



National Centre for
Infectious Diseases
National Healthcare Group



PROTECTING OUR NATION FROM INFECTIOUS DISEASES

ANNUAL REPORT 2023

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COLLABORATIONS



VISION

Strong, trusted and united in keeping Singapore safe from infectious diseases

MISSION

Protecting the people of Singapore from infectious diseases

CORE VALUES

Nurturing

We foster growth within a safe and supportive environment

Compassion & Collaboration

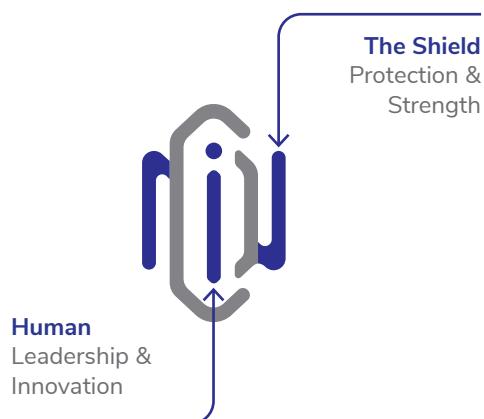
We care for everyone and work with all

Integrity & Innovation

We do the right things and embrace creativity

Dedication

We are ready to respond anytime



The logo of the National Centre for Infectious Diseases is represented by a shield with people at the centre. It is formed from its acronym NCID with N, C, D making up the shield which stands for protection and strength. The character "I" in the middle represents the human element, synonymous with leadership and innovation. Overall, the logo amplifies NCID's role in protecting the nation from infectious diseases.



ABOUT US

The world has endured infectious diseases outbreaks such as COVID-19, Nipah, SARS, Pandemic H1N1, and Zika in the last 25 years. With Singapore's status as an open economy, the nation is especially susceptible to threats from infectious diseases. To combat this, the National Centre for Infectious Diseases (NCID), a national specialty centre within the National Healthcare Group (NHG), was officially opened on 7 September 2019.

NCID proved instrumental in Singapore's fight against COVID-19 with its integrated capabilities in patient care, public health, and research, backed by clinical expertise and resources from across NHG's network of hospitals, polyclinics and other specialty centres. At the same time, NCID holds a national public health role to strengthen disease prevention and outbreak preparedness through collaboration with all healthcare and public health institutions nationally.

NCID's 330-bed purpose-built facility is designed to strengthen Singapore's capabilities in infectious disease management and prevention. It was built to scale up to accommodate more than 500 beds

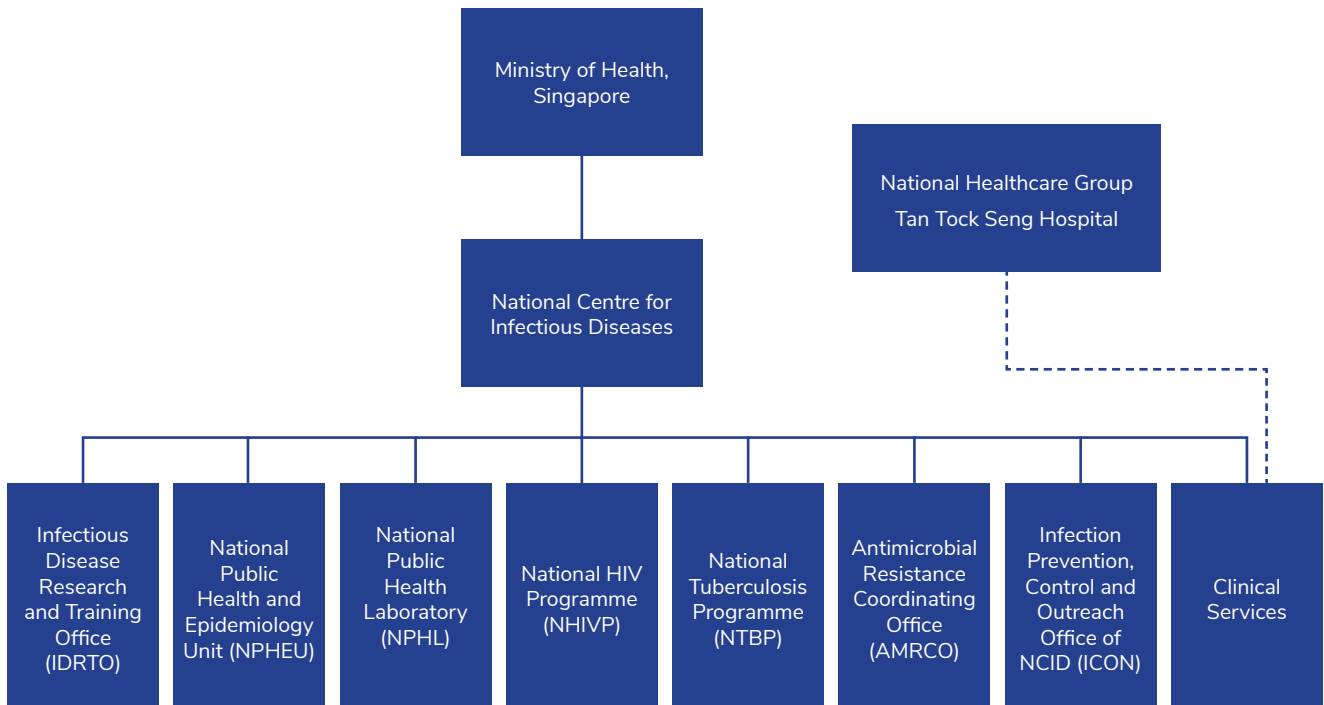
during an outbreak and is equipped with advanced safety features that protect the people within the building and the surroundings. It provides functions in clinical services; public health; research, training, and education; and community engagement in one centre, as a comprehensive setup in managing and preventing infectious diseases.

In addition to outbreak management and clinical treatment of infectious diseases, NCID's functional units include the Infectious Disease Research and Training Office, the National Public Health and Epidemiology Unit, the National Public Health Laboratory, the National HIV Programme, the National Tuberculosis Programme, the Antimicrobial Resistance Coordinating Office, and the Infection Prevention, Control, and Outreach Office of NCID.

With cutting edge facilities and expertise in clinical and public health for the prevention, control, and management of infectious diseases, NCID hopes to continue its role as a national safeguard, strengthen its standing as an infectious disease centre, and be a trusted partner for international collaborations.



STRONG TRUSTED UNITED



Primary Reporting Line

Secondary Reporting Line

Professor Vernon Lee,
Executive Director, NCID
(From 1 July 2023)



Professor Leo Yee-Sin,
Executive Director, NCID
(Until 30 June 2023)

EXECUTIVE DIRECTOR'S MESSAGE FROM

PROFESSOR VERNON LEE AND PROFESSOR LEO YEE-SIN

The year 2023 marked a milestone as Singapore exited the acute phase of the COVID-19 pandemic after battling it for three years. Singapore adjusted the Disease Outbreak Response System Condition (DORSCON) level from Yellow to Green on 13 February 2023. Subsequently, the World Health Organization (WHO) declared COVID-19 to no longer be a public health emergency in May 2023.

As Singapore transitioned to a state of living with COVID-19, it was an appropriate time to pass the baton of leadership in NCID. The change in executive director for NCID took effect in July 2023, marking the next phase of growth for NCID as it continues to build upon its capabilities to strengthen the delivery of clinical care, research, and education for infectious diseases and public health services in Singapore.

Although COVID-19 is now endemic, there were still intermittent surges of COVID-19 infections in 2023 due to its endemic nature. The second and fourth quarters of the year saw significant rises in hospitalisations, especially among individuals aged 60 and above. NCID and Tan Tock Seng Hospital (TTSH) enhanced bed capacity to meet surge requirements, particularly during peaks in April and December.

Concurrently, NCID continued to serve as the centralised site in Singapore for the medical evaluation and management of suspect cases of mpox, and administering post-exposure prophylaxis for close contacts of suspect cases.

Despite these challenges on the clinical front, NCID maintained its operations and efforts in its public health functions. The National HIV Programme and the National Tuberculosis (TB) Programme intensified their efforts in line with their respective goals to end human immunodeficiency virus and TB in Singapore. The National Public Health and Epidemiology Unit provided its expertise in horizon scanning, epidemiological investigations and data analytics, and sense-making of infectious diseases outbreaks. The National Public Health Laboratory continued to enhance the surveillance programmes for various pathogens, and provided scientific inputs for public health policies and strategies. The Antimicrobial Resistance Coordinating Office remained focused on coordinating multisectoral efforts against antimicrobial resistance (AMR) in Singapore through advancing research, raising awareness of AMR, and surveillance of antimicrobial utilisation.

NCID also maintained its emphasis on research, recognising it as a crucial element of national preparedness and defence against the threat of emerging infections. In 2023, NCID received about S\$4.8 million in research grant funding. NCID researchers also published more than 120 research publications in 2023, which would contribute towards elevating NCID's standing as an internationally recognised infectious disease centre.

In terms of training and education, NCID collaborated with partners and community stakeholders to empower the public with essential skills and resources for outbreak preparedness while also sharing updates about infectious diseases of public health concern with clinicians, researchers, and healthcare professionals. One key event was the ASEAN Dengue Day seminar, which NCID organises annually to update healthcare professionals about the epidemiological situation, latest clinical developments in the management of dengue, prevention and control, and intervention strategies.

The COVID-19 pandemic has highlighted the importance of infection, prevention, and control (IPC) to minimise transmission of infectious diseases. In 2023, NCID set up its newest unit, the Infection Prevention, Control, and Outreach Office of NCID (ICON). ICON aims to strengthen Singapore's capabilities in IPC in both healthcare facilities and community settings to pre-empt future outbreaks, and support the Ministry of Health and the National Infection Prevention and Control Committee in driving the national IPC programme.

NCID further broadened its international network and fostered deeper collaborations with local and international partners. Areas of collaboration included exchange of knowledge in clinical management, joint research, and outbreak preparedness measures. NCID also hosted learning visits where international counterparts came to learn about its design principles and integrated functions, visited its facilities, discussed ongoing research efforts and clinical and laboratory response, and distilled lessons from outbreak management efforts. NCID also hosted partners to discuss surveillance and outbreak investigations, emerging infectious diseases, high-risk pathogens, and managing biothreats.

Behind the state-of-the-art facility, systems, and processes that have been put in place, the team of multidisciplinary, committed, and well-trained staff truly forms the heart of NCID. The camaraderie, care for one another, and shared experiences in NCID have built a strong team over the past few years. In 2023, NCID staff received the National Awards (COVID-19) in multiple categories to commemorate their exemplary efforts in keeping Singapore safe during the pandemic. In addition, NCID staff have received other awards, such as the National Medical Excellence Awards and Healthcare Humanity Awards, to name a few. These awards are a recognition of NCID's commitment to providing quality clinical care, administering public health services, and contributing valuable research on infectious diseases.

As a national specialty centre within the National Healthcare Group (NHG), NCID will continue to build upon the strong ties with NHG and work together with its institutions, including TTSH, to be at the forefront of outbreak management and clinical treatment of infectious diseases in Singapore. At the same time, with its national public health role, NCID partners all healthcare and public health institutions nationally to strengthen disease prevention and outbreak preparedness. In addition, NCID needs to expand efforts to continue its collaboration with the community, partners, and the entire healthcare ecosystem to prepare for future crises.

We appreciate the support of the senior leaders and NCID staff during the period of leadership transition, which gave us great confidence that we have a good team behind us and that NCID will continue to stay strong, trusted and united in fulfilling our mission to protect the people of Singapore from infectious diseases.

SPECIAL MESSAGE FROM
**PROFESSOR
KENNETH MAK**

Director-General of Health,
Ministry of Health, Singapore



Since its inception, the National Centre for Infectious Diseases (NCID) has kept true to its mission – to protect the people of Singapore from infectious diseases. This was keenly demonstrated during the COVID-19 pandemic. Thrust to the frontline a few months after it officially opened, NCID was put through a thorough test of its capabilities, capacity, and workflow. Amidst all the uncertainties in dealing with a novel virus and the rapidly evolving situation, NCID presented a strong and united front throughout and collaborated closely with the entire healthcare system to bolster the nation’s resilience. Even though the COVID-19 pandemic is behind us, we need to remain vigilant and stay prepared against the recurring threat of emerging infections.

