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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 from the 2021 Virtual Dialogue Session

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Introduction

On February 10 and 11, 2021, the Johns Hopkins Center for Health Security hosted a virtual meeting of the Southeast Asia Strategic Multilateral Biosecurity Dialogue. Due to health risks stemming from the COVID-19 pandemic as well as associated restrictions and protective measures implemented around the world, the dialogue meeting originally scheduled to be held in Cebu, Philippines, during 2020 was postponed. To continue the productive dialogue between the participating countries, a virtual meeting was held to specifically address challenges and lessons from the countries' experiences with COVID-19.

The Southeast Asia Strategic Multilateral Biosecurity Dialogue began in 2014 as a bilateral Track II dialogue between Singapore and the United States and expanded the following year to include Indonesia and Malaysia. The Philippines and Thailand were added as observers in 2017 and became full participants in 2019. The purpose of this dialogue is to examine biological risks, including natural, accidental, and deliberate threats facing the United States and the Southeast Asia region. The dialogue aims to facilitate cross-border and regional engagement and collaboration, identify novel solutions to common challenges, and share best practices in combatting priority biosecurity threats.

The virtual dialogue meeting convened participants from each of the 6 participating countries, including current and former senior government officials from across relevant health and security agencies and organizations as well as subject matter experts from nongovernmental organizations, academic institutions, and the media. Participants represented national security and foreign affairs, public health and healthcare, homeland security/home affairs, weapons of mass destruction nonproliferation and disarmament, animal and agricultural health, journalism, and other relevant fields. The virtual dialogue was conducted in four 1-hour sessions, covering specific aspects of national COVID-19 responses as well as regional issues in Southeast Asia. Like previous meetings in this dialogue, the virtual session was conducted at an informal Track II level, as opposed to formal government-to-government engagement. Additionally, all dialogue sessions take place on a not-for-attribution basis, which allows for open and transparent discussions that facilitate a more complete understanding of each country's capabilities and limitations.

What follows is a high-level summary of the discussion during the 2021 virtual dialogue session.

Social Distancing, Lockdowns, Mask Use, and Other Nonpharmaceutical Interventions

In the absence of effective medical countermeasures against a novel pathogen, including vaccines and therapeutics, nonpharmaceutical interventions (NPIs) are the principal option in terms of mitigating transmission risk and containing an emerging pandemic. While research, development, and production of medical countermeasures during the COVID-19 pandemic proceeded at a historic pace, countries around the world relied on a variety of traditional and relatively novel approaches to mitigating transmission risk within and between communities. NPIs include a myriad of policies, actions, and techniques for reducing the risk of exposure and transmission at both the individual and community levels, often focusing on public spaces or high-risk settings or activities.

The term "social distancing" became a familiar part of the global lexicon during the pandemic, referring to a broad scope of NPIs that aimed to reduce the frequency of close contact between individuals in public settings, including businesses and restaurants, mass transit, parks and entertainment venues, schools, and other general public spaces. Social distancing efforts generally included measures to increase physical distancing—typically, to remain 1 meter or 6 feet away from others, depending on the local guidance—by restricting certain high-risk activities, such as those that involve prolonged close contact in large crowds, and limiting capacity in high-risk settings, including restaurants, bars and pubs, and cafés as well as public and private gatherings or events.

Some NPIs were bundled under broader "lockdown" measures, which implemented varying degrees of mandatory policies and practices at the community, state/regional, or national level to mitigate SARS-CoV-2 transmission risk. Across various biosecurity dialogue countries, the term "lockdown" referred to highly restrictive measures that limited or prohibited many or nearly all public activities and travel, and in others, it was used largely synonymously with "social distancing" and referred generally to less restrictive measures. Some participants noted challenges associated with the term "lockdown" due to connotations with highly restrictive or oppressive government control, even if that was not necessarily the case under the associated restrictions. In an effort to ease these concerns, some countries deliberately selected alternate terminology to label their packages of NPIs. For example, Singapore referred to these efforts as a "circuit breaker," which aimed to conjure images of breaking or interrupting chains of transmission rather than government oppression.

Dialogue countries in Southeast Asia took a variety of approaches to implementing NPIs. Like many biosecurity policies and programs in the region, COVID-19 risk mitigation largely stemmed from the countries' experiences with SARS (now SARS-

CoV-1) in 2003. Having previous experience responding to a novel respiratory pathogen—arguably with pandemic potential—governments and the public in Southeast Asia were relatively familiar with the types of NPIs that could be implemented to contain SARS-CoV-2, although on a smaller scale. Unlike most other countries, the responsibility and authority for public health in the United States lie at the state level, as opposed to the national level, resulting in an inconsistent patchwork of state- and local-level NPI policies. Several participants noted that variations from state to state fueled severe epidemics in some states that implemented fewer restrictions, which inevitably spread to other states, even those that adhered more closely to expert recommendations and guidance.

