

## **A conversation with Michael Osterholm on July 30, 2013 about pandemics**

### **Participants**

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**Note:** These notes were compiled by GiveWell and give an overview of the major points made by Michael Osterholm.

### **Summary**

GiveWell spoke with Michael Osterholm of the Center for Infectious Disease Research and Policy (CIDRAP) as part of its shallow investigation of biosecurity issues. Conversation topics included: why naturally occurring pandemics are currently the most significant biosecurity threat, how the U.S. government and private organizations prepare for pandemics, and funding gaps in this space.

### **Naturally occurring pandemics**

Naturally occurring pandemics, such as influenza pandemics, are the most significant biosecurity threat that the world faces today.

#### *Definition of a pandemic*

An infectious disease outbreak is classified as a pandemic when:

- The infection spreads internationally
- The infection occurs at rate beyond normally expected

#### *Probability of pandemic*

It is difficult to estimate the likelihood that a pandemic will occur in a given time frame. However, the proper underlying conditions exist for a pandemic to occur in the near future. In particular, the H5N1 and H7N9 strains of the influenza virus and the Middle East Respiratory Syndrome (MERS), which is currently a public health problem in the Middle East and Europe, are current pandemic risks.

#### *Scale of potential effects*

#### Disease characteristics

The magnitude of the risk posed by a particular pandemic depends on disease characteristics such as:

- Reproductive rate — How infectious is an agent? I.e., how many additional cases does each infected person produce?
- Incubation period — How long after someone is exposed to the agent do they begin to show symptoms?
- Are people infectious before showing symptoms, as with influenza? Or do they become infectious several days afterward, as with severe acute respiratory syndrome (SARS)?
- Have people with the disease travelled internationally?

### Past pandemics

Some of the largest pandemics in history include:

- The 1918 "Spanish flu" pandemic
- The bubonic plague in the Middle Ages
- Smallpox throughout the Middle Ages into the 20<sup>th</sup> century

Smallpox killed 250 million people over the course of about 40 years in the early 20<sup>th</sup> century.

### Global threat

Pandemics pose a greater international threat in modern times because of forces of globalization, such as increased international transportation speeds and greater social and economic interaction. If an outbreak similar to the 1918 H1N1 influenza occurred today, it would spread around the world more quickly than the H1N1 influenza did in 1918. In 2009, the H1N1 influenza virus spread from Mexico to 42 other countries within the first month of being discovered. In the event of a pandemic, governments could limit international travel to prevent spread of the disease, but it would be impossible to eliminate travel completely.

### Shutdown of the global “just in time” delivery system

The global economy is based on a “just in time” delivery system in which many critical supplies—particularly medical supplies and drugs—are acquired via international trade shortly before they are used. Generally, countries do not keep significant stockpiles of such supplies. If a pandemic were to occur, countries might close their borders to try to limit the spread of the pandemic, thereby limiting their access to crucial supplies. In this kind of situation, intensive care units and health care systems would become much less effective.

### Importance of vaccines

If a vaccine is not developed, manufactured, and administered within the first 6 to 8 months after a pandemic begins, it is difficult to significantly mitigate the pandemic’s effects. Unexpected influenza pandemics are particularly dangerous because it is highly

unlikely that a vaccine for any particular strain of influenza could be developed, manufactured, and distributed within 6 to 8 months.

Additional resources about influenza vaccines include:

- CIDRAP Comprehensive Influenza Vaccine Initiative report, funded by the Sloan Foundation.
- “Major Challenges in Providing an Effective and Timely Pandemic Vaccine for Influenza A(H7N9),” an article co-authored by Dr. Osterholm and published in the Journal of the American Medical Association. It discusses why a vaccine for the H7N9 flu virus is unlikely to be developed in the near future.

### **Modern advances in responding to potential pandemics**

Modern medicine and epidemiology limit some of the risks associated with pandemics. Today, there is more general health care available to save lives than existed one hundred years ago. Health care innovations such as intensive care units and extracorporeal membrane oxygenation (ECMO) machines are especially important when responding to pandemics. The progress of modern scientific knowledge was evident when, in 2003, SARS was prevented from developing into a pandemic without the use of vaccines or drugs.

### **Man-made pandemics**

#### *Scientific accidents*

Accidents during dual-use research could conceivably cause a pandemic. Whether a pandemic comes from nature or the laboratory, the potential global effects are largely the same.

#### *Bioterrorism*

The biological agents that are most likely to be used in a bioterrorism attack would probably cause fewer catastrophic health effects than a flu pandemic. For example:

- A smallpox release would be disastrous, but it could be controlled within months because the U.S. government stockpiles smallpox vaccines and smallpox is a disease with a long incubation period and a limited reproductive rate.
- A large-scale anthrax release would be a major problem, but it would primarily have local effects because anthrax is not contagious.

Attacks such as these would have significant global implications economically, socially, and politically, but the public health effects would not be as large as the effects of a flu pandemic.

### **The U.S. Government’s work on pandemics**

The United States government prepares for pandemics in a variety of ways:

- Supporting manufacturing capability for influenza vaccines
- Funding research of improved influenza vaccines
- Stockpiling critical medical supplies
- Conducting surveillance of developing pandemics

### *Manufacturing and developing flu vaccines*

Improving manufacturing capability for influenza vaccines is important, but existing influenza vaccines have limited effectiveness, so new and improved vaccines must be developed as soon as possible. The U.S. government and the scientific community are slowly working toward improved vaccines, but producing new vaccines takes time.

### *Stockpiling critical medical supplies*

The U.S. government stockpiles some critical medical supplies, but its stockpiles are ultimately limited; if the global “just in time” delivery system were to shut down, significant shortages in medical supplies—even basic supplies like masks and respirators—would develop quickly.

### *Surveillance*

The U.S. government conducts surveillance of possible epidemics and pandemics at several levels of inquiry, such as:

- Is a disease present in the population?
- How prevalent is the disease in the population?
- What is the impact of the disease on infected people? How many have been hospitalized? How many have died?

Surveillance can be scaled up depending on the answers to these questions. For example, if a disease is detected in the population, more surveillance can be funded to determine the prevalence of the disease.

Based on its surveillance results, the government can take large-scale actions to protect the public, such as shutting down schools and limiting trade and travel.

### **Private funders working on pandemic risks**

Since the Sloan Foundation exited the biosecurity space three years ago, few private funders have stepped in to work on these problems.

The Skoll Global Threats Fund and the Gates Foundation fund some limited work in this area.

### **Funding opportunities in this area**

Since many different biosecurity risks exist, it is difficult to determine how money for improved preparedness should be spent. A philanthropist could fund a systematic review of biosecurity risks to determine what the most important risks are and what can be done about each of them.

### **Why this space is underfunded**

The government has not funded systematic preparedness research because it is expensive and there is not significant political pressure to improve disaster preparedness.

Governments and other organizations tend to prepare for yesterday's problems. For example, significant funds have been invested in improving airport security since 9/11, but little has been invested in forward-looking biosecurity preparedness.

### **Other people to talk to about pandemics and biosecurity**

- Researchers at the University of Pittsburgh Medical Center
- Philip Russell — Former commander of the U.S. Army Medical Research and Development Command, formerly worked at the Department of Health and Human Services
- William Raub — Deputy Director, Office of Public Health Preparedness, U.S. Department of Health and Human Services
- George Poste — Chief Scientist, Complex Adaptive Systems Initiative, Arizona State University, former member of the Defense Science Board

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