschools in Norway, Sweden and the United States: OMEP Policy Forum. <i>IJEC</i> . https://doi.org/10.1007/s13158-020-00267-3	Rosen, G., 2015. A history of public health. Johns Hospkins University Press.	Sprang G, Silman M., 2013. Posttraumatic stress disorder in parents and youth after health-related disasters. <i>Disaster Med Public Health Prep</i> . Feb;7(1):105–10. doi: 10.1017/dmp.2013.22. PMID: 24618142.
Madhav,N., Oppenheim,B., Gallivan,M., Mulembakani, P., Rubin, E., and Wolfe, N., 2017. Pandemics: Risks, Impacts, and Mitigation in Disease Control Priorities: Improving Health and Reducing Poverty. 3rd edition. Jamison DT, Gelband H, Horton S, et al., (Eds.). The International Bank for Reconstruction and Development / The World Bank; Washington DC.	McNeil, W., 1976. <i>Plagues and Peoples</i> . New York: Doubleday.	OECD Economic Outlook, 2020. OECD Economic Outlook, Volume 2020 Issue 1. https://doi.org/10.1787/0d1d1e2e-en	Qiu, W., Rutherford, S., Mao, A. and Chu, C., 2017. The pandemic and its impacts. <i>Health, culture and society</i> , 9, pp.1–11. Retrieved from: http://hcs.pitt.edu/ojs/index.php/hcs/article/view/221/280	Rozario, A., 21 Jul 2020. Helplines, Counsellors: MHRD’s Mental Health Campaign for Students: Under Manodarpan, MHRD has made mental health a compulsory component of teacher training courses. https://www.thequint.com/news/education/helplines-to-counsellors-mhrd-launches-mental-health-initiative	Stearns, P.N., 2017. Periodization in World History: Challenges and Opportunities. In <i>21st-Century Narratives of World History</i> (pp. 83–109). Palgrave Macmillan, Cham. ISBN 978–3–319–62077–0.
Mahato, S., Pal, S. and Ghosh, K.G., 2020. Effect of lockdown amid COVID–19 pandemic on air quality of the megacity Delhi, India. <i>Sci. Total Environ</i> . 730: 139086.	Menon, I.G.K., 1959. The 1957 pandemic of influenza in India. <i>Bulletin of the World Health Organization</i> , 20(2–3), pp.199–224.	Oliu-Barton, M, B S R Pradelski and L Attia., 2020a. “Green zones: A proposal to exit the COVID–19 lockdown”, <i>VoxEU.org</i> , 25 April.	Racaniello, V., <i>Virology Blog</i> , March 2, 2009. https://www.virology.ws/2009/03/02/origin-of-current-influenza-h1n1-virus/	Rubin, G. J., & Wessely, S., 2020. The psychological effects of quarantining a city. <i>The BMJ</i> , 368. https://doi.org/10.1136/bmj.m313	Stiglitz, J.E., Sen, A. and Fitoussi, J.P., 2009. Report by the commission on the measurement of economic performance and social progress.
Malala Fund, 2020. Girls’ education and COVID–19: What past shocks can teach us about mitigating the impact of pandemics. https://downloads.ctfassets.net/0oan5gk9rgbh/6TMYLYAcUpjhQpXLDgmdIa/3e1c12d8d827985ef2b4e815a3a6da1f/COVID19_GirlsEducation_corrected_071420.pdf	Monràs, J., 2020, “Some thoughts on COVID–19 from a labour mobility perspective: From ‘red-zoning’ to ‘green-zoning’”, <i>VoxEU.org</i> , 25 March.	Opal, S.M., 2010. A brief history of microbiology and immunology. In <i>Vaccines: a biography</i> (pp. 31–56). Springer, New York, NY. doi:10.1007/978–1–4419–1108–7_3	Reich, J. and Ito, M., 2017. From good intentions to real outcomes: equity by design in learning technologies. Irvine, California: Digital Media and Learning Research Hub.	Sachs, J.D., Schmidt-Traub, G., Kroll, C., Lafortune, G., Fuller, G., & Woelm, F. 2020. The Sustainable Development Goals and COVID–19. Sustainable Development Report 2020. Cambridge: Cambridge University Press.	Stockman, I.J., Bellamy, R. and Garner, P., 2006. SARS: systematic review of treatment effects. <i>PLoS Med</i> , 3(9), p.e343. Retrieved from: https://doi.org/10.1371/journal.pmed.0030343