One of the principal drivers of NPIs in Southeast Asia, and likely around the world as well, was evidence of superspreading events. It remains unclear whether there are virological, immunological, or physiological factors that make certain individuals are more likely to transmit SARS-CoV-2 infections to numerous other people, but from early in the pandemic, it became clear that certain settings and activities provided conditions that increased transmission risk. Participants noted that settings that involved prolonged close contact between large numbers of individuals (eg, conferences, cruise ships), environments with insufficient ventilation (eg, indoor gatherings), and activities that involved increased respiration (eg, singing) were associated with increased transmission risk that could lead to numerous secondary cases. Many NPIs aimed to mitigate this risk by prohibiting large gatherings, increasing physical distancing, and improving ventilation and/or filtering. Targeting potential superspreading events aimed to curb community transmission without taking drastic measures that would limit a broader scope of community activities.[1]

While NPIs were the only options available to combat SARS-CoV-2 transmission early in the pandemic, many governments were hesitant to implement highly restrictive measures due to widespread downstream effects on society, local and national economies, and the broader geopolitical climate. Many NPIs—such as travel restrictions (including stay-at-home orders), limitations on large gatherings and capacity at restaurants and other businesses, and prohibitions on certain activities like concerts or spectators at sporting events—had substantial economic impact, not only for affected businesses, but also individuals who may have experienced reduced work or unemployment. The extent to which national governments were able or willing to provide financial support for individuals or businesses varied widely between countries. Several dialogue participants noted that individuals were more likely to comply with NPIs if they knew they would be supported by the government. The severe economic impact stemming from COVID-19 restrictions drove some governments to ease NPIs prematurely in an effort to stimulate local or

national economies. Often, steps to relax these measures were taken before community transmission was truly contained and increased social and economic activity provided ideal conditions for SARS-CoV-2 to spread rapidly. In some instances, this led to even larger COVID-19 surges, which subsequently led to additional restrictions and further economic impact. This cyclical approach undermined the efforts of public health and healthcare personnel and generated further mistrust in government.

Recommendations or mandates for the use of masks or other face coverings emerged as another popular NPI during the COVID-19 pandemic. The use of masks or face coverings aimed to mitigate the risk of infection or transmission during contact between infectious and susceptible individuals by filtering infectious respiratory particles from inhaled or exhaled air. The understanding of and evidence supporting mask use evolved considerably over the first year of the pandemic, but current evidence supports mask use both as source control (ie, reducing the volume of virus release into the environment via exhalation) and protection for the wearer (ie, through filtering inhaled air). The attention on mask use increased as evidence emerged regarding the role of asymptomatic and presymptomatic transmission of SARS-CoV-2. While quarantine and isolation measures were only effective for known exposures and for individuals exhibiting symptoms or with a positive diagnostic test, the use of masks and face coverings among the broader public could mitigate transmission by those who are unaware that they are infected and protect individuals who may unknowingly come into contact with an infectious individual.

Interestingly, mask use remains one of the more controversial NPIs in many countries. Mask use is arguably among the least invasive risk mitigation measures, and it is among the few NPIs that actually facilitate increased social and economic activity. Mask use likely has minimal negative downstream effects for most people and communities, but many individuals oppose mask recommendations or mandates. One dialogue participant commented that many individuals are concerned only with their own risk of infection, particularly those at lower risk for severe disease and death; however, the risk of asymptomatic or presymptomatic transmission means that individuals who do not participate in NPIs can unknowingly put others at risk. In fact, many NPIs were targeted at populations that are inherently at lower risk for severe disease and death in order to curb community transmission and protect higher-risk individuals. While older adults and those with underlying health conditions are at elevated risk for severe disease and death, epidemiological data continue to identify younger adults as principal drivers of community transmission, particularly in subsequent "waves."[2,3] Dialogue participants highlighted that local community, political, business, and religious leaders can be excellent partners in encouraging participation in NPIs, such as mask use and limitations on large gatherings. And, in the absence of government mandates or

recommendations, businesses, schools, or other organizations may be able to implement their own risk mitigation measures (eg, mask use, capacity limits).

