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Southeast Asia Strategic Multilateral Biosecurity Dialogue

with Participation from Indonesia, Malaysia, the Philippines, Singapore, Thailand, and the United States

Meeting Report
December 14 and 16, 2021

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Contents

Introduction

On December 14 and 16, 2021, the Johns Hopkins Center for Health Security held a second virtual meeting of the Southeast Asia Strategic Multilateral Biosecurity Dialogue. The ongoing impacts of the COVID-19 pandemic, including health risks as well as quarantine requirements and other travel restrictions, necessitated hosting the meeting virtually. Additionally, many of our dialogue participants play important roles in their country's COVID-19 response, which makes it difficult for them to take time away from work for travel. In order to maintain the relationships that are so critical to the success of this dialogue and to share lessons from national-level COVID-19 response activities, we held a second virtual meeting, which built on the topics and challenges discussed in our previous meeting in February 2021.[1]

The Southeast Asia Strategic Multilateral Biosecurity Dialogue evolved out of a bilateral Track II dialogue between Singapore and the United States, originally held in 2014. The following year, the dialogue expanded to include Indonesia and Malaysia. The Philippines and Thailand participated as observers in 2017 and 2018 and have been full participants since 2019. This dialogue facilitates collaboration on a range of biological risks in Southeast Asia—including natural, accidental, and deliberate threats—as well as their potential impact on the United States. The dialogue focuses on cross-border and regional collaboration and information exchange, which helps participant countries share best practices and identify solutions to existing and emerging threats in the region.

This dialogue meeting consisted of 4 1-hour dialogue sessions across 2 meeting days. The meetings included participants from each of the 6 participating countries, including subject matter experts and current and former senior government officials from across healthcare and public health, national security and foreign affairs, homeland security/home affairs, nonproliferation and disarmament, animal and agricultural health, journalism, and other relevant fields. The dialogue topics included an overview of the national-level COVID-19 responses since our February 2021 meeting and discussions on disease surveillance and vaccination activities. Notably, the participants also looked beyond the current pandemic to future biosecurity challenges, including identifying solutions from the COVID-19 pandemic that could be applicable to other threats. The meeting included a session dedicated to the pandemic's impact on the future of biosecurity in Southeast Asia, and each topic session included discussion on lessons for future events.

The meeting was held at an informal Track II level, as opposed to formal government-to-government engagement, and the discussions were conducted on a not-for-attribution basis to promote open and transparent discussions regarding each country's capabilities and limitations.

What follows is a summary of the discussions held during the December 14 and 16, 2021, virtual dialogue session.

National-Level COVID-19 Impacts and Responses

Over the course of 2021, the COVID-19 pandemic has required governments to adapt to the evolving characteristics of the SARS-CoV-2 virus and implement nimble response strategies to mitigate the pandemic's ever-changing effects. Although the current nature of the emergency looks quite different than it did in February 2021, when we hosted our first virtual dialogue session, COVID-19 continues to impact individuals' health, the public health and healthcare sectors more broadly, and economic and social systems worldwide. The high degree of transmissibility exhibited by the Omicron variant of concern illustrates the adaptability of the SARS-CoV-2 virus, which has required countries to continually update their response strategies to mitigate the evolving threat. To date, our Southeast Asian country partners in Indonesia, Malaysia, the Philippines, Singapore, and Thailand have employed a variety of strategies to mitigate COVID-19 transmission and the associated health, social, and economic effects over the course of the pandemic. With the introduction of vaccines in late 2020, first for high-priority groups and later for the broader public, countries have amended COVID-19 regulations, restrictions, and policies in an effort to return to some form of normalcy.

In Indonesia, COVID-19 daily incidence remained stable in November and December 2021, following the country's surge driven by the Delta variant of concern, and the national test positivity was below 1% at the time of the December dialogue meeting.[2,3] Due to the continued presence of the Delta variant, Indonesia maintained its isolation and quarantine policy for individuals who have recently tested positive or who have come into close contact with known cases, respectively. The quarantine and isolation policies apply to residents in all 34 provinces, and the government reassesses them every 2 weeks. One participant indicated that the government placed restrictions on businesses, schools, and other public settings, depending on the type of setting, local COVID-19 conditions, and vaccination coverage. At the time of the meeting, some businesses—including markets, restaurants and food stalls, and pharmacies—faced both restrictions on operating hours and limitations on capacity (50%). At that time, no provinces outside the islands of Bali and Java were implementing Level 3 or Level 4 (highest) restrictions.[4] The government continued to recommend that businesses and employees that can operate remotely continue to do so, and one participant emphasized that the government remained hopeful that the economic recovery would be swift.