As a national centre, NCID’s close working relationship with the Ministry of Health (MOH) is a special one. NCID provided the full spectrum of clinical, public health, and research support to MOH during the pandemic. This was vital to MOH’s decision making in clinical governance and medical policies during the pandemic. In 2022, as mpox cases were increasingly reported in other countries, NCID worked closely with MOH to put in place drawer plans to mitigate the threat of transmission even before Singapore received its first imported case. NCID provided utmost support to MOH in surveillance, triaging and management of suspected

and confirmed mpox cases, and continued to serve as the centralised site for managing mpox suspect cases and infections in 2023 even during surges in hospitalisations related to the Omicron XBB variant. NCID has also been working closely with MOH to ensure outbreak preparedness. One example is the collaboration with MOH to continually enhance the pre-hospital readiness for the transfer of patients to NCID’s High-Level Isolation Unit (HLIU) as part of the ongoing efforts to ensure that HLIU stays ready to respond to High-Level Isolation Pathogens such as the Ebola Virus Disease and Lassa Fever.

NCID was not afforded the luxury of time even during its early days of set up and had to accelerate and bring forward capabilities that would require years to build up. Time and again, NCID’s leadership and staff have demonstrated remarkable fortitude, agility and adaptability through the various crises and challenges brought about by infectious diseases threats. I would like to extend my deepest appreciation to everyone at NCID for your invaluable contributions, for you have shown that with excellent teamwork, commitment, and unwavering determination, we can overcome any difficulties. With its clinical management and public health capabilities, I am confident that NCID will remain a strong source of support to MOH as it continues to fulfil its national mandate to safeguard the health of Singaporeans.

SPECIAL MESSAGE FROM **PROFESSOR JOE SIM**

Group Chief Executive Officer,
National Healthcare Group



As we navigate the ever-evolving landscape of healthcare, the National Centre for Infectious Diseases (NCID), a national speciality centre of the National Healthcare Group (NHG), continues to be a pivotal institution in safeguarding public health in Singapore. Its role is not only to manage current infectious diseases but also prepare for future threats that could compromise the health and well-being of our population.

In recent years, NCID has been instrumental in addressing significant public health challenges, most notably as the epicentre of the national COVID-19 pandemic response together with Tan Tock Seng Hospital (TTSH) and other NHG institutions. Their tireless efforts in managing the outbreak, conducting critical research, and being a key part of the coordinated national efforts were invaluable in caring for affected patients and saving lives.

NCID's capabilities extend beyond infectious disease surveillance and prevention and clinical care, embracing education, training, and outreach to enhance our nation's resilience to public health threats. This contributes towards NHG's focus on population health, given NHG's expanded role as the Regional Health Manager for 1.5 million residents in Central and North Singapore, and where we collaborate closely with private general practices, public and community health and social care providers to keep our residents well.

On this front, NCID continues to ensure quality of life for patients through its clinical care. In October 2023, it piloted a new outpatient clinical service called Collaborative Prescribing (CP) for people living with human immunodeficiency virus (HIV). Advanced practice nurses (APNs) and pharmacists at the CP

clinic assist people living with HIV in managing chronic comorbidities. They also provide counselling on lifestyle modifications and screening for complications arising from these comorbidities.

As studies have shown an increase in premature age-related comorbidities, common geriatric syndromes, and high prevalence of frailty and sarcopenia in older patients living with HIV, NCID piloted another outpatient service - Geriatric Syndrome Screening Clinic - in November 2023, offering comprehensive assessments and early interventions by APNs specialising in infectious diseases.

Key to population health is the understanding that prevention is more cost-effective and impactful than treatment and cure. In Singapore, infectious disease prevention is thus seen as a collective responsibility involving healthcare providers, government agencies, workplaces, schools, and the larger community. NCID has thus been actively engaging young Singaporeans to increase their awareness of infectious diseases and the potential impact on the nation. In 2023, it reached out to 300 youths, in the hope of cultivating changemakers who could help build community preparedness for outbreaks, as well as advocates who could influence other young adults on ways to prevent the spread of potential infectious diseases.

As NCID continues to be judicious in maintaining outbreak preparedness, ready to respond swiftly to public health threats, we stand together with NCID as One NHG rooted in the integration of infectious disease surveillance, vaccination, clinical care, and education to minimise the impact of any evolving threats, while forging ahead to achieve our vision of Adding Years of Healthy Life for our population.

SENIOR LEADERSHIP TEAM



1. **Professor Vernon Lee**
Executive Director
(From 1 July 2023)
2. **Professor Leo Yee-Sin**
Executive Director
(Until 30 June 2023)
Senior Advisor
(From 1 July 2023)
3. **Adjunct Assistant Professor Shawn Vasoo**
Clinical Director

4. **Professor David Lye**
Director, Infectious Disease Research and Training Office
5. **Adjunct Associate Professor Matthias Paul Toh**
Director, National Public Health and Epidemiology Unit
6. **Adjunct Professor Raymond Lin**
Director, National Public Health Laboratory

7. **Associate Professor Sophia Archuleta**
Director, National HIV Programme
8. **Adjunct Assistant Professor Wong Chen Seong**
Deputy Director, National HIV Programme
9. **Dr Deborah Ng**
Director, National Tuberculosis Programme
(From 1 December 2023)

10. **Adjunct Associate Professor Jeffrey Cutter**
Director, National Tuberculosis Programme
(Until 30 November 2023)
Public Health Advisor
11. **Dr Margaret Soon**
Director, NCID Nursing
12. **Mr Albert Tan**
Director, Operations, Executive Director's Office
13. **Adjunct Assistant Professor Monica Chan**
Head, Department of Infectious Diseases



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- 14. Associate Professor Barnaby Edward Young**
Deputy Director, Infectious Disease Research and Training Office (From 1 October 2023)
Head, Singapore Infectious Disease Clinical Research Network, Infectious Disease Research and Training Office
Head, NCID Research Clinic, Infectious Disease Research and Training Office
- 15. Associate Professor Ng Oon Tek**
Head, Antimicrobial Resistance Coordinating Office (From 10 May 2023)

- 16. Dr Lee Tau Hong**
Head, Antimicrobial Resistance Coordinating Office (Until 12 May 2023)
- 17. Adjunct Assistant Professor Kalisvar Marimuthu**
Head, Infection Prevention, Control and Outreach Office of NCID (From 1 November 2023)
Clinical Lead, Healthcare-Associated Infections, National Public Health and Epidemiology Unit (Until 11 September 2023)

- 18. Assistant Professor Chia Po Ying**
Head, NCID Research Office, Infectious Disease Research and Training Office (From 1 October 2023)
- 19. Dr Mark Chen**
Head, NCID Research Office, Infectious Disease Research and Training Office (Until 30 September 2023)

- 20. Clinical Assistant Professor Tan Seow Yen**
Head, Training and Education Office, Infectious Disease Research and Training Office
- 21. Dr Ho Lai Peng**
Senior Principal Medical Social Worker, NCID Care and Counselling
- 22. Ms Law Hwa Lin**
Senior Principal Pharmacist (Specialist), NCID Pharmacy



PATIENT CARE

PATIENT CARE

Providing Holistic Patient Care Through a Multidisciplinary Approach

INTRODUCTION

NCID's multidisciplinary team comprising doctors, nurses, pharmacists, medical social workers, and operations personnel work in close collaboration to provide patient care in inpatient and outpatient settings. The team also works closely with the Ministry of Health (MOH) to prepare and respond to outbreaks in Singapore.

MANAGING INPATIENT SERVICES AND STRENGTHENING OUTBREAK READINESS

Managing COVID-19 as an Endemic Disease

On 13 February 2023, Singapore reverted to the lowest "Green" level under the disease outbreak response system condition (DORSCON) as the local and global COVID-19 situation remained stable. However, due to the endemic nature of COVID-19, there were periods of surges in the number of hospitalisations during the year, especially among individuals aged 60 and above, who were more vulnerable to disease progression.

With the increase in hospitalisations starting in March and December 2023 amid new waves of COVID-19 infections driven by Omicron sub-variants XBB and JN.1 respectively, NCID and Tan Tock Seng Hospital (TTSH) ramped up bed capacity to manage the increased patient load. NCID also supported incoming transfers of COVID-19 patients from other public hospitals to help alleviate the long wait times at their Emergency Departments. This was coordinated through the NCID Operations Command Centre.

In July 2023, MOH updated the criteria for managing patients in the community, with the aim to encourage management of COVID-19 positive patients in the community and only escalate clinically unstable patients to Accident and Emergency Departments. In December 2023, the Ministry of Health (MOH) revised and streamlined the criteria for deisolation of COVID-19 cases in healthcare facilities and Elderly Homes run by the Ministry of Social and Family Development. NCID recommended updates to deisolation criteria during MOH's review of the existing guidelines, solicited feedback from other public hospitals, and collaborated with MOH to implement the updates. Efforts were directed towards facilitating a consistent outflow of patients through discharging suitable patients to the community, decant to Community Treatment Facility, transferring to Tan Tock Seng Hospital (TTSH) wards post-deisolation, and the expansion of TTSH Mobile Inpatient Care at Home (TTSH@Home) services to COVID-19 patients.

Enhancing Outbreak Readiness for High-Level Isolation Pathogens

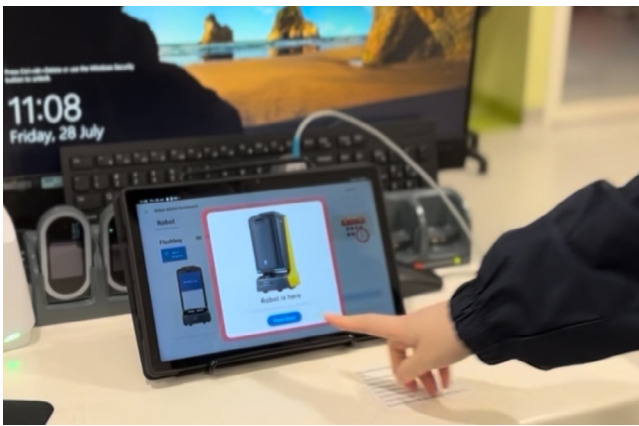
As part of ongoing efforts to prepare its High-Level Isolation Unit (HLIU) to respond to High-Level Isolation Pathogens (HLIP) such as the Ebola Virus Disease and Lassa Fever, NCID collaborated with MOH to enhance the pre-hospital readiness for the transfer of patients to HLIU. In October 2023, NCID led the operationalisation of a new private ambulance operator designated for pre-hospital HLIP transfers, involving a series of ramp-up activities including development of standard operating procedures, audits, training and exercises. This was overseen by the National Portable Medical Isolation Unit (PMIU) Workgroup, comprising members from MOH, NCID, TTSH, KK Women's and Children's Hospital, Singapore Civil Defence Force, and the Singapore Armed Forces.



Validation exercise for private ambulance operator

Autonomous Mobile Robot Trial Funded by the MOH Health Innovation Fund

In August 2023, NCID partnered the Centre for Healthcare Assistive and Robotics Technology (CHART) on an autonomous mobile robot trial for last mile delivery, which was supported by MOH Health Innovation Fund. CHART is a platform that enables healthcare professionals to work closely with industry, academia, and research institutions to co-develop and testbed impactful healthcare solutions in assistive technologies and robotics. The month-long trial studied the use of robotics to deliver items from the Visitor Experience Services counter at NCID to respective



Autonomous mobile robot last mile delivery trial



wards. This reduces manpower costs from manual delivery and the time needed for items to be delivered to patients. In the event of an outbreak or lockdown when visitors are restricted, items such as patients' belongings can still be delivered to patients using the autonomous mobile robot.

NCID was the first deployment site with end-to-end integration of existing infrastructure with the Robotics Middleware for Healthcare system, allowing interoperability across different infrastructure, multiple fleets of autonomous mobile robots, and systems to support delivery without human intervention.

