KFAS covid-19 weekly brief

14 June 2020

Introduction

As the COVID-19 continues to impact the wealth and welfare of our society, much remains to be understood about the pandemic and its impact. Hence, the importance of using scientific research, facts and data for a better understanding of the nature of the pandemic, as well as its associated public health issues, to drive policy making in addressing challenges related to healthcare and wellbeing of the population. This newsletter is intended to provide a weekly overview on the latest information on health-related topics surrounding the COVID-19 pandemic, covering five main themes: infection control and prevention, diagnosis and testing, treatment and therapy, training for healthcare professionals and exit strategies. Each edition of the newsletter will cover a specific sub-theme under the five main themes, providing up to date information on available resources, research, data and studies, along with policy recommendations and implications, based on scientific evidence and facts, for decision makers to utilize in developing polices and measures to address the challenges associated with COVID-19 within the healthcare sector.

News Highlights
(up to June 3rd, 2020)

- Japan reports 52 new coronavirus cases **CNN**

- South Korea approves emergency use of Gilead's anti-viral drug to treat COVID-19 **Reuters**

- NASA and Fitbit have received FDA approval for ventilators designed to help Covid-19 patients **CNN**

- Three potential futures for Covid-19: recurring small outbreaks, a monster wave, or a persistent crisis **STAT**

- COVID-19 significantly impacts health services for noncommunicable diseases **WHO**

- 5 ways COVID-19 has changed workforce management **World Economic Forum**

- Will Warm Weather Slow Spread of Novel Coronavirus? **NIH**

- Anthony Fauci on Covid-19 reopenings, vaccines, and moving at 'warp speed' **STAT**

- International community rallies to support open research and science to fight COVID-19 **WHO**

- Fauci: Moderna's Phase 3 Covid-19 Vaccine Trial Of 30,000 Individuals Will Begin In July **Forbes**

- COVID-19 Convalescent Plasma Therapy is Safe, With 76% of Patients Improving **UT News**

- Social distancing and masks reduce risk of getting Covid-19, review finds **CNN**

Key Takeaways

Infection Control and Prevention:

In this article there are key recommendations for health care facilities on: Universal Source Control, managing individuals entering the healthcare facility, patient placement, engineering controls and environmental controls.

Diagnosis and Testing:

Wastewater surveillance reported to detect Covid-19 cases about 1 week before formal identification and could be used as an early warning system for Covid-19 outbreaks, to identify infection hotspots, and to evaluate when it is safe to reduce restrictions.

Treatment and Therapies:

A vaccine candidate for COVID-19 has been identified by researchers from the Oxford Vaccine Group and Oxford's Jenner Institute. A chimpanzee adenovirus vaccine vector (ChAdOx1) was chosen asthe most suitable vaccine technology for a SARS-CoV-2 vaccine. It can generate a strong immune response from one dose without causing an ongoing infection in the vaccinated individual. Phase II and Phase III of the clinical trials will be taking place across multiple clinical research sites in UK in May and June.

Training of Healthcare Professionals:

The Ventilator Training Alliance (VTA) app is a new resource for medical professionals that provides a multi-vendor library of training and product materials for medical professionals. Created through a partnership between leading ventilator manufacturers and Allego, Inc., the app provides free mobile access to how-to videos, product manuals, and reference guides for ventilator equipment that is critical to treating patients suffering from respiratory distress.

Exit Strategies:

What lessons can be learned from countries that have reopened? Examples of reopening strategies and plans in various countries are presented, some which have shown success, and others that have faced issues and challenges.

Infection Control and Prevention

Infection Control and Prevention for Patients with Confirmed or Suspected COVID-19 in Health Care Facilities

Mode of transmission:

Current data suggest person-to-person transmission primarily happens via respiratory droplets produced when an infected person speaks, coughs, or sneezes. Droplets can land in the mouths, noses, or eyes of people who are nearby or possibly be inhaled into the lungs of those within close proximity. Transmission may also occur through contact with contaminated surfaces followed by self-delivery to the eyes, nose, or mouth. Airborne transmission from person-to-person over long distances is unlikely. Recent data has confirmed that individuals with COVID-19 frequently do not report typical symptoms (i.e. fever or respiratory symptoms) and some remain asymptomatic. Unrecognized asymptomatic and pre-symptomatic infections likely contribute to transmission in healthcare settings. Limiting transmission is an essential component of care in patients with suspected or documented COVID-19. In an early report of COVID-19 in 138 patients from China, it was estimated that 43 percent acquired infection in the hospital setting. In Washington State, suboptimal use of infection control procedures contributed to the spread of infection to 81 residents, 34 staff members, and 14 visitors in one long-term care facility

Source control which involves having the infected person wear a cloth face covering or facemask over their mouth and nose to contain their respiratory secretions, might help reduce the risk of transmission of SARS CoV-2 from both symptomatic and asymptomatic people.

Below are key concepts to direct healcare facilities in infection control:

Reduce Facility Risk	-Cancel elective procedures -Teleheath -Limit points of entry -Manage visitors -Screen everyone entering -Source control for everyone entering
Isolate symptomatic patients	-Well ventilated triage areas -Patients with confirmed or suspected COVID-19 placed in private rooms with closed door and WC. -AIIR for patients with COVID-19 undergoing aerosol generating procedures
Protect Health Care Workers	-Hand hygiene -Install barriers to limit contact with patients at triage -Isolate patients with COVID-19 -Limit number of staff providing care for COVID patients -Prioritize respirators (N95) for aerosol generating procedures

Recommendation for Health Care Facilities:
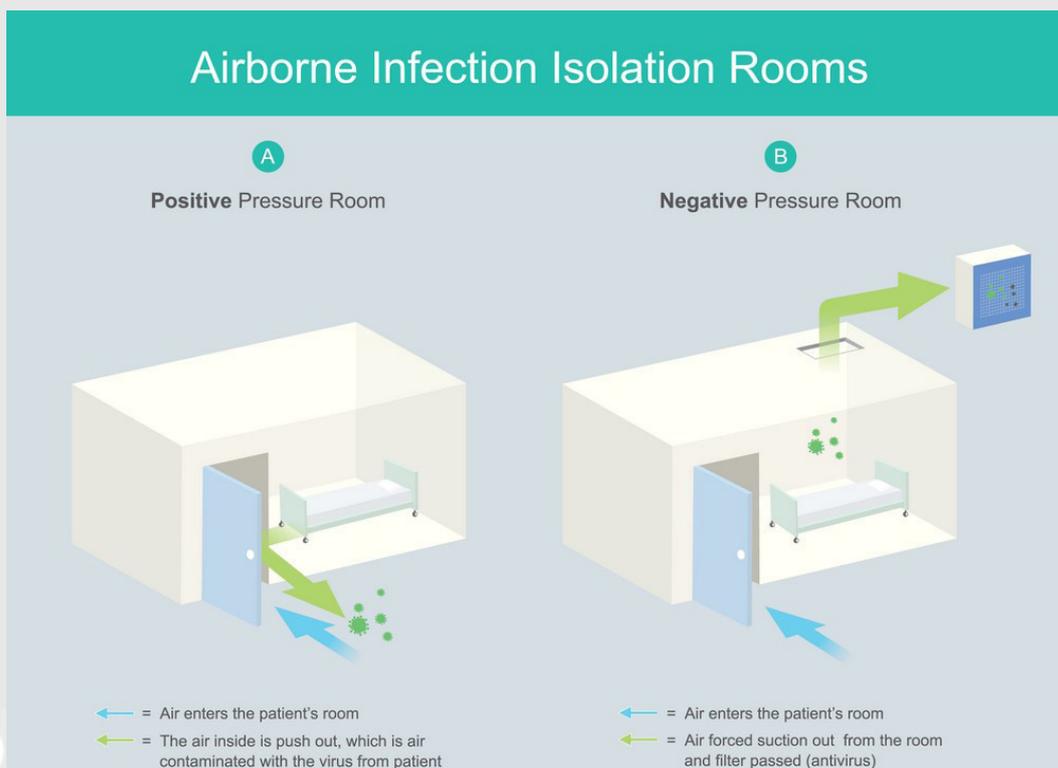
1. Universal Source Control:

Healthcare facilities should implement policies requiring everyone entering the facility to wear a cloth face covering (if tolerated) while in the building, regardless of symptoms. If the individual does not have a face cover, they should be offered a facemask or cloth face covering as supplies allow it.