Manuell M-E, Cukor J., 2011. Mother Nature versus human nature: public compliance with evacuation and quarantine. <i>Disasters</i> ; 35: 417–42.	Morens D. M. & Fauci, A. S., 2007. The 1918 influenza pandemic: insights for the 21st century”. <i>The Journal of Infectious Diseases</i> . 195 (7): 1018–28. doi:10.1086/511989.	Pardee Center and UNDP, 2020. Impact of COVID–19 on the Sustainable Development Goals: Pursuing the Sustainable Development Goals (SDGs) in a World Reshaped by COVID–19. https://sdgintegration.undp.org/sites/default/files/Impact_of_COVID-19_on_the_SDGs.pdf	Reid, A.H., Fanning, T.G., Hultin, J.V. and Taubenberger, J.K., 1999. Origin and evolution of the 1918 “Spanish” influenza virus hemagglutinin gene. <i>Proceedings of the National Academy of Sciences</i> , 96(4), pp.1651–1656.	Sambala, E.Z., Kanyenda, T., Iwu, C.J., Iwu, C.D., Jaca, A. and Wiysonge, C.S., 2018. Pandemic influenza preparedness in the WHO African region: are we ready yet?. <i>BMC infectious diseases</i> , 18(1), p.567. https://bmcinfectdis.biomedcentral.com/track/pdf/10.1186/s12879-018-3466-1	Stuart-Harris, C.H., Schild, G.C. and Oxford, J.S., 1985. <i>Influenza, The viruses and the disease</i> , A. Arnold Publication, London.
Marinoni, G, van’t Land, H, Jensen, T., 2020. The impact of COVID–19 on higher education around the world: IAU Global Survey Report. Paris: IAU. https://www.iau-aiu.net/IMG/pdf/iau_covid19_and_he_survey_report_final_may_2020.pdf	Morens, D., M., Taubenberger, J., K. Harvey, H., A., and Memoli, M., J., 2010. The 1918 influenza pandemic: Lessons for 2009 and the future. <i>Crit Care Med</i> . 2010 Apr; 38(4 Suppl): e10–e20.	Perrings, C., Castillo-Chavez, C., Chowell, G., Daszak, P., Fenichel, E.P., Finnof, D., Horan, R.D., Kilpatrick, A.M., Kinzig, A.P., Kuminoff, N.V. and Levin, S., 2014. Merging economics and epidemiology to improve the prediction and management of infectious disease. <i>EcoHealth</i> , 11(4), pp.464–475.	Rewar, S., Mirdha, D., & Rewar, P., 2015. Treatment and Prevention of Pandemic H1N1 Influenza. <i>Annals of Global Health</i> , 81(5), 645–653. Retrieved from: http://dx.doi.org/10.1016/j.aogh.2015.08.014	Sambala, E.Z., Kanyenda, T., Iwu, C.J., Iwu, C.D., Jaca, A. and Wiysonge, C.S., 2018. Pandemic influenza preparedness in the WHO African region: are we ready yet?. <i>BMC infectious diseases</i> , 18(1), p.567. https://bmcinfectdis.biomedcentral.com/track/pdf/10.1186/s12879-018-3466-1	Sumner, A., Hoy, C. and Ortiz-Juarez, E., 2020. Estimates of the Impact of COVID–19 on Global Poverty (UNU-WIDER, April, pp. 800–809). Retrieved from: https://www.wider.unu.edu/sites/default/files/Publications/Working-paper/PDF/wp2020-43.pdf
Maunder, R., Hunter, J., Vincent, L., Bennett, J., Peladeau, N., Leszcz, M., Sadavoy, J., Verhaeghe, L.M., Steinberg, R. and Mazzulli, T., 2003. The immediate psychological and occupational impact of the 2003 SARS outbreak in a teaching hospital. <i>Cmaj</i> , 168(10), pp.1245–1251.	Murray, C.J., 1994. Quantifying the burden of disease: the technical basis for disability-adjusted life years. <i>Bulletin of the World health Organization</i> , 72(3), p.429.	