ENHANCING OUTPATIENT SERVICES

Outbreak Containment and Vaccination Response

Clinic J continued to provide centralised services to contain the mpox outbreak. In 2023, the clinic screened close to 40 suspected cases and deisolated around 30 recovered cases. As part of the national vaccination strategy in containing and preventing mpox infections in Singapore, Clinic J was designated as the national service provider to administer the Jynneos vaccine as post-exposure prophylaxis (PEP) to mpox close contacts. In addition, the vaccine was offered as pre-exposure prophylaxis (PrEP) to high-risk persons, and to healthcare workers who have direct or close contact with mpox.

Clinic J was also appointed by MOH to undertake the assessment and administering of PEP for close contacts of a suspect rabies case in June 2023, and two separate cases of Hepatitis A in September 2023.

Responding to the Growing Needs of Patients Living With Human Immunodeficiency Virus

In October 2023, Clinic J piloted Collaborative Prescribing (CP) as a new clinical service to assist patients living with human immunodeficiency virus (HIV) in managing chronic comorbidities such as diabetes, hypertension, and hyperlipidaemia. These chronic diseases have been observed to be increasingly prevalent among the ageing population, including patients living with HIV. In addition, research has shown that HIV infection and cumulative exposure to antiretroviral therapy (ART) may induce or accelerate metabolic syndrome. Hence, it is crucial to promptly diagnose, optimise treatment, and manage chronic comorbidities among patients living with HIV. The CP clinic comprises advanced practice nurses (APNs) and pharmacists who are dually trained in clinical management of infectious diseases, and in prescribing and adjusting existing medications. It also provides counselling on lifestyle modifications and screening for complications arising from these comorbidities.

Studies have also shown an increase in premature age-related comorbidities, common geriatric syndromes, increased frailty, and high prevalence of sarcopenia in older patients living with HIV. This highlighted the importance of early geriatric syndrome screening. In November 2023, Clinic J piloted the Geriatric Syndrome Screening Clinic which is targeted at outpatients who are older patients living with HIV. The GSSC offers comprehensive assessments and early interventions by APNs specialising in infectious diseases and is part of the move to provide holistic care services for patients living with HIV.

Beyond improving care services for ageing patients living with HIV, Clinic J became the first among public healthcare institutions to administer the injectable Cabotegavir and Rilpivirine combination drugs as antiretroviral treatment for patients living with HIV. This treatment is administered every two months and is more convenient compared to daily ART pills.

ADVANCING NURSING RESEARCH AND PRACTICE

As healthcare needs evolve, strengthening nursing research and practice is critical to improving care delivery and patient outcomes. NCID's Nursing team has continued expanding their research capabilities and gained recognition for their contributions to the global dialogue about nursing education.

In 2023, NCID Nursing sent its project teams to present the findings of their studies at the International Microsystem Festival 2023 in Sweden, and the 10th World Congress on Nursing Education and Practice 2023 in Germany, held in February 2023 and July 2023 respectively. These international platforms allowed NCID Nursing to share insights with the global nursing community and affirmed the team's commitment to advancing nursing research and practice.

Presentations by NCID Nursing at International Platforms

International Microsystem Festival 2023

Enhancing ICU Retrieval of Intubated Patients at the National Centre for Infectious Diseases

The study focused on the review of the ICU retrieval protocol for intubated patients at NCID. The project resulted in the retrieval team achieving a 100% compliance rate for the retrieval protocol of an intubated patient.

Time to Take the Pressure Off

The research focused on the increased occurrence of facial pressure injuries associated with non-invasive ventilation (NIV) masks during the COVID-19 pandemic. The project successfully reduced the prevalence of facial pressure injuries related to NIV masks from a median 5% to 0%. It provided an innovative, cost-effective, and safe approach to facial pressure injuries reduction.

The 10th World Congress on Nursing Education and Practice 2023

Exploration of Factors Influencing Nurses' Preparedness and Response to the COVID-19 Outbreak

The paper, published in *Sage Open Nursing* in December 2022, was dedicated to the experience of the nurses rather than focusing solely on

nurse-patient outcomes. It offered a nuanced understanding of the challenges faced by nurses, and was pivotal in giving nurses a voice during health crises. The impact of the research also extends to health emergency readiness for future outbreak preparedness.



NCID Nursing and T&E co-hosted 10 APNs from Hong Kong for an 11-day attachment programme in November 2023

EXPANDING OUTREACH AND COLLABORATION

Training Attachments for Overseas Partners

In February 2023, NCID hosted a team of three infectious disease fellows-in-training from The Medical City (TMC), Philippines for a 28-day clinical hands-off observership and rotation programme. The programme was led by the Training and Education Office (T&E) under the Infectious Disease Research and Training Office, with contributions from various NCID clinical and public health units. The programme provided a broader perspective and depth in clinical practices, through clinical hands-off attachments and observations at various clinical settings. The fellows-in-training also gained an understanding of the public health landscape in Singapore through the briefings by National Public Health and Epidemiology Unit, National Public Health Laboratory, National HIV Programme and NCID Clinical HIV Programme, National Tuberculosis Programme, and Antimicrobial Resistance Coordinating Office.

In addition, NCID Nursing and T&E co-hosted 10 APNs from Hong Kong for an 11-day attachment programme in November 2023. This was the first training collaboration between NCID and the Hospital Authority of Hong Kong. The group of trainees comprised APNs who specialised in infectious diseases and were selected from various

public hospitals in Hong Kong. This training collaboration helped the APNs learn about care delivery models for infectious diseases and outbreaks in Singapore, and best practices in infectious disease management from NCID Nursing. The APNs also attended clinical attachments and an Antimicrobial Stewardship Round at NCID and TTSH, to learn and observe the delivery of patient care in peace time and during outbreaks.

HIV Education

NCID Nursing has been working closely with NCID Enhanced HIV Programme (EHIVP) to improve the quality of care for people living with HIV. NCID EHIVP in-patient nursing team also supported the various events organised by NCID EHIVP. Targeted at healthcare workers and the general public, the events included the HIV Nursing Education Series in February and July 2023, HIV educational talk at the National Kidney Foundation (NKF) in November 2023, and the World AIDS Day event in December 2023. These events aimed to raise awareness about HIV-related topics, such as the vital role that nurses play in the biopsychosocial well-being of people living with HIV; latest ART recommendations; importance of HIV treatment adherence; PEP and PrEP; the impact of HIV on ageing and its associated health issues; and the optimal care strategies.

PROVIDING INPATIENT AND OUTPATIENT PHARMACY SERVICES

The NCID Pharmacy contributes to the quality of patient care in NCID by ensuring the stable and continuous supply of medicines and vaccines to support inpatient and outpatient operations.

Local and International Engagements

Smart shelving has been implemented at the NCID Pharmacy since 2022 to improve drug management, workflow efficiencies, and medication safety. NCID Outpatient Pharmacy shared their knowledge and experience in implementing the smart shelving system during visits by the Singapore Civil Defence Force in March 2023, and Malaysia's Sunway Medical Centre in November 2023. The Outpatient Pharmacy team also demonstrated the smart shelving system, and outlined its productivity and medication safety benefits.

NCID Pharmacy also lent their support towards the World AIDS Day 2023 webinar organised by NCID EHIVP. Mr Eugene Toh, Senior Pharmacist, joined the multidisciplinary panel to discuss the importance of holistic care. He spoke about the pharmacist's role and involvement in HIV therapy. This included the provision of specialised drug adherence counselling for proper usage, monitoring of adverse effects, and drug interactions. The other panellists included a doctor, nurse, medical social workers, and a person living with HIV.

Professional Development

Pharmacists play an important role in reducing antimicrobial resistance (AMR) and antimicrobial stewardship. During the GRIP Forum 2023 (Interventions for Lasting Change in Antimicrobial Resistance) organised by the Pharmaceutical Society of Singapore, Ms Kee Ya Ling, Senior Pharmacist (Clinical) represented NCID Pharmacy in insightful discussions and inspiring interventions for a sustainable approach to AMR. The forum provided healthcare professionals a platform to share insights in combating inappropriate antibiotic usage on a global scale, with a particular focus on Southeast Asia. Ms Kee also shared on the pharmacist's role in AMR-sensitive interventions and stewardship to reduce the need of antimicrobials, and decrease the selection pressure for development/escalation of AMR.

In 2023, two more pharmacists - Ms Annabel Chua, and Ms Varsha Ramakrishnan, both Senior Pharmacists from NCID Pharmacy, completed the Collaborative Practitioners Prescribing Programme (CP3). The CP3 is targeted at pharmacists and APNs, empowering them to practise at the top of their licence and to prescribe under a Collaborative Practice Agreement with medical practitioners. With the setup of the chronic HIV disease clinic, NCID's pharmacists have been involved in the management of people living with HIV with chronic diseases, identifying the issues, prioritising interventions,



Presentation on the smart shelving system by NCID Outpatient Pharmacy to the team from Singapore Civil Defence Force

and making informed decisions tailored for individual patients. People living with HIV receiving current ART are living longer and have other comorbidities that need attention. Hence, pharmacists who have completed CP3 are better equipped with the skillsets to provide holistic care for people living with HIV, including those with chronic diseases.

PROVIDING CARE AND COUNSELLING IN A MULTIDISCIPLINARY TEAM

NCID's Medical Social Workers (MSWs) and Social Work Assistants play a crucial role in providing counselling and psychosocial support to patients and their families. Additionally, the team manages outreach programmes and are involved in community initiatives.

Treatment Adherence and Psychosocial Support for Persons Living with HIV

Treatment adherence is critical for people living with HIV to ensure care continuity and to achieve the 95-95-95 target established by UNAIDS. The HIV Defaulter Programme, managed by NCID Care and Counselling, helps patients who have missed their appointments to return to the continuum of care. In 2023, NCID Care and Counselling received more than 1,000 referrals from Clinic J to recall patients. NCID Care and Counselling identified a group of persons living with HIV who are unable to adhere to treatment due to obstacles other than work commitments, and worked with them to overcome these challenges to resume treatment.

NCID Care and Counselling organised four support group sessions for persons living with HIV under the HIV Support Group Programme. Each session has about 15 participants

and provided a safe space for persons living with HIV to interact with one another, and engage in activities such as painting and hiking. The peer support formed among the participants during these group sessions contributes to their psychosocial well-being.

Community Engagement

NCID Care and Counselling has been involved in community engagement events aimed at educating and encouraging the public to support people living with HIV. During the World AIDS Day 2023 webinar organised by NCID EHIVP, MSWs joined other healthcare workers from NCID and participated in a panel discussion. They were also joined by a person living with HIV. This session highlighted the importance of relationships and social connections as part of providing holistic support for persons living with HIV.

In addition, NCID Care and Counselling also supported the Singapore HIV Congress organised by the National HIV Programme. Dr Ho Lai Peng, Senior Principal MSW, spoke during the congress about the role of MSWs as part of a multidisciplinary team in caring for people living with HIV. NCID Care and Counselling also submitted two posters that featured the HIV Support Group Programme and the HIV Defaulter Programme.

As part of NCID's collaboration with NKF, the MSWs, together with doctors and nurses from NCID, have been giving biannual HIV education talks to healthcare workers at NKF. Since 2021, NKF has extended their dialysis services to accommodate people living with HIV. Hence, this initiative aims to educate NKF's healthcare workers about HIV, and HIV-related stigma and discrimination to increase understanding and support for people living with HIV.



Medical social workers were among the panellists in the World AIDS Day 2023 webinar organised by NCID EHIVP



**PUBLIC
HEALTH
EXPERTISE**

NATIONAL PUBLIC HEALTH AND EPIDEMIOLOGY UNIT

Leading the Way in the Prevention, Surveillance, and Response to Infectious Disease Outbreaks in Singapore

INTRODUCTION

The National Public Health and Epidemiology Unit (NPHEU) offers expertise in horizon scanning, epidemiological investigations, data analytics, and sense-making of infectious disease outbreaks such as COVID-19, human immunodeficiency virus (HIV), and tuberculosis (TB). This supports the Ministry of Health (MOH) in prevention and preparedness, surveillance, and response management of communicable disease outbreaks in Singapore.