Malaysia coped well with initial variants during the pandemic, but like many countries, it struggled with high levels of SARS-CoV-2 transmission during its Delta variant surge.[5] When vaccines were introduced and made available to the general public

around March 2021, there was a high demand for the vaccine. Coupled with effective vaccine distribution and administration operations, this high demand and positive perception of the vaccines enabled the Philippines to approach 80% full vaccination coverage at the national level by October.[6] Additionally, one dialogue participant indicated that Malaysia experienced an increased demand for booster doses in early December 2021, around the time that the Omicron variant was first identified. At the time of the dialogue meeting, Malaysia was coming down from its Delta surge and had not yet experienced increasing transmission associated with the Omicron variant.[7] Malaysia had entered Phase 4 of its response and recovery plan, in part as a result of widespread vaccination coverage. Under Phase 4, Malaysia required individuals to provide documentation of vaccination in public places, such as parks, shopping malls and retail stores, and restaurants and bars.

The Philippines' experience with COVID-19 mitigation required the reconfiguration of healthcare facilities and reallocation of resources to ensure continuity of care during major COVID-19 surges. During the height of its Delta variant surge, the Philippines mobilized firefighters to support operations at the country's largest testing facility as well as at quarantine and isolation facilities. The Philippines Bureau of Health Protection supported response activities at hospitals by converting existing treatment units to COVID-19-specific units. At the time of the dialogue meeting, the Philippines was recovering from its Delta surge, its largest of the pandemic, which peaked in late August/early September 2021.[8] Like many other countries, the Philippines' health system was under considerable strain due to the influx of patients during the Delta surge; however, hospitalization rates slowed considerably in the weeks leading up to the meeting and were more manageable, due in part to public–private partnerships that provided support and additional capacity.

Singapore experienced its Delta variant surge between August and October 2021. Despite reaching approximately 80% vaccination coverage nationwide, the Delta variant caused Singapore's most severe surge since the start of the pandemic.[9,10] One dialogue participant indicated that the surge was largely attributable to the Delta variant's increased transmissibility, but the combination of waning immunity, especially among older adults and healthcare workers who received the earliest doses, and the resumption of social activity after easing COVID-19 restrictions contributed as well. At the time of the meeting, Singapore continued to require masking and physical distancing in public, including restrictions on large gatherings. During the Delta surge, community transmission was largely driven by younger portions of the population. One participant indicated that schools transitioned back to remote learning and the government reimposed restrictions on indoor dining in an effort to mitigate community transmission. Singapore's government authorized the use of booster doses around

October 2021, toward the end of its Delta surge, but one participant noted that, while the booster effort was successful, the country still struggles with vaccine hesitancy and anti-vaccine sentiment. The government implemented vaccination mandates and expanded testing efforts in order to slow transmission until booster shots were more widely available. The government also imposed vaccination mandates in an effort to incentivize vaccination, as those who remained unvaccinated faced additional restrictions on public activities. Singapore's health system was overwhelmed from nearly 2 years of pandemic response activities, and public health officials began recommending home recovery for patients during the Delta surge as a way to shift lower-acuity patients away from hospitals and make room for more severe COVID-19 patients. The military stepped in to support the public health and healthcare systems, including with recovery programs, intake and triage of patients at COVID-19 treatment centers, and transferring severe COVID-19 patients to hospitals for care.

In Thailand, the Ministry of Public Health leveraged its national network of primary health clinics and cadre of healthcare workers to respond and adapt to the changing needs of the pandemic. One participant emphasized that Thailand's universal healthcare system was a core component of the country's ability to collaborate and organize its COVID-19 response across its healthcare facilities, personnel, and other resources. Thailand's economy relies heavily on travel and tourism, and the government has made considerable efforts to resume domestic and international travel through the use of vaccination and testing requirements. In fact, Thailand explicitly included tourism in its COVID-19 recovery plans to revitalize the economy and industry. International travelers must register on the Thailand Pass system—which requires documentation of vaccination, health insurance, and a negative PCR-based diagnostic test 72 hours prior to travel[11]—before entering the country. Thailand also set up a "sandbox" in Phuket, which essentially allows vaccinated travelers to avoid quarantine upon arrival, as long as they remain in the city.[12] In 2021, the government restricted travel from high-risk countries, but this policy is being evaluated based on changes to the pandemic situation. As with international travel, the country is taking a layered approach to COVID-19 control measures. One participant indicated that Thailand aims to achieve 70% vaccination coverage nationwide and that the government has prioritized strengthening surveillance at the community level, including by making testing easily accessible at primary health clinics as part of the country's universal healthcare system.

