OCT 2022 • VOL. 1 NO. 2 • WWW.NCID.SG/IDINTELLIGENCE • ISSN: 2972-3116

INFECTIOUS Disease Intelligence

Pandemic Health

PLUS

Contents

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Editor's Note

With public health concerns making the news headlines lately, NCID is working doubly hard to safeguard the health and wellbeing of our community. This issue's thematic focus is on "Pandemic Health" which requires a coordinated multisectoral approach to plan for urban health emergencies and respond to emergent threats, especially at the human-animal-environment interface. As a result of our changing infectious disease landscape, public health response using a multisectoral One Health approach to such outbreaks is rapidly gaining acceptance worldwide.

For our cover story, we have brought together three articles acknowledging how movements enable disease spread, as a timely reminder that we live in a world where national boundaries are becoming ever more porous from all our global trade and travel. Our first article is an account of multilateral cooperation against emerging infectious diseases. The second article is on how we can embrace SARS-CoV-2 endemicity with bio-surveillance – this is vital for early detection of unusual infectious disease events. Our third article highlights urban health emergency preparedness for super-spreading events and rapid outbreak response.

Being an international hub, Singapore is always at risk from emerging infectious diseases. We are "vulnerable" to the introduction of imported infections because of our position as a key transportation node, and "receptive" due to the presence of tropical vectors. Hence, vigilance remains key. Besides promoting community awareness, we are opening up new vistas in public health training and education.

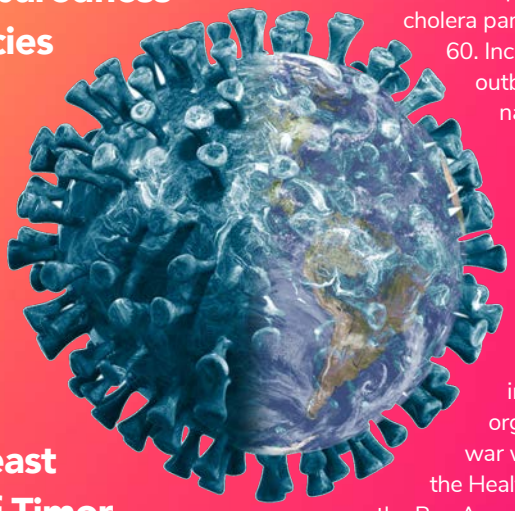
Thank you for all the suggestions and feedback we have received since the launch of Infectious Disease Intelligence. We appreciate all your comments and ideas, so please keep them coming!

Steven

Multilateral Cooperation *Against* Emerging Infectious Diseases

By **Assoc Prof Steven Ooi,**
Senior Consultant, Infectious Disease Research and Training Office,
National Centre for Infectious Diseases and
International TEPHINET Advisory Board Member

In an age of emerging infectious diseases (EIDs), preparedness for health emergencies in cities and urban settings must be a priority for all. The countries of East Asia include China, Japan, Mongolia, North Korea, South Korea, while Southeast Asia is composed of Timor-Leste and the 10 ASEAN states of Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam. A region of impressive diversity in many ways, it is also at risk of EIDs causing health emergencies with pandemic potential.[1,2]



A history of pandemic health

Multilateral cooperation in pandemics has its roots in the third cholera pandemic which swept across Europe from 1846-60. Incidentally, it was around this time that a cholera outbreak in London made famous one physician named John Snow who identified a town pump as contaminated and convinced officials to remove its handle to prevent people from drawing water there. The first international sanitary conference was held in France in July 1851 with the objective of harmonising and reducing costly maritime quarantine requirements among the nations. Cholera and plague became the first two diseases to be addressed in international conferences. Independent health organisations which co-existed after the first world war were the Office International d'Hygiene Publique, the Health Organization of the League of Nations, and the Pan American Sanitary Organization. In April 1945, at a United Nations conference, China and Brazil proposed that an international health organisation should be established and this brought about the birth of the World Health Organization (WHO).

WHO's World Health Assembly adopted the International Health Regulations (IHR) in 1969 to control six quarantinable diseases, namely plague, cholera, yellow fever, smallpox, typhus and relapsing fever. IHR was twice amended to reduce coverage to yellow fever, plague and cholera, and to mark the global eradication of smallpox. Shortcomings were apparent when cholera emerged in South America in 1991, plague in Surat, India in 1994, and Ebola in Kikwit, Democratic Republic of Congo in 1995.[3] These included a dependency on governments to notify, lack of internationally coordinated mechanisms to contain disease spread, and inability of WHO to ensure compliance. Revisions were called for in 1995, and reinforced by the SARS pandemic in

2003. A new IHR was adopted by the World Health Assembly on 23 May 2005 and came into effect on 15 June 2007.[4,5] This IHR(2005) is an international legal instrument that binds 196 countries, including 194 state parties. WHO is mandated under IHR(2005) to strengthen the global and regional systems and capacities in detecting, assessing and responding to all acute public health emergencies of international concern (also known as PHEIC). Despite delays in implementation, the importance of IHR(2005) was demonstrated in its first decade when WHO declared four events to be PHEIC – influenza A(H1N1) pandemic in 2009, spread of wild poliovirus in 2014, Ebola outbreaks in West Africa in 2014, and complicated Zika virus infections in 2016. WHO developed its Asia Pacific strategy for emerging diseases and public health emergencies to strengthen existing systems for surveillance, risk assessment, information sharing, preparedness and response.

Health emergency prepareness is key to dealing with EIDs in densely populated urban settings such as Singapore's

Regional cooperation and training

Regional capacity building is key to effective health emergency preparedness. In January 2022, ASEAN convened its global health security agenda consultative meeting on multi-sectoral workforce development at the sub-national level. ASEAN+3 countries engaged partners in a project on "Strengthening public health and animal health epidemiological capacity for emerging infectious diseases response" with the Canada Global Partnership programme, and another on "Enhancing regional field epidemiology training workforce capability to prevent, detect and respond to transboundary emerging infectious diseases" with the US Centers for Disease Control and Prevention. In addition, the region is blessed to have the multiple applied epidemiology networks:

- **ASEAN+3 [China, Japan, South Korea] Field Epidemiology Training Network (FETN)**
- **ASEAN Veterinary Epidemiology Group (AVEG)**
- **WHO Global Outbreak Alert and Response Network (GOARN)**
- **South Asia Field Epidemiology Training Network (SAFETYNET)**
- **Training in Epidemiology and Public Health Interventions Network (TEPHINET)**

At the beginning of the COVID-19 pandemic, regional countries formed a community of practice known as the FETN technical expert and advisory panel. To date, four expert meetings have been convened involving 17 experts from nine countries, with the last one on 9 March 2022. Despite considerable progress in disease control, EIDs continue to challenge public health systems and hotspots pepper the region.[1,2] Serious outbreaks can result in high mortality and morbidity, and enormous economic loss to the country. The COVID-19 pandemic experience has particularly underscored the impact of EIDs on human health and economic development.[6] While initial impact would be within the countries with weaker public health systems or inadequate resources, global health will ultimately be all at risk. Singapore serves as the representative for Western Pacific countries in TEPHINET and contributes in the One Health WHO-FAO-WOAH field epidemiology curriculum group. Singapore is also the current co-chair with Indonesia in SAFETYNET.