Despite growing evidence of the effect of NPIs on mitigating transmission risk, many countries struggled to combat misinformation and skepticism around these policies and practices. One of the principal challenges was combating efforts to establish a false dichotomy between full lockdown and "freedom." Some opponents of NPIs attempted to frame the issue as either implementing a full, highly oppressive lockdown or permitting personal choice or liberty by removing all restrictions, with no opportunity for moderate options. Participants noted that, in reality, NPIs exist on a spectrum, ranging from minimally invasive activities such as mask use to partial restrictions on public activities and gatherings to full, highly restrictive lockdown. Social media provides a myriad of platforms that facilitate the rapid spread of information, and multiple dialogue participants discussed challenges in combating misinformation and disinformation that was spread, knowingly or unknowingly, by social media influencers with large social networks, some of whom have hundreds of thousands or millions of followers. Misinformation spread via these influencers contributed to growing mistrust in government, which negatively impacted adherence to NPI guidance and requirements.

Surveillance

Dialogue participants acknowledged that the novel nature of the SARS-CoV-2 virus and certain characteristics of the COVID-19 disease posed challenges to surveillance and reporting activities from the onset of the pandemic. Beyond the initial challenges of developing and distributing diagnostic test kits, some countries had very limited laboratory capacity to perform polymerase chain reaction (PCR)-based testing. Indonesia, for example, had only 12 laboratories nationwide at the beginning of the pandemic that were capable of performing PCR-based diagnostic testing. As the pandemic progressed, Indonesia quickly expanded this capacity to nearly 600 laboratories, which, by February 2021, provided national capacity to perform 100,000 tests per day.

The participating Southeast Asian countries faced a number of unique challenges in terms of disease surveillance and reporting. Perhaps most notably, many of these countries are home to both densely populated urban areas and small, remote villages, including many located on geographically disparate islands spread across thousands of square miles of water. Challenges in distributing test kits, establishing associated laboratory capacity and reporting networks, and implementing contact tracing operations outside of urban areas resulted in incomplete surveillance data in remote areas. It may be more feasible to identify and isolate cases in smaller communities than

in larger populations, but confirmatory diagnostic testing and reporting might be more difficult.

Some countries faced additional barriers in terms of identifying sufficient personnel with the training and certifications required to process diagnostic tests at public health, private, and academic laboratories. In addition to laboratory skills and experience, laboratory personnel also required training on the chain of custody for clinical specimens, particularly those collected in areas of ongoing armed conflict, due to biosecurity-related concerns that nefarious actors could attempt to divert the specimens for deliberate release. In addition to protecting specimens, some countries also faced challenges in protecting the identity of COVID-19 patients in their reporting. Thailand, for example, reported a detailed cumulative "line list" of all detected cases, but it needed to ensure that patients' personal information remained secure, particularly for migrant workers, who would at high risk for increased public stigma.

Dialogue countries took a variety of approaches to conducting surveillance and monitoring activities, including contact tracing efforts. One popular approach was the use of smartphone applications or other technical means to identify individuals at risk for exposure to SARS-CoV-2. Some countries utilized the Bluetooth capability in smartphones to identify users who were in close proximity to known COVID-19 cases, and others utilized lower-technology solutions such as scanning QR codes or tracking fobs at businesses or other public spaces to retrospectively identify individuals who were at those locations at the same time as known COVID-19 cases. These technical solutions are more easily implemented in areas where smartphone use is pervasive and the population has reliable access to mobile phone or other wireless networks. Additionally, trust in government is critical, as government entities need to protect and ensure the proper use of data regarding users' location and COVID-19 status.

In addition to traditional public health surveillance activities, including traditional diagnostic testing, the COVID-19 pandemic highlighted the importance of more advanced forms of surveillance and associated analysis. In particular, the prolonged nature of the pandemic provided demand for longer-term modeling and forecasting capabilities, much of which exists outside of government public health agencies. There are many individuals and organizations that specialize in communicable disease modeling, including at academic institutions and private sector organizations; however, government agencies called upon these groups to share their analysis, often without compensation. Nongovernmental organizations and experts can provide modeling services, but these efforts inherently compete for finite resources against these experts' and organizations' existing responsibilities and commitments. Modeling is a critical tool in the response to major epidemics and pandemics, and COVID-19 highlighted

the absence of a coordinated and sustainable infrastructure to provide this capacity. Similarly, the emergence of SARS-CoV-2 variants of concern drew attention to the importance of genomic sequencing as a part of routine public health surveillance activities. In most countries, genomic sequencing was only performed on a small proportion of positive specimens, which allowed emerging variants to circulate more widely in the community before they were detected and analyzed. Like modeling, much of the genomic sequencing capacity exists outside of government agencies, and governments called on private sector partners, including academic institutions, to provide that service in support of government response activities.