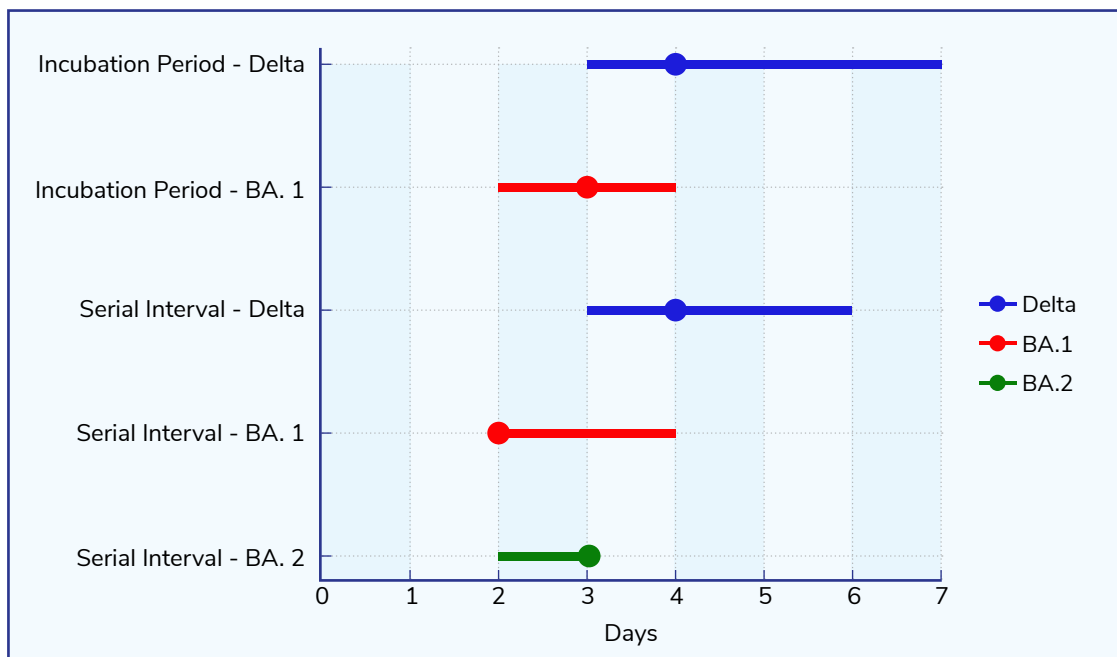
CONTRIBUTIONS TOWARDS COVID-19 RESEARCH

COVID-19 Vaccine Uptake and its Associated Concerns

NPHEU conducted a survey in July 2022 among NCID staff in various job roles to understand their concerns about the first generation of COVID-19 vaccines. The survey on “COVID-19 Vaccine Uptake rates in a High-Risk population: Health Behaviours of Staff in NCID” aimed to investigate the respondents’ motivations and willingness to receive annual COVID vaccines or variant-specific boosters. Results showed that despite some reservations on its efficacy and safety, most healthcare workers received their primary course of vaccines and were open to receive variant-specific boosters. The survey also found that frontline staff with direct patient contact had reduced fear towards COVID-19 after being vaccinated. These findings of the survey were presented at the Singapore Health and Biomedical Congress 2023.

Study on Serial Intervals and Incubation Periods of COVID-19 Delta and Omicron Variants

NPHEU conducted a joint study with MOH, KK Women’s and Children’s Hospital, National University of Singapore, Nanyang Technological University, and the National Public Health Laboratory (NPHL) to estimate and compare the serial interval as well as the incubation period of the COVID-19 Delta and Omicron variants. The study found that the median incubation period was three days for BA.1 versus four days for Delta. The serial interval was two days for BA.1, three days for BA.2, and four days for Delta. This could partially explain Omicron’s more rapid epidemic trajectory, and the shorter serial interval could also have rendered public health interventions for earlier COVID-19 variants less effective for Omicron subvariants. The findings were published in the Emerging Infectious Diseases Journal in April 2023.



Serial Interval and Incubation Period of COVID-19 Delta and Omicron Variants (Median with interquartile range)

SUPPORTING NATIONAL PROGRAMMES AND SURVEILLANCE EFFORTS

The Severe Illness and Death from Possibly Infectious Causes Programme

Established in 2009, the national Severe Illness and Death from Possibly Infectious Causes (SIDPIC) Programme works with eight participating public hospitals to review cases of critical illness and unexplained deaths in previously healthy individuals. The aim is to expedite the identification of emerging or reemerging pathogens that could be of public health importance.

As the national secretariat in 2023, NPHEU prepared SIDPIC reports on a fortnightly, quarterly, and annual basis, along with hosting quarterly meetings for the national SIDPIC committee. These meetings benefitted the hospital site coordinators, infectious disease physicians, and officers from MOH and NPHL.

As part of their role in providing expertise, NPHEU contributed comprehensive analyses of SIDPIC indicators, facilitated discussions of positive infectious pathogens identified among SIDPIC cases, and conducted encephalitis syndromic surveillance.

In 2023, NPHEU conducted a study to understand the predictors of severity of diseases in SARS-CoV-2 Omicron variants of interest. The study was published in the Journal of Medical Virology.

UNAIDS Global AIDS Monitoring 2023

NPHEU's HIV Registry and Surveillance Team engaged government agencies, a non-governmental organisation, and a specialised clinic to compile qualitative and quantitative data for Singapore's submission to UNAIDS for their annual Global AIDS Monitoring on existing national policies and practices. The data collected included national statistics on the global 95-95-95 estimate for the HIV care cascade; indicators for HIV prevalence, transmission, prevention, management, and surveillance; and national budget allocated to different aspects of the national response to the HIV epidemic.

Men Who Have Sex With Men Seroprevalence Survey

NPHEU collaborated with the National HIV Programme (NHVP) to conduct the ninth round of the Men Who Have Sex With Men (MSM) Seroprevalence Survey. It is a community-based project to monitor the prevalence of HIV and syphilis, while improving the understanding of behavioural risks among MSM aged 18 years and above.

NPHEU conducted in-depth analyses of the data using latent class modelling and multivariable methods. The findings were published in an international peer-reviewed journal, and an abstract submission about the survey was accepted for the AIDS 2024 conference. Using the findings from the MSM Seroprevalence Survey and combining it with the data from HIV Registry, NPHEU presented the "HIV Epidemiological Updates" during the Singapore HIV Congress 2023. It provided behavioural insights on HIV testing in MSM and other key populations. In addition, the data on estimates of HIV infection in residents, and seroprevalence among MSM showed a plateau in the HIV epidemic. The results highlighted the importance of continuing efforts targeting the reduction and prevention of undiagnosed infections.

CONTRIBUTING TO INFECTIOUS DISEASE INTELLIGENCE

Clinical, Research, Epidemiology, Education, and Diagnostic Platform

The Clinical, Research, Epidemiology, Education, and Diagnostic (CREED) platform facilitates the sharing and learning of infectious disease topics of public health importance. Hosted by NPHEU, the monthly meetings featured international experts from various healthcare disciplines, sharing various aspects about infectious diseases, global health, and bio-surveillance. The number of attendees per session ranges from 80 to 120 persons, which include clinicians, epidemiologists, public health practitioners from polyclinics, and organisations such as public and private hospitals.

NPHEU's Research Achievements in 2023

NPHEU co-authored six publications in 2023, covering the NHVP Recommendations and COVID-19 topics such as its variants and predictors of disease severity, therapeutics, and home recovery.

NPHEU also delivered 11 scientific presentations. These included studies on risk factors for COVID-19 transmission; willingness, and coverage of COVID-19 vaccine among healthcare workers; data management and analytics in COVID-19 response; HIV epidemiology updates; clinical audit on HIV care practices; non-communicable diseases prevalence and annual influenza vaccine uptake among people living with HIV; and data science in public health and outbreak response.

NATIONAL PUBLIC HEALTH LABORATORY

Surveillance of Communicable Diseases and Outbreak Investigations

INTRODUCTION

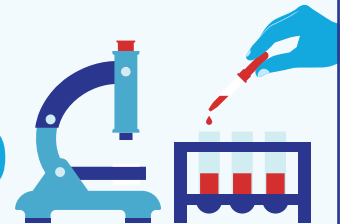
The National Public Health Laboratory (NPHL) supports the Communicable Diseases Group, Ministry of Health (MOH), in the surveillance of communicable diseases, outbreak investigation, and preparedness for new and dangerous pathogens. NPHL helped perform and oversee national testing for the COVID-19 pandemic and provided scientific advice regarding laboratory testing and virus variants. Following Singapore's transition to DORSCON green in February 2023, NPHL continued to enhance the surveillance programmes for various pathogens, and provided scientific input to help with public health policies and strategies. In March 2023, MOH issued a circular to all clinical laboratories to provide an updated list of laboratory isolates and samples for public health surveillance programmes. The revised and expanded list of pathogens to be submitted by the clinical laboratories across the country is critical to its surveillance work.

2023 Key Figures

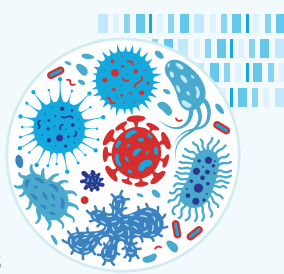
Received more than
92,400
specimens



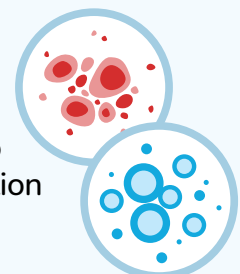
Performed more than
150,000
tests



Sequenced approximately
21,600
whole genomes of
bacteria and viruses

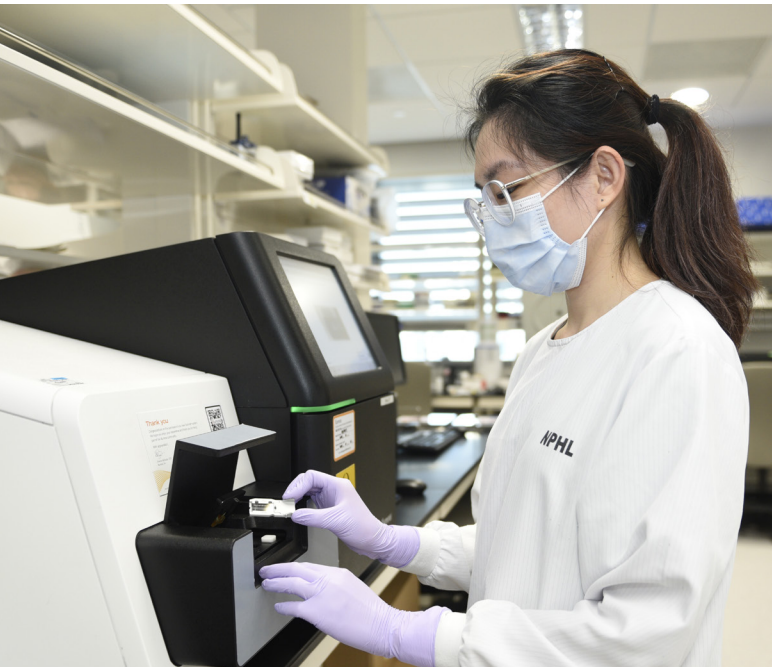


Provided around
330 isolates and
specimens to
World Health Organization
and European Virus
Archive-Global



Investigated more than
110 clusters of respiratory and
gastrointestinal infections,
and suspected nosocomial infections





Performing whole genome sequencing

INVESTIGATION OF OUTBREAKS

In 2023, NPHL was involved in the investigation of several infection clusters, employing extensive use of whole genome sequencing (WGS) to provide high resolution data. These investigations included foodborne outbreaks such as salmonellosis, detecting and monitoring SARS-CoV-2 and its new variants, as well as the investigation of nosocomial cases, such as carbapenem-resistant *Enterobacteriales* (CRE), methicillin-resistant *Staphylococcus aureus* (MRSA), melioidosis, and legionellosis, in various public healthcare institutions.

HEIGHTENED SURVEILLANCE OF ACUTE RESPIRATORY INFECTION AND INFLUENZA-LIKE ILLNESS

During the COVID-19 pandemic, enhanced sentinel surveillance for acute respiratory infection (ARI) and influenza-like illness (ILI) was further expanded to encompass more polyclinics. NPHL collected more than 21,000 samples from 21 polyclinics and 57 general practitioners clinics in 2023. By utilising WGS to determine COVID-19 variant types from ARI/ILI surveillance samples, in combination with laboratory-based surveillance and dormitory ARI surveillance samples, NPHL supported MOH in the timely monitoring of variant prevalence and assessment of the severity of COVID-19 XBB and JN.1 variants during their respective waves.