One example of multilateral cooperation is in regional response using a multi-sectoral One Health approach towards emerging disease outbreaks. Through regular joint AVEG-FETN conferences, public health and veterinary health professionals have come together on common issues since the first annual Joint Consultative AVEG–FETN Meeting was convened in 2019. The last joint video conference was held on 14 November 2021 while the fourth annual meeting was on 14–15 December 2021 to develop its five-year strategic framework of cooperation. In addition, a workshop on risk communications titled, "Lessons learned from the Covid-19 pandemic" was held on 17, 20 and 24 August 2021 for 50 participants from regional countries. Another regional workshop to provide training on One Health risk assessment was held on 19, 21 and 26 April 2022. These small steps all add up to promote sharing of epidemiological information with counterparts, contingency planning for outbreaks of EIDs, and health emergency preparedness.

International experts and partners conferring with each other on disease intelligence at risk management and global health meetings

Conclusion

The transmission potential of high urban density settings, coupled with travel frequency and novel epidemic occurrences all make cities at high-risk in pandemics. According to WHO, Disease X represents the knowledge that a serious international epidemic could be caused by a pathogen currently unknown to cause human disease. The emphasis on regional preparedness, alert and response can provide the mechanisms to promote the sharing of epidemiological information with counterparts, contingency planning for outbreaks of EIDs, and rapid epidemiological response.[7,8] Professionals with expertise ranging from public health to food safety, veterinary medicine, wildlife and the environment have to join forces in designing and implementing programmes, policies, legislation and research in which multiple sectors collaborate to achieve better public health outcomes. The test of Disease X is yet to come!

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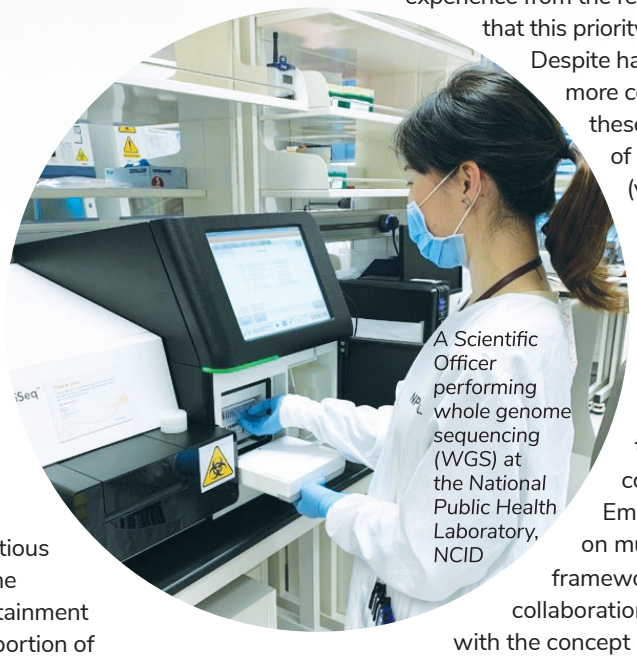
Embracing SARS-CoV-2 *Endemicity with* Bio-Surveillance

By **Asst Prof Vincent Pang,**
Global Health Institute Centre for Outbreak Preparedness,
Duke-NUS Medical School

A novel infectious agent, which has acquired the ability to infect humans especially from animal origins (zoonotic), may result in a surge of infected human cases over a specific period within a geographical area. This phenomenon is termed as epidemic (or pandemic when a large number of countries are affected globally). This is largely due to a lack of herd immunity within this highly susceptible population against the novel infectious agent. Over time, depending on the intensity and effectiveness of containment and mitigation strategies, the proportion of susceptible population will be reduced. Moreover, with the availability of a safe and efficacious vaccine, the proportion of this susceptible population will be further reduced, as herd immunity progressively increases.



A Scientific Officer performing whole genome sequencing (WGS) at the National Public Health Laboratory, NCID

Even though elimination or even eradication of any novel infectious agent remains to be a key public health priority,[1] experience from the recent SARS-CoV-2 pandemic shows that this priority may be elusive and ambitious at times. Despite having newer variants that are potentially more contagious, embracing endemicity with these variants, which are also progressively of poorer ability to cause disease (virulence), and deaths (pathogenicity) while circulating in a highly vaccinated population may be timely and well justifiable.[2] Endemicity, classically, is defined as a phase when the incidence of cases occurred over a period is relatively stable, but has a significantly lower trend (at least two-four times) of incidences as compared to the peak of the epidemic.[2] Embracing endemicity can be focused on multi-factorial using a One Health framework,[3] highlighting the importance of collaboration across multi-sectoral and disciplines with the concept of epidemiologic triad. Epidemiologic triad is defined as the dynamics of multiple systems focusing on three key factors namely, microbial agent, human population and environment that may explain the occurrence of a specific disease of interest. As we embrace endemicity with SARS-CoV-2, a One Health surveillance system will provide a targeted "sense and strike" platform to reduce the risk of large clusters or epidemic from emerging.

First, with mutating capability of a microbial agent especially RNA virus such as SARS-CoV-2, it has the ability of mutating its viral genome into different variants such as Delta and Omicron, with potentially different virulence and pathogenicity. In particular, laboratory-based WGS surveillance and indicator-based mandatory notifiable disease surveillance for SARS-CoV-2 will be critical among individuals with acute respiratory infections (ARI), especially among those who require intensive care admission or succumbed to the disease. This surveillance can "sense" the presence of an emerging variant that is potentially more virulent and pathogenic as we embrace endemicity.

Members of the public waiting for their turn to receive the COVID-19 vaccination at a community club in Singapore

Second, with the possibility of waning antibodies derived from either vaccine or natural infection,[4] or with lower vaccine effectiveness due to newer variants, the effective herd immunity in the human population which confers adequate protection against sporadic transmissions may diminish. With the availability of safe vaccine boosters, it serves as an excellent opportunity to embrace endemicity. However, with the prolonged need to maintain vaccine booster requirements, there is a possibility of poor compliance due to social and psychological fatigue among the community. This may increase the risk of transmission due to waning herd immunity over time. A regular seroprevalence surveillance among community cohorts will be useful to "sense" the risk of potential transmission in different age groups and occupational settings, to guide appropriate risk communication, vaccination and infection, prevention and control strategies and policies.