Peterman, A., Potts, A., O’Donnell, M., Thompson, K., Shah, N., Oertelt-Prigione, S. and van Gelder, N., 2020. Pandemics and violence against women and children. Center for Global Development working paper, 528. https://https://www.cgdev.org/publication/pandemics-and-violence-against-women-and-children .	Reynolds DL, Garay JR, Deamond SL, Moran MK, Gold W, Styra R., 2008. Understanding, compliance and psychological impact of the SARS quarantine experience. <i>Epidemiol Infect</i> ; 136: 997–1007.	Shastri P. 2020, 6 April 2020. Migrant worker has nervous breakdown in Ahmedabad. http://timesofindia.indiatimes.com/articleshow/75000134.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst .	Tatem, A.J., Rogers, D.J. and Hay, S.I., 2006. Global transport networks and infectious disease spread. <i>Advances in parasitology</i> , 62, pp.293–343.
Mayor, S., 2000. “Flu experts warn of need for pandemic plans”. <i>British Medical Journal</i> . 321 (7265): doi:10.1136/bmj.321.7265.852. PMC 1118673. PMID 11021855.	National Bureau of Economic Research, 2020. “Business Cycle Dating Committee, National Bureau of Economic Research.” Accessed July 30, 2020. https://www.nber.org/cycles/jan08bcdc_memo.html	Policy Responses to the Coronavirus Pandemic, 2020. Our World in Data. https://ourworldindata.org/policy-responses-covid	Rogers, D.S., Duraipappah, A.K., Antons, D.C., Munoz, P., Bai, X., Fragkias, M. and Gutscher, H., 2012. A vision for human well-being: transition to social sustainability. <i>Current Opinion in Environmental Sustainability</i> , 4(1), pp.61–73.	Simonnet A, Chetboun M, Poissy J, Raverdy V, Noulette J, Duhamel A, Labreuche J, Mathieu D, Pattou F, Jourdain M., 2020. LICORN and the Lille COVID–19 and Obesity study group. High Prevalence of Obesity in Severe Acute Respiratory Syndrome Coronavirus-2 (SARS–CoV–2) Requiring Invasive Mechanical Ventilation. <i>Obesity</i> (Silver Spring). 2020 Jul;28(7):1195–1199. doi: 10.1002/oby.22831. Epub 2020 Jun 10. Erratum in: <i>Obesity</i> (Silver Spring). Oct;28(10):1994. PMID: 32271993; PMCID: PMC7262326.	Taubenberger, J., K. and Morens, D., M., 2010. Influenza: The Once and Future Pandemic. <i>Public Health Reports</i> 125 (Suppl 3):16:26.
	Nelson, V.M. , 2020 Suicide Prevention India Foundation. http://www.rfi.fr/en/international/20200514-mental-illness-suicides-on-the-rise-in-india-during-covid-19-lockdown	Pollinger, S., 2020. “Optimal case detection and social distancing policies to suppress COVID–19”, <i>COVID Economics</i> 23, 28 May.	Rogers, F.H. and Sabarwal, S., 2020. The COVID–19 Pandemic: Shocks to Education and Policy Responses (No. 148198, pp. 1–56). The World Bank. https://www.worldbank.org/en/topic/education/publication/the-covid19-pandemic-shocks-to-education-and-policy-responses	Sotgiu, G. and Dobler, C.C., 2020. Social stigma in the time of coronavirus disease 2019. <i>European Respiratory Journal</i> ; DOI: 10.1183/13993003.02461–2020	Teixeira da Silva, J.A., Tsigaris, P. and Erfanmanesh, M. Publishing volumes in major databases related to Covid-19. <i>Scientometrics</i> (2020). https://doi.org/10.1007/s11192-020-03675-3
	NZFVC, New Zealand Family Violence Clearinghouse, 2020. “Preventing and responding to family and sexual violence during COVID–19”, available at: https://nzfvc.org.nz/covid-19/preventingresponding-violence-covid-19 .	Prager, F., Wei, D., and Rose, A., 2017. Total Economic Consequences of an Influenza Outbreak in the United States: Economic Consequences of Influenza. <i>Risk Analysis</i> 37(1), 4–19.			