2. Managing individuals entering the facility:

	Before Arrival	Upon Entry	During Visit
Patients and visitors	1. Instruct patients to call ahead of time. 2. Reschedule elective procedures and non-essential appointments. 3. Patients with signs and symptoms of COVID-19 can be managed from home through telemedicine and will not need to enter the health care setting 4. If patient has symptoms of COVID-19, and requests evaluation instruct patient to have a face cover before entering the facility 5. Limit ALL non-essential visitation.	1. Limit and monitor points of entry 2. Patients should be screened for clinical manifestations consistent with COVID-19 (e.g., fever, cough, myalgias, sore throat, dyspnea, anosmia/hyposmia) prior to entry into a health care facility. 3. All patients and any exempted visitors should be given face coverings upon entry into the health care setting (medical or cloth masks) for universal source control. They should wear the mask throughout their visit	1. Patients and visitors, regardless of symptoms, should put on a cloth face covering or facemask throughout their visit. 2. Take steps to ensure everyone adheres to respiratory hygiene and cough etiquette, hand hygiene 3. Ensure rapid, safe triage and isolation of patients with symptoms of suspected COVID-19 or other respiratory infection (e.g., fever, cough). 4. Patients should be seated 2 meters apart in waiting areas.
Healthcare Workers	1. Health care workers should monitor themselves for fever and symptoms of COVID-19 and stay home if they are ill. 2. Implement sick leave policies for HCW that are non-punitive, flexible, and consistent with public health guidance. 3. Return to work criteria for HCW with suspected or confirmed COVID-19 should be established	1. HCW should be screened for fever prior to entry into a health care facility. 2. All HCW should also wear a facemask while in the hospital setting.	1. All HCW should use standard, contact, and droplet precautions (i.e., gown, gloves, and medical mask), with eye or face protection when evaluating any patient with an undiagnosed respiratory infection, even those who are not under consideration for COVID-19. 2. HCP should perform hand hygiene before and after all patient contact, contact with potentially infectious material, and before putting on and after removing PPE, including gloves

3. Patient placement:

Patient	Room Placement
Patients with COVID-19 or other respiratory infections where hospitalization is not medically necessary	Home care Telemedicine
Patients with COVID-19 or suspected COVID-19 where hospitalization required	1. Single-occupancy room with a closed door and dedicated bathroom 2. Patients with confirmed COVID-19 should not be in a positive-pressure room. 3.Limit transportation of patient outside of the room: portable x-ray units, tests/procedure in the room
Patients with COVID-19 or suspected COVID-1 where aerosol-generating procedures / treatments are required	Airborne Infection Isolation Rooms (AIIRs): AIIRs are single-patient rooms at negative pressure relative to the surrounding areas, and with a minimum of 6 air changes per hour (12 air changes per hour are recommended for new construction or renovation).

Airborne Infection Isolation Rooms

A
Positive Pressure Room

B
Negative Pressure Room

= Air enters the patient's room
= The air inside is push out, which is air contaminated with the virus from patient

= Air enters the patient's room
= Air forced suction out from the room and filter passed (antivirus)

What is aerosol-generating procedures / treatments?

Although there is no consensus as to what constitutes an aerosol-generating procedure, in patients with COVID-19, these procedures typically include:
- Bronchoscopy (including mini bronchoalveolar lavage)
- Cardiopulmonary resuscitation
- Colonoscopy
- Filter changes on the ventilator
- High-flow oxygen
- Manual ventilation before intubation
- Nasal endoscopy
- Noninvasive ventilation
- Open suctioning of airways
- Tracheal intubation and extubation
- Tracheotomy
- Upper endoscopy (including transesophageal echocardiogram)
- Swallowing evaluation

(IMPORTANT: Nasopharyngeal or oropharyngeal specimen collection is not considered an aerosol-generating procedure that warrants an airborne infection isolation room)

4. Implement engineering Controls:

1. Install physical barriers (e.g., glass or plastic windows) at reception areas to limit close contact between triage personnel and potentially infectious patients.

2. Physical barriers or partitions to guide patients through triage areas.

3. Curtains between patients in shared areas.

4. Air-handling systems (with appropriate directionality, filtration, exchange rate, etc.) that are properly installed and maintained.

5. Designating an area at the facility (e.g., an ancillary building or temporary structure) or identifying a location in the area to be a "respiratory virus evaluation center" where patients with fever or symptoms of COVID-19 can seek evaluation and care.

5. Implement Environmental controls:

To help reduce the spread of COVID-19, environmental infection control procedures should be implemented. The importance of environmental disinfection was illustrated in a study from Singapore, in which viral RNA was detected on nearly all surfaces tested (handles, light switches, bed and handrails, interior doors and windows, toilet bowl, sink basin) in the airborne infection isolation room of a patient with symptomatic mild COVID-19 prior to routine cleaning. Viral RNA was not detected on similar surfaces in the rooms of two other symptomatic patients following routine cleaning (with sodium dichloroisocyanurate).

Recommendations:

1. Routine cleaning and disinfection procedures are appropriate for SARS-CoV-2. Products approved by the Environmental Protection Agency (EPA) for emerging viral pathogens should be used. FULL LIST

2. Enhanced environmental cleaning and disinfection protocols may be implemented for rooms used by patients with known or suspected COVID-19, and for areas used by health care workers caring for such patients, to prevent secondary transmission. As an example, adjunctive disinfection methods, such as UV light and hydrogen peroxide vapor, are used in some facilities to disinfect the rooms that have housed or been used for aerosol-generating procedures on patients with COVID-19.

3. Environmental services workers who are cleaning areas potentially contaminated with SARS-CoV-2 should be trained to conduct the cleaning in appropriate PPE:
- N95 respirators (or facemask with face shield)
- Goggles
- Gown

4. Dedicated medical equipment should be used when caring for patients with known or suspected COVID-19.

Diagnosis and Testing

Wastewater surveillance as an early warning system for Coronavirus case resurgence

More than a dozen research groups world-wide have adopted Wastewater Based Epidemiology (WBE) as a tool to estimate the total number of infections in a community when individual testing is limited[1]. Additionally, wastewater surveillance can be utilized as an early warning system to identify coronavirus outbreaks in communities or facilities, reportedly up to a week before a case is formally identified. A third application for this community-based testing method is to minimize unnecessarily long stay-at-home orders that place stress on both humans and economies. Monitoring the levels of coronavirus found in wastewater would allow us to evaluate when it is safe to reopen businesses, areas, or facilities[2]. While additional research is needed to accurately quantify cases, wastewater testing can already detect changes in prevalence[3]. Although the technique still needs to be refined, countries are not waiting for every question to be answered: Finland, Germany, and the Netherlands have already launched national wastewater surveillance programs to capture any new outbreaks or a resurgence in cases. "People are already starting to scale this up" an engineer from University California Berkeley told the Academies' Water Science and Technology Board in a wastewater testing panel held last week[4].