Third, as the SARS-CoV-2 virus can be transmitted via air-borne mode,[5] an enclosed area with poor airflow circulation and limited inflow of fresh air may predispose individuals to prolong exposure to infectious individuals, who may be asymptomatic if not actively screened with antigen rapid test or PCR test. This may result in the occurrence of a transmission. Therefore, settings that have vulnerable subpopulations who are susceptible to severe disease or large outbreaks such as nursing homes, childcare centres, dormitories, and prisons will need to closely monitor ventilation quality.[6] Moreover, it will be useful to build up air[7] or wastewater surveillance[8] to "sense" the risk of an active transmission for timely public health responses during endemicity.

Last, there are increasingly more evidence suggestive of animals and avians as potential reservoirs of SARS-CoV-2.[9] The co-existent relationship and space between animals, avians and humans are progressively closer, especially in a developed urban setting. Our closer co-existence within the same environment may call for regular surveillance of these animals and birds using a combination of nuclei-acid amplification, WGS and serological methods to assess the potential emerging risk of SARS-CoV-2 infection and transmission from humans to these animals and from animals to humans.

A robust One Health surveillance system during endemicity will never be complete without an information-sharing platform between countries regionally and globally under the World Health Organization's International Health Regulation framework.[10] This information sharing process, integrated with the ongoing systematic collection of data from the above-highlighted surveillance systems would provide adequate analysis and interpretation of the emerging threats due to SARS-CoV-2 as an early-warning system to guide, implement and evaluate the appropriate public health responses.

Despite the significant commitment and resources to build up good surveillance system, Sir Alexander Duncan Langmuir, the father of shoe leather epidemiology, once shared "Good surveillance does not necessarily ensure making the right decisions, but it reduces the chances of wrong ones."

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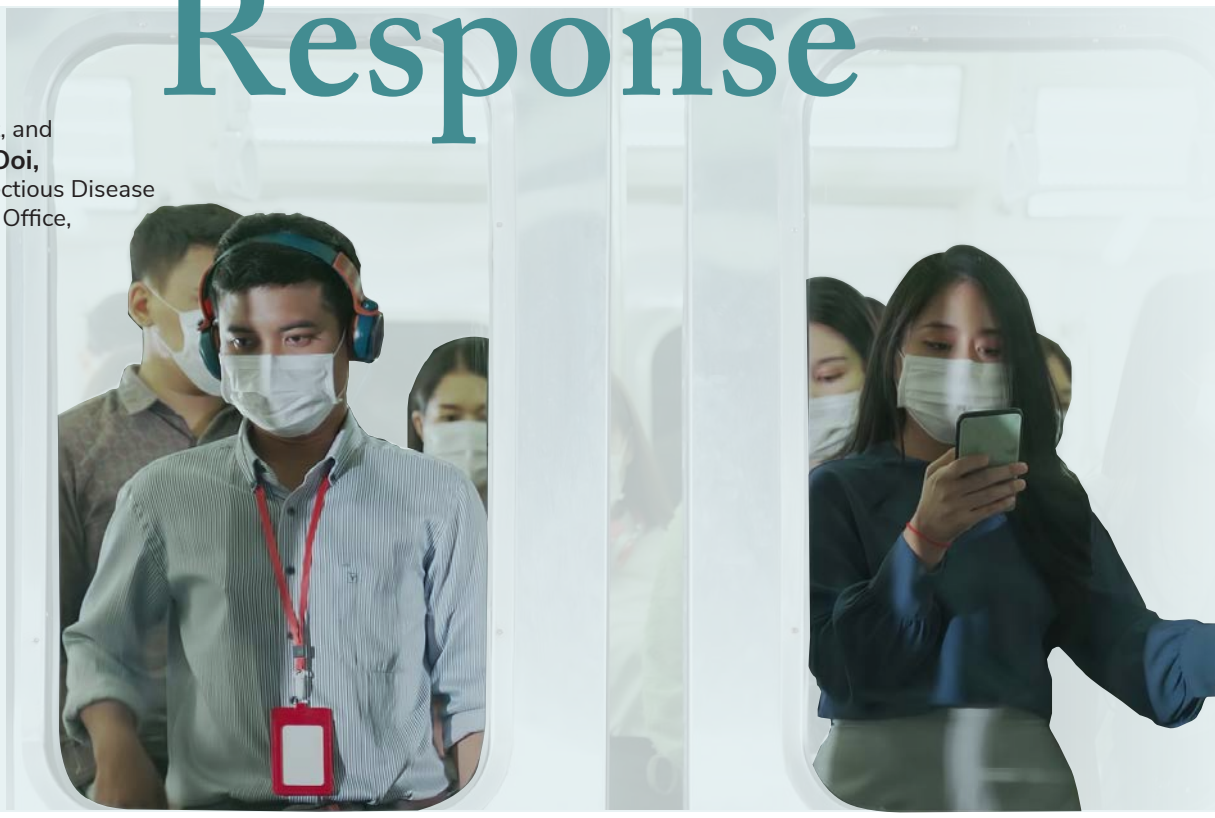
Urban Health Emergency Preparedness for

Superspreading Events and Rapid Outbreak Response

By **Dr Gao Qi,**
Senior Epidemiologist,
National Public Health
and Epidemiology Unit, and
Assoc Prof Steven Ooi,
Senior Consultant, Infectious Disease
Research and Training Office,
National Centre for
Infectious Diseases



The COVID-19 pandemic is at present still quickly evolving with continued emergence of new mutations that challenge scientists around the world. Amid growing concerns over the presence of SARS-CoV-2 variants, the World Health Organization (WHO) has added BA.4 and BA.5, "sister variants" of the original BA.1 Omicron variant to its list of variant monitoring. Therefore, the COVID-19 situation remains uncertain for many of us and recurrent waves of infection could happen in the future.

Superspreading events

During this COVID-19 pandemic, superspreading events resulting in disturbing mega-clusters of cases were reported worldwide. In general, a superspreading event refers to an event in which an infectious disease is spread to a larger number of individuals than usual. Some defined it as an event that one single individual infects many more people than an average person does at once, estimated by the basic reproduction number R0.[1] It is now well established that superspreading events are one of the main drivers of the COVID-19 pandemic and they play a key role in the initial stage of outbreaks.[2]

Some notable examples of COVID-19 superspreading events around the world involved a businessman who returned to Europe from a conference in Singapore and infected at least 11 other people at a ski chalet in the Alps, a biotech conference at a Boston hotel that was linked to more than 99 cases within 2 weeks, and an outbreak in South Korea where 92 patients were associated with a Zumba dance class comprising instructors, practitioners, their household members and other close contacts. In Singapore, a sharp rise in COVID-19 infections in migrant worker dormitories was identified in 2020 where an infected worker infected co-workers at a construction site. The latter in turn spread the disease to residents of dormitories or other congregations. In November 2021, a Norway company Christmas party became an Omicron superspreading event outside South Africa, leaving at least half of the 120 participants infected with the Omicron variant.