Medical Countermeasures

While NPIs were the primary risk mitigation strategy over much of the pandemic, considerable resources were dedicated to the research, development, production, and regulatory oversight of medical countermeasures. The general consensus among experts is that vaccination is the best long-term solution to bringing the COVID-19 pandemic under control. The global scale of COVID-19—with more than 176 million cumulative cases and 3.8 million deaths as of June 17, 2021[4]—has provided researchers with a wealth of patients to enroll in clinical trials for therapeutics, but dialogue participants noted that the pandemic has illustrated numerous challenges in terms of coordinating trial design and implementation across many different settings. Earlier in the pandemic, many facilities elected to design and conduct their own small-scale clinical trials for COVID-19 therapeutics. While initiating clinical trials provided an avenue to access investigational drugs, these smaller trials did not provide sufficient data to generate statistically significant findings, and the independent and disparate nature of the trials made it difficult or impossible to consolidate data to generate reliable results. Additionally, inconsistent trial protocols—including differing courses of treatment, metrics, and endpoints—often resulted in studies reaching conflicting conclusions, which exacerbated existing uncertainty and mistrust in the response, treatment options, and vaccines. Several coordinated, large-scale efforts have emerged, including the Solidarity Trial and the Adaptive COVID-19 Treatment Trial (ACTT),[5,6] illustrating the capability to implement clinical trials and utilize data across a variety of settings, including those with varying levels of available resources and COVID-19 burden. Additionally, adaptive trial designs have also enabled researchers to evaluate multiple investigative treatment protocols simultaneously, including the ability to add or remove investigational protocols as necessary in the midst of an ongoing trials.

The unprecedented demand for a vaccine and the financial, political, and other support for vaccine development and production illustrates the benefit of establishing national pharmaceutical research and development capacity. Countries with major biotechnology and pharmaceutical sectors—including China, Russia, the United

Kingdom, United States, and some European countries—were able to more rapidly develop and test vaccines, which gave them access ahead of most other countries. The ability to rapidly scale up research, development, and production capacity in response to a novel pathogen is encouraging, but the disparities in access to vaccines and other response assets could pose longer-term challenges for the global response.

Nearly a year into the pandemic, candidate vaccines began to be authorized for emergency use. While there were notable exceptions—including those developed in Russia and China—the leading vaccine candidates finalized their analysis of Phase 3 clinical trial data starting in late November and early December 2020. The Pfizer-BioNTech, Moderna, and AstraZeneca-University of Oxford vaccines were the first to be authorized for emergency use in European Union (EU) countries, the United Kingdom, and the United States, followed shortly by the Johnson & Johnson-Janssen Pharmaceuticals vaccine. Each of these vaccines underwent its own regulatory review and authorization process in each country (or the EU as a whole). Not all vaccines have been authorized for use in all countries, and the order in which countries (or the EU) authorized vaccines varied. The initial production in these countries was extremely limited and, even as production capacity scaled up, relatively few doses were exported for use around the world. Multiple dialogue participants, including some from the United States, discussed the issue of "vaccine nationalism" and expressed frustration that countries like the United Kingdom, United States, and those in Europe were reserving nearly all of the initial supply for themselves, leaving low- and middle-income countries around the world with few options to access effective and authorized vaccines. Some participants noted that, in light of the financial investments made by higher-income countries in developing the vaccines, and the severe COVID-19 burden in these countries compared to many other parts of the world, it was politically difficult to share any of the limited initial supply with other countries, even if it would be the most effective use of the vaccine from a public health perspective.

Without access to the SARS-CoV-2 vaccines from Western countries, many countries around the world sought alternatives, most notably those developed in China. While China authorized several of its SARS-CoV-2 vaccines for emergency use, none of the Chinese pharmaceutical companies had publicly released Phase 3 clinical trial data at the time of the meeting. Nevertheless, China exported doses of SARS-CoV-2 vaccines manufactured by Sinovac and Sinopharm as well as the raw ingredients to establish production capacity in several other countries, including Indonesia.[7] Participants noted that these kinds of "vaccine diplomacy" efforts, largely led by China and India (where the Serum Institute manufactured the AstraZeneca-Oxford vaccine), could potentially have lasting effects on regional and global alliances and partnerships. While Indonesia, Malaysia, the Philippines, and Singapore are eligible to receive vaccine doses under

the COVAX Facility—led by the World Health Organization and Gavi, the Vaccine Alliance—distribution of the first allocation had not yet begun at the time of the dialogue session. Dialogue countries expected to receive a collective total of nearly 18 million doses from COVAX by the end of March 2021.[8] Several participants emphasized that their governments were pursuing numerous options to obtain vaccines, including directly from multiple manufacturers and through bilateral arrangements, to mitigate the risk of delays and shortages.