Tikkanen, R., Wharton, G.A., Djordjevic, A., Mossialos, E and Williams II, R.D., June 10, 2020. The 2020 International Profiles of Health Care Systems: A Useful Resource for Interpreting Country Responses to the COVID-19 Pandemic. <https://www.commonwealthfund.org/blog/2020/2020-international-profiles-useful-resource-interpreting-responses-covid-19>

Torrejón Pérez, S, M Fana, I González-Vázquez and E Fernández-Macías., 2020, “The asymmetric impact of COVID-19 confinement measures on EU labour markets”, VoxEU.org.

Torrejón Pérez, S., Fana, M., González-Vázquez, I. and Fernández-Macías, E., 2020. The Asymmetric Impact of COVID-19 Confinement Measures on EU Labour Markets, VOXEU. org.

UN 2020. Policy Brief: Education during COVID-19 and beyond. https://www.un.org/sites/un2.un.org/files/sg_policy_brief_covid-19_and_education_august_2020.pdf

UN 2020. The Sustainable Development Goals Report 2020. <https://unstats.un.org/sdgs/report/2020/The-Sustainable-Development-Goals-Report-2020.pdf>

UN Committee for the Coordination of Statistical Activities (CCSA), 2020. How COVID-19 is changing the world: a statistical perspective. https://unstats.un.org/unsd/ccsa/documents/covid19-report-ccsa_vol2.pdf

UN DESA, 2019. World population prospects 2019: Highlights. New York (US): United Nations Department for Economic and Social Affairs.

UN Report 2006. Joint United Nations Programme on HIV/AIDS (UNAIDS) (2006). Report on the global AIDS epidemic. Geneva, Switzerland: UNAIDS; Available at http://www.unaids.org/en/hiv_data/2006globalreport/default.asp.

UN, 2020. Policy Brief: Education during COVID-19 and beyond (August 2020). New York: United Nations.

UNDESA 2020. World Social Report 2020. Retrieved from: <https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/02/World-Social-Report2020-FullReport.pdf>

UNDP, 2020. COVID-19 and human development: Assessing the crisis, envisioning the recovery. 2020 Human Development Perspectives. New York: UNDP, available at <http://hdr.undp.org/en/hdp-covid>

UNESCO MGIEP, 2019. Rethinking pedagogy: Exploring the potential of digital technology in achieving quality education. New Delhi: UNESCO Mahatma Gandhi Institute of Education for Peace and Sustainable Development (MGIEP). <https://unesdoc.unesco.org/ark:/48223/pf0000372786>

UNESCO, 2017. Accountability in education: meeting our commitments; Global education monitoring report summary, 2017/8 <https://unesdoc.unesco.org/ark:/48223/pf0000259593>

UNESCO, 2019. Global Education Monitoring Report 2019 Gender Report: Building bridges for gender equality. Paris: UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000368753>

UNESCO, 2020a. Health & nutrition during home learning. UNESCO COVID-19 Education Response, Education Sector issue notes, Issue note n° 1.1 – April 2020. Paris: UNESCO.

UNESCO, 2020b. Supporting teachers and education personnel during times of crisis. UNESCO COVID-19 Education Response, Education Sector issue notes, Issue note n° 2.2 – April 2020. Paris: UNESCO.

UNESCO, 2020c. Open and distance learning to support youth and adult learning. UNESCO COVID-19 Education Response, Education Sector issue notes, Issue note n° 2.5 – June 2020. Paris: UNESCO.

UNESCO, 2020d. Anticipated impact of COVID-19 on public expenditures on education and implication for UNESCO work. UNESCO COVID-19 Education Response, Education Sector issue notes, Issue note n° 7.2 – April 2020. Paris: UNESCO.