Superspreading events typically occur in close spaces, crowded places and close-contact settings such as pre-schools, schools, long-term care facilities, face-to-face events and meetings,

Rapid outbreak response in Singapore saw shopping malls implementing safe management measures like safe entry checks

religious gatherings, cruises, singing groups and so on. These settings are often ideal for disease to spread due to the difficulty in ensuring compliance with good personal hygiene and cough etiquette. Imported infections also form part of the landscape of this phenomenon. Therefore, rapid outbreak response is required to identify the causes and source of outbreak in order to implement timely control measures that will minimize or prevent further transmission in the community.

Rapid outbreak response

In Singapore, we adopt the One Health framework protocol as the risk management system for rapid outbreak response and emergencies preparedness. One Health is a collaborative interdisciplinary multi-sectoral approach to achieve optimal public health outcomes, recognising the interconnection between people, animals, plants and the environment.[3] In particular, One Health outbreak response involves multiple public health agencies such as the Ministry of Health (MOH), Singapore Food Agency (SFA), Public Utilities Board (PUB), National Parks Animal & Veterinary Service (NParks), and National Environmental Agency (NEA) working together to prevent and control acute threats at the human-animal-environment interface.

Such interagency collaborations have guided outbreak response in the past, such as human cases of *Plasmodium knowlesi* malaria infection that were acquired from local macaque population, food-borne outbreaks, and surveillance of novel influenza viruses like H5N1. With global transformations in politics, economics and culture, increasing connectivity and cosmopolitanism, our city is becoming very vulnerable to the threat of outbreaks. Health authorities today face multiple challenges, from emerging and re-emerging infections to the spread of antimicrobial drugs resistance, which all demand improvements to urban health security. These require disease intelligence efforts to minimize the impact of acute pandemic health events that can endanger the collective health of our community.

Singapore as a tropical city state experiences a unique convergence of circumstances that condition our disease control measures based on the local situation. For instance, Singaporeans like to eat out and are exposed to multiple risks ranging from contaminated food imports to insanitary practices at food establishments involving poor food and personal hygiene. The principal agencies for epidemic response are MOH which protects public health by minimizing disease transmission and SFA which ensures food safety by prompt recall of implicated food products from the market. The latter has an integrated food safety system which includes accreditation of countries and overseas export plants, import inspection as well as the regulation of farms, food factories, and retail food establishments. Hence, Singapore's One Health risk management system requires cross-disciplinary ongoing exchanges that must be integrated and analysed to provide early warnings and inform interventions. Partnerships with private sector stakeholders who can be actively engaged in surveillance, prevention and response measures are essential elements in this enterprise.

In summary, superspreading events remain a concern in pandemics and the urban health emergency response system requires expanding multi-sectoral collaborations and communications especially at the human-animal-environment interface to protect our population from emerging disease threats.

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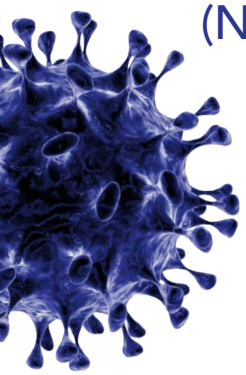
A Personal Recount of NPHL's Omicron Journey

By **Dr Constance Chen,**
Medical Officer (Trainee),
Department of Laboratory Medicine,
Tan Tock Seng Hospital

As part of my microbiology specialty training, I rotated to the National Public Health Laboratory (NPHL) at the National Centre for Infectious Diseases (NCID) and was fortunate to have participated in and observed their efforts against SARS-CoV-2, the biological agent of the COVID-19 disease.



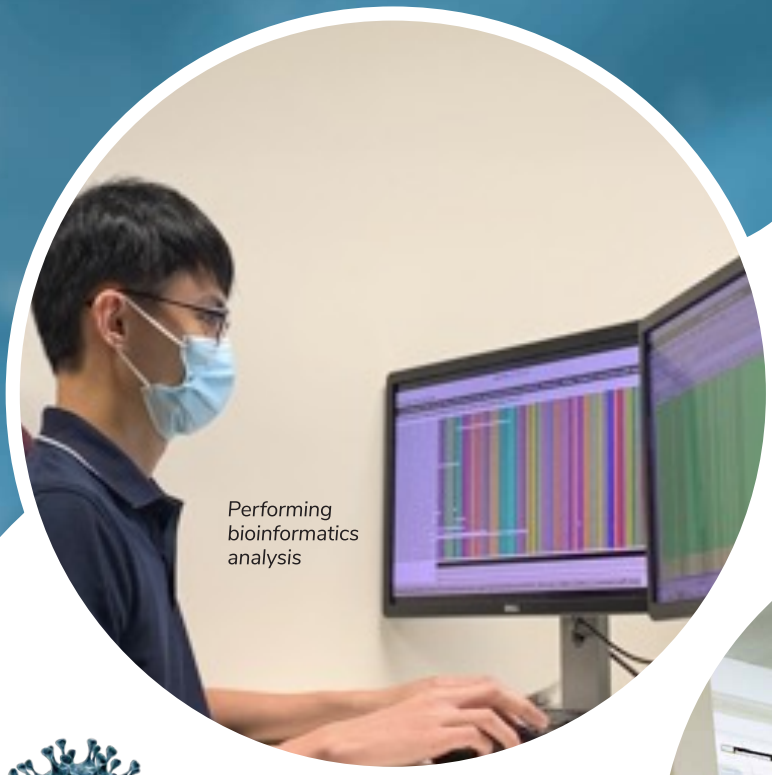
Loading a flow cell in preparation for sequencing of SARS-CoV-2

Whole genome sequencing for SARS-CoV-2

The World Health Organization (WHO) classified Omicron as a SARS-CoV-2 variant of concern on 26 November 2021.[1] Given the uncertainty of the Omicron variant at the initial stages, the Ministry of Health (MOH) adopted a risk containment approach. To align with the targeted measures, NPHL acted fast to establish a workflow for the Omicron variant despite being in the midst of transitioning back to business as usual. This involved a two-stage process – to screen SARS-CoV-2 detected samples using a diagnostic assay already available at NPHL for S-gene Target Failure (SGTF) and to confirm these samples using whole genome sequencing (WGS).

The timely collection and submission of SARS-CoV-2 detected samples from all diagnostic laboratories, both private and in public health institutions to NPHL were critical. Without coordination amongst MOH, testing operations, diagnostic laboratories and clinical teams, NPHL would not have been able to detect the first few imported and locally transmitted Omicron variant cases within 24 hours of testing positive for SARS-CoV-2. We confirmed the first two Omicron variant cases in Singapore on 6 December 2021.[2]

NPHL also optimized the WGS process that is required to confirm the SARS-CoV-2 Omicron variant during the initial stages. The existing sequencing method at NPHL has a turnaround time of three days, which would have delayed the update of the Omicron variant case numbers. An alternative sequencing method was set up within two days with the support of colleagues from NCID's Infectious Disease Research Laboratory,



Performing bioinformatics analysis

Processing of SARS-CoV-2 samples

Singapore General Hospital and A*STAR Bioinformatics Institute. This reduced the confirmation time to 3-6 hours.