At the time of the virtual dialogue meeting, most of the participating countries in Southeast Asia had not yet commenced vaccination activities, and even those that had did so only in a limited fashion. But while most dialogue countries had not yet received vaccine doses nor commenced large-scale mass vaccination efforts, the participants indicated that planning and preparedness efforts were well underway to support future vaccination operations. Like with surveillance, the wide variation in settings, ranging from densely populated urban areas to remote island villages, could complicate vaccination operations in some countries. One major barrier to implementing large-scale, nationwide vaccination programs was the logistical challenges of transporting and storing the vaccines. While Singapore's population is condensed into a single, urban city-state, countries like Indonesia, Malaysia, and the Philippines must transport doses across hundreds or thousands of miles, including to areas with little existing infrastructure to maintain the proper cold chain. This was a particular concern for products like the Pfizer-BioNTech vaccine, which requires ultra-cold freezing temperatures (-94°F; -70°C). Vaccines that can be transported or stored in normal freezer or refrigerator temperatures could provide an enormous advantage for these countries. In fact, the COVAX Facility only distributed a limited number of Pfizer-BioNTech doses in the first allocation and only to eligible countries that both explicitly requested it *and* demonstrated the ability to maintain a proper cold chain.[9]

Without sufficient supply of SARS-CoV-2 vaccines or vaccination capacity to cover the entire population, countries around the world have implemented prioritization programs that aim to make the most efficient use of the initial limited supply until enough doses are available to expand eligibility to the entire population. Because each country—or in the case of the United States, state-level government—is responsible for determining its own priority groups, they have all taken slightly different approaches to vaccine prioritization. While there are variations in the exact order and classification of priority groups across the dialogue countries, individuals at the highest risk for infection (eg, healthcare workers) and severe disease (eg, older adults, those with underlying health conditions) are generally among the highest priority groups, along with some other essential workers (eg, law enforcement, border control). Looking further ahead to when they are able to expand eligibility to the broader public, some

governments have raised concerns regarding how to allocate doses between citizens and noncitizens, including foreign or migrant workers and undocumented immigrants. In some countries, such as Singapore,[10] migrant workers represent a large proportion of reported cases, and many live and work in high-risk conditions. Similar to the issue of vaccine nationalism, it might be politically challenging for governments to allocate vaccines to noncitizens and migrant workers, even if it is the most appropriate action from the public health perspective.

In light of the limited vaccine supply, one dialogue participant questioned whether there could be a test or other method of determining existing immunity (eg, via natural infection). If individuals with existing immunity could be readily identified and vaccines can be demonstrated to supplement or boost this immunity, countries could make more efficient use of their available doses by only vaccinating those who remain susceptible to SARS-CoV-2 or potentially only administering a single dose to those with evidence of immunity from prior natural infection. At the time of the dialogue, there was limited data available to support such a policy, but since then, some experts have called for similar plans based on evolving evidence of the immune response in individuals who have recovered from SARS-CoV-2 infection.[11] As the understanding of natural and vaccine-conferred immunity evolves, adapting vaccination guidance and protocols could improve countries' efficiency in increasing the degree of protection among the public.

All of the dialogue countries are struggling to combat vaccine hesitancy as they plan for, initiate, and scale up vaccination efforts. As we will discuss in further detail next, the proliferation of misinformation and disinformation, particularly via social media, remains a major challenge in many dialogue countries, and it continues to play a primary role in the spread of vaccine hesitancy. Beyond traditional vaccine hesitancy concerns (eg, for routine immunizations), SARS-CoV-2 vaccines face unique challenges. The rapid pace of vaccine research, development, testing, and authorization has driven perceptions that these vaccines were rushed through the regulatory process without sufficient evaluation and oversight. The shortened clinical trial and regulatory timeline and use of new technologies, such as mRNA vaccine platforms, have driven concerns regarding the vaccines' efficacy and safety, including the potential for longer-term adverse events that may not yet be evident. Perceptions of the actual threat from COVID-19—at times driven by high-profile political officials, celebrities, and other influential individuals—have resulted in many individuals resisting vaccination, believing it to be unnecessary, including younger individuals who may not perceive a direct health threat from COVID-19 due to their age group being at lower risk for severe disease. Dialogue participants indicated that their respective countries are taking a variety of approaches to countering vaccine hesitancy, even prior to and early

on in their vaccination efforts, when demand still far exceeds the available supply. In Indonesia, for example, President Joko Widodo received the country's very first dose of the vaccine, and he did so publicly in order to help instill a sense of safety and trust among the public.[12]