SUPPORTING NATIONAL PROGRAMMES

NPHL conducts molecular epidemiological surveillance to support the National HIV Programme (NHIVP) and the National Tuberculosis Programme (NTBP). By implementing universal tuberculosis (TB) WGS, NPHL plays a crucial role in providing information for the detection of TB clusters which helps TB disease control nationwide. Laboratory analysis provided by NPHL, in support of the NHIVP, allows MOH to improve public health measures in the control and prevention strategies of human immunodeficiency virus (HIV), with the aim of achieving the UNAIDS 90-90-90/95-95-95 targets. The determination of transmissible resistance contributed to the national guidelines on HIV drug treatment.

STRENGTHENING INTERNATIONAL COLLABORATIONS

NPHL strengthened collaborations with counterparts in ASEAN and the World Health Organization (WHO) Western Pacific Region. This includes the WHO Western Pacific Regional Office, Regional Public Health Laboratory Network, and Asia Pacific Pathogen Genomics Network. Alongside them, NPHL also collaborated with the United Kingdom's New Variant Analysis Programme. NPHL worked with these partners primarily by sharing surveillance and testing strategies, as well as exchanging insights of each other's experiences during outbreak investigations.

Additionally, NPHL contributed 16,911 high-quality SARS-CoV-2 sequences to the Global Initiative on Sharing All Influenza Data (GISAID), and shared isolates of SARS-CoV-2 variant XBB with both WHO BioHub System and European Virus Archive – Global.



Testing surveillance samples

NATIONAL HIV PROGRAMME AND NCID ENHANCED HIV PROGRAMME

Managing Human Immunodeficiency Virus Infections Through Quality and Holistic Patient-centric Care

INTRODUCTION

The National HIV Programme (NHIVP) and NCID Enhanced HIV Programme (EHIVP) work closely together towards ending HIV in Singapore. NHIVP provides policy and strategic oversight for the NCID Enhanced HIV Programme which is operationalised by the NCID Clinical HIV Programme to provide care for people living with HIV.

NHIVP

The NHIVP takes a multidisciplinary approach in coordinating the national response to manage human immunodeficiency virus infections. It strives to achieve the Ministry of Health's (MOH) objectives of eliminating HIV in Singapore and the new UNAIDS 95-95-95 targets by 2025 through the formulation of evidence-based guidelines and recommendations on HIV testing, prevention, treatment and patient management; conducting national-level epidemiological surveillance and molecular surveillance on HIV; providing enhanced training to healthcare professionals in the management of patients with HIV; and developing HIV education campaigns for greater awareness and to address HIV-related stigma.

National Guidelines and Recommendations Updates

NHIVP collaborates with local healthcare professionals to develop and disseminate national guidelines and recommendations. This can help enhance clinical services for people at risk of and living with HIV, by establishing best practices and evidence for HIV management.

In 2023, NHIVP launched the Primary Care Recommendations for People Living with HIV to assist infectious disease physicians, geriatricians, and primary care physicians in delivering holistic care for older people living with HIV, along with areas for improvement in the current care services. The other three national guidelines were also updated to align with international guidelines and the latest clinical evidence. These are:

1. HIV testing recommendations;
2. Pre-exposure prophylaxis (PrEP) guidance; and
3. Antiretroviral therapy (ART) recommendations, featuring a new section addressing antenatal and perinatal care for infants and women living with HIV.

Conducting National Surveillance Through HIV Integrated Biological-Behavioural Surveillance

The HIV Integrated Biological-Behavioural Surveillance, which started as the Seroprevalence Survey in 2007, has been a vital component of Singapore's national HIV surveillance efforts. The 10th round of the survey, started in 2023, is a commissioned study co-led by NHIVP, National Public Health and Epidemiology Unit, the Department of STI Control Clinic, and Action for AIDS Singapore, and employs the Time Location Sampling which is a rigorous method used in bio-behavioural surveillance surveys for populations congregating in specific venues. This approach ensures equitable sampling by randomly selecting venues, days, and times where the target population can be found, adding robustness to the methodology.

Singapore HIV Congress 2023

The third iteration of the Singapore HIV Congress (SHC), held in December 2023, invited experts to discuss new developments in HIV landscape. Themed "Integrate –



Associate Professor Sophia Archuleta, then-Director of NHIVP, addressing the audience at SHC 2023

Empower – Advance: Improving Outcomes, Enhancing Health,” the congress focused on integrating HIV care across medical specialities and other areas in healthcare through partnerships. Mdm Rahayu Mahzam, then-Senior Parliamentary Secretary, Ministry of Health, and Ministry of Law, graced the occasion and gave the opening address as the guest of honour. The congress featured prominent regional keynote speakers, covering pertinent topics on HIV and related subjects. Parallel sessions highlighted the importance of sociobehavioural research and integrating HIV care with primary care, addressing topics such as sexually transmitted infections (STIs), PrEP, tuberculosis, and ageing among people living with HIV.

BETTER CLINICAL CARE THROUGH THE NCID EHIVP

The NCID EHIVP aims to bring high-quality, evidence-based clinical care to people living with HIV in Singapore. The NCID EHIVP team provides care to the largest cohort of people living with HIV. In addition to clinical care, NCID EHIVP is also actively involved in conducting training and education activities for healthcare workers to enhance the delivery of care services to people living with HIV.

HIV Grand Rounds

The NCID EHIVP organised four HIV Grand Rounds in 2023, which function as forums for the local and international HIV care community to discuss recent advances in HIV medicine, and share learnings and potential teaching areas. More than 650 participants attended the four sessions of HIV Grand Rounds, each focusing on different topics. Overseas experts presented on topics focusing on HIV in women; landmark HIV trials in HIV treatment; shortening the care cascade for patients co-infected with HIV and hepatitis C virus; and point-of-care HIV viral load testing for children and community-centred approaches.

HIV Masterclass

The HIV masterclass, organised by the NCID EHIVP, is designed to educate physicians on essential HIV-related topics focusing on the application within specific medical specialities. In 2023, the NCID EHIVP conducted two sessions

for surgeons and emergency medicine physicians under the National Healthcare Group cluster. These virtual sessions covered a comprehensive range of HIV-related subjects, including epidemiology, transmission, screening algorithms, opportunistic infections, ART, drug-drug interactions, PrEP, and post-exposure prophylaxis.

HIV Sensitivity Training Workshop

Sensitive communication is an important aspect in delivering HIV care services, helping to foster environments where people living with HIV feel safe, at ease, and are not discriminated. Discrimination towards HIV has created barriers in accessing HIV prevention services, testing services for HIV and STIs, enrolment and retention in HIV treatment and care, and support programmes for people living with HIV.

To increase understanding of sensitive communication among healthcare workers, the NCID EHIVP conducted two in-person sessions of the HIV Sensitivity Training Workshop in September 2023, covering topics such as gender identity, sex work, sexuality, drug use, and HIV stigma. The NCID EHIVP invited expert facilitators from community groups to provide practical and relevant information to healthcare professionals from NCID and three other public hospitals.

Building International Networks

The NCID EHIVP team contributed to international conferences which included the Asia-Pacific AIDS and Co-Infections Conference held in Singapore in June 2023, the International AIDS Society Conference, and the Sex, Health and Society Conference which were held in Australia in July and September 2023 respectively. The NCID EHIVP team presented their abstracts and participated in debates.

In October 2023, the NCID EHIVP team visited the Peter Doherty Institute, and The Alfred Hospital in Australia. The team learned about community engagement strategies for HIV cure research, trials on low dose Nivolumab in adults living with HIV on ART, and Australia’s successful HIV elimination programme. The visit also laid grounds for potential multicentre research on HIV cure between the three institutions.

The NCID EHIVP team and the HIV Sensitivity Training Workshop participants gathering for a group photo after a fruitful session



NATIONAL TUBERCULOSIS PROGRAMME

Moving Towards Ending Tuberculosis in Singapore

INTRODUCTION

In 2023, the incidence rate of tuberculosis (TB) among Singapore residents dropped to 28.8 cases per 100,000 population. This is the first time that Singapore's TB incidence rate fell below under 30 cases per 100,000 population. In the last two decades, Singapore's TB incidence rate had hovered in the range of 30 to 40 cases per 100,000 population among residents. By adopting a people-centric approach in its TB prevention and care strategies, National Tuberculosis Programme (NTBP) continues its efforts towards ending TB in Singapore.

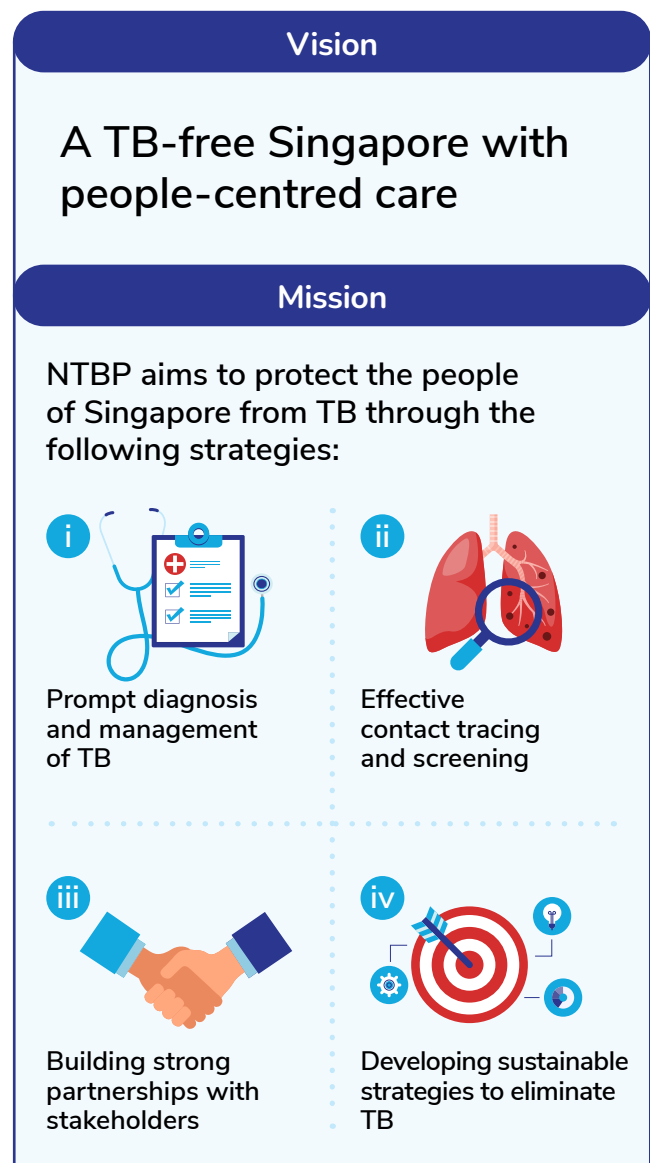
REALIGNING WITH NATIONAL POLICIES AND STRATEGIES

In August 2022, the Singapore TB Elimination Programme (STEP) was formally renamed NTBP. A department retreat was held in February 2023, where staff from all levels discussed the realigning of programme goals with current and upcoming TB national policies and strategies. A workgroup was borne from this retreat, where they worked on the revamped vision and mission statements of NTBP. The statements, encapsulating the core of NTBP's work, were approved by the Ministry of Health (MOH).

COORDINATING AN INTEGRATED STRATEGY

The NTBP Steering Committee was established in August 2023 to streamline processes in the delivery of TB clinical care and screening, and to facilitate programme changes. It comprises stakeholders from NTBP, other departments in NCID, and Tan Tock Seng Hospital (TTSH).

To better reflect the integrated strategies to prevent and manage TB, one of the first tasks of the Steering Committee was initiating the reorganisation of the TB clinical and public health services. TB Control Unit and TB Contact Clinic would be renamed as National Tuberculosis Care Centre (NTBCC) and National Tuberculosis Screening Centre (NTBSC), respectively. NTBCC is overseen by TTSH's Department of Respiratory and Critical Care Medicine, while NTBSC is overseen by TTSH's Department of Infectious Diseases. NTBP looks forward to the continued collaboration with TTSH's Department of Respiratory and Critical Care Medicine, and Department of Infectious Diseases, in working towards a TB-free Singapore.





