安心できる未来へ
～Homeland Securityとは ～

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UBITEQ
UBIQUITOUS TECHNOLOGY

報告書の構成内容

定義(米国政府による)

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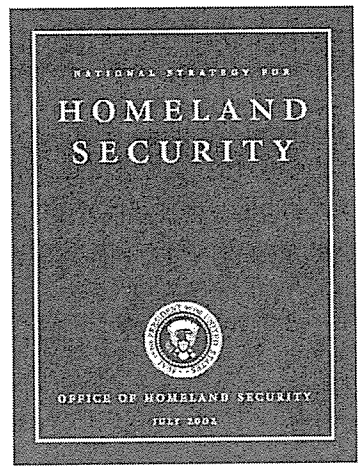
■ 定義/Definition

- Homeland Securityとは、米国内で発生するテロ攻撃に対する防衛、テロに対するアメリカの脆弱性の削減、攻撃によるダメージの最小化、攻撃からの回復を、全国一致団結して行う努力である。
- Homeland security is a concerted national effort to prevent terrorist attacks within the United States, reduce America's vulnerability to terrorism, and minimize the damage and recover from attacks that do occur.

(from "The National Strategy for Homeland Security", July 2002)



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Homeland Securityの目的

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■ 目的/Objectives

- Homeland Securityは非常に複雑なミッションである。国内と海外の両方での活動を含み、政府と民間の一連の機能を必要とする。そして、これまで共に活動することはなかった、安全保障が常に最重要の任務ではない多くの人々による、統一的かつ集中した努力を必要とする。
- Homeland security is an exceedingly complex mission. It involves efforts both at home and abroad. It demands a range of government and private sector capabilities. And it calls for coordinated and focused effort from many actors who are not otherwise required to work together and for whom security is not always a primary mission.

- 本戦略ではHomeland Securityの定義に従って、3つの目的を定めている:
- This Strategy establishes three objectives based on the definition of homeland security:

I. 米国内でのテロ攻撃の防止
Prevent terrorist attacks within the United States;

II. テロに対する米国の脆弱性の削減
Reduce America's vulnerability to terrorism;

III. 攻撃発生時のダメージの最小化と早期復興
Minimize the damage and recover from attacks that do occur.

(Introduction, pp.3)

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テロリズムとは

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- Homeland Securityは米国内でのテロリズムに重点をおく。本戦略では、テロリズムを一般市民、または政府に対して脅迫、および強要する事を意図した、人命または公共の福祉にとって危険な、計画的で非合法な活動と位置づける。
- Homeland security is focused on terrorism in the United States. The *Strategy* characterizes terrorism as any premeditated, unlawful act dangerous to human life or public welfare that is intended to intimidate or coerce civilian populations or governments.

- これは、誘拐(拉致)、ハイジャック、狙撃、従来型の爆破、科学・生物・放射性物質・核兵器による攻撃、サイバーアタック、その他、多くのあらゆる形態の悪意ある暴力を含んでいる。
- This description covers kidnappings; hijackings; shootings; conventional bombings; attacks involving chemical, biological, radiological, or nuclear weapons; cyber attacks; and any number of other forms of malicious violence.

- テロリストは、米国市民または外国人であり、協力者と共に、単独で、または敵性国家の名の下に活動を行う。
- Terrorists can be U.S. citizens or foreigners, acting in concert with others, on their own, or on behalf of a hostile state.

(Introduction, pp.2)

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6つの重点対策領域

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重点対策領域 / Critical Mission Areas

1. 諜報と警告/Intelligence and Warning
2. 国境と輸送の安全/Border and Transportation Security
3. 国内のテロ対策 / Domestic Counterterrorism
4. 重要インフラと資産の防御 / Protecting Critical Infrastructures and Key Assets
5. 壊滅的な脅威に対する防衛/Defending against Catastrophic Threats
6. 緊急事態への準備と対応/Emergency Preparedness and Response