Patients with COVID-19 Omicron infections were isolated at NCID in the initial stages when the variant was discovered in Singapore. Clinical data was collated to guide public health intervention, especially because the Omicron variant was relatively new. NPHL also took charge of generating the daily list of patients with confirmed COVID-19 Omicron infections. This information was passed on to the NCID clinical team and relevant agencies to aid with case investigations, contact tracing and case management.

Gradually, with sufficient clinical and laboratory data, MOH concluded that SGTF alone will suffice for categorisation of the Omicron variant. MOH also announced the adjusted approach for the Omicron variant on 26 December 2021,[3] exactly one month after WHO's initial announcement. NPHL has since re-focused its efforts in managing the Omicron variant detection. SARS-CoV-2 WGS is still being performed for sentinel surveillance, monitoring of all variants and epidemiological investigations. This also facilitates concurrent monitoring of the Omicron variant transmission in the community.

In reflection, NPHL's Omicron journey nicely demonstrated the collaborative spirit of diagnostic and public health laboratories, epidemiology units, clinical teams and academia. The speed with which new technology was adopted, capabilities built and workflows changed enabled real-time, evidence-based public health interventions. All laboratories, medical technologists and scientific officers have worked tirelessly behind the scenes, without which all these would not have been possible.

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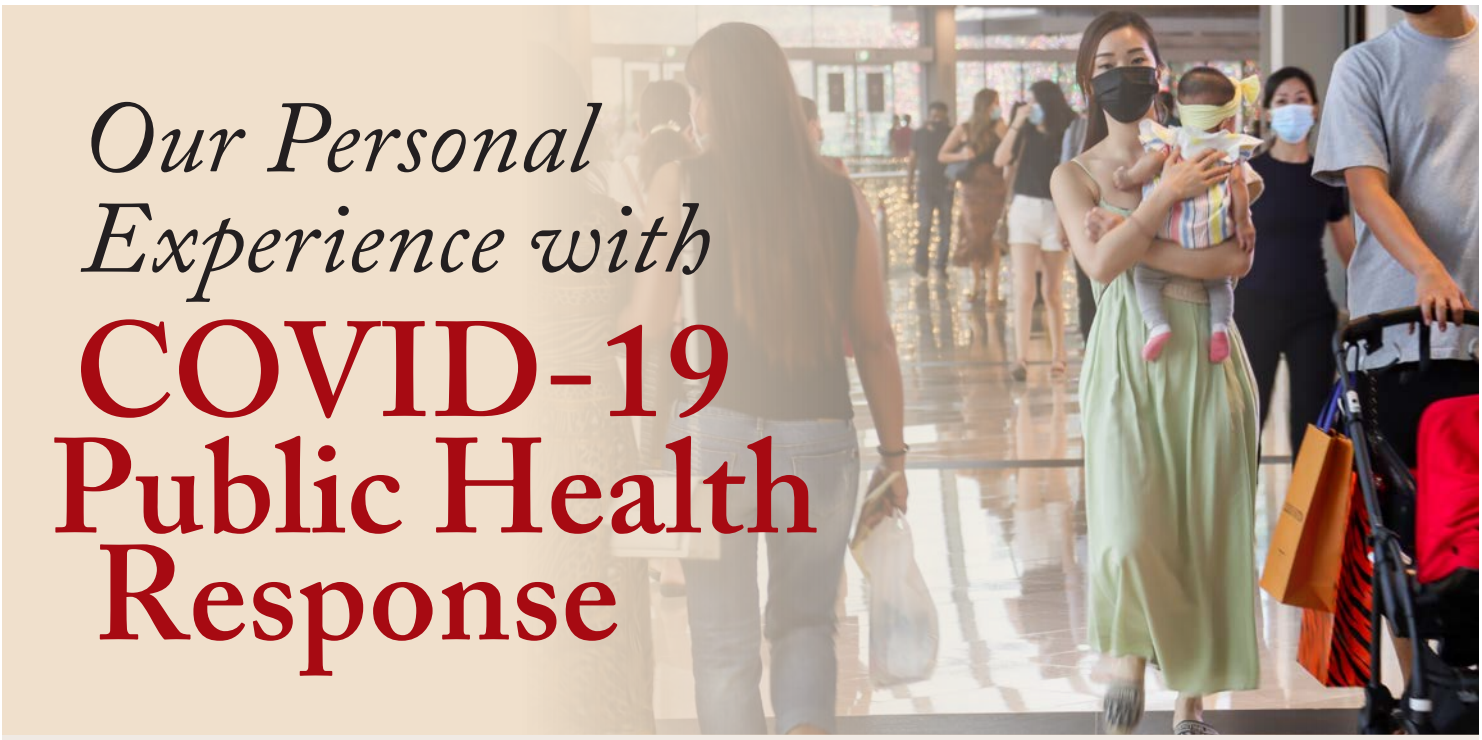

Our Personal Experience with COVID-19 Public Health Response

By **Runni Simm,**
Assistant Manager and
Jayson Teo, Senior Executive,
National Tuberculosis Programme,
National Centre for Infectious Diseases

When Singapore experienced its first surge of COVID-19 cases in 2020, it called for massive public health operations on an unprecedented scale. These operations involved areas like contact tracing, the conveyance of confirmed and suspect cases, the issuance of quarantine orders, monitoring of persons under quarantine and phone surveillance, border control, swab operations, disinfection of premises, the setting-up of facilities such as Government Quarantine Facilities, Swab Isolation Facilities, Community Care Facilities, and SHN-dedicated facilities. As we had a background in operations in the National Public Health and Epidemiology Unit and at the start of the COVID-19 outbreak in the NCID Operations Command Centre, we were posted to assist the Ministry of Health (MOH) in these efforts.

During our attachment, we worked alongside others to establish ground processes for activity mapping operations as well as communication lines with stakeholders. Our main objective was to ensure that the COVID-19 cases who were admitted to hospitals had comprehensive activity maps completed. The work was very fast-paced during the early stages of the pandemic as we frequently adapted to the rapidly changing situation with new understanding on the behaviour of the virus. Workflows were reviewed and disseminated quickly to the hospitals to ensure that ground processes were aligned with the policies that were adjusted frequently.

