Policy Brief

INVESTMENT IN LABORATORY READINESS IN PANDEMIC MANAGEMENT

Task Force 6
Global Health Security and COVID-19
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Abstract

Rapid, systematic, and consistent access to whole-genome sequence data has played a key role in the global response to COVID-19. This pandemic has revealed a high-impact shock to the level of capacity and resilience of the health care system, including the laboratory readiness and health information technology to support the delivery of high-quality, efficient, and safe care which almost all countries struggled with. More than ever, solving the problem of inequity in access to advanced diagnostic capabilities, data, and information to control infection and disease transmission requires a globally coordinated and sustainable approach for both current and future pandemics. Thus, new frameworks for assessing laboratory readiness for biodefense and global health security are needed. These frameworks should facilitate setting clear targets and establishing ways to assess progress across diverse providers and settings, facilitate the clinical leadership of such transformation, and be agile by allowing targets to be updated through a learning system. This contextually driven approach will entail wider acceptability for the laboratory readiness for biodefense global transformation.

Keyword: laboratory readiness, diagnostic capacity, genomic sequencing, surveillance, pandemic preparedness.
Challenges

One thing we can learn from the COVID-19 pandemic is the issue of laboratory readiness which almost all countries struggled with. Aside from suffering, the COVID-19 pandemic has cost human lives. In addition, psychosocial impact and an economic slowdown have also occurred due to this pandemic. All these are compelling reasons for countries to translate and share experiences into actionable lessons, not simply to prevent similar future crises, but rather to improve the whole spectrum of population health and healthcare delivery.

In the context of building the resilience of healthcare delivery, we know that rapid, systematic, and consistent access to whole-genome sequence data has played a key role in the global response against COVID-19. But on the other side, the COVID-19 pandemic brought to light the clear disparity in surveillance capabilities between high and low-income countries as well as varying geographic regions.

Over 80% of the genomes uploaded to the Global Initiative on Sharing All Influenza Data (GISAID), the primary public data repository for genomic data, came from only two continents: North America and Europe (Financial Times, 2022). Moreover, genomic data uploaded to GISAID from LMICs represent only 0-1% of total positive SARS-CoV-2 cases (FIND, 2021). As a result of economic globalization, one country’s response to an outbreak has consequences on the health security of the rest of the world, emphasizing the need for all regions, including Asia and Africa, to continue to bolster surveillance capabilities.

Furthermore, only 50% of next-generation sequencing data is uploaded onto GISAID, while data obtained from other surveillance technologies is completely absent. In fact, this holistic surveillance data will enable manufacturers to quickly develop diagnostic tests in response to new pathogens and permits optimization of existing diagnostics as pathogens mutate and evolve. In addition, centralized data repositories and dashboards, which public health agencies can easily interpret are key to enabling rapid and targeted public health responses to be generated. On the other hand, several countries were able to conduct successful COVID-19 countermeasures through adequate laboratory response, e.g., in Saudi Arabia, its laboratory response was rooted in the previous infectious disease responses (for SARS-CoV-1 in 2003 and H1N1 Influenza pandemic in 2009), resulting to integrated surveillance systems and scalable laboratory response, thus enabling a testing capacity as needed.
Similarly, Indonesia produced a successful cross-sectoral collaboration among previously siloed national and sub-national government institutions, international development agencies, and private sector stakeholders. This collaboration managed to scale up the COVID-19 referral laboratory network from one Ministry of Health NIHRD laboratory in the capital to 685 laboratories across 34 provinces within the first 12 months of the pandemic. Seeing the diversity between countries in the development of life-saving countermeasures, including in terms of diagnostics, the discussion on addressing the laboratory readiness in the healthcare system to create global testing solutions for biodefense and global health security is very important.

Responding to the portrait of the challenges still faced in the development of laboratory capacity between countries, the goal of this policy brief is to illuminate the investments and reforms needed in the multisectoral plan of action to leverage laboratory capacity, connectivity, and long-term security that are expected to positively impact a more effective public health response.
Looking ahead, the development of laboratory capacity is needed not only to diagnose COVID-19, but also to diagnose other endemic diseases that still been a major threat to global health security, like Tuberculosis, HIV/AIDS, zoonotic diseases, and Antimicrobial Resistance (AMR). So, it can be concluded that the ability to leverage laboratories’ capacity in diagnostic testing and the ability to increase the number of people being tested are critical to be highlighted as a future policy direction (Aisyah, et al, 2021). At the global level, all countries should be prepared to detect in a timely any agents that emerge and potentially cause an endemic or pandemic. Understanding these needs, to solve the problem of laboratory readiness, this policy brief proposes:

1. **Diagnostic System Integration for Automated Data Generation**

   Compiling data from the field, a national public health officer, is to the international body that deals with certain diseases is a cumbersome process. Therefore, diagnostics need to be integrated with automated data generation systems. So, with a strong control system, some of the data can be shared and public health decisions can be made. This concerted effort can be taken by the bodies or organization which deals with certain diseases. As an example, respiratory disease associations or cardiothoracic surgeon associations keep sharing some of the trends of diseases. But, when it comes to lab data sharing, automated data generation by using the instruments which are capable to provide data automation is very needed.