Guest speakers Dr Paula Fujiwara (top row, extreme right), Chairperson of Stop TB Partnership Global Plan 2023–2030 Task Force, Dr Kalpesh Rahevar (top row, middle), World Health Organization representative, and Dr Lucica Ditiu (top row, extreme left), Executive Director of the STOP TB Partnership, posing for a photo with other participants

WORKING WITH REGIONAL PARTNERS

In November 2023, NTBP hosted the inaugural ASEAN Video Conference on TB. It is a platform to address the global eradication of TB through a regional approach. The conference was attended by representatives from Brunei Darussalam, Cambodia, Indonesia, Malaysia, Philippines, and Thailand. This conference gave attendees opportunities to learn about each countries' challenges and strategies in dealing with TB, and distilled insights from trends. The meaningful discussions marked the affirmation of ASEAN's member states towards collaboration in global health.

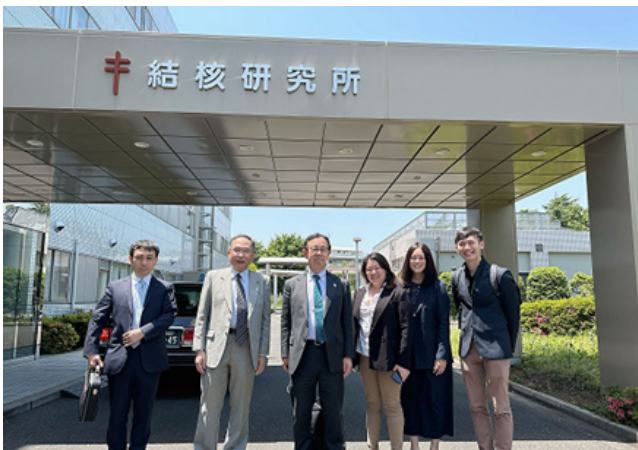
GATHERING INSIGHTS FROM JAPAN'S TB PROGRAMME

The NTBP team visited Tokyo, Japan in May 2023 to learn more about Japan's TB programme, its preventative measures and care strategies, and how these can be adapted for Singapore.

The visit helped to distil insights on how Japan managed TB, as it had a much higher TB burden compared to Singapore during the post-war period. The team learnt about the epidemiology of TB in Japan and overall TB programme structure, contact tracing and screening, outbreak and cluster investigation, TB genotyping, implementation of Directly Observed Therapy (DOT), and how Japan plans to implement pre-entry screening for foreigners.

EXCHANGING KNOWLEDGE WITH AUSTRALIA

NCID also hosted Professor Justin Denholm, Medical Director of the Victorian TB Programme in Australia in December 2023. Professor Denholm shared his experiences from the Victorian TB programme as well as on whole genome sequencing (WGS) with attendees from NTBP and the National Public Health Laboratory. This allowed for knowledge exchange about the way WGS is used in Victoria and Singapore for public health functions and the clinical management of TB.



Dr Deborah Ng (third from right), Director, NTBP, Ms Kelly Foo (second from right), Assistant Director, NTBP, and Dr Tay Jun Yang (first from right), Consultant, NTBP with counterparts from Japan's TB programme



The NTBP team with Professor Justin Denholm (back row, first from left)

ANTIMICROBIAL RESISTANCE COORDINATING OFFICE

Leading Multisectoral Efforts Against Antimicrobial Resistance

INTRODUCTION

The Antimicrobial Resistance Coordinating Office (AMRCO) coordinates multisectoral efforts against antimicrobial resistance (AMR) in Singapore. AMRCO plays a key role in advancing the National Strategic Action Plan (NSAP) on AMR and acts as the secretariat for AMR-related national committees. It continues to fortify the One Health framework and maintain oversight on multisectoral AMR efforts.



Breakout group discussion at the One Health AMR Research Workshop

ADVANCING ONE HEALTH AMR RESEARCH

AMRCO organised the One Health AMR Research Workshop in February 2023 to identify and consolidate research areas aligned with the NSAP. Research is one of the NSAP core strategies, which aims to advance understanding of AMR to achieve the NSAP goal of preventing and reducing the emergence of drug-resistant microorganisms.

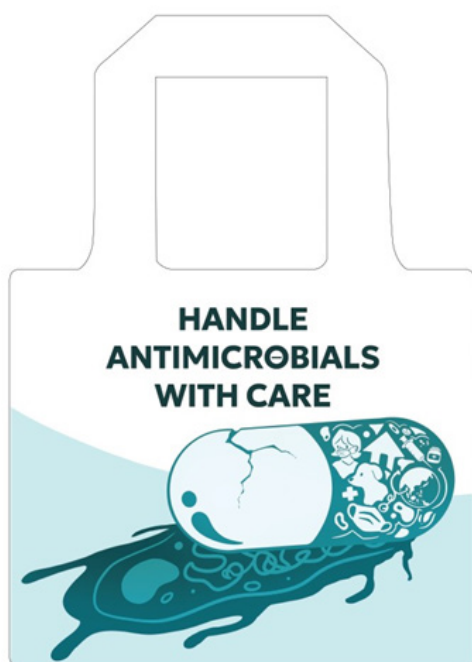
More than 40 participants from the Ministry of Health (MOH), One Health agencies, institutes of research and higher learning, and healthcare professionals attended the workshop. AMRCO gave an overview of the One Health AMR Research Programme and presented findings from the Report on Singapore's AMR Research Landscape 2009–2019 published by AMRCO. Workshop participants discussed and identified research priorities and gaps, providing important insights on One Health AMR research needs in Singapore.

RAISING AWARENESS OF AMR

AMRCO organised outreach programmes targeted at the public and healthcare professionals before and during World AMR Awareness Week (WAAW), held annually from 18 to 24 November.

To raise the public's awareness of AMR and the importance of appropriate antimicrobial use, AMRCO organised an AMR Competition. It was opened to Singapore citizens and residents aged seven and above. Participants could submit a tagline, an animated image in graphic interchange format, a TikTok video, or an eco-bag design. The competition received more than 250 submissions across the four categories.

AMRCO collaborated with seven acute-care healthcare institutions, and NCID's Infectious Disease Research and Training Office to organise the WAAW Inter-Hospital Webinar Series. More than 4,000 healthcare professionals attended the eight webinars held in October and November 2023.



Winning eco-bag design from Stevie Ardhen Loka Djaja, in the 17 to 25 year old category, of the AMR Competition



Group photo of participants at the One Health AMR Research Workshop

SURVEILLANCE OF ANTIMICROBIAL UTILISATION IN PRIMARY CARE

In 2023, 52 general practitioner (GP) clinics participated in the Primary Care Antimicrobial Utilisation (AMU) Surveillance, up from 29 participating clinics in 2021. This monitoring of AMU provides insights on the trend of antibiotic usage across the participating GP clinics and is part of AMRCO's expanding initiative to encourage primary care physicians to prescribe antibiotics judiciously.

AMRCO also analysed AMU data from 23 polyclinics. The results showed a decline from 2018 to 2022 and consistent adherence to WHO's recommended levels for consumption of Access group antimicrobials.

DEVELOPING THE ASEAN MONITORING AND EVALUATION FRAMEWORK

AMRCO represented Singapore in the development of the ASEAN Monitoring and Evaluation (M&E) Framework. This framework was developed in collaboration with Thailand, with consultation from representatives in human health, livestock, and fisheries sectors from all ASEAN Member States. As a project under the ASEAN Health Cluster 2 Workplan, the framework aims to track ASEAN's progress in combatting AMR through a set of agreed monitoring indicators.

The M&E Framework has been endorsed by the Senior Officials Meeting (Health Division), the Senior Officials Meeting (ASEAN Ministers for Agriculture and Forestry), as well as the ASEAN Senior Officials for Environment. It will be implemented in 2024.

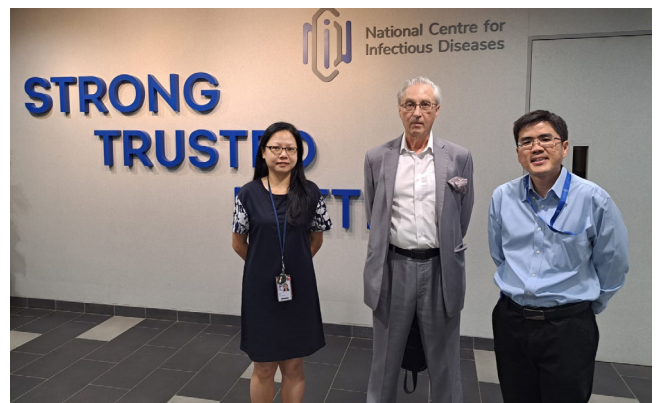
STRENGTHENING COLLABORATIVE EFFORTS IN COMBATTING AMR

AMRCO shares knowledge and best practices by collaborating with regional and international counterparts through meetings, symposiums, and official visits.

In September 2023, AMRCO hosted Dr Dennis Dixon, the Chief of Bacteriology and Mycology Branch, Division of Microbiology and Infectious Disease from the National Institutes of Health (NIH), and National Institute of Allergy and Infectious Diseases (NIAID) in the United States.

Dr Dixon's visit signified strengthening collaborations with NIH, NIAID, and Korea's National Institute of Infectious Diseases. It began in February 2023, when NCID participated in the first International Symposium for Infectious Diseases Research Institutes Cooperation.

Both parties distilled insights from each other and shared experiences tackling AMR issues, leading the path for increased collaborations between themselves, other countries, and organisations.



Dr Dennis Dixon, Chief of Bacteriology and Mycology Branch from the NIH and NIAID in the United States, visited NCID in September 2023

INFECTION PREVENTION, CONTROL AND OUTREACH OFFICE OF NCID

Strengthening Singapore’s Infection Prevention and Control Capabilities

INTRODUCTION

The Infection Prevention, Control and Outreach Office of NCID (ICON) is the newest public health unit under NCID. The establishment of ICON was approved by the Ministry of Health (MOH) on 11 September 2023. ICON aims to strengthen Singapore’s capabilities in infection, prevention, and control (IPC) in both healthcare facilities and community settings to pre-empt future outbreaks, and support MOH and the National Infection Prevention and Control (NIPC) Committee in driving the national IPC programme. Its responsibilities comprise:

- Supporting MOH in IPC surveillance and audits, along with the development of national IPC policies, in conjunction with the NIPC;
- Engaging in outreach efforts to initiate and improve IPC as part of pandemic preparedness and response in the broader community; and
- Collaborating and coordinating with MOH and relevant stakeholders on IPC research and training programmes to enhance the provision of innovative IPC services.

ICON achieved the following in 2023

Presented second national healthcare-associated infections (HAI) point prevalence surveillance results to the NIPC Committee



Conducted surveillance for infrastructural adequacy for IPC measures and compliance to transmission-based precautions



Completed audits:



Data about device-associated infection submitted to MOH



Data regarding the hospital-onset Methicillin-resistant Staphylococcus aureus blood stream infection submitted to MOH



Annual antimicrobial stewardship utilisation (AMU) and submitted the audit data to the Antimicrobial Resistance Coordinating Office



Hand hygiene compliance

STRENGTHENING SINGAPORE'S IPC CAPABILITIES THROUGH SURVEILLANCE

One of ICON's core functions is strengthening Singapore's IPC capabilities. It leverages a multisectoral and multidisciplinary approach to engage partners and conduct site visits to advise IPC improvement. ICON also conducts regular surveillance and audits for MOH and national committees to monitor trends, assess the impact of interventions, and provide suggestions for improvement.

OUTREACH ACTIVITIES ON IPC

ICON imparts crucial IPC knowledge and best practices to healthcare facilities, external agencies, and the community through regular outreach, training, and the development of guidance materials and protocols which are tailored to their specific needs.