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Homeland Securityの市場

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- 市場規模
  - DHSの予算は$40.2Bに上る。これに他の省庁や州、地方政府の調達、民間セクターによる投資を加えた合計のHomeland Security市場はUS$100B程度(約10兆円)と言われている*1。
  - なお、米国政府のIT関連支出を省庁別に比較すると、DHSが国防省を抜いてトップとなっている。
- 関連する産業は広範に渡る
  - 航空・空港設備、銀行・金融、国境警備、化学工業・危険物質、商業・オフィスビル、エネルギー・電気事業、食品・農業、医療、ホテル・リゾート、ハイテク全般とサイバーセキュリティ、大規模イベント・会場、ショッピングモール、海港、郵便・宅配便、学校、陸上交通、電気通信、水源施設、など
- 防御が必要な米国内の重要インフラの数は膨大である(数字は施設の数)。
  - 農場191万2,000 、食品加工場8 万7,000 、連邦の水源設備1,800 、下水処理施設1,600、
  - 地方政府の緊急サービス施設8万7,000 、病院5,800 、国防関連施設25 万
  - 通信ケーブル2億マイル、発電所2,800 、原子力発電所104、石油・天然ガス施設300,000
  - 空港5,000 、鉄道12 万マイル、橋梁59 万、パイプライン200万マイル、港湾300 、都市交通設備500、ダム80,000 、金融機関2万6,600、化学薬品工場6万6,000 、
  - 国家記念建造物5,800 、政府施設3,000 、高層ビル460

*1 Market Opportunities in Homeland Security (Mindbranch Inc., July 2003)

日本における取り組み例

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- "日本版US-VISIT"
  - 2004年12月10日に発表された内閣府の国際組織犯罪等・国際テロ対策推進本部が策定した「テロの未然防止に関する行動計画」に盛り込まれている。
  - 米国のUS-VISITをモデルに、日本でも入国審査時に外国人の指紋採取及び写真撮影を行う。
  - 平成17年中に検討を行い、平成18年の通常国会に入管法の改正案を提出する予定。
- e-Passport
  - 内閣府、法務省、外務省、経済産業省、国土交通省が共同歩調を取って、電子パスポートの導入を図る。
  - 2005年1月から実験開始
  - 顔認証システムを採用したICパスポートを使用し、オプションとして指紋、虹彩認証も可能にする。
  - 実験システムの納入メーカーはNEC。
  - 国土交通省が日本航空(JAL)、全日空(ANA)と共同で行う。JALが用いる実験システムは松下電器産業が提供。ANAは未発表。
  - 経済産業省は各国のICポスポートとリーダの互換性を確認する。

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日本におけるテロの可能性

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■ 日本で発生した主要な事件

- 日本で過去20年における主要な事件は、「天災」「病気」「カルト系犯罪」「大規模な事故」「ゲリラ」「海外事件」「犯罪」に分類することができる。

■ 日本におけるテロの可能性

- 現在までの所、米国で危惧されているような、爆弾や大量殺戮兵器によるテロは発生していない。
- オウム真理教の一連の事件が示すとおり、カルト的な宗教団体によるテロは、今後も発生する可能性が残っている。しかし、現在の多くのカルト団体は金銭目的に見受けられるため、「こけ脅し」的に人命を脅かす事はあっても、オウム真理教と同等のテロ事件が発生する可能性は低い。
- また、政治的なイデオロギーの対立をベースとした伝統的なテロ活動も、近年は停滞しており、今後再び活発化するとは考えられない。
- しかし、比較的最近でもハイジャック事件が発生するなど、重要施設に脆弱性が存在する事は事実と考えられる。また、日本ではその防御に対する意識が弱い、いわゆるソフトターゲット(ライフラインのように、軍事施設などに比べて警備が手薄で狙いやすく、政治的な効果も高い標的)を狙ったテロ攻撃が起こる可能性は高いと考えられる。
- さらに、海外に駐在する日本人が、テロ(主に誘拐、拉致)の対象となる事件は多く発生している。また、海外で発生するテロ事件に巻き込まれる可能性も高い。

