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Globally Resilient Supply Chains for Seasonal and Pandemic Influenza Vaccines

Influenza viruses, both seasonal and pandemic, have the potential to disrupt the health and well-being of populations around the world. The global response to the COVID-19 pandemic and prior public health emergencies of international concern illustrate the importance of global preparedness and coordination among governments, academia, scientists, policy makers, nongovernmental organizations (NGOs), the private sector, and the public to address the threat of pandemic influenza. These health emergencies have revealed opportunities to enhance global vaccine infrastructure, manufacturing, distribution, and administration, which are critical to saving lives.

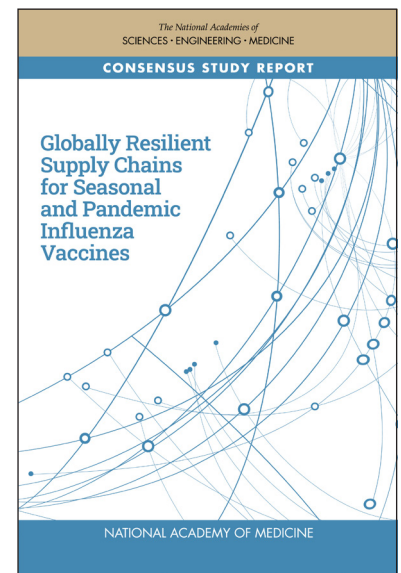
This report provides key findings, conclusions, and recommendations from an expert committee—convened under the auspices of the National Academy of Medicine and the National Academies of Sciences, Engineering, and Medicine—on supply chain and distribution challenges related to vaccines and vaccinations for seasonal and pandemic influenza, drawing on lessons learned from the COVID-19 pandemic.

CRITICAL COMPONENTS FOR VACCINE MANUFACTURING

Global vaccine manufacturing requires timely access to hundreds of items that are produced by multiple suppliers in several countries. A lack of any component, including a skilled workforce, can cripple vaccine production. Components must be defined, identified, and managed to ensure the equitable supply of seasonal and pandemic influenza vaccines. This will require the scale up of manufacturing for input materials and a free flow of goods to facilitate production. A well-coordinated global body with an inclusive governance structure could orchestrate a globally distributed supply chain to produce influenza vaccines.

Recommendations for vaccine manufacturing:

- The G20 should constitute a Global Pandemic Manufacturing and Supply Chain Task Force as a permanent structure orchestrated by a globally inclusive



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governance body to ensure global pandemic influenza manufacturing and supply chain preparedness and response.

- The U.S. Department of Health and Human Services' Office of the Secretary (HHS/OS) and its technical agencies should provide technical and resourcing support to the recommended task force to develop a comprehensive pandemic preparedness and response capability framework.
- The U.S. Food and Drug Administration's (FDA's) and the World Health Organization's (WHO's) regulatory arm should evaluate the development of fast turn-around batch release assays for seasonal and pandemic influenza vaccine manufacturing and ready global access to international reference standards and benchmark comparators for use in product analytics and clinical trials.
- Government, commercial, NGOs, and academic institutions with the requisite knowledge and skillsets should partner with advanced and developing vaccine manufacturers to develop vaccine manufacturing and development technology hubs.
- HHS's Office of Global Affairs (OGA), with other U.S. interagency stakeholders and global agencies, should provide technical and resourcing support to the recommended task force to evaluate the feasibility, structure, and sustainability of a globally distributed network of regional and local vaccine manufacturing capacity.

DISTRIBUTION AND DELIVERY

Transporting vaccines from manufacturing facilities to points of administration requires carefully orchestrated global and in-country logistics. Transport capacity and cold-chain logistics are primary bottlenecks, particularly in low- and middle-income countries. As different vaccines will have different logistical demands, these constraints should be accounted for early in the vaccine development process. Global vaccine distribution in a pandemic relies on robust and responsive systems reporting real-time information. Countries need access to a balanced portfolio of vaccines that are suitable for different country contexts and better data-driven tools for supply and demand planning at local, regional, and global levels.

Recommendations for distribution and delivery:

- HHS, in partnership with its counterparts in other countries, and relevant global stakeholders and funders should ensure a systems thinking approach to design and develop vaccines for feasible distribution and delivery in various global contexts and support relevant innovations.
- WHO, its partners, and funders should facilitate a global vaccine portfolio rollout to ensure the development and access to a broad portfolio of influenza vaccines.
- The U.S. Centers for Disease Control and Prevention (CDC) should work with WHO, Gavi, and global counterparts to commission studies in demand forecasting and demand uptake.
- CDC and the National Institutes of Health should support the development of better models for influenza vaccine cost effectiveness. The U.S. Agency for International Development (USAID) should support technical assistance to strengthen vaccine uptake in countries.
- OGA, in partnership with WHO, Gavi, the United Nations Children's Fund (UNICEF), and relevant global funders, should facilitate the development of global tools to help countries with better supply planning for vaccines and ancillary supplies planning, allocation, and rollout decisions and to obtain the necessary funding for operations.