Several labs have demonstrated the ability to successfully detect Coronavirus genetic material in wastewater

The efficacy of WBE has been previously proven for enteric viruses such as norovirus, hepatitis A and poliovirus. Recent key studies in this field have reported successful molecular identification of SARS-CoV-2 in wastewater samples in the United States (Wu et al., 2020), Netherlands (Medema et al., 2020), France (Moulin et al., 2020), Australia (Ahmad et al., 2020) and Italy (La Rosa et al., 2020)[5]. In the United States, a national panel discussion was held last Wednesday to determine what additional research or collaborations are needed to further refine the technique and develop a standard best practice protocol. Hosted by the National Academies' Water Science and Technology Board, the panel concluded that by the end of this week they will have developed a quality control test essential for rolling out a nation-

1. Mallapaty S. How sewage could reveal true scale of coronavirus outbreak. Nature. 2020;580(7802):176 177. doi:10.1038/d41586-020-00973-x

2. Christian G. Daughton, Wastewater surveillance for population-wide Covid-19: The present and future, Science of The Total Environment, Volume 736, 2020, 139631, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2020.139631.

3. W. Ahmed, N. Angel, J. Edson, K. Bibby, A. Bivins, J.W. O'Brien, et al. First confirmed detection of SARS-CoV-2 in untreated wastewater in Australia: a proof of concept for the wastewater surveillance of COVID-19 in the community Sci. Total Environ., 728 (2020), Article 138764

4. Sharon Begley, Wastewater testing gains traction as a Covid-19 early warning system https://www.statnews.com/2020/05/28/wastewater-testing-gains-support-as-covid19-early-warning/

5. W. Ahmed, N. Angel, J. Edson, K. Bibby, A. Bivins, J.W. O'Brien, et al. First confirmed detection of SARS-CoV-2 in untreated wastewater in Australia: a proof of concept for the wastewater surveillance of COVID-19 in the community Sci. Total Environ., 728 (2020), Article 138764

wide effort to analyze wastewater for coronavirus. Until then, US based wastewater surveillance company, Biobot is working with 400 water facilities in 42 states to examine the potential of mass testing at a faction of the cost of clinical testing using WBE.

Studies suggest sewage surveillance data correlated with number of positive cases and can identify an outbreak about a week before the first positive case is identified.

Policies to implement or remove public health measures and restrictions depend on timely information on outbreak dynamics in a community[6]. Diagnostic tools offering early identification of cases are essential when early implementation of social distancing measures is currently accepted as the best method for infection control. A recent study by researchers at Columbia University estimated 61% of cases could have been avoided nationwide if social distancing measures had been implemented just 1-2 weeks earlier, as well as 55% reduction in reported deaths[7]. Coronavirus material levels detected in sewage water has been reported to be highly correlated with hospital admissions or positive cases in corresponding areas[8]. Another study in Paris also confirmed this correlation between increases in viral material found in wastewater and the identified Covid-19 cases in the region. Once Paris imposed a lockdown, coronavirus prevalence in sewage water decreased in correspondence with a decrease in official cases in the region. Most significant perhaps, is the finding that viral genomes were detectable before the beginning of exponential growth of the epidemic[9]. Studies in the US and the Netherlands have demonstrated that a signal can be identified about a week before the first clinical case. A researcher from the Harvard T.H. Chan School of Public Health has stated that so far regarding ``small studies in the Boston area, the data has "correlated very nicely with the arrival of Covid-19 into different communities" and that "significant amounts of viral material" were found in Boston Sewage weeks before the first cases were recorded in March[10]. This can be attributed to the ability of WBE to identify both symptomatic and asymptomatic carriers before they are identified by random testing[11].

6. Peccia and Omer et al., SARS-COV-2 RNA concentrations in primary municipal sewage sludge as a leading indicator of COVID-19 outbreak dynamics. medRxiv 2020.05.19.20105999; doi:

7. Pei et al., Differential Effects of Intervention Timing on COVID-19 Spread in the United States

8. Peccia and Omer et al., SARS-COV-2 RNA concentrations in primary municipal sewage sludge as a leading indicator of COVID-19 outbreak

9. Moulin et al., Evaluation of lockdown impact on SARS-CoV-2 dynamics through viral genome quantification in Paris wastewaters. medRxiv 2020.04.12.20062679; doi: https://doi.org/10.1101/2020.04.12.20062679

10. Sharon Begley, Wastewater testing gains traction as a Covid-19 early warning system https://www.statnews.com/2020/05/28/wastewater-testing-gains-support-as-covid19-early-warning/

11. Christian G. Daughton, Wastewater surveillance for population-wide Covid-19: The present and future, Science of The Total Environment, Volume 736, 2020, 139631, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2020.139631.

Despite limitations, WBE can be initiated immediately for non-invasive mass surveillance as a solution to limitations in testing and to provide real-time data to policy makers.

According to a recent Johns Hopkins study, a swab test will miss 67 out of 100 infected people if the test is given four days after infection, 20 out of 100 eight days after infection, and 38 out of 100 positive cases will be missed on the first day of experiencing symptoms[12]. Additionally, testing at its current capacity is still insufficient to provide the data needed to safely reopen schools and workplaces, which would require regular testing every few days to monitor for case resurgence. Since testing is costly and currently in limited supply, WBE could help inform which areas need testing the most, making for smarter, more targeted testing strategies. Monitoring targets could include schools, universities, public housing, hospitals, prisons, naval vessels, airports and shopping malls. In addition, confined areas or sub-populations with limited healthcare education or access such as migrant workers. A nation-wide WBE monitoring system could be used to generate a map, showing patterns and clusters where infections are spreading or subsiding[13]. While WBE is still not accurate enough to detect and quantify and exact number of cases present in a sewage sample it can detect changes in the level of viral material[14]. Biobot has been able to identify a difference between 10 and 100 cases reportedly, however they are still working on more precise estimates. Another factor still being studied is identifying the optimal sampling location within a water treatment facility. Early studies indicate the sludge line as the most ideal location, at the separation between liquids and solids[15]. Despite these limitations many water utility centers have already begun their own independent monitoring or via collaboration with research projects. For example, the Southern Nevada Water authority in the United States found high levels of SARS-CoV-2 genetic material in samples taken around March 9 which correlates with when the state had its first confirmed case. Hampton Roads Sanitation District in Virginia has been sampling since March 11 to look at trends and has indicated the cost to do so was about 140,000 USD for an extractor and PCR machine and 100 dollars per sample, and the Water Research Foundation will analyze these findings and release guidelines for nation-wide implementation by this fall, they hope[16].

12. Kucirka et al., Variation in False-Negative Rate of Reverse Transcriptase Polymerase Chain Reaction–Based SARS-CoV-2 Tests by Time Since Exposure. Annals of Internal Medicine 0 0:0

13. Christian G. Daughton, Wastewater surveillance for population-wide Covid-19: The present and future, Science of The Total Environment, Volume 736, 2020, 139631, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2020.139631.

14. Christian G. Daughton, Wastewater surveillance for population-wide Covid-19: The present and future, Science of The Total Environment, Volume 736, 2020, 139631, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2020.139631.