Misinformation and Disinformation

From the very beginning, misinformation and disinformation have plagued local, national, and international responses to the COVID-19 pandemic, with inaccurate and deliberately misleading information spread from and by a myriad of sources and platforms. The dialogue participants discussed 3 principal challenges related to misinformation: (1) the evolving understanding and evidence during the pandemic, (2) misinformation from public officials, and (3) the spread of misinformation via social media. Misinformation has impacted nearly every facet of the pandemic, from its origin and routes of transmission to epidemiological data and reporting, the impact of nonpharmaceutical public health interventions, and treatment and vaccine efficacy. While not a wholly new concept, the term "infodemic" was also quickly incorporated into pandemic lexicon, and several dialogue participants noted that the spread of misinformation is actually the biggest problem facing their respective countries.

Identifying inaccurate or misleading messaging is one issue, but countering misinformation campaigns is a much larger and more complex challenge. The effort and resources required to combat misinformation can far exceed the effort required to propagate it. One participant noted that Singapore prioritized rapid response to emerging misinformation, even if that meant basing communications and messaging on information that may be incomplete or not yet completely verified, and then following up as necessary to provide updates or more complete information. Historically, Singapore would wait to fully verify information before responding to misinformation in order to avoid the need to issue corrections, but this often resulted in statements being issued late at night or long after the public stopped paying attention to the original issue. By accelerating its response, Singapore aimed to combat misinformation in a more timely manner, even if the response was not perfect. Participants also noted that, in some instances, even accurate information can be taken out of context and spread as misinformation, further complicating efforts to identify and respond to misleading information. Singapore also has national legislation that enables the government to prosecute individuals for disinformation, including the ability to both levy punishments against those who knowingly disseminate false information and compel individuals remove or correct inaccurate information that they spread inadvertently.

Numerous dialogue participants commented on the importance of establishing trusted voices to communicate or disseminate accurate information. Several participants discussed their governments' use of regularly scheduled (eg, daily) COVID-19 briefings, including information from their leading technical experts, to provide necessary updates on response operations and policies and proactively address emerging misinformation. In the United States, for example, the Biden Administration reestablished regular COVID-19 briefings by senior health and other experts as a way to restore trust in federal government communications after the Trump Administration largely eliminated regular briefings during the first year of the pandemic. While government officials and agencies often have the most current and complete information, public mistrust in the government can limit their effectiveness in communicating about the pandemic. The dialogue countries have taken a myriad of approaches to promoting trusted voices capable of sharing accurate information and countering misinformation, ranging from the use of more traditional voices, such as elected and appointed officials and the news media, to more novel approaches, including independent experts on social media and celebrities and other influencers. Participants from Indonesia discussed initial concern that the government was withholding information from the news media and that there were no opportunities at press conferences for the media to ask questions of government officials. Without complete information from the government, journalists sought out their own sources, and over time, the government opened the press conferences to questions to reestablish itself as a trusted source of information. In Thailand, 2 former Miss Thailand winners are doctors, and the government engaged them to help disseminate accurate information during the pandemic via their social media networks. In fact, many celebrities have much broader reach via social media platforms than government agencies and officials, and one participant noted that younger individuals may have more trust in celebrities than they do in government officials.

Some participants noted that during the Trump Administration in the United States, the process for communicating to the public devolved over a period of months, decreasing in frequency, quality, and accuracy and shifting away from evidence-based guidance and analysis and toward politicized content. These changes forced many in the public to seek other sources for reliable, trustworthy information and sowed opposition to evidence-based guidance. Some participants noted that some senior federal government officials who would otherwise be the face and voice of the government response—including the US secretary of Health and Human Services, the directors of the US Centers for Disease Control and Prevention and the National Institutes of Health, the US surgeon general, and the commissioner of the US Food and Drug Administration—either repeated the administration's talking points or were sidelined in favor of those who would, including political appointees with little or no expertise in communicable

diseases or epidemiology. Traditional news media outlets became a critical source of fact-checking for government agencies and officials, including through direct contact with senior officials at various federal government agencies, becoming a key source of trusted information for many Americans. Additionally, many Americans turned to state and local elected and appointed officials for information, but like the federal government, many state and local jurisdictions also faced challenges with misinformation, including from elected officials. One participant commented that the spread of misinformation by government officials in the United States, at all levels of government, was a barrier to implementing evidence-based policies and risk mitigation measures at the community and individual levels and contributed to the scale of the US COVID-19 epidemic.