■ 日本人にとって脅威

- 全体としてみると、日本人にとっての身近な脅威は、ここ数年特に多発している児童誘拐や無差別殺人と、地震や台風、洪水といった自然災害とそれに伴う二次的な被害と考えられ、テロに対する脅威を身近に感じている人は少ないと思われる。

サイバースペースの脅威

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■ サイバーテロとは

- インターネットなどのコンピュータネットワーク上で行われる大規模な破壊活動。社会機能に打撃を与え、結果人命に危機がおよぶ可能性がある、又は被害が深刻かつ悪質なものを指す。

■ サイバーテロの特徴

- 攻撃に要するコストが低い。
- 専門的技術者さえいればよい。
- 匿名性、無痕跡性
- 地理的・時間的制約がない。
- 経済・社会に多大な影響を与える。
- 連鎖反応的に被害が波及する。

■ 日本における対策「サイバーフォース」の設置

- 警察庁が1998年から組織的な対策を行っており、技術力、知見も十分である。
- 全国の警察に約60人の専門家を配置し、都道府県と連携した機動的技術部隊を構成している。
  - 米国のFBI管轄のNIPC(米国インフラ保護センター)をモデルとしている。
- 警察は事後捜査を基本としているが、サイバーテロは社会に対する影響が大きいため、事前に予防することが求められる。そのため警察組織の中でも、かなり特殊な活動を行う部隊である。
- 主なミッションは、攻撃手法の情報収集、防御手法の研究開発、重要インフラとの連携、脆弱性評価、事案の認知・緊急対処、などである。

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FOREIGN AFFAIRS
http://www.foreignaffairs.org

Preparing for the Next Pandemic

By Michael T. Osterholm

From *Foreign Affairs*, July/August 2005

Summary: If an influenza pandemic struck today, borders would close, the global economy would shut down, international vaccine supplies and health-care systems would be overwhelmed, and panic would reign. To limit the fallout, the industrialized world must create a detailed response strategy involving the public and private sectors.

Michael T. Osterholm is Director of the Center for Infectious Disease Research and Policy, Associate Director of the Department of Homeland Security's National Center for Food Protection and Defense, and Professor at the University of Minnesota's School of Public Health.

FEAR ITSELF

Dating back to antiquity, influenza pandemics have posed the greatest threat of a worldwide calamity caused by infectious disease. Over the past 300 years, ten influenza pandemics have occurred among humans. The most recent came in 1957-58 and 1968-69, and although several tens of thousands of Americans died in each one, these were considered mild compared to others. The 1918-19 pandemic was not. According to recent analysis, it killed 50 to 100 million people globally. Today, with a population of 6.5 billion, more than three times that of 1918, even a "mild" pandemic could kill many millions of people.

A number of recent events and factors have significantly heightened concern that a specific near-term pandemic may be imminent. It could be caused by H5N1, the avian influenza strain currently circulating in Asia. At this juncture scientists cannot be certain. Nor can they know exactly when a pandemic will hit, or whether it will rival the experience of 1918-19 or be more muted like 1957-58 and 1968-69. The reality of a coming pandemic, however, cannot be avoided. Only its impact can be lessened. Some important preparatory efforts are under way, but much more needs to be done by institutions at many levels of society.

THE BACKDROP

Of the three types of influenza virus, influenza type A infects and kills the greatest number of people each year and is the only type that causes pandemics. It originates in wild aquatic birds. The virus does not cause illness in these birds, and although it is widely transmitted among them, it does not undergo any significant genetic change.

Direct transmission from the birds to humans has not been demonstrated, but when a virus is transmitted from wild birds to domesticated birds such as chickens, it undergoes changes that allow it to infect humans, pigs, and potentially other mammals. Once in the lung cells of a mammalian host, the virus can "reassort," or mix genes, with human influenza viruses that are also present. This process can lead to an entirely new viral strain, capable of sustained human-to-human transmission. If such a virus has not circulated in humans before, the entire population will be susceptible. If the virus has not circulated in the human population for a number of years, most people will lack residual immunity from previous infection.