15. Balboa et al., The fate of SARS-CoV-2 in wastewater treatment plants points out the sludge line as a suitable spot for incident monitoring. medRxiv 2020.05.25.20112706; doi: https://doi.org/10.1101/2020.05.25.20112706

16. Sharon Begley, Wastewater testing gains traction as a Covid-19 early warning system https://www.statnews.com/2020/05/28/wastewater-testing-gains-support-as-covid19-early-warning/

Key Takeaways for policy makers:

1. As a conclusion, this review suggests that quantitative monitoring of SARS-CoV-2 genetic material in wastewaters would bring important additional information for an improved survey of SARS-CoV-2 circulation at the local or regional scale.

2. Studies suggest sewage surveillance data correlated with number of positive cases and can identify an outbreak about a week before the first positive case is identified.

3. While best practice guidelines are still in development many countries have already begun to implement WBE to utilize the information it can provide on changes in prevalence in the meantime.
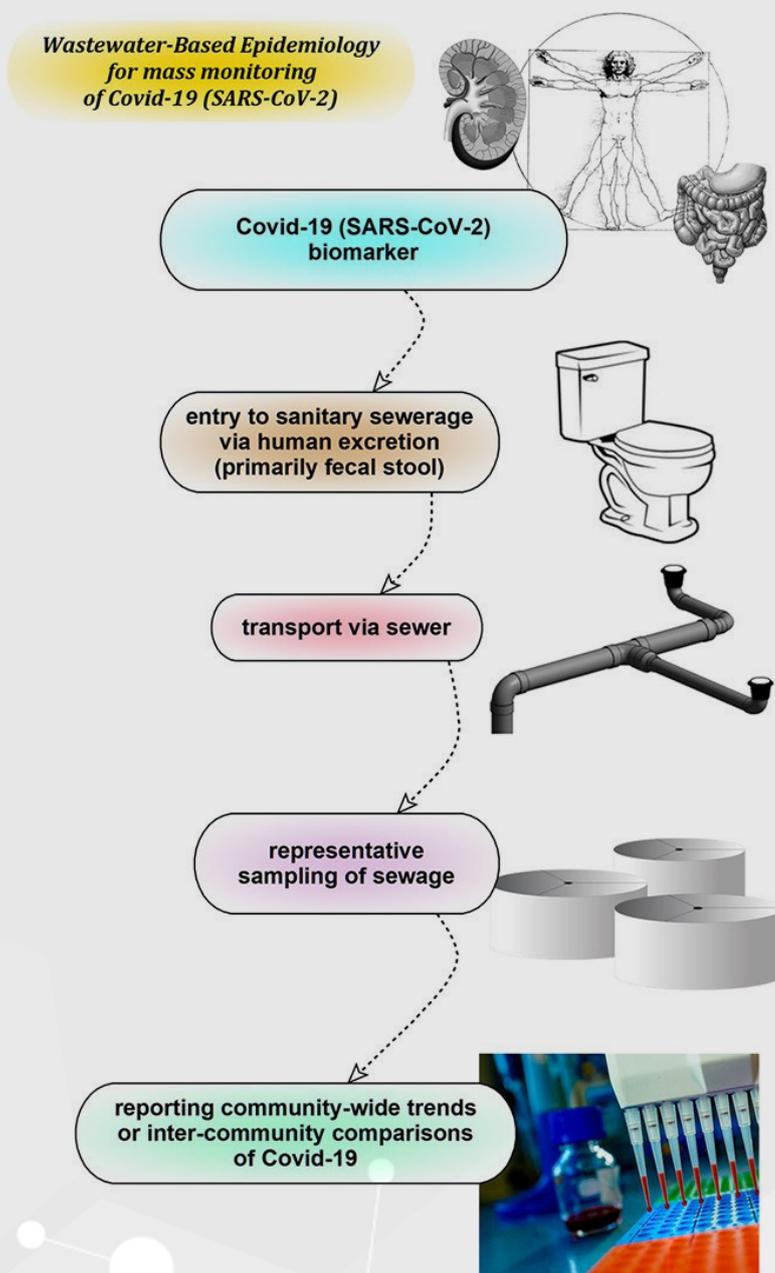
Wastewater-Based Epidemiology for mass monitoring of Covid-19 (SARS-CoV-2)

Covid-19 (SARS-CoV-2) biomarker

entry to sanitary sewerage via human excretion (primarily fecal stool)

transport via sewer

representative sampling of sewage

reporting community-wide trends or inter-community comparisons of Covid-19

*Figure 1. Wastewater Based Epidemiology for mass monitoring of Covid-19.*

Christian G. Daughton, Wastewater surveillance for population-wide Covid-19: The present and future, Science of The Total Environment, Volume 736, 2020, 139631, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2020.139631.

Treatment and Therapy: Vaccines

The coronavirus has spread across the globe with speed and ferocity, reaching almost every country on the planet. The world has been sent into lockdown in an attempt to flatten the curve and prevent health care systems from being overwhelmed, that's why scientists and researchers are turning their attention to: Development of treatments and vaccines.

Developing new vaccines takes time, and they must be rigorously tested and confirmed safe via clinical trials before they can be routinely used in humans. The National Institute of Allergy and Infectious Diseases in the US 1, has frequently stated that a vaccine is at least a year to 18 months away. In developing a vaccine that targets SARS-CoV-2, scientists are looking at spike proteins or "S" proteins which project on the virus surface. These projections enable the virus to enter human cells where it can replicate, and research suggests they could be a viable antigen in any coronavirus vaccine.

COVID-19 Oxford Vaccine Trial
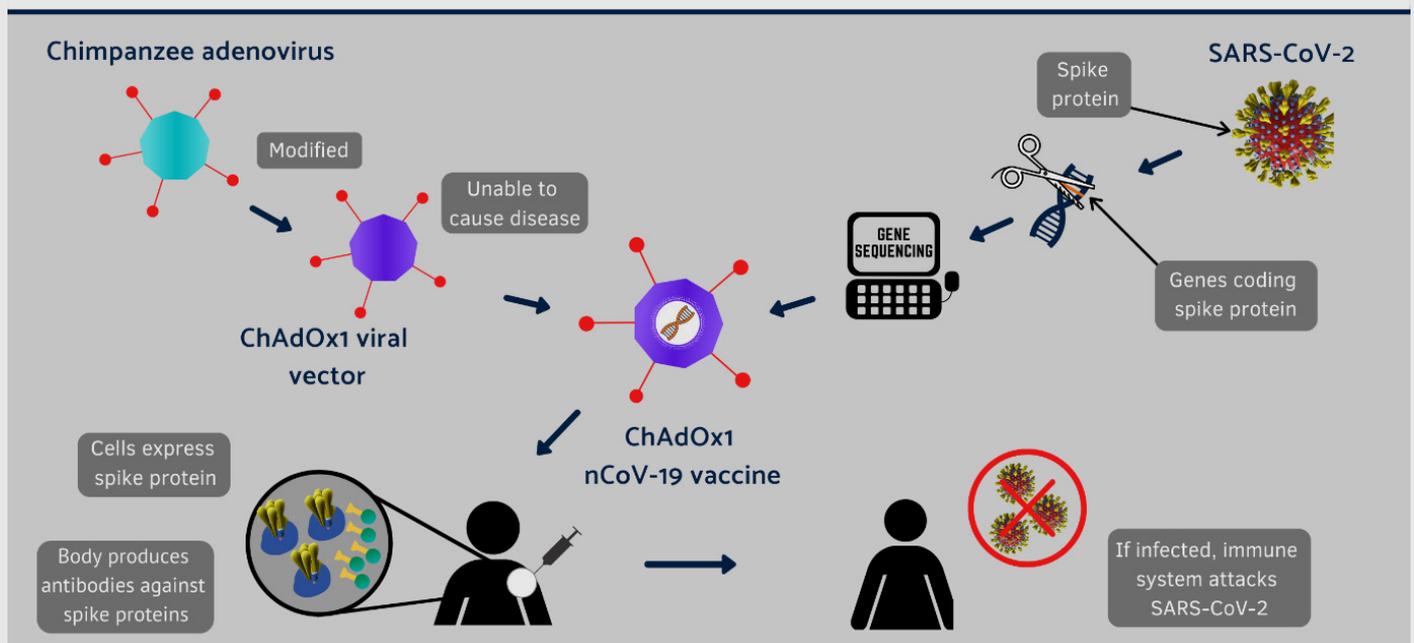
COVID-19 Oxford Vaccine trial