In the United States, intense political debate and division have played a major role in selecting and implementing COVID-19 response policies and activities. Although the US Centers for Disease Control and Prevention operates at the federal level, the responsibility and authority for public health services lie at the state and local level. One

participant emphasized that this results in more than 50 different response strategies and frameworks across the country. Each state and local jurisdiction encountered unique challenges, such as SARS-CoV-2 transmission dynamics; public health and healthcare capacity, including diagnostic laboratories; political environment and public perception; and social and economic support systems. The range of approaches used by state and local jurisdictions in responding to federal guidance and policies, including vaccination and testing mandates, has resulted in vast disparities in terms of COVID-19 morbidity, mortality, and vaccination coverage, particularly with respect to geography and political affiliation. While variations across state and local jurisdiction responses have added complexity to the US COVID-19 response, the federal government has faced its own challenges in developing and implementing response policies and guidance. One participant commented that the US government is a massive bureaucracy, which can impede interagency collaboration and can slow progress in developing cohesive guidance and response policies. Additionally, the federal government has struggled since early in the pandemic to effectively communicate about pandemic-related recommendations and policies, particularly when updates were made in response to changing epidemiologic conditions or emerging data and analysis. Vaccine hesitancy and anti-vaccine sentiment remain major challenges in the United States as well. In fact, at the time of the dialogue meeting, only about 60% of the US population was fully vaccinated and only 18% had received booster doses, despite having access to vaccines earlier than the vast majority of countries.[13,14]

At the time of the meeting, the Omicron variant had only recently been identified and had not yet resulted in major surges in transmission.[15] Initial efforts were underway to leverage existing COVID-19 surveillance systems to track the emergence of the new variant and to better understand its transmission and disease characteristics. Since the December 2021 meeting, many countries have faced their most severe COVID-19 surges, driven by the highly transmissible Omicron variant, which have resulted in associated effects on health system capacity; however, considerable uncertainty surrounded the variant at the time of the meeting. In the context of the Omicron variant, participants expressed concerns about limited genomic sequencing capacity to support surveillance efforts, equitable access to COVID-19 vaccines to provide protection against more transmissible SARS-CoV-2 variant, the role vaccination mandates in mitigating the risk of an Omicron surge (as well as associated public perceptions and reactions), and the potential need for updated quarantine and isolation guidelines. Global disparities in access to COVID-19 vaccines persist, and concerns about these inequities grew considerably with the emergence of the Delta and Omicron variants. Low- and middle-income countries (LMICs) with low vaccination coverage faced greater risk from highly transmissible variants. The World Health Organization (WHO) continues to call on higher-income countries to increase access to COVID-19 vaccines for LMICs, including

through donations; however, many higher-income countries have shifted their focus toward administering booster doses to increase protection against new variants for fully vaccinated individuals. WHO emphasizes that the relative value of the first and second doses of COVID-19 vaccines is much greater than boosters in terms of increasing global protection, and WHO Director-General Dr. Tedros Adhanom Ghebreyesus called for a moratorium on booster doses until national-level vaccination coverage could reach its 2021 target of 40% for all countries.[16] In addition to the direct health risk for many LMICs due to low vaccination coverage—particularly in Africa, where vaccine inequities are the most prominent[17]—the continued widespread community transmission of SARS-CoV-2 provides the opportunity for the virus to evolve, which facilitates the emergence of future variants. One participant commented that it appears that the global vaccine supply is becoming less of an issue and that countries that previously struggled to access adequate supply are now facing challenges in their capacity to distribute and administer vaccinations. When examining response strategies in the context of the Omicron variant, participants stressed the need to improve genetic sequencing capacity at the national level and surveillance efforts at the local level, especially as governments begin to ease COVID-19 restrictions and more transmissible variants, including Delta and Omicron, continue to emerge.

Diagnostic Testing and Disease Surveillance Systems

From the very beginning, the COVID-19 pandemic has stressed disease surveillance systems around the world, including in the context of developing and testing medical countermeasures, characterizing their disease and transmission attributes, and identifying and monitoring the emergence of new variants.[18] Countries have developed unique and specific solutions to these challenges, and the December 2021 dialogue meeting included a session on disease surveillance challenges and lessons that could be applied to both the ongoing COVID-19 response and future emergency preparedness efforts.