While many individuals obtain much, if not most or all, of their information about the pandemic via various social media platforms, this is not the case for everyone. Access to and participation in social media is increasing worldwide, but many individuals and communities do not have access to the internet or social media sites or applications. Participants noted that it may be convenient to disseminate information via social media accounts, but governments must ensure that they are leveraging other communications pathways as well in order to reach individuals and communities that do not engage via social media.

Broader Impact on Biosafety and Biosecurity

Participants discussed numerous ways in which the COVID-19 pandemic has starkly illustrated major gaps in local, national, and global biosecurity programs and capabilities as well as myriad broad-reaching downstream effects, including social, political, economic, and security. Several dialogue participants commented that their respective governments identified COVID-19 as a national security threat and implemented relevant national response plans that reached beyond human health agencies and resources. One participant noted that, in contrast to other types of emergencies or disasters, the response to a pandemic starts small and gets bigger. It is critical to implement a robust, multisectoral pandemic response from the very beginning, even if the impact to the country is minimal at the onset.

As a novel pathogen, SARS-CoV-2 highlights the critical role of laboratory capacity, including for functions such as public health surveillance and research. National and international laboratory networks played major roles in processing early specimens and tracking the spread of SARS-CoV-2 around the world. Several participants discussed the importance of establishing and maintaining national laboratory capacity, particularly to handle the large volume of specimens during COVID-19 surges. Additionally, they noted the challenges of ensuring sustainable laboratory capacity, as investments made

before and during the pandemic, including to establish high-containment laboratories, may not provide necessary resources to continue operations in the longer term. While high-containment laboratories (eg, biosafety level [BSL] 3 or 4) often receive the most attention, the COVID-19 pandemic illustrated that lower levels of containment may be sufficient to handle pandemic pathogens, even those without effective treatments or vaccines. Lower-level containment laboratories (eg, BSL-2) could provide the necessary laboratory capacity with a lower initial and ongoing investment. Many laboratories in Southeast Asia demonstrated the ability to safely handle SARS-CoV-2 without high-containment facilities through the implementation of appropriate biosafety protocols. The pandemic also provided some countries with additional motivation to finalize and implement related national-level plans and programs, including national implementation for the Biological and Toxin Weapons Convention and Select Agent and Toxin programs.

While the origin of the COVID-19 pandemic remains uncertain, participants agreed that the attention on laboratories as a potential source will likely have lasting effects on biosecurity and biosafety programs and oversight, particularly for high-containment laboratories, regardless of the existence or outcome of associated investigations. As the global community recovers from the pandemic, many laboratories could face increased scrutiny, particularly for advanced research such as gain-of-function studies. As national governments evaluate the need for additional oversight and regulation of research laboratories, they will need to balance the desire for risk mitigation against the benefit provided by the research, as increased regulation and enhanced biosafety and biosecurity protocols could have adverse effects on research activities. Additionally, the COVID-19 pandemic has called attention to international collaborations on advanced laboratory research, underscoring the need for international standards for biosafety and biosecurity systems. Several participants emphasized that these collaborations are critical and that regulatory and oversight efforts should identify the appropriate level of control without unnecessarily hindering collaboration or scientific progress.

The COVID-19 pandemic also called attention to nonbiological security threats. As much of the world shifted away from direct personal interaction to remote, virtual, and online activities to enable the continuation of work in businesses, schools, and other settings, the pandemic illustrated the importance of preparing for increased cybersecurity risks. With the increased global dependence on technology, a cyberattack could severely exacerbate both the direct health effects and indirect downstream effects of a pandemic, particularly at a time when individuals, businesses, and other organizations increasingly rely on communication technologies, including new platforms that may be vulnerable to cybersecurity threats. Additionally, one participant discussed their government's concern that nefarious actors could take advantage

of the government's focus on the pandemic in order to carry out attacks. With finite government resources allocated to pandemic response activities, decreased attention to routine responsibilities could result in vulnerabilities across many government agencies, including those dealing with national security.