To facilitate our operations, an application was developed to streamline COVID-19 activity mapping. It served as a portal to carry out, track and store information on activity mapping. We organised the training on the use of this application and facilitated the creation of user accounts for the public hospitals. The application helped tremendously in assigning cases electronically to users and allowed users to input data directly into the portal when they interviewed patients.

Subsequently, we were deployed as Operations Leads to the team in MOH that did activity mapping and contact tracing to oversee its logistical needs and daily operations, providing inputs on the enhancement of IT systems used for contact tracing and activity mapping, reviewing of workflows, coordinating operations with external stakeholders and providing daily updates on contact tracing operations at multi-agency meetings.

The challenge we had juggling our routine duties with COVID-19 roles was certainly an energising experience, working with various teams from other organisations in such a fast-paced environment, with only one ultimate goal in mind – to protect the public from COVID-19 as best as we could. We gained deeper insights and broadened perspectives of the various aspects of public health work. With the challenges faced and struggles that we went through together, we forged new friendships and built stronger rapport with teammates from other organisations!

Wrap-up of World TB Day 2022

By **Kelly Foo,**
Assistant Director and
Dr Tay Jun Yang,
Associate Consultant,
National Tuberculosis Programme,
National Centre
for Infectious Diseases


TB Awareness talk with AWWA

Each year, on 24 March, we commemorate World Tuberculosis (TB) Day to raise awareness about the devastating health, social and economic consequences of TB. This date marks Dr Robert Koch's discovery of Mycobacterium tuberculosis, the bacterium that causes TB in 1882.

TB remains a global public health threat. The COVID-19 pandemic has slowed down the progress of providing TB services and reducing the burden of TB. The World Health Organization estimates that globally in 2020, 9.9 million people developed TB and 1.5 million people died of TB.

TB is endemic in Singapore. In 2021, the TB incidence rate among Singapore residents (Singaporeans and Permanent Residents) was 32.6 cases per 100,000 population, meaning there were 1,306 new cases of active TB among them. The TB mortality rate among Singapore residents is low, at 0.7 case per 100,000 population, with 28 deaths from TB in 2018. Despite the COVID-19 pandemic, the National TB Programme (NTBP) under the National Centre for Infectious Diseases (NCID) remained committed to its goal of detecting and treating TB locally by ensuring the continuity of TB-related services.

Community Engagements

To commemorate World TB Day 2022, NTBP worked with community partners to raise awareness about TB among the community through two talks entitled 'TB is Among Us'.

The first talk was organised in collaboration with AWWA, on World TB Day at AWWA's Active Ageing Centre, with participants attending both in-person and virtually. We spoke on the discovery and forms of TB, how TB gets transmitted, the common misconceptions of TB, management of TB in Singapore, symptoms of active TB, fun facts about TB, and preventive steps that one can take to safeguard his or her health from TB. The session included a Q&A segment and was attended by a total of 150 participants.

The other talk was held prior to World TB Day 2022, together with Sembawang West Constituency Office on 12 February. The talk was conducted via Facebook Live where Adjunct Assoc Prof Jeffery Cutter, Director, NTBP, NCID spoke on the aforementioned topics and addressed questions from online attendees. The event garnered a total of 406 participants' views.

Reflection of NTBP's experience planning and preparing for World TB Day 2022

The NTBP team decided to focus its efforts on community engagement to address misconceptions of TB. This was due to the commonly received feedback that TB is no longer present locally as Singapore is a developed country. Hence, infected individuals are often met with stigma and discrimination, and delays in diagnosis due to a lack of awareness of TB symptoms perpetuate onward transmission.

Due to COVID-19 safe management measures, a hybrid approach was chosen for the talk at AWWA. Off-site and on-site rehearsals were conducted prior to the event to ensure smooth execution of the programme on the actual day.

The participants were mainly elderly folks and their main spoken language is Mandarin. The meticulous preparation, which included translating the publicity poster and presentation slides into Mandarin, and the speakers' lively engagement with both physical and online participants were instrumental to the event's success.

TB Public Education Programmes

To continuously increase the awareness of TB, NTBP plans to work with relevant stakeholders to educate the community through media campaigns and community engagement programmes with a focus on these key messages – seek early treatment and diagnosis; contact tracing and the need to go for the screening; importance of adherence to TB treatment with support from family and employer being key for patients' recovery; and reduce stigma associated with TB.

Living with HIV in An Age of COVID-19

By **Dr Wong Chen Seong,**
Deputy Director and
Assoc Prof Sophia Archuleta,
Director, National HIV Programme,
National Centre for Infectious
Diseases

It has been more than two years since the COVID-19 pandemic started, and more than 30 years since the first case of HIV infection was reported in Singapore. Much has changed in the way we live our lives due to the effect of both these viruses, and many more changes are likely to come.

All evidence points towards COVID-19 becoming an endemic infection – which may have seasonal variations or mutate into variants from time to time. This means that the way in which we live our lives will be shaped by our response to COVID-19; and these changes have bearing on the way HIV is treated as well.

The global community, led by the United Nations HIV/AIDS Programme (UNAIDS), has developed an ambitious campaign to End AIDS by 2030.[1] Ending AIDS does not necessarily mean that we intend to eradicate the HIV virus in the same way that we have successfully eradicated the smallpox virus. Rather, we are working to end HIV as a major public health problem, by reducing the rate of new HIV infections globally to less than one per 1,000 population, as well as ensuring that as many people as possible who are infected are diagnosed, get started on effective HIV treatment, achieve an undetectable viral load and enjoy good health.[2]

It is easy to see how this goal bears similarities with our current move towards 'Living with COVID-19' – that is, COVID-19

HIV-related workshops are important avenues to educate and enlighten the public on HIV and to facilitate healthy, constructive conversations pertaining to it

endemicity. We are learning to live in a new reality where COVID-19 and HIV are ever-present. However, we should not become complacent or blasé about either, for they remain as infections that have the potential to be severe, and can significantly affect both the individual and the community. Instead, the goals of 'Ending HIV' and 'Living with COVID-19' both underline the importance of learning to co-exist with these diseases, and yet to never stop trying to overcome them.

In this "new world order", there are other ways in which COVID-19 and HIV are interrelated – particularly in the way we must learn to live with them.