A vaccine candidate for COVID-19 has been identified by researchers from the Oxford Vaccine Group and Oxford's Jenner Institute. A team in Oxford started designing a vaccine on Saturday 10th January 2020. A chimpanzee adenovirus vaccine vector (ChAdOx1), developed at Oxford's Jenner Institute, was chosen as the most suitable vaccine technology for a SARS-CoV-2 vaccine as it can generate a strong immune response from one dose and it is not a replicating virus, so it cannot cause an ongoing infection in the vaccinated individual. This also makes it safer to give to children, the elderly and anyone with a pre-existing condition such as diabetes. Chimpanzee adenoviral vectors are a very well-studied vaccine type, having been used safely in thousands of subjects, from 1 week to 90 years of age, in vaccines targeting over 10 different diseases.[2]
The Oxford vaccine contains the genetic sequence of the surface spike protein inside the ChAdOx1 construct. After vaccination, the surface spike protein of the coronavirus is produced, which primes the immune system to attack the coronavirus if it later infects the body.

The **phase I** trial in healthy adult volunteers began in April 2020. More than 1,000 immunisations have been completed and follow-up is currently ongoing.
The next study will enrol up to 10,260 adults and children and will involve a number of partner institutions across the UK. [2]

The **phase II** part of the study involves expanding the age range of people the vaccine is assessed in, to include a small number of older adults and children:
• Aged between 5-12 years
• Aged 56-69
• Aged over 70

For these groups, researchers will be assessing the immune response to the vaccine in people of different ages, to find out if there is variation in how well the immune system responds in older people or children.

The **phase III** part of the study involves assessing how the vaccine works in a large number of people over the age of 18. This group will assess how well the vaccine works to prevent people from becoming infected and unwell with COVID-19.
Adult participants in both the Phase II and Phase III groups will be randomised to receive one or two doses of either the ChAdOx1 nCoV-19 vaccine or a licensed vaccine (MenACWY) that will be used as a 'control' for comparison.[2]

How will the trial work?

The main focus of the study is to find out if this vaccine is going to work against COVID-19, if it won't cause unacceptable side effects and if it induces good immune responses. The dose used in this trial was chosen based on previous experiences with other ChAdOx1 based vaccines. Study participants will not know whether they have received the ChAdOx1 nCoV-19 vaccine until the end of the trial.

To recruit the large number of participants needed for this trial, multiple clinical research sites across the UK are involved in delivering the study. This is a collaborative effort led by the University of Oxford. Vaccinations will be taking place across the sites in May and June.

What about after the vaccination?

Some participants will be given an E-diary to record any symptoms experienced for 7 days after receiving the vaccine and if they feel unwell for the following 3 weeks. There is also a weekly survey that participants will be asked to complete about any household exposure to COVID-19.

In order to monitor exposure to COVID-19 in people who do not have symptoms, participants in some areas will be asked to collect swabs at home to be sent to the laboratory for testing.

Following vaccination, participants will attend a series of short follow-up visits. During these visits, the team will check participants' observations, take a blood sample and review the completed E-diary and questionnaire. These blood samples will be used to assess the immune response to the vaccine.

If participants develop COVID-19 symptoms during the study, they can contact a member of the clinical team, and they will assess them to check whether they have become infected with the virus. If a participant was very unwell, the trial team would call their colleagues in the hospital and ask them to review the volunteer if appropriate.

When will the results be available?

To assess whether the vaccine works to protect from COVID-19, the statisticians in the team will compare the number of infections in the control group with the number of infections in the vaccinated group. For this purpose, it is necessary for a small number of study participants to develop COVID-19. How quickly the numbers required is reached will depend on the levels of virus transmission in the community. If transmission remains high, they may get enough data in a couple of months to see if the vaccine works, but if transmission levels drop, this could take up to 6 months. Recruitment of those who have a higher chance of being exposed to the SARS-CoV-2 virus is being prioritised, such as frontline healthcare workers, frontline support staff and public-facing key workers, in an effort to capture the efficacy data as quickly as possible.

What if it doesn't work?

A significant proportion of vaccines that are tested in clinical trials don't work. If the team are unable to show that the vaccine is protective against the virus, they would review progress, examine alternative approaches, such as using different numbers of doses, and would potentially stop the programme.

1.   **www.nih.gov**
2.   **www.ovg.ox.ac.uk**

Training of Healthcare Professionals

When Industry Comes Together to Fill in a Training Gap: The Ventilator Training Alliance (VTA)

The Ventilator Training Alliance provides a library of training and product resources for medical professionals. Created through a partnership between ventilator manufacturers, including Dräger, GE Healthcare, Getinge, Hamilton Medical, Medtronic, Nihon Kohden, Philips, and other manufacturers and powered by Allego. The central knowledge hub provides free mobile access to video tutorials, instruction manuals, and other training materials for equipment that is critical to help clinicians treat patients suffering from COVID-19 related respiratory distress.

"In nearly 20 years in medical devices, I have never seen competitors come together for something that's so completely altruistic. This is an inspiring effort for the sake of mankind and to help our health care heroes on the frontlines."- Pat Berges, VTA chair and VP of commercial capabilities at Medtronic

The VTA set to addresses two main challenges that affect every hospital globally:

1. Educate end-users on the influx of new ventilator models rapidly entering the market.

2. Provide comprehensive resources for end-users who may be newly assigned to respiratory care and those that are experienced but need training on how to operate different types of ventilator models.

Within 48 hours of launching, the app saw more than 10,000 downloads in over 100 countries.
The app sorts information by manufacturer and model. It includes instructional videos, troubleshooting guides, and user manuals. More manufacturers are joining the alliance and adding their material to the app on an ongoing basis. The app targets clinicians with different needs: community hospitals and academic medical centers, respiratory specialists and repurposed clinicians, hospitals at surge capacity, and hospitals not at full capacity. The goal is to have a platform that allows a wide variety of users to access materials quickly and get information on best practices.

Advantages of the Ventilator Training Alliance (VTA) app:

1. Benefit a wide range of hospitals currently experiencing surges in COVID-19 cases, or in preparation for a surge, or training future staff.

2. It provides easy, fast, and immediate access to guidance on ventilator use (regardless of the clinician's background).

3. Clinicians can access information on a mobile or web browser device click here.

4. Video and instructional manuals are provided. All videos have transcripts that can be viewed as close captions or full transcripts. Additional links to resources are also provided.

5. The app is multilingual.

6. Resources may be downloaded for offline use.

7. Easy search for specific ventilators using pictures of particular machines or searching by product name and manufacturer.