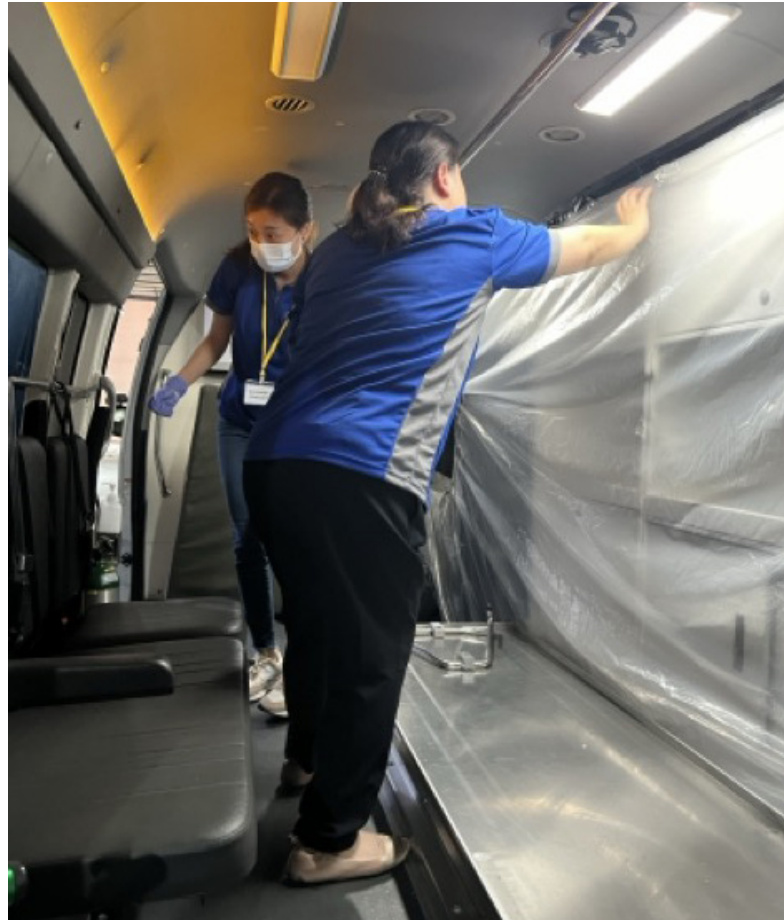
In 2023, ICON worked with multiple partners including government agencies, and a long-term care facility, to provide consultation and expertise on IPC to establish workflows, review standard operating procedures, and put in place measures for outbreak management and pandemic preparedness in healthcare and isolation facilities.

Before the NCID IPC team was subsumed under ICON, it had played an important role in providing expert advice on infection control to external agencies and organisations, as well as providing training to frontliners and healthcare workers. In appreciation of the invaluable contributions of the former NCID IPC Team to the community and its partners, ICON was awarded The Courage Fund Healthcare Humanity Award 2023, and Friends of ACE 2023 by the Ministry of Manpower.

REGIONAL AND INTERNATIONAL EVENTS

ICON contributes its expertise in the development of international guidelines and facilitates the implementation of global IPC priorities through its active participation in various international and regional events. ICON represented NCID in the following global IPC initiatives by the World Health Organization:

- Global action plan and monitoring framework on IPC 2024 to 2030;
- Guidelines for the prevention of bloodstream infections and other infections associated with the use of intravascular catheters; and
- Guideline development group for the global surveillance criteria for HAI.



Private ambulance operator IPC audit



N95 mask fitting and personal protective equipment training



ICON team engaging in a discussion



**RESEARCH,
TRAINING, AND
EDUCATION**

INFECTIOUS DISEASE RESEARCH AND TRAINING OFFICE

Protecting Singapore from Infectious Diseases Through Research, Training, and Education

INTRODUCTION

The Infectious Disease Research and Training Office (IDRTO) plays an important role in safeguarding Singapore from emerging infections and infectious disease threats by providing expertise in public health and infectious disease research. IDRTO also provides professional training for outbreak management and pandemic preparedness, while driving public education initiatives for community partners.

IDRTO consists of:

1 National Infectious Disease Research Coordinating Office	5 Pandemic Preparedness and Research Coordinating Office
2 NCID Research Office	6 NCID Research Clinic
3 Training and Education Office	7 Infectious Disease Research Laboratory
4 Singapore Infectious Disease Clinical Research Network	

2023 Research Achievements at a Glance



Received about
S\$4.8 million
in research grant funding



More than **120 publications** were published, with one-third of them in journals with a Journal Impact Factor (JIF) of 10 or higher¹.

¹ Using Clarivate JIF Listing

2023 Research Awards

Clarivate Highly Cited Researchers 2023
(Cross-field category)

Professor Leo Yee-Sin
Senior Advisor, NCID

Professor David Lye
Director, Infectious Disease Research and Training Office, NCID

Associate Professor Barnaby Young
Head, Singapore Infectious Disease Clinical Research Network, NCID

Clarivate Highly Cited Researchers 2023: The Clarivate list of Highly Cited Researchers recognises researchers who have demonstrated significant and broad influence in their field(s) of research through the production of multiple Highly Cited Papers that rank in the top 1% by citations for field and year.

World's Top 2% Scientists by Stanford University

Professor Vernon Lee
Executive Director, NCID

Adjunct Assistant Professor Shawn Vasoo
Clinical Director, NCID

World's Top 2% Scientists by Stanford University

Professor Leo Yee-Sin
Senior Advisor, NCID

Professor David Lye
Director, Infectious Disease Research and Training Office, NCID

Associate Professor Barnaby Young
Head, Singapore Infectious Disease Clinical Research Network, NCID

Associate Professor Ng Oon Tek
Head, Antimicrobial Resistance Coordinating Office, NCID

Assistant Professor Chia Po Ying
Head, NCID Research Office, NCID

Dr Sean Ong
Visiting Investigator, NCID

World's Top 2% Scientists by Stanford University: The top 100,000 scientists by c-score or a percentile rank of 2% or above in the sub-field according to the standard Science-Matrix classification were selected based on the citations received in a single year (by calendar year).

NCID'S RESEARCH ACHIEVEMENTS

NCID Research Citation by World Health Organization

An NCID research titled "BNT162b2 Vaccine Protection Against Omicron and Effect of Previous Infection Variant and Vaccination Sequence Among Children and Adolescents in Singapore: A Population-based Cohort Study" was cited by the World Health Organization in its COVID-19 Weekly Epidemiological Update published in September 2023.

The retrospective, population-based cohort study found that the BNT162b2 vaccination provided additional protection against the Omicron variant BA.4, BA.5, and XBB in previously infected children and adolescents. Hybrid immunity against XBB was lower than against BA.4 or BA.5, especially in adolescents. Early vaccination of previously uninfected children before their first SARS-CoV-2 exposure could potentially strengthen population immunity resilience against future variants.

Collection of Biospecimens Under National Infectious Disease Biorepository

The National Infectious Disease Biorepository (NIDB) was mooted by NCID as a national resource for the systematic preservation of microbial specimens and associated materials to support public health efforts, outbreak preparedness, and infectious disease research and training. NCID received the support from the Ministry of Health in 2020 to start NIDB and initiate the storage of COVID-19 related biospecimens under NIDB. NIDB has since expanded to include specimens other than COVID-19 related biospecimens.

These various collections will enable NIDB to develop, maintain, and serve as a custodian of a national repository and reference collection of microbes (bacteria, viruses, and fungi) of public health importance and associated biospecimens in Singapore.

Biospecimens in NIDB as of 31 December 2023

Collection	Number of Biospecimens
Public Health ²	24,412
Restricted Access ³	13,635
Special ⁴	1,726

² Public Health Collection: Includes samples collected under the Infectious Diseases Act. These samples are overseen by the Public Health Collection oversight committee.

³ Restricted Access Collection: Includes samples where Principal Investigators (PI) retain the ownership of the samples, typically samples from ongoing studies. Use and transfer of these samples are under the purview of the PI.

⁴ Special Collection: Includes valuable bio-preservation samples that were initially classified as Special Collection under Clinical/Research Collection. The samples are overseen by the NIDB oversight committee (NIDBOC) and may be converted to open access following an evaluation by NIDBOC and depositors.

The TRipartite Programme in Infectious Diseases for New Discoveries and Treatment

Administered and managed by NCID, the TRipartite Programme in Infectious Diseases for New Discoveries and Treatment (TRIDENT) is a collaboration between the National Healthcare Group (NHG), Agency for Science, Technology and Research (A*STAR), and Nanyang Technological University's Lee Kong Chian School of Medicine (LKCmedicine). The joint programme, which was awarded S\$9 million in funding, focuses on accelerating local research in infectious diseases and enhancing knowledge and capabilities to tackle three priority disease areas based on major infectious diseases burden for mortality and morbidity in Singapore. These include antimicrobial resistance (AMR), respiratory tract infections, and emerging infectious diseases. NCID also provides clinical expertise in infectious diseases as part of the programme.

TRIDENT aims to gather infectious disease researchers and clinicians from partner institutions to collaborate, drive, and deliver translational infectious disease research to impact policymaking and clinical practice for better patient outcomes. Additionally, it aims to develop a centre of excellence for infectious disease research, seed promising research ideas and capabilities, and increase tripartite partners' competitiveness to vie for larger ecosystem grants. The first grant call application ended in October 2023.

Coordinating High-quality Research Through the Singapore Infectious Disease Clinical Research Network

The Singapore Infectious Disease Clinical Research Network (SCRN) coordinates high-quality clinical and public health research. It has embarked on seven new clinical trials and three observational studies in 2023. It also joined two notable worldwide clinical research platforms: Randomised, Embedded, Multi-factorial, Adaptive Platform Trial for Community-Acquired Pneumonia (REMAP-CAP), and Strategies and Treatments for Respiratory Infections and Viral Emergencies (STRIVE).

NCID is the partnering site in Singapore for REMAP-CAP, with the National University Hospital serving as the primary coordinating centre. REMAP-CAP is a multinational academic research trial that aims to identify the effect of varied interventions on the outcome of severe community-acquired pneumonia adult patients in an intensive care unit, and it is an adaptive platform trial designed to evaluate multiple treatment options simultaneously. Currently, it has over 250 collaborating sites globally.

STRIVE is another international platform trial led by Australia's Kirby Institute, in collaboration with NCID. It was set up during the COVID-19 pandemic to rapidly test multiple experimental agents or interventions to determine if they are effective in preventing disease progression for respiratory diseases.

Study Showcase: Investigation and Comparison of the Antibody Response Initiated by Recombinant, Cell-Based and Egg-Based Influenza Vaccines (VAP3)

SCRN conducted a prospective and randomised clinical trial called the "Investigation and Comparison of the Antibody Response Initiated by Recombinant, Cell-Based and

Egg-Based Influenza Vaccines (VAP3)". The study aims to compare antibody responses to three influenza vaccines to determine whether recombinant vaccines result in a better antibody response than standard egg-grown or cell-based formulations. In addition, it aims to study if prior vaccination history has different effects on antibody responses when induced by the different influenza vaccines.

This vaccine trial is a collaboration between NCID, A*STAR ID Labs, and Royal Melbourne Hospital (RMH) from Australia. NCID is the main participant enrolment site and successfully enrolled more than 360 participants for the trial in four months. The study samples were sent to both A*STAR ID Labs and RMH for processing and data analysis. The analysis is still on-going.

The Singapore Platform for Controlled Human Infections with SARS-CoV-2 (Sing-CoV)

With this project, Associate Professor Barnaby Young aims to conduct the first controlled human infection

study in Singapore. A controlled human infection study (also known as human challenge) involves infecting carefully selected individuals in a safe, controlled environment to conduct detailed investigation of host-pathogen interactions and develop the next generation of diagnostics, treatments, and vaccines.

The pilot study is led by Associate Professor Young, in collaboration with Professor Christopher Chiu, an infectious disease physician and immunologist at Imperial College London. It aims to confirm the safety and infectivity of nasal inoculation of an infectious dose of a SARS-CoV-2 Delta variant in seropositive healthy volunteers. It also aims to establish the framework for safe conduct of human challenge studies in Singapore and build a multidisciplinary consortium committed to pursuing controlled human infection studies in COVID-19 and other infectious diseases.

TRAINING AND EDUCATION

In 2023, IDTRO's Training and Education (T&E) Office conducted and supported training activities related to outbreak management, clinical and public health professional training, and public education in high-level isolation, antimicrobial stewardship, clinical management, infection control, COVID-19, dengue, human immunodeficiency virus (HIV), tuberculosis (TB), field epidemiology, outbreak management, and urban health security.