FRAMEWORKS, TOOLS, AND INNOVATIONS FOR DISTRIBUTION READINESS

Vaccine distribution requires preparedness on global, national, and local levels. Readiness frameworks either do not exist or need improvement in many countries. Countries need high-quality, robust, and actionable pandemic preparedness plans that are periodically updated. Given the potential of pandemics to cause widespread negative health and economic effects, multiple stakeholders—including global health agencies, multilateral development banks, development financial institutions, and private-sector entities—are needed to harmonize and collaborate on strategies that improve regional and country preparedness. Regional structures can deliver technical assistance and improve coordination and engagement.

Recommendations for distribution readiness:

- Actionable and quality preparedness plans, assessments, and tools should be better harmonized and coordinated across global stakeholders.

- WHO, with relevant partners (UNICEF, Coalition for Epidemic Preparedness Innovations [CEPI], Gavi), should support the development of a global influenza vaccine supply and demand planning tool.
- The United States and international agencies should develop mechanisms to evaluate pandemic preparedness plans and financing mechanisms to support their development, while incentivizing country compliance.
- The United States, international agencies, and regional bodies should support the development of regional structures with appropriate expertise to assist countries in the region to develop pandemic preparedness plans and ensure plan quality and compliance.
- HHS should fund a comprehensive review of innovations developed and deployed during the COVID-19 pandemic, carried out by an independent scientific body.

BARRIERS, INCENTIVES, AND INNOVATIONS FOR SUSTAINABLE MANUFACTURING

The global effort to produce COVID-19 vaccines highlighted pertinent issues to sustainable manufacturing for seasonal and pandemic influenza vaccines. Barriers to the rapid development of novel vaccines include slow and disjointed regulatory review, high risks, uncertainties, and legal liabilities with vaccine production for manufacturers, especially for novel platforms. Because seasonal influenza vaccines have low uptake in most countries and generate low rates of return on investment, manufacturers lack significant incentives to innovate. Financial incentives for developing vaccines may help increase the demand for influenza vaccines and improve the return on investment. Guidelines need to be streamlined, via processes of harmonization or reliance, per accepted steps in regulatory pathway(s).

Recommendations for sustainable manufacturing:

- WHO, in collaboration with CEPI, PATH, FDA, and the Biomedical Advanced Research and Development Agency, should conduct a comparative assessment of all available and potential manufacturing technologies for influenza vaccines. The assessment should inform a decision-making framework for future investments.
- Public funders of vaccine development for influenza viruses of pandemic potential should ensure that contracts and awards to biotechnology innovator grantees stipulate, in detail, their proposed mechanism to scale up production.
- The G20 should provide substantial monetary and other incentives to develop improved seasonal and pandemic influenza vaccines that would increase uptake and demand, leading to sustainable manufacturing capacity investments. The U.S. International Development Finance Corporation and USAID should provide concessional capital and technical assistance to developing country manufacturers.
- The World Bank should develop a global indemnification mechanism that can be applied to all vaccines with WHO Emergency Use Listing (EUL) or prequalification.
- To ensure safe, efficacious, and quality vaccine production,
 - HHS and FDA should investigate the barriers to public transparency of vaccine clinical trial protocols during a public health emergency and evaluate measures to remove barriers.
 - WHO should support an independent after-action review of its EUL processes. HHS and WHO should support the creation of a network of inspectors to conduct rapid inspections of vaccine manufacturing plants during a pandemic to ensure vaccine quality.
 - WHO should prioritize efforts for the creation of a treaty mechanism for pandemic influenza vaccine manufacturing countries where they agree to undergo plant inspections by the independent inspectors and only export vaccines that are approved through WHO's EUL or prequalification program.

This is one of four studies conducted under the [Advancing Pandemic and Seasonal Influenza Vaccine Preparedness and Response Initiative](#), which explores how the scientific and technological breakthroughs throughout the COVID-19 pandemic could inform and advance future pandemic and seasonal influenza vaccine preparedness and response efforts.

**Committee on Addressing Issues of Vaccine Distribution
and Supply Chains to Advance Pandemic and Seasonal
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To read the full report, please visit
<https://nationalacademies.org/flu-vaccine-supply-chain>



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