8. It provides opportunities for self-assessment using multiple-choice-questions.

9. The content of the app is continually being updated.

Potential drawbacks and considerations:

1. The app does not currently include training for non-invasive ventilators.

2. The content of the app is not standardized across manufacturers. Some manufactures may have more digital content than others or use different formats for learning.

3. The app has a variety of content geared for different skill levels. Hospital leaders should account for the varying time it takes staff to reach proficiency.

Below are the links to the VTA resource:

VTA app link
VTA desktop access

Exit Strategies

Lessons Learned from Reopening Strategies and Plans

As most countries have started lessening restrictions, and reducing lockdown measures, there are valuable lessons that can be learned from countries that have well advanced into the implementation of their exit strategies. Countries that have successfully reopened their economies have ensured that scientific evidence and real-time data, as well as a thorough risk assessment, have been key in controlling the current state of infection, and a potential second surge[1]. Their goal has been to ensure that transmission is controllable due to the low level of incidence, and that the healthcare and testing capacities are capable and well equipped to handle new cases[2]. There is an emphasis for establishing contact tracing mechanisms to complement the testing efforts, either through the adoption of technology or through the traditional routes, to further evidence based decision and policy making.

What lessons can be learned from countries that have reopened? The following are examples of countries and their reopening plans, some which have shown success, and others that have faced issues and challenges. The lessons learned from these examples can potentially be used by other countries in driving their reopening strategies, especially in driving decisions and setting policies[2].

- **China[3]:** After slowly opening up its economy in April, China has continued to see a share decline in the number of cases. The following are some of the measures that were taken to ensure that the number of infections continued to drop, while allowing for opportunities to revitalize their economy:

  o   Health Codes and Travel Cards: Individuals in China were assigned a health code based on their residence, identification and whether they exhibit any symptoms of COVID-19. Through the use of big data, these codes were used to help locate at risk populations, especially within the public domain.

  o   Transport of Laborers: Due to the large labor force in China, workers were transported directly from their homes to their workplaces, with designated buses that followed specific routes. Buses were filled at half capacity, to allow for social distancing, including an isolation row, for

1. https://foreignpolicy.com/2020/05/09/coronavirus-pandemic-reopening-economy-life-after-lockdown/;
https://www.healthline.com/health-news/covid-19-countries-that-have-already-reopened-lessons;
https://theconversation.com/exit-from-coronavirus-lockdowns-lessons-from-6-countries-136223
2. https://www.americanprogress.org/issues/security/news/2020/05/06/484652/international-lessons-learned-coronavirus-reopenings/
3. ttps://www.bloombergquint.com/coronavirus-outbreak/covid-19-learnings-from-china-on-reopening-the-economy

anyone that might start showing symptoms (i.e. fever).

o   **Special Measures in Manufacturing Companies:** China's manufacturing industries are the country's leading economic driver; thus the safe reopening of these production facilities was essential to boost the economy again. Special measures were taken and instituted. For example, in Zhengzhou, workers were clustered in groups of 20, and these individuals ate, slept, traveled and worked together to reduce transmission risks. Infrared cameras were used to track body temperature of factory workers in real time.

o   **Contact Tracing:** Using research and scientific data, it was shown that in China, the 23-44 years old age group were most prone to transmission, placing their families and communities at risk. Through the use of digital tracing, transmission hot spots were identified for this specific age group, and social distancing norms, strictly enforced.
Case Studies

o   **Different Reopening Plans in Each City:** Based on the population demographics, social settings, and other factors, the reopening of businesses, especially policies and restrictions enforced, were tailored to fit the nature and context of the city.

o   **Collaborations Nationally for Contact Tracing and Testing:** The cooperation of several governmental agencies is key for the implementation of a national testing and tracing plan. The scientists (primarily epidemiologists) worked on organizing and tracing close contacts, while community leaders, security agencies, transportation agencies, as well as communication departments cooperated with the epidemiologist to track, trace and isolate individuals. Information was readily stored and accessible to all.

o   **Private Investment for R&D:** China, similarly to Europe and the US, have facilitated Corporate Social Responsibility investment in public health and public health research to focus on the development of therapeutics, diagnostics, artificial intelligence for big data analysis, telemedicine, and other potential innovative solutions to address challenges, as a result of the pandemic.

•   **New Zealand[4]:** The country's population of 4.8 million and the sparsity of the population naturally provides social distancing needed to hinder the virus's ability to spread. However, the country also took some rapid measures to further mitigate the impact of the disease.

o   **Early lockdown measures:** School and business closures were implemented immediately after over a 100 cases were reported in New

4. https://www.businessinsider.com/how-new-zealand-beat-coronavirus-testing-tracing-trust-in-government-2020-5

Zealand, including travel restrictions.

o   Public Compliance: Citizen mobility and activity dropped as lockdown measures were implemented, leading to the leveling off of cases, just 10 days after lockdown measures were in place.

o   Testing and Tracing: Besides testing of its population, the country adopted a tracing application, called NZ Covid Tracer[5], which uses QR codes at various locations. Once a person test positive, contact tracers will track and trace that individual, and will decide on alerting individuals or venues that might be at risk.

o   Open, transparent communication with the Public: Good communication by the Prime Minister during a challenging time was key and allowed for public buy-in and compliance to measure that were put in place. In addition, Scientific expertise was at the forefront of policy making process, which provided to be key in mitigating the pandemic and preventing further infections.

•   **Germany[6]:** In March, the number of infections in Germany had started to rise and politicians decided to halt public life, including closing of schools, businesses and country's borders. Social distancing measures were in place, although people were allowed to buy groceries and take a walk, and the healthcare system increased the number of intensive care beds and quadrupled its testing capacity[2].

On May 6th, the country decided to ease the lockdown restrictions in place, with the condition that if the number of new cases rises above 50 in 100,000 inhabitants across seven days in an area, then restrictions must be reinstated[7]. Experts in the country disagreed on this approach, as the toll of the economy was taken into consideration.
Schools have also reopened in Germany[8]. Social distancing and PPE measures are in place, including hallways being one way avenues, masks being worn, seats assigned and spaced apart, opening of windows to improve air circulation and keeping a 6-foot distance between students when standing in line.

•   **Iran[9]:** Very early on, Iran was the epicenter of the pandemic in the Middle East. When Iran started reopening at the end of April, contrary to the opinion of public health experts, social distancing measures were not enforced, as commuters packed public transportation and shopping bazars. Furthermore, worshipers resumed communal prayer at mosques,

5. https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-novel-coronavirus-resources-and-tools/nz-covid-tracer-app

6. https://www.businessinsider.com/coronavirus-germany-reopening-low-deaths-testing-lockdown-2020-5

7. https://www.bloomberg.com/news/articles/2020-05-08/germany-s-new-coronavirus-cases-rise-the-most-in-a-week

8. https://www.vox.com/21270817/coronavirus-schools-reopen-germany-vietnam-new-zealand

9. https://www.nytimes.com/2020/05/18/world/middleeast/iran-coronavirus-surge.html

as a part of the Ramadan rituals.

As predicted by health experts, the result of the lack of proper PPE and social distancing measures led to a surge of new infections three weeks later. Khuzestan, home to the country's oil and petrochemical industries, showed a 300% increase in the number of cases since the area reopened. Other provinces, such as Isfahan, East Azerbaijan, Khorasan, Lorestan, and Sistan Baluchestan, also have been impacted by during numbers of new infections.