Once the novel strain better adapts to humans and is easily transmitted from person to person, it is capable of causing a new pandemic. As the virus passes repeatedly from one human to the next, it eventually becomes less virulent and joins the other influenza viruses that circulate the globe each year. This cycle continues until another new influenza virus emerges from wild birds and the process begins again.

Some pandemics result in much higher rates of infection and death than others. Scientists now understand that this variation is a result of the genetic makeup of each specific virus and the presence of certain virulence factors. That is why the 1918-19 pandemic killed many more people than either the 1957-58 or the 1968-69 pandemic.

A CRITICAL DIFFERENCE

Infectious diseases remain the number one killer of humans worldwide. Currently, more than 39 million people live with HIV, and last year about 2.9 million people died of AIDS, bringing the cumulative total of deaths from AIDS to approximately 25 million. Tuberculosis (TB) and malaria also remain major causes of death. In 2003, about 8.8 million people became infected with TB, and the disease killed more than 2 million. Each year, malaria causes more than 1 million deaths and close to 5 billion episodes of clinical illness. In addition, newly emerging infections, diarrheal and other vector-borne diseases, and agents resistant to antibiotics pose a serious and growing public health concern.

Given so many other significant infectious diseases, why does another influenza pandemic merit unique and urgent attention? First, of the more than 1,500 microbes known to cause disease in humans, influenza continues to be the king in terms of overall mortality. Even in a year when only the garden-variety strains circulate, an estimated 1-1.5 million people worldwide die from influenza infections or related complications. In a pandemic lasting 12 to 36 months, the number of cases and deaths would rise dramatically.

Recent clinical, epidemiological, and laboratory evidence suggests that the impact of a pandemic caused by the current H5N1 strain would be similar to that of the 1918-19 pandemic. More than half of the people killed in that pandemic were 18 to 40 years old and largely healthy. If 1918-19 mortality data are extrapolated to the current U.S. population, 1.7 million people could die, half of them between the ages of 18 and 40. Globally, those same estimates yield 180-360 million deaths, more than five times the cumulative number of documented AIDS deaths. In 1918-19, most deaths were caused by a virus-induced response of the victim's immune system -- a cytokine storm -- which led to acute respiratory distress syndrome (ARDS). In other words, in the process of fighting the disease, a person's immune system severely damaged the lungs, resulting in death. Victims of H5N1 have also suffered from cytokine storms, and the world is not much better prepared to treat millions of cases of ARDS today than it was 85 years ago. In the 1957-58 and 1968-69 pandemics, the primary cause of death was secondary bacterial pneumonias that infected lungs weakened by influenza. Although such bacterial infections can often be treated by antibiotics, these drugs would be either unavailable or in short supply for much of the global population during a pandemic.

The arrival of a pandemic influenza would trigger a reaction that would change the world overnight. A vaccine would not be available for a number of months after the pandemic started, and there are very limited stockpiles of antiviral drugs. Plus, only a few privileged areas of the world have access to vaccine-production facilities. Foreign trade and travel would be reduced or even ended in an attempt to stop the virus from entering new countries -- even though such efforts would probably fail given the infectiousness of influenza and the volume of illegal crossings that occur at most borders. It is likely that transportation would also be significantly curtailed domestically, as smaller communities sought to keep the disease contained. The world relies on the speedy distribution of products such as food and replacement parts for equipment. Global, regional, and national economies would come to an abrupt halt -- something that has never happened due to HIV, malaria, or TB despite their dramatic impact on the developing world.

The closest the world has come to this scenario in modern times was the SARS (severe acute respiratory syndrome) crisis of 2003. Over a period of five months, about 8,000 people were infected by a novel human coronavirus. About ten percent of them died. The virus apparently spread to humans when infected animals were sold and slaughtered in unsanitary and crowded markets in China's Guangdong Province. Although the transmission rate of SARS paled in comparison to that of influenza, it demonstrated how quickly such an infectious agent can circle the globe, given the ease and frequency of international travel. Once SARS emerged in rural China, it spread to five countries within 24 hours and to 30 countries on six continents within several months.