UNESCO, UNICEF, World Bank, and WFP, 2020. Framework for reopening schools. Paris: UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000373348>

US CDC, 1968 Pandemic. <https://www.cdc.gov/flu/pandemic-resources/1968-pandemic.html>

Valiathan, R., Ashman, M. and Asthana, D., 2016. Effects of ageing on the immune system: infants to elderly. Scandinavian journal of immunology, 83(4), pp.255-266. doi:10.1111/sji.12413. PMID: 26808160

Van-Fleet, J., 18 March 2020. Education in the time of COVID-19. <https://www.globalpartnership.org/blog/education-time-covid-19>

Vaswani, K., 19 March 2020. Coronavirus: The detectives racing to contain the virus in Singapore. <https://www.bbc.com/news/world-asia-51866102>

Veeraraghavan N., 1969. Hong Kong influenza in Madras State, India, 1968. Bulletin of the World Health Organization, 41(3), 399–400.

Verikios, G., Sullivan, M., Stojanovski, P., Giesecke, J., & Woo, G., 2015. Assessing Regional Risks From Pandemic Influenza: A Scenario Analysis. The World Economy. CDC. Pneumocystis pneumonia (2006). MMWR 1981;30:250--2.

Viscusi, W.K. and Masterman, C.J., 2017. Income elasticities and global values of a statistical life. Journal of Benefit-Cost Analysis, 8(2), pp.226-250.

Voth, H.J., 2020. Persistence: myth and mystery. CESP Discussion Paper Series. Retrieved from: <https://repec.cepr.org/repec/cpr/ceprdp/DP15417.pdf>

Wan, W., 11 March 2020. WHO declares a pandemic of coronavirus disease covid-19. <https://www.washingtonpost.com/health/2020/03/11/who-declares-pandemic-coronavirus-disease-covid-19/>

Wenham, C., Smith, J., Morgan, R., 2020. COVID-19: the gendered impacts of the outbreak. Volume 395, Issue 10227, P846–848, March 14, 2020

WFP, 2017. Kenya, Food for Education and Child Nutrition: An endline evaluation. Available at: <https://www.wfp.org/publications/kenya-food-education-and-child-nutrition-endline-evaluation>

Whittaker, E., Bamford, A., Kenny, J., Kaforou, M., Jones, C.E., Shah, P., Ramnarayan, P., Fraisse, A., Miller, O., Davies, P. and Kucera, F., 2020. Clinical Characteristics of 58 Children With a Pediatric Inflammatory Multisystem Syndrome Temporally Associated With SARS-CoV-2. Jama. doi:10.1001/jama.2020.10369

World Bank. 2020. Global Economic Prospects, June 2020. Washington, DC: World Bank. © World Bank. <https://openknowledge.worldbank.org/handle/10986/33748>
World Bank 2020. Remote Learning, EdTech & COVID-19. <https://www.worldbank.org/en/topic/edutech/brief/edtech-covid-19>

World Bank, 2020. Gender dimensions of the COVID-19 pandemic. Policy Note. <http://documents1.worldbank.org/curated/en/618731587147227244/pdf/Gender-Dimensions-of-the-COVID-19-Pandemic.pdf>

World Bank, 2020. Pandemic Preparedness and Covid-19 (Coronavirus). <https://www.worldbank.org/en/topic/pandemics>

World Health Organization, 2013. Pandemic Influenza Risk Management WHO Interim Guidance.

World Health Organization, 2006. WHO strategic action plan for pandemic influenza (No. WHO/CDS/EPR/GIP/2006.2 a). World Health Organization.

World Health Organization, 2008. International health regulations (2005). World Health Organization. https://www.who.int/health-topics/international-health-regulations#tab=tab_1
https://www.uvzsr.sk/en/docs/info/9789241580410_eng.pdf

World Health Organization, 2008. WHO outbreak communication planning guide. <https://www.who.int/ihr/publications/outbreak-communication-guide/en/>

World Health Organization, 2009. Pandemic influenza preparedness and response: a WHO guidance document. World Health Organization. <https://www.ncbi.nlm.nih.gov/books/NBK143066/>

World Health Organization, 2017. Pandemic Influenza Risk Management: A WHO guide to inform and harmonize national and international pandemic preparedness and response. Geneva. Licence: CC BY-NC-SA 3.0 IGO. <https://apps.who.int/iris/bitstream/handle/10665/259893/WHO-WHE-IHM-GIP-2017.1-eng.dccdpd.pdf;jsessionid=FF0E44DE342CCEF9F0A31E1EFB14C8E8?sequence=1>