• **South Korea**[10,11]**:** Since its reopening, the role of contact tracing and tracking of individuals in South Korea has played a tremendous role in ensuring that a resurgence does not occur. Similar to Hong Kong, South Korea has largely succeeded in reopening and preventing a second surge of infections by implementing three measures: widespread testing, tracking (sharing data with the public on the location of infections) and tracing, including following up with infected people and their contacts.

The use of digital contact tracing applications, as well the use of other surveillance measures, including CCTV cameras, have helped officials in the country, keep track of those infected, as well as notifications to those living with or in proximity to that individual, including notifications of their whereabouts. As a result of the MERS outbreak in 2015, Korea passed the Infectious Disease Control and Prevention Act, which establishes the authority and duty of the Ministry of Health to collect and share location-tracking data of infected individuals, based on the severity of the outbreak[12]. Despite the data privacy implications that some countries would say sways the balance between privacy and public good, in South Korea, the policy decision to use surveillance and data associated with it to track and trace individuals, in this form, has made all the difference in keeping infection rates down[10].

These measures allowed the country to manage the number of infections, between January 19th and February 18th, where South Korea had confirmed a total of 31 cases, most linked to travel to China. However, new cases peaked on February 29th, when the country reported 813 new cases, bringing the total to 3,150, according to WHO data.11 By March 10th, the total number of cases doubled.
As a result, the government immediately rolled out an aggressive testing regime that processed tests for more than 259,000 people and confirmed more than 8,000 infections by mid-March[11]. In comparison, at that same time, the United States, had tested roughly 22,000 people[5]. Testing

10. https://www.cnbc.com/2020/05/07/coronavirus-lessons-learned-in-asia-show-us-is-at-risk-of-a-resurge-in-cases-as-states-reopen-businesses.html

11. Flattening the curve on COVID-19: How Korea responded to a pandemic using ICT (Source: ROK Ministry of Economy and Finance).
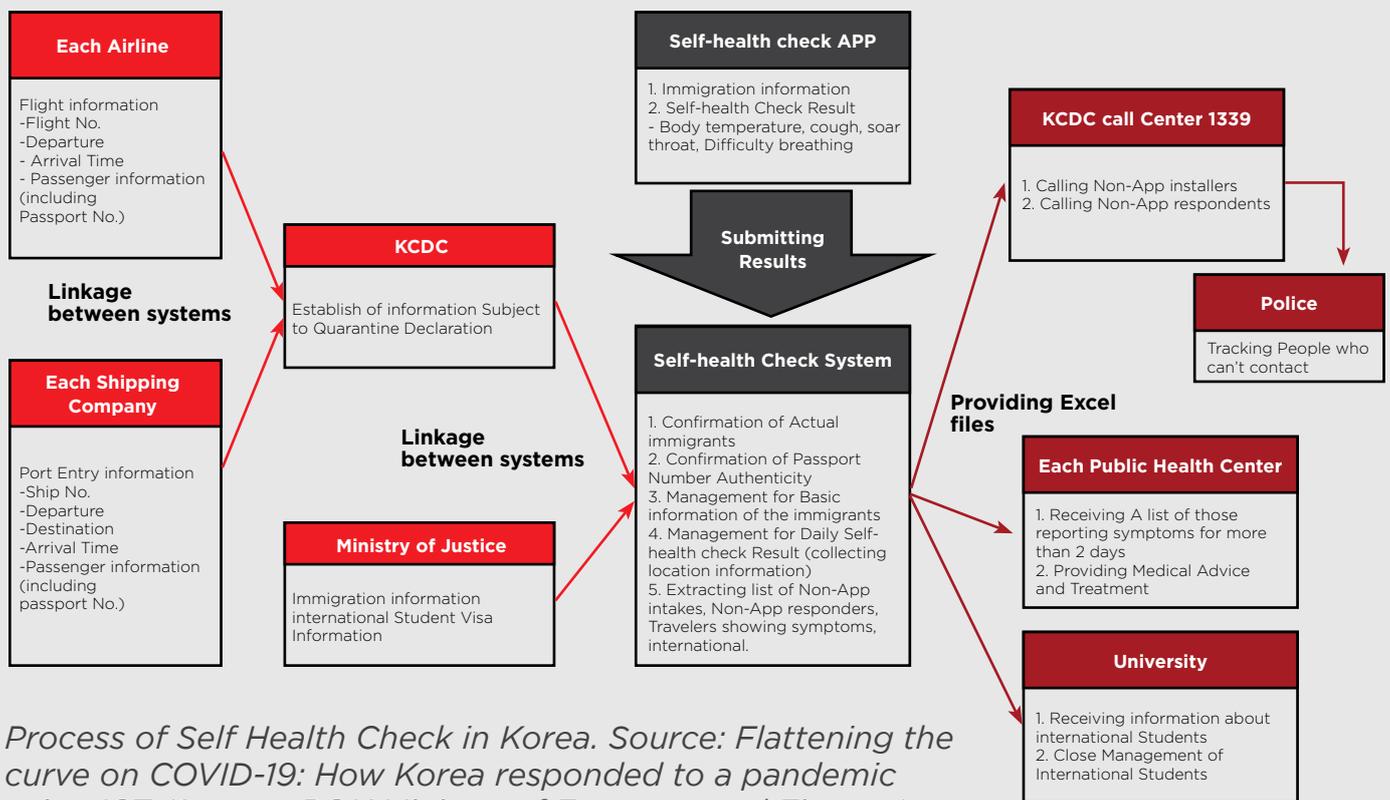
12. COVID-19 National Emergency Response Center, Epidemiology & Case Management Team, Korea Centers for Disease Control & Prevention. Contact Transmission of COVID-19 in South Korea: Novel Investigation Techniques for Tracing Contacts. Osong Public Health Res Perspect. 2020;11(1):60 63. doi:10.24171/j.phrp.2020.11.1.09

facilities were established, and the increase in testing, along with tracing and isolation, led to plateauing of the number of cases to 100 cases per day, for much of the remainder of March and April. On April 15th the country led its parliamentary elections, with the highest turnout of a national election since 1992. On May 6th, the country reported just two cases[11].

The key to success in Korea emphasizes the importance and vital role of Information and Communications Technology (ICT) for testing, tracking, tracing and surveillance, as well as for the dissemination of key emergency information to the public.
Examples of ICT initiatives that helped Korea combat COVID-19 are[11]:

o   **For Social Distancing:** The Korean government used CBS (cellular broadcasting service) to transmit text messages as an effective tool to keep the population alert on disaster response. The Korean government also developed a website to provide solutions for remote working and education through local companies. Telemedicine was also enforced to avoid increasing infections in vulnerable facilities including medical institutions and nursing homes.

o   **Testing and ICT:** Emergency use authorization was granted to companies in South Korea to produce the testing supplies needed, including RT-PCR reagents. The role of artificial intelligence (AI) also provided support for researchers and healthcare workers in the diagnosis and screening of patients, as well as in establishing testing stations with minimal human contact.

o   **Tracing and ICT:** The introduction of mobile applications for self-diagnosis to monitor symptoms of inbound travelers, as well as the Self-quarantine Safety Application to effectively support the monitoring of those under self-quarantine were key in tracking of individuals, but also provided resources for individuals to monitor their conditions and conduct self-diagnosis.

o   **ICT and Treatment:** The use of AI for drug discovery has been a key emphasis in discovering potentially new treatments towards COVID 19.

o   **ICT and Flattening the Curve:** The use of ICT is pertinent in capturing information and data and communicating these on websites and central databases for access provides an efficient way to manage data and information, and the dissemination of quick, accurate and reliable information to policymakers and the public. Access to this information for

Each Airline

Flight information
-Flight No.
-Departure
- Arrival Time
- Passenger information (including Passport No.)