Singapore took multiple proactive approaches to using disease surveillance systems, including early warning systems and at-home testing, to stay ahead of its COVID-19 epidemic. The country implemented a wastewater surveillance system to provide early warning for COVID-19 outbreaks by screening for the presence of SARS-CoV-2. The system was initially used at college campuses and dormitories due to the high concentration of individuals living and working in close proximity. After demonstrating the ability of wastewater surveillance to provide early warning of COVID-19 outbreaks in these settings, Singapore expanded the system and integrated it with other COVID-19 surveillance systems. One participant shared that the Singaporean government also distributed noninvasive, saliva-based rapid antigen test kits to each household to provide faster results than were available from traditional testing sites

(eg, via diagnostic laboratories). The at-home rapid tests allowed individuals to easily and quickly identify and isolate infected individuals, rather than relying on individuals to seek out community testing sites and waiting for a diagnosis before isolating.[19] Asymptomatic individuals who tested positive via the rapid tests were required to isolate at home and retest in a few days. If a symptomatic individual tested positive via a rapid test, however, they were required to get a confirmatory PCR-based diagnostic test, and all positive PCR-based tests were reported to the Ministry of Health. The home test kits reduced the burden on diagnostic laboratories by reserving testing capacity for symptomatic individuals at a time when the country was facing its Delta surge, which more-than-tripled its previous record high daily incidence.[20] One participant suggested that the combination of expanded testing (ie, via at-home test kits) and mandatory isolation for asymptomatic individuals with positive rapid tests made it difficult for many people to return to work; however, it likely contributed to lower community transmission by those who may not be aware that they are infected.

While the world is focused on COVID-19, it is important to remain vigilant for other pathogens as well. Many countries have expanded existing disease surveillance systems during the pandemic to accommodate additional demands for COVID-19 surveillance, and it is critical that they incorporate this new capacity and lessons learned to improve disease surveillance systems for the future. Notably, the volume of SARS-CoV-2 testing and the need for timely results drove many countries to shift existing laboratory and other public health and healthcare resources from routine surveillance programs to SARS-CoV-2. If routine surveillance remains a second-tier priority, countries run the risk of allowing other pathogens the opportunity to surge, including vaccine-preventable diseases like measles, vectorborne diseases like dengue and malaria, and emerging infectious diseases like Nipah. Participants noted that the pandemic resulted in the inevitable displacement of public health surveillance activities and required a reallocation of resources. For example, one participant described significant setbacks in the Philippines in terms of eliminating tuberculosis and polio (following an outbreak in late 2019) as a result of shifting disease surveillance resources and priority away from routine programs and toward COVID-19. Dialogue participants discussed similar experiences during the 2003 SARS epidemic. Routine disease surveillance systems and capacities that were diverted or repurposed for SARS-CoV-2 will need to be reintegrated in a post-COVID-19 world, with additional considerations for addressing a waning public health and healthcare workforce capacity and ensuring the sustainability of new surveillance and reporting mechanisms established during the pandemic.

Looking forward, disease surveillance systems, advanced molecular diagnostics, and biosecurity threat detection remain priorities for countries in Southeast Asia, particularly as laboratories have shifted much of their time, personnel, funding, and materiel to SARS-CoV-2. Scaling up public health and diagnostic laboratory capacity

and expanding capabilities are necessary to improving pandemic surveillance efforts while maintaining sustainable routine disease surveillance activities. These efforts will require infrastructure, public–private partnerships, multisectoral collaboration, and political will to maintain momentum from the COVID-19 pandemic. In Thailand, for example, national response strategies focused on scaling up national SARS-CoV-2 testing capacity throughout 2021. While the country was able to leverage its universal healthcare networks to link primary care, hospital, and laboratory facilities nationwide, other countries will need to establish and maintain more varied networks—and potentially networks of networks—if they are to provide the necessary testing and disease surveillance coverage for major events like the COVID-19 pandemic. This will require ongoing investment and strategic direction at the national level as well as the appropriate allocation of local resources toward disease surveillance, testing, monitoring, and reporting. COVID-19 is clearly the priority for many countries, but these capabilities and capacities can be repurposed to establish sustainable and flexible surveillance systems for a broad range of biological threats.

Vaccines and Vaccination Activities

One of the biggest differences between the February and December 2021 discussions was the greatly increased availability of COVID-19 vaccines. In February, the dialogue participants indicated that their respective countries had commenced the earliest stages of vaccination efforts, but the supply of vaccine doses was very limited in most countries. In contrast, dialogue countries were all reporting approximately the same values for per capita daily doses administered at the time of the December meeting—ranging from approximately 0.4 to 0.6 daily doses per 100 population.[21] Additionally, Malaysia, Singapore, and Thailand surpassed the United States in terms of full vaccination coverage by early December, and Indonesia and the Philippines appear to be on a trajectory to surpass the United States over the coming weeks or months.[22] The participants discussed the current state of their national vaccination efforts, activities to combat vaccine misinformation and disinformation, disparities in vaccination coverage, and the investments needed to improve vaccine development, production, distribution, and administration for future pandemics.