2. **Setting Up a Proper Communication System for Sharing Information**

   We can generate data, we can generate information, but often we don't know the best way to use it. In fact, data is needed to make strategic planning for handling health problems, at the national and global levels. Therefore, to ensure optimal use of data, an official forum for sharing data between countries is needed, of course, while maintaining its security. We need to find a more sustainable, more transparent, and safer way to have cross-regional integration, not just in terms of data, but also in terms of assistance for the accessibility and affordability of diagnostic technology, vaccines, and medication. By building a larger network, so advanced techniques for detection or the new discoveries of vaccines and drugs can be shared and the information available in public domain. a centralized data repository and dashboard that public health agencies can easily interpret would also enable a rapid, targeted public health response. In addition to sequencing data, manufacturers require
access to clinical samples infected with a new pathogen to validate new diagnostic tests, enabling an effective public health response.

We need to give emphasis on the effort to connecting the labs across the country, with the principle that data security remains the major concern. So, it is very important to ensure that the forum can facilitate the setting of what data can be shared and what data should be kept. Thus, each country can share and at the same time secure data as their biodefense to prevent potential bioterrorism. Since authorization need to be laid out, so we need to develop the framework on this data sharing and the security data. Currently, there have been certain committees, groups, and philanthropic organizations which has the system set up across countries. To connect the labs across the country and build a forum for sharing data between countries, we can refer to them.

3. Increasing Public Funding for Healthcare and Investment in Laboratory Capacity: Evidence Based Policies

In some countries, especially Low Middle-Income Countries (LMICs), spending on health is not large enough. So, what must be done is how to convince the system to put more money into strengthening health resilience, because health is very important and determines the productivity of individuals, communities, and countries.

We should go by data and scientific input from all around to identify how much resources are needed to strengthen health services which are determined by laboratory readiness, diagnostic capacity, and surveillance. We have seen the COVID-19 pandemic in recent years and there is always an opportunity to have a new disease or a new pandemic. Big data will be the backbone of innovation. This is a strong reason for every country to invest appropriately in order to secure our future generations.

The data is generated along with surveillance. When we generate data, it will tell us about scientific ways or rationale for doing something, which in this context is tackling future health disasters due to pandemics. Strategies for increasing or slowing monitoring depend on how many variants, or how many new pathogens are detected. Therefore strengthening surveillance determined by diagnostic capacity should be encouraged.

In addition, each country needs to implement a continuous monitoring and evaluation system with economic analysis in it. One of the commonly used methods is the health technology assessment which includes cost-effectiveness analysis, cost-benefit analysis, and cost-utilization analysis. Another method is the National Health Account (NHA). The results of each analysis will help each country to make evidence-based policies.
4. **Building a Country Coordinating Mechanism to Strengthen Collaboration**

Every country needs to build platforms where local innovations are given enough space to build and develop themselves and then convert into an adequate financial model. And the Coordination Mechanism (CCM) is the right platform, where the innovation centre is developed. Besides actively supporting local innovation, CCM can also be a forum for collaborative meetings. At CCM, various local and foreign manufacturers and innovative start-ups can collaborate to support each other’s product development, until they can identify solutions for local leads. In the end, it can spread all over the world.

Currently, India is one of the countries that already have CCM. CCM has successfully developed local content technology, as well as stakeholder roles in India. The key point is local content and technological innovation. To date, CCM has also encouraged India to have more manufacturing locations for the medical device industry, both locally owned and in foreign partnerships. CCM in India can be a reference for the implementation of CCM in other G20 countries. In the future, CCM can also be directed to develop research and development centre, training centre, or technology transfers.

5. **Developing Adaptive Diagnostic and Therapeutic Technologies for the Different Needs of Each Country**

There is no one size fits all, there is no one policy that will solve all the issues. Each people, each community, each nation, and each country and region have unique conditions and needs that should influence the expansion of surveillance infrastructure, taking into account budgetary requirements, throughput and capacity needs, human resource requirements and the physical footprint of the technology. Recognizing the diverse needs of each country due to geographic influences, diagnostic and therapeutic technologies of adaptive point of care are urgently needed.

To tackle addressing the unmet need of a point of care technology, rapid point of care is an important component of the future. Countries can discuss the need for rapid molecular devices for detection. These devices like this are robust enough to operate in many different environments. It makes works smaller, faster, and costs less. For a good result of the point of care device, laboratory quality must be considered. This is the challenge, to meet real needs, be cost-effective, and be operable in the hands of the people who will use it in the field.
At the moment, some point-of-care testing already implements with artificial intelligence or supported by internet technology. When health workers must go to remote or isolated islands, they will bring a portable handheld testing kit. Then, the result will be sent to a referral hospital or the main hospital in the Big Island for domain specialists to read and analyze. So, digitalization is critical as well in terms of availability and affordability.

In addition to point-of-care testing, there is also Next-Generation Sequencing (NGS) technology that can be developed to meet the diverse needs of disease detection and surveillance in each country. Although Next-Generation Sequencing (NGS) is a cornerstone of disease surveillance, a holistic infrastructure that supplements NGS with alternative, more cost-effective technologies can be just as effective in the rapid alert of new pathogens and controlling outbreaks. This includes existing technologies already present throughout Asia, including Sanger Sequencing, Real-Time PCR (RT-PCR) and digital PCR (dPCR).

Additionally, a diverse landscape where manufacturers must compete on quality, pricing and service terms has been pivotal to the success of other transformative global health initiatives (Clinton Health Access Initiative, 2020). This holistic approach also allows for integration of new pathogen surveillance efforts into ongoing management of endemic diseases like HIV and TB, where “increasing drug resistance is significantly undermining patient outcomes and the overall success of eradication programs.” (Clinton Health Access Initiative, 2020). Integration of technology across disease areas for both surveillance and clinical management decreases the overall cost to the public health system while ensuring that this technology is well-maintained and operational on a routine basis.
References