World Health Organization, 2020. Coronavirus disease 2019 (COVID-19): situation reports. Retrieved from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports>

World Health Organization Regional Office for Europe 2020. National preparedness plans. <https://www.euro.who.int/en/health-topics/communicable-diseases/influenza/pandemic-influenza/pandemic-preparedness/national-preparedness-plans>

World Health Organization Regional Office for Europe 2020. Publicly available plans prepared after 2009 pandemic. <https://www.euro.who.int/en/health-topics/communicable-diseases/influenza/pandemic-influenza/pandemic-preparedness/national-preparedness-plans/publicly-available-plans-prepared-after-2009-pandemic>

World Health Organization, 2016. International Health Regulations. Third edition. World Health Organization. Retrieved from: <https://apps.who.int/iris/bitstream/handle/10665/246107/9789241580496-eng>.

Woolhouse, M., Scott, F., Hudson, Z., Howey, R. and Chase-Topping, M., 2012. Human viruses: discovery and emergence. Philosophical Transactions of the Royal Society B: Biological Sciences, 367(1604), pp.2864-2871. doi:10.1098/rstb.2011.0354

Wu, J.T., Leung, K., Bushman, M., Kishore, N., Niehus, R., de Salazar, P.M., Cowling, B.J., Lipsitch, M. and Leung, G.M., 2020. Estimating clinical severity of COVID-19 from the transmission dynamics in Wuhan, China. Nature Medicine, 26(4), pp.506-510. <https://doi.org/10.1038/s41591-020-0822-7> (2020).

Yang, W., Petkova, E. and Shaman, J., 2014. The 1918 influenza pandemic in New York City: age-specific timing, mortality, and transmission dynamics. Influenza and other respiratory viruses, 8(2), pp.177-188. doi:10.1111/irv.12217. PMC 4082668. PMID 24299150.

Yao, L., Yao, H.L., Chen, J., Yao, Y.P., Wu, X.J. and Zhu, L.L., 2019. Analysis on the incidence of occupational pneumoconiosis of migrant workers in Shiyang city from 2013 to 2017. Zhonghua lao dong wei sheng zhi ye bing za zhi= Zhonghua laodong weisheng zhiyebing zazhi= Chinese journal of industrial hygiene and occupational diseases, 37(9), pp.683-686.

Yoshikawa, H., Wuermli, A. J., Britto, P. R., Dreyer, B., Leckman, J. F., Lye, S. J., Ponguta, L. A., Richter, L. M., & Stein, A., 2020. Effects of the Global Coronavirus Disease-2019 Pandemic on Early Childhood Development: Short- and Long-Term Risks and Mitigating Program and Policy Actions. The Journal of pediatrics, 223, 188–193. <https://doi.org/10.1016/j.jpeds.2020.05.020>.

Zenner, D. and Wickramage, K., 2020. National preparedness and response plans for COVID-19 and other diseases: Why migrants should be included, 14 mayo.

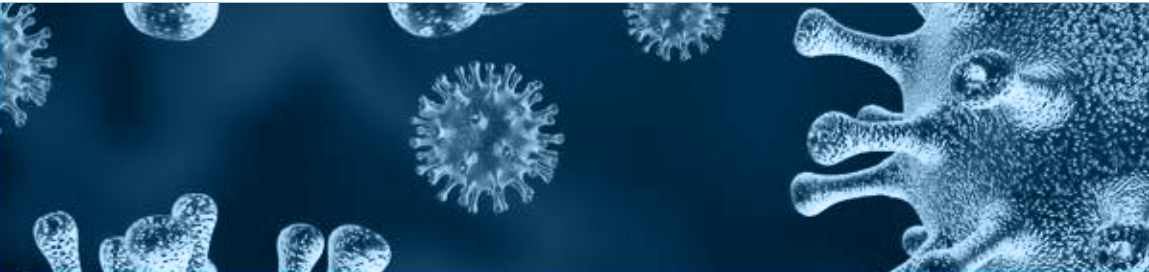
Zhao, X., Zhang, B., Li, P., Ma, C., Gu, J., Hou, P., Guo, Z., Wu, H. and Bai, Y., 2020. Incidence, clinical characteristics and prognostic factor of patients with COVID-19: a systematic review and meta-analysis. MedRxiv.