Participants from each participating country indicated that their respective governments prioritized certain high-risk groups for access to limited supply of vaccine doses early in their vaccination efforts. Each country took its own approach, but generally, high-risk populations were identified based on their risk of infection or severe disease. Individuals at elevated risk for transmission included healthcare workers, who could be exposed by known COVID-19 patients or patients or visitors with undiagnosed SARS-CoV-2 infection, and other frontline or essential workers, and those at high risk

for severe disease included older adults and individuals with compromised immune systems or various other underlying health conditions. In many instances, the priority groups were organized into tiers, and countries expanded eligibility to subsequent tiers as sufficient supply became available. At the time of the December 2021 meeting, some countries had expanded eligibility to children (eg, ages 5 or 6 years and older), and some had started offering booster doses to portions of the fully vaccinated population, generally also using a tiered approach. Several participants indicated that their respective countries permitted heterologous vaccination—also referred to as "mix-and-match" dosing—in which individuals received different vaccines for their first, second, or booster doses. Many of the initial doses available were inactivated virus and viral vector vaccines (eg, Oxford–AstraZeneca, various vaccines from China), but as mRNA vaccines became available, governments authorized them for second doses or booster doses to increase the degree of protection and provide additional options to make it easier for individuals to complete their 2-dose series. As noted above, one participant argued that vaccine supply may no longer be the limiting factor in terms of increasing vaccination coverage. That individual indicated that most countries now have sufficient inventory of COVID-19 vaccines, but many are struggling to establish and maintain sufficient capacity to distribute and administer the vaccines to the public, which illustrates ongoing limitations in public health and healthcare infrastructure. Another participant indicated that the doses received via the COVAX facility were often 3 to 6 months away from expiration. To ensure they could obtain sufficient supply, countries had to request more doses than they needed, but they then ran the risk of some doses going to waste if they could not be administered in time.

Vaccine hesitancy and anti-vaccine sentiment continue to be major challenges for many countries. As we have discussed in previous dialogue meetings, vaccine hesitancy and anti-vaccine sentiment were growing problems in many participating countries even before the COVID-19 pandemic.[23] Several participants indicated that political divisions during the pandemic compounded widespread and coordinated misinformation and disinformation campaigns spread via social media and exacerbated the existing prevalence of vaccine hesitancy and anti-vaccine sentiment. National governments are struggling to combat these challenges during the pandemic, but most efforts have been more reactive than proactive, which allows vaccine opposition to take root before counter communication can be disseminated. In addition to broader hesitancy toward COVID-19 vaccines, some participants described opposition to or concern about *specific* COVID-19 vaccines, particularly those developed and manufactured in China. Unlike the European Commission, United Kingdom, and United States, other countries, most LMICs, including some dialogue countries, were unable to secure large-scale advance purchase commitments directly from pharmaceutical companies, so they had to use alternate sources for their initial vaccine supply. Many LMICs relied on COVAX to

distribute COVID-19 vaccines, but this was a slow process, particularly early after vaccines were authorized for use.[24] One major alternative source was China, which donated millions of doses of several of its vaccines to LMICs around the world and even helped establish production facilities in some countries, including Indonesia.[25] There are concerns that China's internal regulatory processes did not meet the same stringent standards as those of the European Commission, United Kingdom, and United States, and limited clinical trial data were published publicly, which gave rise to concerns about the vaccines' safety and efficacy. In countries that received donations from China, dialogue participants described hesitancy among healthcare workers and a desire to wait for access to vaccines authorized for use in other countries (eg, Pfizer–BioNTech, Moderna, Oxford–AstraZeneca, Johnson & Johnson–Janssen). Conversely, one participant described hesitancy toward the mRNA vaccines among pregnant women, in part, as a result of the novel technology.