Linkage between systems

Each Shipping Company

Port Entry information
-Ship No.
-Departure
-Destination
-Arrival Time
-Passenger information (including passport No.)

KCDC

Establish of information Subject to Quarantine Declaration

Linkage between systems

Ministry of Justice

Immigration information international Student Visa Information

Self-health check APP

1. Immigration information
2. Self-health Check Result
- Body temperature, cough, soar throat, Difficulty breathing

Submitting Results

Self-health Check System

1. Confirmation of Actual immigrants
2. Confirmation of Passport Number Authenticity
3. Management for Basic information of the immigrants
4. Management for Daily Self-health check Result (collecting location information)
5. Extracting list of Non-App intakes, Non-App responders, Travelers showing symptoms, international.

KCDC call Center 1339

1. Calling Non-App installers
2. Calling Non-App respondents

Police

Tracking People who can't contact

Providing Excel files

Each Public Health Center

1. Receiving A list of those reporting symptoms for more than 2 days
2. Providing Medical Advice and Treatment

University

1. Receiving information about international Students
2. Close Management of International Students

Process of Self Health Check in Korea. Source: Flattening the curve on COVID-19: How Korea responded to a pandemic using ICT (Source: ROK Ministry of Economy and Finance).

the public to visualize is key in ensuring their compliance, another vital aspect to reducing the impact of the pandemic.

- **Singapore[11]:** At first, Singapore seemed to have the outbreak under control in February, after the first case was detected late January. The country relied on contact tracing and isolation measures for dealing with the infections, and although the borders to travelers from high risk countries were closed, businesses remained open. By the end of March, the country had reported 879 confirmed cases and three deaths[13].

However, in April, Singapore was hit by as surge of infections, and by April 10th, the number of confirmed infections had doubled, and has continued to do so since[14]. The issue was in the fact that Singapore's response overlooked a crucial and large segment of the population: the hundreds of thousands of migrant workers (low-wage labor), who live in dormitories. There was a discrepancy in the daily new case counts: new case counts were relatively low in the general population, but there were hundreds of new cases in the isolation wards that were created for the thousands of migrant workers, unnoticed by many of the country's other residents and the government itself[14].

The case of Singapore and how it has handled the pandemic in relation to migrant works resonated among neighboring countries, such as

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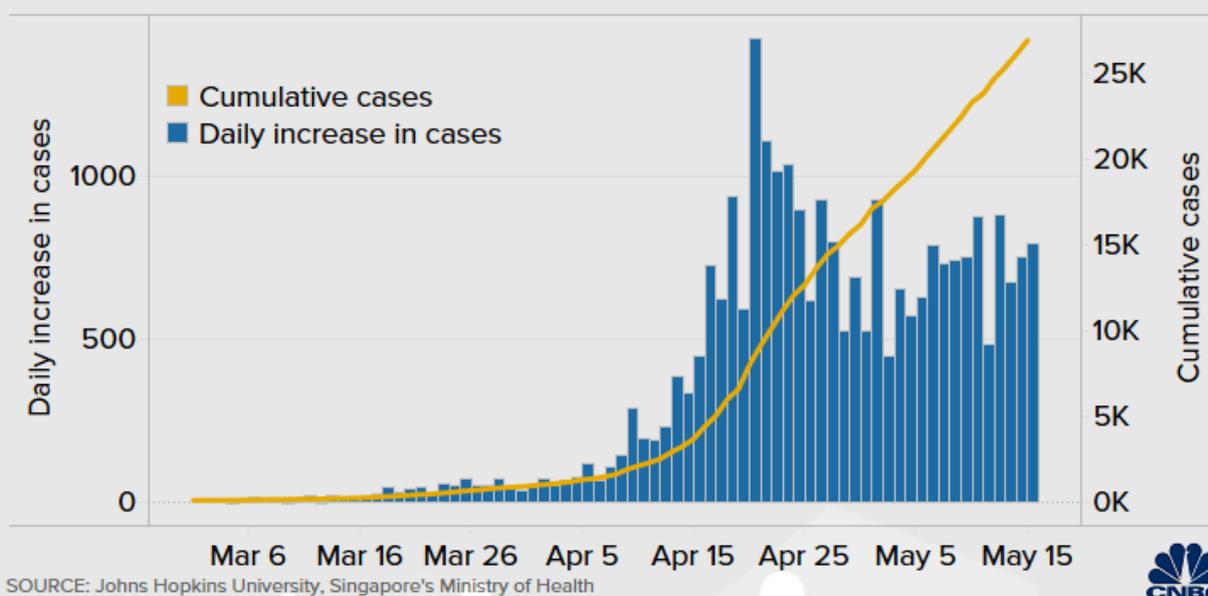13. https://www.nytimes.com/2020/04/20/world/asia/coronavirus-singapore.html
14. https://edition.cnn.com/2020/05/14/asia/singapore-migrant-worker-coronavirus-intl-hnk/index.html

Malaysia, which scrambled to test its large population of migrant workers[15]. Malaysians, like Singaporeans, heavily rely on the contributions of migrant workers, who work in factories, construction, and rubber and palm plantations. The living conditions of these workers are similar to Singapore, in that most live in large dorms or hostels sleeping 10 to 20 people to a room , at times, even more, with one bathroom[16]. In the GCC region, which is also heavily dependent upon blue collar labor from South Asia, Southeast Asia and Africa, a similar trend was also observed[17].

Policy Implications and Recommendations:

1. The challenge in reopening and lessening restrictions for governments and decision makers worldwide is striking the right balance between guarding public health and restarting their economies. As these challenging decisions and plans are made and developed, it is essential that at the forefront is the use of scientific data and evidence to drive policymaking.

2. Lessons and trends observed from countries that have reopened, especially those showing a resurgence in infections, highlight the importance and impact of a national testing strategy, which should be complemented with tracking and tracing. Adopting a unified Test-Isolate-Trace-quarantine (TITQ) Strategy is in the best of interest of the public and the economy[18].

3. Governments and decision makers need to be swift in reintroducing restrictions and measures, should a resurgence occur, such as the

Increase in coronavirus cases in Singapore

SOURCE: Johns Hopkins University, Singapore's Ministry of Health

CNBC

15. https://www.voanews.com/covid-19-pandemic/singapores-coronavirus-outbreak-sends-malaysia-scrambling-test-migrant-workers
16. https://www.voanews.com/covid-19-pandemic/singapores-coronavirus-outbreak-sends-malaysia-scrambling-test-migrant-workers
17. https://time.com/5825261/singapore-coronavirus-migrant-workers-inequality/
18. https://ncs-tf.ch/de/policy-briefs

introduction of widespread effective and efficient testing approaches, as was done in South Korea and Wuhan[11,19].

4. As countries reopen, it is important to consider all demographics of the society on how to best mitigate the impact of the pandemic, as well as prevent the number of new infections. This involves considering the socioeconomic factors of the various segments of the population, especially in countries with a high number of migrant workers, taking into consideration living and working conditions, as well as accessibility to healthcare resources and information. Measures and approaches for reopening the society might vary for each segment of the population but should be based on having holistic understanding for developing measures that will be effective in reducing transmission.

5. Effective leadership is key in ensuring public acceptance and compliance, critical components of ensuring a successful reopening strategy.

19. https://www.voanews.com/covid-19-pandemic/chinas-wuhan-tests-11-million-covid-19