T&E Office demonstrating the use of personal protective equipment as part of their engagement sessions with school partners about infectious diseases



2023 Training and Education Achievement Highlights

Conducted and supported around **50** training activities



Engaged about **5,400** individuals from local and international healthcare institutions and non-healthcare organisations



Reached around **300** youths and young adults through public engagement sessions on infectious diseases such as HIV and COVID-19



Conducted a learning journey for about **30** pre-university biology students aged 16 to 19, as part of the Memorandum of Understanding with the Ministry of Education



Outbreak Training and Continuing Education for Healthcare and Public Health Professionals

Conducted more than **20** sessions of high-level isolation training for approximately

260 staff from NCID, Tan Tock Seng Hospital, KK Women's and Children's Hospital, and National University Hospital



Trained approximately **120** funeral service operators and embalmers through six training sessions on basic infection control when handling the remains of deceased persons



Trained around **100** individuals from middle- and lower-income countries in clinical attachment, antimicrobial stewardship, dengue, field epidemiology, and urban security



EXPANDING LOCAL AND INTERNATIONAL PARTNERSHIPS

International Symposium for Infectious Diseases Research Institutes Cooperation

NCID participated in the inaugural International Symposium for Infectious Diseases Research Institutes Cooperation (IDRIC) which was held in February 2023, alongside the National Institute of Allergy and Infectious Diseases, United States of America, and Statens Serum Institut, Denmark. The IDRIC was organised by Korea's National Institute of Infectious Diseases (KNIID).

As part of IDRIC, NCID and KNIID co-organised a joint symposium, with experts from both organisations sharing their research work in the areas of AMR and COVID-19. The joint symposium provided a platform to explore priority research and strengthen collaborations between NCID and KNIID by combining complementary strengths. More than 100 participants from both institutions attended the symposium.

Research, Engagements, and Alliance for Diseases Caused by Infections Programme

The Programme for Research in Epidemic Preparedness and Response (PREPARE) collaborated with Temasek Foundation (TF) to run the Research, Engagements, and Alliance for Diseases Caused by Infections (READI) Programme which seeks to establish strong collaborative relationships with regional partners for impactful research that would better prepare our region for a prompt response to future pandemics.

The inaugural workshop offered by READI Programme and held in May 2023, was organised by PREPARE and its partners including Diagnostics Development Hub, Institute of High Performance Computing under A*STAR, and the ASEAN Diagnostic Initiative. The workshop focused on genomics, detection technologies, molecular diagnostics, and infection and immunity response, and featured experts and participants from Singapore and the ASEAN region, providing a platform to enhance ASEAN's resilience to future epidemics.

Grand Challenges Global Call-to-Action Initiative

PREPARE also partnered the Bill and Melinda Gates Foundation for the Grand Challenges Global Call-to-Action Initiative to fund projects that tackle pathogen genomic surveillance and immunology in Asia. The call, launched in October 2022, received more than 120 proposals, mostly from non-governmental organisations and national public health institutions in South and Southeast Asia. After a rigorous review by a panel of global experts, PREPARE is funding three out of the six grant awards, with the aim to develop genomic surveillance research capabilities and foster robust collaboration networks for research on infectious diseases in the region. The research outcomes will closely align with PREPARE's commitment to enhance Singapore's epidemic preparedness and response capabilities. The three projects awarded in October 2023 were the Genomic Surveillance to Strengthen Public Health Response in Cambodia; A Pilot Surveillance System for Respiratory Syncytial Virus (RSV) in Children Presenting to Hospitals

in Lao PDR; and Pathogen Genomic Surveillance and Immunology in Vietnam.

Joint Infectious Disease Symposium

The fifth Joint Infectious Disease Symposium, organised by NCID, Institute of Infection at Imperial College London, and the Nanyang Technological University's LKCMedicine, was held in November 2023.

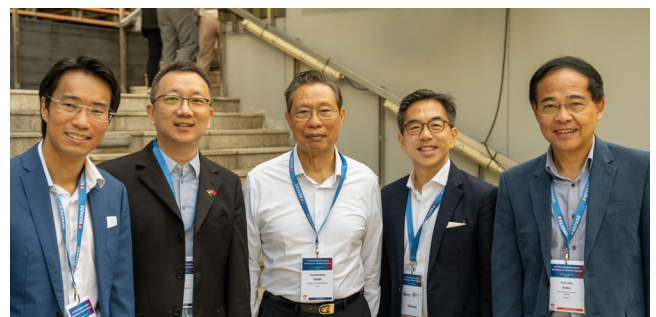
The symposium aims to enhance information and knowledge sharing, explore areas of research priorities and complementary strengths, and serve as an avenue to further bolster collaborations. Close to 80 clinicians, researchers, and scientists attended the virtual event, where speakers shared their work on malaria and bacterial infections.

Memorandums of Understanding

NCID signed two Memorandums of Understanding (MoUs) with Australia's Kirby Institute, and Peter Doherty Institute of Infection and Immunity in August 2023. Aimed at strengthening partnerships in the areas of research and training, the MoUs will bring greater opportunities for research collaborations in areas relating to pandemic preparedness, AMR, HIV, and knowledge exchange through training and education opportunities.

First China-Singapore Experts' Workshop on Pandemic Sciences

The National Research Foundation and China's Ministry of Science and Technology jointly supported a series of workshops on global health and sustainability challenges as part of their efforts to strengthen scientific collaborations. The inaugural China-Singapore Experts' Workshop on Pandemic Sciences was co-organised by PREPARE, Duke-NUS Medical School, and China's Tsinghua University in September 2023. More than 50 Singapore and Chinese academics from various institutions attended the two-day workshop and engaged with infectious disease experts, medical practitioners, and government officials from both countries. The presentations and panel discussions focused on epidemiology and data sciences; clinical research; regional networks and biosafety; detection technologies for diagnostics and surveillance; immunology and medical countermeasures; and sociobehavioural and regulatory science.



(From left to right) Professor Vernon Lee, Executive Director, NCID, Mr Zhu Jing, Chargé d'Affaires, Embassy of the People's Republic of China in Singapore, Professor Zhong Nanshan, Director, Guangzhou National Laboratory, Professor Wong Tien Yin, Vice Provost, Tsinghua University, Professor Wang Linfa, Executive Director, PREPARE, attended the opening of the first China-Singapore Experts' Workshop on Pandemic Sciences in Singapore



LOCAL AND INTERNATIONAL COLLABORATIONS

LOCAL AND INTERNATIONAL COLLABORATIONS

Fostering Closer Cooperation in the Fight Against Infectious Diseases

INTRODUCTION

NCID stays at the forefront of the infectious diseases landscape through collaborations and partnerships with local, regional, and international partners.

LOCAL ENGAGEMENTS

As part of continued efforts to foster greater knowledge exchange with local networks and further strengthen NCID's role in Singapore's healthcare system, NCID hosted teams from local public healthcare institutions including a planning workgroup from Singapore General Hospital's Emergency Department, Eastern General Hospital planning office, and delegations from Ministry of Health, Singapore's Public Service Commission, and The Alpha Society, which is an association of administrative officers in the Civil Service. During these visits, NCID shared its design principles, functions, key facilities and capabilities, and its infection control and prevention practices and concepts. The visitors were also led on guided tours to key facilities in NCID to enhance their understanding. These visits provided a platform for meaningful discussions on learnings from the COVID-19 pandemic, NCID's efforts in infectious disease surveillance and outbreak investigations, and NCID's outbreak preparedness.



The planning workgroup from Singapore General Hospital's Emergency Department learnt how specific operations were conducted at the Screening Centre during the COVID-19 pandemic



The team from Eastern General Hospital Planning Office visited the negative pressure rooms and the High-Level Isolation Unit in NCID

REGIONAL AND INTERNATIONAL COLLABORATION

In 2023, NCID welcomed regional and international experts and visitors from Africa, Australia, China, Europe, Hong Kong, Japan, Malaysia, Mongolia, Taiwan, Thailand, United Arab Emirates, United Kingdom, and United States of America, as well as a research network comprising hospitals across Asia, and a multinational, voluntary organisation in the Asia Pacific.

NCID also hosted delegations from healthcare institutions, disease control and prevention centres, and officials from health authorities. Two of the health authorities that visited were the Dubai Health Authority (DHA), and the Abu Dhabi Department of Health (DOH). NCID and DHA discussed on surveillance for communicable diseases, challenges faced during the COVID-19 outbreak, and the protocols for managing infectious diseases cases in both countries. Discussions between NCID and Abu Dhabi DOH centred around NCID's role in working with other organisations to tackle challenges arising from emerging infectious diseases.

Other overseas organisations that visited NCID comprised infectious diseases institutes or centres, public healthcare institutions, and academic and research institutions. As part of NCID's efforts in expanding its research network, NCID

hosted Guangzhou Laboratory and the discussions focused on strengthening international academic exchanges, exploring different research strategies, and finding ways to improve diagnosis and treatment.



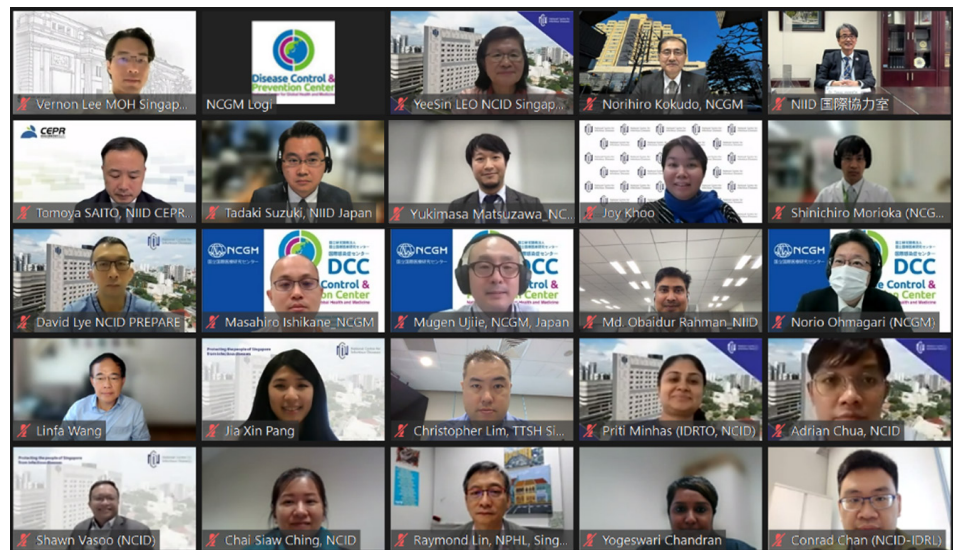
The delegation from Guangzhou Laboratory were given an overview of NCID's research infrastructure, facilities and capabilities

VIRTUAL EXCHANGES

Beyond physical meetings with foreign delegates, NCID also participated in various virtual meetings with regional and international partners.

One of the key meetings included the National Center for Global Health and Medicine (NCGM) – National Institute of Infectious Diseases (NIID) – NCID Joint Symposium held in January and September 2023. The January 2023 symposium covered Emerging Infectious Diseases, and was attended by more than 100 participants from Singapore and Japan.

Discussions included plans for future bilateral collaboration in information and specimen sharing, training and education, joint research, surveillance and risk assessment, mutual visitations, and human resource development. The September 2023 symposium focused on Antimicrobial Resistance (AMR) and Infection, Prevention, and Control (IPC), and fostered learning from each centre on the national strategies for AMR and IPC. More than 80 participants from Singapore and Japan attended, with discussions for future bilateral collaboration in research, methods, and genomic surveillance.



NCGM-NIID-NCID Joint Symposium on Emerging Infectious Diseases held in January 2023

Another important meeting was the Regional Expert Panel Discussion where infectious disease clinicians and experts from various countries across Asia exchanged experiences and research findings. The sixth run of the meeting focused on paediatric experiences with COVID-19, COVID-19 vaccination strategies, and clinical observations and specific studies on the prevalence of Long COVID. Participants included members of the Paediatrics Infectious Diseases Workgroup, and clinicians and experts from Brunei, Indonesia, Philippines, South Korea, and Taiwan.

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