

A Global Lab Against Influenza

During any given year, influenza epidemics kill 500,000 to 1,000,000 people worldwide, and an unpredictable pandemic could kill millions more. Yet such statistics do not reflect influenza's full impact: millions of hospitalizations, secondary bacterial pneumonias, and middle ear infections in infants and young children. The World Health Organization (WHO) Influenza Program was established in 1948 to deal with these public health threats. Today, 111 national centers in 83 countries collect and screen about 175,000 samples each year from an estimated 600 to 1200 million cases of influenza worldwide, and four WHO collaborating centers receive about 6500 samples for further immunologic and genetic characterizations. Twice yearly, WHO organizes formal meetings to identify circulating strains that new vaccine formulations should target. After review by national health authorities, vaccine manufacturers have roughly 6 months for scale-up, production, and distribution. Health care services then have another 3 months to administer about 200 million doses of trivalent vaccine worldwide. Despite its sophistication, however, the WHO Influenza Program has limitations.

First, current lab methods for characterizing influenza are time-consuming and labor-intensive. Only a small fraction of influenza virus isolates undergo definitive characterization. Second, it could take weeks or months to detect and analyze an unusual or unexpected strain and to understand its significance. Delays can be costly or disastrous.

A meeting* organized under the auspices of the Institute of Medicine and National Academy of Engineering has resulted in a plan that would expedite disease surveillance and intervention efforts on an international scale. It integrates biological, engineering, and informatic technologies into a centralized facility and makes them available via the Internet. WHO national centers would be able to collect samples, screen them on the spot with dipsticks, record epidemiologic observations on positives, select appropriate tests, and ship samples directly to the global lab. High-throughput automated systems for replicating, phenotyping, genotyping, and archiving influenza viruses would work together and, within days, epidemiologic observations and test results would appear in the lab's Web-enabled database for analysis. Within several years, such a global lab would generate a petabit-sized (about 10^{15} bits) database on influenza viruses worldwide, allowing rapid and consistent monitoring of circulating strains for vaccine development, serving as a pandemic sentinel, and expanding surveillance to animals known to harbor strains that could spread to humans. The global lab could be implemented over 5 years at a projected cost of U.S. \$45 million. Although this investment may seem high, it will pay for itself many times over in morbidity prevented and lives saved through influenza vaccines that are better matched to the circulating strains and thus more effective.

The building block technologies to create the first global lab against influenza are available; all that remains is their integration. The key questions are: Who will invest in the first global lab? Governments? Trusts? Foundations? Industries? Should the international health community wait until the next pandemic?

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*See *Firepower in the Lab* at <http://books.nap.edu/catalog/9749.html>.