Firstly, we must continue to capitalise on the leaps we have made in science and healthcare to reduce the risks posed by both HIV and COVID-19. These include the introduction of many evidence-based treatments for COVID-19 (including new drugs like remdesivir and a number of monoclonal antibodies, and familiar remedies such as steroids), which have greatly reduced the mortality from severe illness.[3] COVID-19 vaccines across various platforms have proven to greatly ameliorate the risk of becoming seriously ill or dying from infection, and regular boosters seem likely to be needed to provide ongoing protection. In essence, we have developed the necessary weaponry to fight this war in the long term.[4]

Similarly, we have at our disposal the means to reduce the impact HIV has on the health and wellbeing of individuals and populations alike. These include accurate testing technology, and highly effective antiretroviral drugs that can be used for the treatment and prevention of HIV infection. HIV-positive individuals who are adherent to regular HIV treatment will achieve an undetectable viral load in their bloodstream, which not only means that their immune systems remain strong and healthy, but they are also effectively incapable of transmitting the virus to their sexual partners – a phenomenon now known as 'Undetectable Equals Untransmittable', or U=U.[5] Certain HIV medications can also be used by HIV-negative individuals at risk of HIV infection to greatly reduce this risk, through a strategy known as pre-exposure prophylaxis or PrEP.[6] PrEP places the power of HIV prevention squarely in the hands of the person at risk, and in this way, is a great additional tool to our existing armamentarium of behavioural interventions to prevent HIV – the "ABCD" approach (namely **A**bstinence, **B**eing faithful to one's partner, the **C**orrect and consistent use of condoms, all of which require the co-operation and agreement of both partners to work; and the early **D**etection and treatment for viral suppression). [7]

Secondly, we must recognise that a major enemy in our war against both COVID-19 and HIV is not the viruses themselves, but rather, misinformation and stigma.

We have seen the effect of widely-peddled mistruths and fake news from the start of the COVID-19 pandemic. These have ranged from speculations about the source of the SARS-CoV-2 virus, to falsehoods about the safety and trustworthiness of vaccines (leading to slow uptake of lifesaving immunisation and sickness and death from taking dangerous, unproven medications).[8,9] If we are to eventually prevail over COVID-19, we must not neglect the war against misinformation. Efforts must be redoubled to publicly address them, and where they result in harm, then action must be taken against the perpetrators. Resources must also be directed towards public education so that the community as a whole is kept abreast of the rapidly advancing science. [10]

In parallel, HIV stigma has existed since the very beginning. This stigma stems from a lack of knowledge and misconceptions about HIV, including the fact that HIV cannot be easily transmitted through casual contact; and only affects certain sectors of society like sexual and gender minorities. Stigma leads to discrimination of people living with HIV, and is a major cause of poor quality of life and health outcomes. Studies have shown that anticipated and experienced HIV stigma is a major deterrent to seeking HIV testing and treatment for people who are most at risk of HIV infection, and is also a barrier to staying engaged in care.[11] If we are to realistically hope to end HIV by the end of this decade, we will have to work hard to increase HIV-related knowledge and fight HIV stigma, and build a more compassionate world for people living with HIV.

HIV self-testing kits allow individuals to screen for HIV in the privacy of their homes

Thirdly, we must rethink conventional attitudes towards healthcare and harness innovations that democratise health and give more responsibility and ownership to individuals in the fight against both COVID-19 and HIV.

We have already seen how effectively this works with COVID-19, particularly with the rapid development, rollout and adoption of home-based testing. The introduction of home testing has been, in general, smooth – and the acceptance of this testing strategy nearly universal. Home tests are now available for sale in retail pharmacies as well as online and via vending machines, allowing almost everyone to take control of their own health and wellbeing. Awareness of the importance of home testing has also grown rapidly, with public campaigns to educate the public on when, and how, to perform these tests. Through our experience with COVID-19, it has been shown that members of the public are able to perform diagnostic test procedures at home, and that self-testing can be an integral part of the health ecosystem – complementing facility-based testing in the diagnosis and management of diseases of public health importance. People who test positive are still able to access care and support where needed, and the risk of poor outcomes (such as emotional distress) from home-testing is low.

We should move quickly to replicate these gains in the realm of HIV testing. Singapore has done well in terms of achieving the second and third of the UNAIDS 90-90-90 goals – that is, getting 90% of those who are HIV-positive on medications, and achieving an undetectable viral load in 90% of those on treatment.[12] However, we have yet to achieve the all-important first 90: ensuring that at least 90% of those who are HIV-infected are aware of their diagnosis. In other words, we need to increase the rates of HIV testing. Studies done both locally and overseas have demonstrated that a major barrier to early and regular HIV testing is the need to get tested at healthcare or community-based facilities – even those that offer anonymous tests.[13] Some local studies have also shown that people who have either never tested for HIV, or seldom do so despite being at risk, would be more likely to get tested if they had the option of purchasing self-test kits to get tested in the privacy and convenience of their own homes.[14]
If we are to truly commit to 'Ending HIV' by 2030, we must increase HIV testing – and self-testing will be crucial on this front. As of 1 August 2022, the National HIV Programme has initiated a pilot programme for HIV self-testing together with community and professional partners (Action for AIDS Singapore (AfA) and the Department for Sexually Transmitted Infections Control Clinic (DSC)), with the aims of assessing the feasibility and acceptability of self-funded HIV home testing. The self-testing kits are available at the DSC and AfA at 31 Kelantan Lane, costing between $20 and $32 per kit.

As we progress towards the end of 2022, HIV remains as relevant as ever and we must take stock of how far we have come. More importantly, we must be prepared to put in the work needed to get to where we need to go: a world where both COVID-19 and HIV may still remain, but where we no longer live in fear of how they affect our lives.

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Human Immunodeficiency Virus (HIV)

WHO SHOULD NOTIFY
Laboratories

HOW TO NOTIFY
Submit MD131 Notification Form via CDLENS (http://www.cdlens.moh.gov.sg) or fax (6221 5528/38/67)

NOTIFIABLE DISEASE: YES

WHEN TO NOTIFY
Upon laboratory confirmation

NOTIFICATION TIME LINE
Within 72 hours

CAUSATIVE AGENT

Human immunodeficiency virus species, HIV-1 and HIV-2 (HIV-1 causes the majority of infections worldwide).

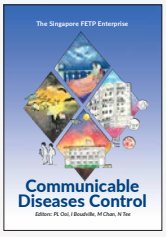
INCUBATION PERIOD
Variable.

Median incubation period is shorter in infants than in adults. The time from infection to development of detectable antibodies (i.e. window period) is generally 3-12 weeks. From 1-6 weeks (median 3 weeks) after exposure to HIV, half to two-thirds of infected individuals develop a mononucleosis-like illness referred to as acute seroconversion syndrome. Without treatment, about half of infected adults will develop acquired immune deficiency syndrome (AIDS) within 10 years after infection.

INFECTIOUS PERIOD
An individual will be infectious for the whole duration of infection if not virally-suppressed with antiretroviral therapy (ART). The most infectious period is during seroconversion and untreated late-stage disease, when the viral load is very high.

TRANSMISSION
Transmission occurs via unprotected sexual intercourse (most common), transfusion of infected blood (or blood products), sharing of contaminated needles, mother-to-child transmission (during pregnancy, delivery and breastfeeding). No transmission from contact with saliva, tears, sweat, urine, vomitus, stool and bronchial secretions from persons with HIV has been reported.