Countries took a variety of approaches toward increasing interest in vaccination, including using positive and negative incentives. "Vaccine passports"—documentation of vaccination status and possibly of recent SARS-CoV-2 infection or negative tests—were among the most widely used incentives. Vaccine passports allowed individuals to take part in various public activities, including travel and in-person dining at restaurants. Several dialogue participants commented that the desire to return to a semblance of normalcy contributed substantially to increases in vaccination uptake over the course of 2021, and vaccine passports were one tool that governments employed to achieve this. While these incentives may be effective in urban and suburban communities, they may be less so in some remote areas where there have been lower levels of community transmission and fewer public activities. Many participating countries—particularly Indonesia, Malaysia, and the Philippines—have large populations spread across large geographic areas, including densely populated urban centers; small, rural villages; and tens of thousands of islands. Remote populations are more difficult to access, due to the additional resources required for effective community engagement and logistical challenges, particularly for vaccines that require ultra-cold chains. One US participant indicated that their state faced similar issues reaching rural populations, although not quite to the same degree. The combination of prioritizing urban centers (where dense populations facilitate community transmission) and tourist destinations (which drive many economies) for vaccination and the barriers to reaching more remote populations contributed to geographic disparities in vaccination coverage both between and within countries. Countries also face disparities among racial and ethnic minority populations, some of which align directly with geographic disparities. Several dialogue participants indicated that language barriers were a major factor in lower coverage among some racial and ethnic minority populations. In the Southeast Asian countries, the vast number of local and

regional dialects make it difficult to effectively communicate about COVID-19 vaccine recommendations and the associated benefits and risks. Language-based challenges can compound urban–rural disparities. These participants described efforts to identify local champions who could serve as trusted voices and communicate in local dialects and their positive impact on vaccination efforts in these communities. In Singapore, migrant worker dormitories were major loci of transmission early in the pandemic, as a result of densely populated living conditions. These individuals have faced prolonged, highly restrictive "lockdowns" in order to mitigate transmission risk,[26] and one participant reported that the government identified them as a priority group for vaccination and implemented dedicated vaccination efforts at these facilities in order to increase protection among this high-risk population.

Looking Ahead: Laboratory Biosecurity and Investigations

The world is beginning to look beyond COVID-19 and initiate efforts to apply lessons learned and improve preparedness and resilience systems for pandemics and other large-scale health emergencies. One of the principal areas of focus for the Southeast Asia Multilateral Biosecurity Dialogue is regional collaboration, and the participants addressed ongoing efforts to develop and establish regional programs to address pandemic and other biosecurity threats. In the final session, the participants also addressed the pandemic's longer-term effects on regional collaboration, laboratory biosecurity practices and regulations, and the ability to conduct investigations into the origin of future events.

Several dialogue participants discussed how COVID-19 has generated a sense of solidarity and resolve among senior government officials in the region that is driving efforts to formalize regional collaboration in Southeast Asia. WHO remains a core component of global health security; however, regional efforts could be better positioned to prioritize relevant threats and provide more nimble response capacity for their member countries, including material and technical support. Regional efforts could range from establishing and maintaining equipment and medical materiel stockpiles (including for influenza, COVID-19, and other threats) to developing COVID-19-specific recovery plans to regional laboratory networks and creating a permanent ASEAN-based Centers for Disease Control (CDC). Creation of an ASEAN CDC, in particular, appears to have made concrete progress, with Japan's commitment of US$50 million to establish the necessary infrastructure, and negotiations continue to determine the location of the proposed headquarters—with bids from Indonesia, Thailand, and Vietnam. In the absence of a formal regional network, cross-border personal and professional relationships remain a critical component of international collaboration in Southeast Asia and in other parts of the world. One dialogue participant argued that health officials need to be comfortable operating outside their explicit responsibilities,

consider what governments are and are not doing, and be willing to critique government responses to events like the COVID-19 pandemic. The frank and open discussion that occurs at each meeting, particularly regarding countries' challenges and limitations, underscored the value of the Southeast Asia Multilateral Biosecurity Dialogue as a forum for regional collaboration, information sharing, and emergency preparedness.

At the national level, the COVID-19 pandemic has revealed shortcomings in diagnostic testing capacity, disease surveillance systems, and health system capacity in countries around the world, including many that have been assessed as having strong preparedness and resilience capacity.[27] The pandemic has also highlighted the importance of a multidisciplinary, whole-of-government approach to preparedness and response activities. Since its earliest meetings, this dialogue has stressed the importance of collaboration and integrating public health and healthcare (including human and animal health), national security and law enforcement, international relations, and other relevant government sectors as well as nongovernmental organizations, academic institutions, and the media in preparedness activities. The emergence of SARS-CoV-2 variants of concern during the COVID-19 pandemic illustrates the critical importance of genomic sequencing, as genomic data can provide some of the earliest and most detailed information about viral evolution and support early efforts to characterize new variants. Once a new variant is identified, countries then need to establish robust surveillance capacity to track the introduction and prevalence of the variant within their respective populations. The Delta and Omicron variants illustrated this need during the first 2 years of the COVID-19 pandemic. Without adequate sequencing capacity, countries must rely on screening processes to identify priority specimens for sequencing, which could miss relevant cases and leave countries blind to major changes in their respective epidemics. Discussions are ongoing regarding regional laboratory networks in Southeast Asia, which could provide capacity to supplement national and private sector laboratories, potentially including genomic sequencing. The COVID-19 pandemic has motivated some countries to establish advanced laboratory capacity, including high-containment laboratories (eg, biosafety level 3 or 4), to provide enhanced technical capabilities for research and outbreak response on dangerous pathogens. Some participants, however, expressed considerable concern about how speculation about the origins of SARS-CoV-2 could affect regulatory and oversight systems for high-containment laboratories in the future. Health systems have struggled in many countries to keep pace with COVID-19 surges, and one participant noted that their country is actively rethinking hospital and health system operations to provide additional capacity during emergencies. The COVID-19 pandemic has illustrated the complex nature of large-scale and prolonged health emergencies and has called attention to the need to adapt emergency and routine health system operations and engage the public to build community-based resilience for these types of events.