Zhdanov, V.M., Zakstelskaya, L.Y., Isachenko, V.I., Reznik, V.I., Andreyev, V.P., Lvov, D.K., Yakhno, M.A., Braude, N.A., Pysina, T.V. and Podchernyaeva, R.Y., 1978. Return of epidemic A1 (H1N1) influenza virus. The Lancet, 311(8059), pp.294-295.

Acronyms

AI	Artificial Intelligence	MHPSS	Mental Health And Psychosocial Support
AIDS	Acquired Immune Deficiency Syndrome	MHRD	Ministry of Human Resource Development
BAU	Business As Usual	NA	Neuraminidase
CCSA	Canadian Centre on Substance Abuse	NEET	Not in Education, Employment or Training
CD4	Cluster Of Differentiation 4	NZFVC	New Zealand Family Violence Clearinghouse
CDC	Centers for Disease Control and Prevention	OERs	Open Educational Resources
CFR	Case Fatality Rate	OxCGRT	Oxford COVID-19 Government Response Tracker
CI	Confidence Interval	PHEIC	Public Health Emergency of International Concern
COVID-19	Coronavirus Infectious Disease 2019	RNA	Ribonucleic Acid
DALY	Disability Adjusted Life Years	SARS	Severe Acute Respiratory Syndrome
DNA	Deoxyribonucleic Acid	SARS-CoV-2	SARS Coronavirus 2
EID	Emerging Infectious Diseases	SCBA	Social Cost-Benefit Analysis
EU	European Union	SDGs	Sustainable Development Goals
GBV	Gender-based Violence	TTQT	Test, Track, Quarantine, Treat
GDP	Gross Domestic Product	TVET	Technical and Vocational Education and Training
H1N1/Swine flu	Hemagglutinin Type 1 and Neuraminidase Type 1	UN	United Nations
H5N1/ Avian flu	Hemagglutinin Type 5 And Neuraminidase Type 1	UN DESA	United Nations Department of Economic and Social Affairs
HA	Haemagglutinin	UNDP	United Nations Development Programme
HIV	Human Immunodeficiency Virus infection	UNESCO	United Nations Education, Scientific and Cultural Organization
IHR	International Health Regulations (2005)	UNESCO MGIEP	UNESCO Mahatma Gandhi Institute of Education for Peace and Sustainable Development
ILO	International Labour Organization	UNICEF	United Nations Children’s Fund
ITU	International Telecommunications Union	WFP	World Food Programme
LDC	Least Developed Countries	WHO	World Health Organization
MERS	Middle East Respiratory Syndrome		
MERS-CoV	Middle East Respiratory Syndrome coronavirus		

Annex 1: WHO
Pandemic Phase
Descriptions &
Main Actions by
Phase



1. **Inter Pandemic period (low risk of pandemic):** Phase 1: No new influenza virus subtypes have been detected in humans. An influenza virus subtype that has caused human infection may be present in animals. If present in animals, the risk of human infection or disease is considered to be low. Phase 2: No new influenza virus subtypes have been detected in humans. However, a circulating animal influenza virus subtype poses a substantial risk of human disease.
2. **Pandemic Alert Period (medium to high risk of pandemic):** Phase 3: Human infection(s) with a new subtype but no human-to-human spread, or at most rare instances of spread to a close contact. Phase 4: Small cluster(s) with limited human-to-human transmission but spread is highly localized, suggesting that the virus is not well adapted to humans. Phase 5: Larger cluster(s) but human-to-human spread still localized, suggesting that the virus is becoming increasingly better adapted to humans but may not yet be fully transmissible (substantial pandemic risk).
3. **Pandemic Period:** Phase 6: Pandemic phase: increased and sustained transmission in general population.