EPIDEMIOLOGY
HIV infections continue to be reported among Singapore residents. Local mother-to-child transmissions have remained rare. Individuals at risk of HIV infections include those having unprotected sexual intercourse, concurrent or multiple recent sexual partners, new sexual partner, sexual partner with a current or previous history of sexually transmitted infections (STI), and those with drug use via injections, tattooing or skin piercing procedures with improperly sterilised needles.



SCAN ME!

Editor's Note:
Excerpt taken from Communicable Diseases Control, a practical handbook on infectious diseases of public health importance in Singapore. The PDF copy of this 372-page book is downloadable from the NCID website via this QR code.

NCID Opens Up
New Educational Vistas in Public Health and Field Epidemiology

By **Dr Tan Seow Yen,**
Head, Training and Education Office
and **Assoc Prof Steven Ooi,** Senior Consultant,
Infectious Disease Research and Training Office,
National Centre for Infectious Diseases

The mission of the National Centre for Infectious Diseases (NCID) is to protect the people of Singapore from infectious diseases. Training in public health and field epidemiology, community engagement, and holistic education form vital parts of our national preparedness and defence against the threat of emerging infections, and to respond effectively to an outbreak. The Training and Education Office under the Infectious Disease Research and Training Office exists as a core unit in this national asset with domain expertise and networking to fulfil such a role for professionals and the general public.

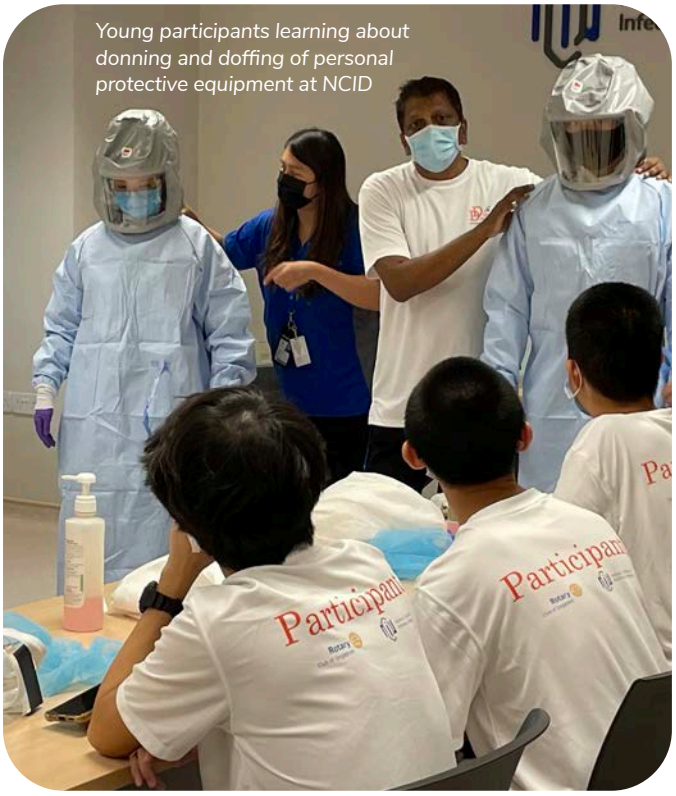
Participants learn about public health practices at a Rotary Club youth event

Real experiences of COVID-19 and pandemic preparedness have strengthened our resolve to prevent the spread of infectious diseases and build community preparedness for outbreaks. Taking a whole-of-society approach towards capacity building, we are working closely in partnership with the NUS Saw Swee Hock School of Public Health (SSH SPH), One Health agencies, social enterprises, and across the public sector, to provide fresh learning opportunities:

Collaborators in Singapore's first Disease Detective Camp, from 13-15 June 2022

Junior field epidemiology training programme in progress

Prof Leo Yee Sin, Executive Director, engages with the audience and hosts an educational visit to NCID



Young participants learning about donning and doffing of personal protective equipment at NCID

CONTINUING EDUCATION IN THE YEAR 2022-2023

Professional Training Courses

- Epidemic Intelligence Service and Proficiency Programme Fellowships (1-2 Years)
- Master Classes in Fundamental Field Epidemiology for Public Health Practitioners
- Professional Certificate Course in Outbreak Alert and Response for Field Investigators

Work Experience Opportunities

- Foundational Rapid Response Course for Frontline Public Sector Professionals
- Public Health Sciences Workshop for School Teachers

Training and Education Internships

- Disease Detective Camp for Secondary School/Junior College Students
- Outbreak Scene Investigation for Secondary School/Junior College Students

Tutorials, Workshops, Symposium

- Bespoke Programmes for Schools and Undergraduates, Master's Degree/Doctoral Candidates, Medical Students and Residents

Education leaders from institutions which are interested to avail of these offerings may seek details from NCID's Training and Education Office via email at **training@ncid.sg**. In opening up these new educational vistas, we welcome all queries.

We are also grateful for our growing resource of practitioner-educators as faculty. From strengthening individual citizens' capabilities to community outreach and engagement, let us together do our part to be strong, trusted and united in keeping Singapore safe from infectious diseases!

Urban Outbreak Management Course

13 Jan-14 Apr 2023 (Fridays, 6-9pm)
@NUS SSH SPH

An effective outbreak management system is core to safeguarding public health and reducing morbidity and mortality. Outbreak investigation, when properly managed, fosters cooperation between stakeholders in rapid mobilisation, community engagement, communications, and business continuity. By introducing a combination of hard and soft skills, as well as knowledge and tools related to field epidemiology, environmental health, microbiology, communication and social sciences, it is designed for the application of knowledge and skills to manage, foresee and solve outbreak problems efficiently and effectively.

For enquiries, please contact **Assoc Prof Steven Ooi** at **steven_pl_ooi@ncid.sg**

7th World One Health Congress 2022

Singapore has been chosen to be the host nation for the 7th World One Health Congress 2022 from 7-11 November 2022! Centred around the theme of ***'Integrating Science, Policy and Clinical Practice: A One Health Imperative Post-COVID-19'***, the congress will feature both local and international infectious diseases experts who will share learnings across diverse disciplines through keynote sessions and panel discussions.

The congress will be held at the Sands Convention Centre in a hybrid fashion. For more information on the programme, please visit **https://worldonehealthcongress2022.miceapps.com/client/sites/view/WOH2022 or scan the QR code.**

INFECTIOUS Disease Intelligence

ABOUT US

Infectious Disease Intelligence, an NCID publication by the infectious diseases and public health community, is published twice a year. Readership is for general audiences, students, undergraduates, physicians, epidemiologists, microbiologists, laboratorians, researchers, scientists, and public health practitioners.

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CORRESPONDENCE ADDRESS

The Editor (*Infectious Disease Intelligence*),
Executive Director's Office,
National Centre for Infectious Diseases,
16 Jalan Tan Tock Seng,
Singapore 308442

National Centre for Infectious Diseases