The investigations into and speculation about the origins of the SARS-CoV-2 virus have called attention to the absence of a recognized, independent authority and the capacity to conduct such investigations and the importance of establishing this kind of capability for future events. It is nearly impossible to definitively identify the original source of an outbreak or epidemic, but with the COVID-19 pandemic, the uncertainty fueled speculation about the nature of the pandemic and exacerbated national political divisions and global geopolitical tensions. Participants noted that, under the current global system, WHO does not have the authority to conduct any activities unless explicitly invited by the host country. If they are invited, WHO must abide by the conditions of that country, including potentially limited access to facilities, personnel, and data that would be needed to investigate the origin of a novel pathogen or outbreak. These circumstances played a major role in the WHO investigation into possible SARS-CoV-2 origins in China—specifically, Wuhan—and the restrictions placed on the investigators' access further fueled speculation that the Chinese government was concealing relevant activities that could have contributed to the emergence of the virus. The dialogue participants debated the degree to which WHO could be granted increased access for such investigations in the future and whether WHO was the appropriate agent to conduct those activities. Other potential mechanisms, including the United Nations Secretary-General's Mechanism, could provide similar capabilities but in a more formal capacity; however, those options have their own restrictions. For example, requests or findings brought before the United Nations Security Council could be subject to vote or possibly veto by a permanent member. The Biological and Toxin Weapons Convention (BWC) is another potential option, but the BWC has limited options for investigating biological events. The BWC would likely need to rely on the United Nations Security Council to determine if an investigation is warranted or voluntary access by the host country. Considering the current barriers to conducting an independent investigation, it is highly unlikely that a thorough review of the circumstances related to the emergence of an epidemic or novel pathogen will be possible for future events.

Conclusion

The COVID-19 pandemic continues to expose new weaknesses in national, regional, and global preparedness and response systems. The regulatory authorization or approval and availability of multiple COVID-19 vaccines—developed, tested, and reviewed in record time—drastically changed the course of the pandemic, but the emergence of the Delta and Omicron variants have somewhat hindered the vaccines' impact. Health systems, governments, economies, and communities continue to struggle under the burden of COVID-19, and the prolonged response weighs heavily on all aspects of society.

As several participants commented, the COVID-19 pandemic has illustrated the need for international collaboration and highlighted the many political, technical, logistical, and operational barriers to leveraging that collaboration. Since the previous dialogue meeting in February 2021, many countries have shifted from relying on nonpharmaceutical interventions—including large-scale "lockdowns," mask use, and other social restrictions—to a vaccine-forward approach to their COVID-19 responses. The pandemic continually demonstrates that a balanced, layered approach is necessary to mitigate the worst effects of large-scale and prolonged health emergencies. As countries continue to implement pandemic response activities and look to the future, it is important that they document and share key lessons learned, which can be used to identify, develop, and adapt effective mechanisms to improve preparedness and response capacity and establish sustainable resilience policies and practices.

The Southeast Asia Multilateral Biosecurity Dialogue continues to serve as a forum for highlighting challenges, barriers, and shortcomings in national and regional preparedness and response efforts as well as identifying and sharing lessons and best practices.

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Appendix A. Agenda

SOUTHEAST ASIA MULTILATERAL BIOSECURITY DIALOGUE
VIRTUAL MEETING

DAY 1: 14 DECEMBER 2021

7:00 – 7:05am **Welcome & Introduction**

7:05 – 8:05am **National-Level COVID-19 Impacts & Response Overview**

Much has changed since our last virtual session in February 2021, but the COVID-19 pandemic continues to impact health, economies, and social wellbeing around the world. The Delta variant comprises approximately 90% or more of new cases around the world, and the emerging Omicron variant is cause for concern. Global vaccination coverage is increasing, but progress is slow. The pandemic's effects are not consistent across countries and regions. To start this meeting, we have invited brief opening remarks from several dialogue participants about their country's COVID-19 situation and response.