The SARS experience teaches a critical lesson about the potential global response to a pandemic influenza. Even with the relatively low number of deaths it caused compared to other infectious diseases, SARS had a powerful negative psychological impact on the populations of many countries. In a recent analysis of the epidemic, the National Academy of Science's Institute of Medicine concluded: "The relatively high case-fatality rate, the identification of super-spreaders, the newness of the disease, the speed of its global spread, and public uncertainty about the ability to control its spread may have contributed to the public's alarm. This alarm, in turn, may have led to the behavior that exacerbated the economic blows to the travel and tourism industries of the countries with the highest number of cases."

SARS provided a taste of the impact a killer influenza pandemic would have on the global economy. Jong-Wha Lee, of Korea University, and Warwick McKibbin, of the Australian National University, estimated the economic impact of the six-month SARS epidemic on the Asia-Pacific region at about $40 billion. In Canada, 438 people were infected and 43 died after an infected person traveled from Hong Kong to Toronto, and the Canadian Tourism Commission estimated that the epidemic cost the nation's economy $419 million. The Ontario health minister estimated that SARS cost the province's health-care system about $763 million, money that was spent, in part, on special SARS clinics and supplies to protect health-care workers. The SARS outbreak also had a substantial impact on the global airline industry. After the disease hit in 2003, flights in the Asia-Pacific area decreased by 45 percent from the year before. During the outbreak, the number of flights between Hong Kong and the United States fell 69 percent. And this impact would pale in comparison to that of a 12- to 36-month worldwide influenza pandemic.

The SARS epidemic also raises questions about how prepared governments are to address a prolonged infectious-disease crisis -- particularly governments that are already unstable. Seton Hall University's Yanzhong Huang concluded that the SARS

epidemic created the most severe social or political crisis encountered by China's leadership since the 1989 Tiananmen crackdown. China's problems probably resulted less from SARS' public health impact than from the government's failed effort to allay panic by withholding information about the disease from the Chinese people. The effort backfired. During the crisis, Chinese Premier Wen Jiabao pointed out in a cabinet meeting on the epidemic that "the health and security of the people, overall state of reform, development, and stability, and China's national interest and image are at stake." But Huang believes that "a fatal period of hesitation regarding information-sharing and action spawned anxiety, panic, and rumor-mongering across the country and undermined the government's efforts to create a milder image of itself in the international arena."

Widespread infection and economic collapse can destabilize a government; blame for failing to deal effectively with a pandemic can cripple a government. This holds even more for an influenza pandemic. In the event of a pandemic influenza, the level of panic witnessed during the SARS crisis could spiral out of control as illnesses and deaths continued to mount over months and months. Unfortunately, the public is often indifferent to initial warnings about impending infectious-disease crises -- as with HIV, for example. Indifference becomes fear only after the catastrophe hits, when it is already too late to implement preventive or control measures.

READY FOR THE WORST

What should the industrialized world be doing to prepare for the next pandemic? The simple answer: far more. So far, the World Health Organization and several countries have finalized or drafted useful but overly general plans. The U.S. Department of Health and Human Services has increased research on influenza-vaccine production and availability. These efforts are commendable, but what is needed is a detailed operational blueprint for how to get a population through one to three years of a pandemic. Such a plan must involve all the key components of society. In the private sector, the plan must coordinate the responses of the medical community, medical suppliers, food providers, and the transportation system. In the government sector, the plan should take into account officials from public health, law enforcement, and emergency management at the international, federal, state, and local levels.

At the same time, it must be acknowledged that such master blueprints may have their drawbacks, too. Berkeley's Aaron Wildavsky persuasively argued that resilience is the real key to crisis management -- overly rigid plans can do more harm than good. Still, planning is enormously useful. It gives government officials, private-sector partners, and the community the opportunity to meet, think through potential dilemmas, purchase necessary equipment, and set up organizational structures for a 12- to

36-month response. A blueprint forces leaders to rehearse their response to a crisis, preparing emotionally and intellectually so that when disaster strikes the community can face it.