PHASE	DESCRIPTION
PHASE 1	No animal influenza virus circulating among animals have been reported to cause infection in humans
PHASE 2	An animal influenza virus circulating in domesticated or wild animals is known to have caused infection in humans and is therefore considered a specific potential pandemic threat.
PHASE 3	An animal or human-animal influenza reassortment virus has caused sporadic cases or small clusters of disease in people, but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks
PHASE 4	Human to human transmission of an animal or human-animal influenza reassortment virus able to sustain community-level outbreaks has been verified
PHASE 5	The same identified virus has caused sustained community level outbreaks in two or more countries in one WHO region.
PHASE 6	In addition to the criteria defined in Phase 5, the same virus has caused sustained community level outbreaks in at least one other country in another WHO region
POST PEAK PERIOD	Levels of pandemic influenza in most countries with adequate surveillance have dropped peak levels.
POST PANDEMIC PERIOD	Levels of influenza activity have returned to the levels seen for seasonal influenza in most countries with adequate surveillance.

MAIN ACTIONS				
PLANNING AND COORDINATION	SITUATION MONITORING AND ASSESSMENT	COMMUNICATIONS	REDUCING THE SPREAD OF DISEASE	CONTINUITY OF HEALTH CARE PROVISION
Develop, exercise and periodically revise national influenza pandemic preparedness and response plans.	Develop robust national surveillance systems in collaboration with national animal health authorities, and other relevant sectors.	Complete communications planning and initiate communications activities to communicate real and potential risks.	Promote beneficial behaviours in individuals for self protection. Plan for use of pharmaceuticals and vaccines.	Prepare the health system to scale up.
Direct and coordinate rapid pandemic containment accivities in collaboration with WHO to limit or delay the spread of infection.	Increase surveillance. Monitor containment operations. Share findings with WHO and the international community.	Promote communicate recommended interventions to prevent and reduce population and individual risk.	Implement rapid pandemic containment operations and other activities; collaborate with WHO and the international community as necessary	Activate contingency plans.
Provide leadership and ccoordination to multisectoral resources to mitigate the soccietal and economic impacts	Actively monitor and assess the evolving pandemic and its impacts and mitigation measures	Continue providing updates to general public and all stakeholders on the state of pandemic and measures to mitigate risk.	Implement individual, societal, and pharmaceutical measures.	Implement contingency plans for health systems at all levels.
Plan and coordinate for additional resources and capacities during possible future waves	Continue serveillance to detect subsequent waves.	Regularly update the public and other stakeholders on any changes to the status of the pandemic.	Evaluate the effectiveness of the measures used to update guidelines, protocols and algorithms.	Rest, restock resources, revise plans, and rebuild essential services.
Review lessons learned and share experiences with the international community. Replenish resources.	Evaluate the pandemic characteristics and situation monitoring and assessment tools for the next pandemic and other public health emergencies.	Publicly acknowledge contributions of all communities and sectors and communicate the lessons learned; incorporate lessons learning into communications activities and planning for the next major public health crisis.	Conduct a thorough evaluation of all interventions implemented.	Evaluate the response of the health system to the pandemic and share the lessons learned.

Table 3: WHO Pandemic Phase Description and Main Actions by Phase (2009) Source: Pandemic Influenza Phases (2009). Pandemic influenza preparedness and response: a WHO guidance document. World Health Organization.



United Nations
Educational, Scientific and
Cultural Organization



Mahatma Gandhi Institute
of Education for Peace
and Sustainable Development

As the world continues to grapple with COVID-19, this booklet comes in handy to answer and reflect upon basic questions encompassing the word “pandemic”- the what, where, when and how of it. If there is one thing that the COVID-19 pandemic has revealed it is the power of oneness- power of global coordination, international scientific collaboration, and aligned action in fighting against the virus. We are all in this together. As we learn to live with the fact that coronavirus is here to stay for a while, and continue to acclimatize to the “new normal”, our aim should be to trust scientific evidence and align our actions in a manner that maximizes “normal” living and minimizes inconveniences caused due to the pandemic. We hope this booklet will provide its audience with necessary information to help achieve this goal.

+91 11 23072356-60

35 Ferozshah Road,
ICSSR Building, 1st Floor,
New Delhi, 110001, India

Website: mgiep.unesco.org

Email: mgiep@unesco.org



[/MGIEP.UNESCO.ORG](http://MGIEP.UNESCO.ORG)



[/MGIEP](#)



[/UNESCO_MGIEP](#)



[/UNESCO_MGIEP](#)