Introductory Statements (5 minutes per speaker):

- **Indonesia**: Pratiwi Sudarmono, Universitas Indonesia
- **Malaysia**: Chong Chee Kheong, Ministry of Health (*Invited*)
- **Philippines**: Irma Makalinao, University of the Philippines Manila
- **Singapore**: Poh Lian Lim, National Centre for Infectious Diseases
- **Thailand**: Soawapak Hinjoy, Department of Disease Control, Ministry of Public Health
- **United States**: Julie Fischer, CRDF Global

8:05 – 9:00am **Diagnostic Testing & Disease Surveillance Systems**

The COVID-19 pandemic has posed a dynamic series of challenges for disease surveillance systems around the world. Challenges range from identifying and characterizing the earliest cases to developing and scaling up production capacity for PCR-based and rapid diagnostic tests to identifying and tracking emerging variants. In this session, we will discuss testing and disease surveillance systems as well as lessons and suggestions for future emergency preparedness efforts.

Questions addressed by participants during this session will include:

- As we look ahead to the third year of the pandemic, what surveillance challenges remain in your country, and what surveillance systems or strategies do you anticipate in the coming years?

- To the extent that your country has a national SARS-CoV-2 testing strategy, what are its successes, challenges, and areas for improvement? What are your current or proposed future strategies for testing in schools?
- What capacity-building measures do you have for diagnostic, research, and public health laboratories in your country, and are these sufficient to support providing quick diagnostic test results for SARS-CoV-2 and future pathogens?
- Is your country conducting genomic sequencing surveillance, and if so, are these systems and capacities sufficient? What investments or infrastructure improvements are required to ensure adequate preparedness for future emerging threats? The WHO is working to develop a BioHub System as a mechanism to share biological materials and sequences; what are your initial views on this proposed system?

9:00am **Day 1 Adjourns**

SOUTHEAST ASIA MULTILATERAL BIOSECURITY DIALOGUE
VIRTUAL MEETING

DAY 2: 16 DECEMBER 2021

7:00 – 8:00am Vaccines & Vaccination Activities

Despite increases in global vaccine production and distribution capacity, supply constraints and international and regional disparities persist, including for both access to COVID-19 vaccines and vaccination coverage. In this session, we will discuss challenges and lessons regarding global vaccine distribution and access as well as national administration efforts in dialogue countries.

Questions addressed by participants during this session include:

1. Where is your country in its vaccination campaign, for both adults and children, and what challenges are you experiencing? What goals has your country set in terms of vaccination (eg, percent of the population fully vaccinated)?
2. What degree of anti-vaccine sentiment or vaccine hesitancy is present in your country, and what impact is it having on national and local vaccination efforts? What actions have you taken to address this issue? Are misinformation and disinformation impacting vaccination efforts, and if so, how is your country addressing this?
3. Are there major disparities in your country with respect to vaccination coverage, such as among certain racial or ethnic minority populations—including immigrant or migrant populations—or other vulnerable groups? If so, how is your country addressing this challenge?
4. What national- or regional-level investments, strategies, or activities are needed to speed vaccine development, production, distribution, and administration in future epidemics or pandemics?

8:00 – 8:55am Looking Ahead: Laboratory Biosecurity & Investigations

As we look ahead beyond COVID-19, we want to think about how this pandemic will shape the future of biosecurity and biosafety, both in Southeast Asia and globally. In particular, we are interested in how the impacts of this pandemic and the uncertainty regarding the origin of SARS-CoV-2 could affect laboratory biosafety and biosecurity and the continued advancement of life science research and biotechnology. Additionally, we want to discuss the systems and frameworks needed to investigate the origins of future outbreaks and epidemics and the capacities needed to respond to deliberate events.

Questions addressed by participants during this session include:

1. Does your country currently have systems in place (or in development) to investigate the origins of outbreaks or epidemics? How do you think your government would collaborate with the WHO to investigate a future outbreak of unknown origin?
2. Is your country taking steps to implement additional protections, regulations, or controls on certain types of research or on biological research laboratories, including high-containment laboratories (eg, BSL-3/4)?
3. How can countries best prepare for deliberate biological events, including those that may be accompanied by cybersecurity attacks and/or disinformation campaigns? What systems and capacities are needed to improve preparedness for these types of events?
4. What regional or international capacities need to be implemented in advance of the next pandemic? What are your views on the potential benefits or challenges of a global pandemic treaty?

8:55 – 9:00am **Closing Remarks & Meeting Adjourns**

Appendix B. Participants

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