Conclusions

The COVID-19 pandemic exposed a broad scope of shortcomings in biosecurity preparedness and response capacity in countries around the world, and government agencies and other organizations will be documenting and remedying these gaps for years to come. The Southeast Asia Strategic Multilateral Biosecurity Dialogue provides a forum for participating countries to discuss challenges, lessons, and solutions to common national- and regional-level biosecurity problems, and while an in-person meeting could not be held in 2020 due to the pandemic, the virtual dialogue session in February 2021 enabled participants to share their COVID-19 experiences and learn from others. Even though the impact of the pandemic has varied widely by country, both before the virtual dialogue and since, participants identified a number of common challenges, including enacting social distancing and other NPI measures, enabling testing and disease surveillance, distributing and allocating vaccines and other medical countermeasures, and countering misinformation and disinformation. Sharing lessons from countries that were more severely affected earlier in the pandemic provided valuable information for those that would face more severe COVID-19 surges in the future. At the time of the virtual dialogue, most of the participating countries had not yet implemented large-scale mass vaccination efforts. Participating countries will identify additional lessons learned from those activities and share them in future dialogue sessions. Although COVID-19 will be a major topic for discussion as the Southeast Asia Strategic Multilateral Biosecurity Dialogue moves forward, many other national, regional, and global biosecurity challenges and threats remain, and new threats will undoubtedly emerge in the future. This virtual session allowed participants to maintain existing relationships developed over the course of the dialogue program and share COVID-19 lessons in the interim before the next full dialogue event.

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Appendix A. Agenda

Southeast Asia Multilateral Biosecurity Dialogue – Virtual Meeting
Day 1 - February 10, 2021

19:00 – 19:10 Welcome & Introduction

19:10 – 20:05 Social Distancing, Shutdowns, Mask Use & Other Non-Pharmaceutical Interventions (NPIs)

Over the first year of the pandemic, particularly early in 2020, there were only very limited medical countermeasures (MCMs) available to combat COVID-19. We were forced to rely largely on NPIs to limit transmission, including isolation or quarantine, travel restrictions, mask use, and social distancing policies ranging from "stay-at-home orders" to more restrictive "lockdowns."

- What NPIs did your country use? Were there any that were particularly beneficial or any that were less effective than you anticipated?
- What were the most significant downstream effects of these measures, including social, economic, and political? Did any NPIs result in resistance from the public?
- Has your country adapted your NPIs to address emerging SARS-CoV-2 variants?

20:05 – 21:00 Surveillance & Vaccines

In this session, we will address two of the highest-profile challenges during the pandemic: disease surveillance and vaccination. Disease surveillance—including testing, reporting, and contact tracing—was one of the principal problems early in the pandemic, as delayed and incomplete data made it difficult to get an accurate picture of the disease epidemiology and implement effective response measures. And now that vaccines have received authorization and approval in some countries and production capacity is beginning to scale up, countries are facing the largest mass vaccination effort in history.

- What are the most difficult challenges that your country has faced in terms of testing, contact tracing, surveillance, and reporting?
    - What measures did your country put into place to increase testing and contact tracing capacity?

- How has your country addressed the allocation of limited vaccine supply? How has your country addressed high-risk populations, including older individuals, those with underlying health conditions, frontline healthcare workers and other essential workers, and racial and ethnic minorities?
    - Is vaccine hesitancy a barrier in your country?
- How will your country address the logistical challenges associated with distributing and administering vaccines nationwide?
- What steps has your government taken to procure vaccine doses? Has your country addressed the possibility of establishing domestic production capacity?

21:00 **Day 1 Adjourns**

Southeast Asia Multilateral Biosecurity Dialogue – Virtual Meeting
Day 2 - February 11, 2021

19:00 – 20:00 Communication & Misinformation

Mis- and disinformation have impacted a myriad of issues over the course of the pandemic, including disease and pandemic severity, the effectiveness of various public health interventions, the downstream social and economic impacts of these interventions, and the efficacy of vaccines and treatments.

- How did your country experience mis- or disinformation challenges? Were there specific topics that stood out as being affected more severely by mis- and disinformation?
- What measures did your country implement to counter mis- or disinformation? Were there certain topics or communication platforms that were more difficult to address than others?
- What other communication challenges did your country face, including between government officials and agencies as well as with the general public?

20:00 – 21:00 Biosafety & Biosecurity

We would like to use this final session to discuss the significant longer-term implications this pandemic will have for future health security, biosecurity, and biosafety issues.

- What changes are needed to improve biosecurity in the United States and the Southeast Asia region?
- To what extent could the extraordinary vulnerabilities revealed by COVID-19 encourage the deliberate use of biological weapons in the future?
- Once the pandemic is brought under control, what changes will be needed in order to improve biosafety for pathogens with pandemic potential, like SARS-CoV-2, including to national biosafety systems and international agreements and arrangements?
- How has COVID-19 affected national, regional, and global security, aside from the direct effects of pandemic?

21:00 Virtual Meeting Adjourns

Appendix B. Participants

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