Influenza-vaccine production deserves special attention. An initiative to provide vaccine for the entire world must be developed, with a well-defined schedule to ensure progress. It is laudable that countries such as the United States and Vietnam are pursuing programs with long-term goals to develop and produce H5N1 vaccine for their respective populations. But if the rest of the world lacks supplies, even the vaccinated will be devastated when the global economy comes to an abrupt halt. Pandemic-influenza preparedness is by nature an international issue. No one can truly be isolated from a pandemic.

The pandemic-related collapse of worldwide trade and its ripple effect throughout industrialized and developing countries would represent the first real test of the resiliency of the modern global delivery system. Given the extent to which modern commerce relies on the precise and readily available international trade of goods and services, a shutdown of the global economic system would dramatically harm the world's ability to meet the surging demand for essential commodities such as food and medicine during a crisis. The business community can no longer afford to play a minor role in planning the response to a pandemic. For the world to have critical goods and services during a pandemic, industry heads must stockpile raw materials for production and preplan distribution and transportation support. Every company's senior managers need to be ready to respond rapidly to changes in the availability, production, distribution, and inventory management of their products. There is no model for how to revive the current global economy were it to be devastated.

To truly be complete, all planning on international, regional, national, and local levels must consider three different scenarios: What if the pandemic begins tonight? What if it starts one year from now? What if the world is so fortunate as to have an entire decade to prepare? All are possible, but none is certain.

STARTING TONIGHT

What would happen today in the office of every nation's leader if several cities in Vietnam suffered from major outbreaks of H5N1 infection, with a five percent mortality rate? First, there would be an immediate effort to try to sort out disparate disease-surveillance data from a variety of government and public health sources to determine which countries might have pandemic-related cases. Then, the decision would likely be made to close most international and even some state or provincial borders -- without any predetermined criteria for how or when those borders might be

reopened. Border security would be made a priority, especially to protect potential supplies of pandemic-specific vaccines from nearby desperate countries. Military leaders would have to develop strategies to defend the country and also protect against domestic insurgency with armed forces that would likely be compromised by the disease. Even in unaffected countries, fear, panic, and chaos would spread as international media reported the daily advance of the disease around the world.

In short order, the global economy would shut down. The commodities and services countries would need to "survive" the next 12 to 36 months would have to be identified. Currently, most businesses' continuity plans account for only a localized disruption -- a single plant closure, for instance -- and have not planned for extensive, long-term outages. The private and public sectors would have to develop emergency plans to sustain critical domestic supply chains and manufacturing and agricultural production and distribution. The labor force would be severely affected when it was most needed. Over the course of the year, up to 50 percent of affected populations could become ill; as many as five percent could die. The disease would hit senior management as hard as the rest of the work force. There would be major shortages in all countries of a wide range of commodities, including food, soap, paper, light bulbs, gasoline, parts for repairing military equipment and municipal water pumps, and medicines, including vaccines unrelated to the pandemic. Many industries not critical to survival -- electronics, automobile, and clothing, for example -- would suffer or even close. Activities that require close human contact -- school, seeing movies in theaters, or eating at restaurants -- would be avoided, maybe even banned.

Vaccine would have no impact on the course of the virus in the first months and would likely play an extremely limited role worldwide during the following 12 to 18 months of the pandemic. Despite major innovations in the production of most other vaccines, international production of influenza vaccine is based on a fragile and limited system that utilizes technology from the 1950s. Currently, annual production of influenza vaccine is limited to about 300 million trivalent doses -- which protect against three different influenza strains in one dose -- or less than one billion monovalent doses. To counter a new strain of pandemic influenza that has never circulated throughout the population, each person would likely need two doses for adequate protection. With today's limited production capacity, that means that less than 500 million people -- about 14 percent of the world's population -- would be vaccinated within a year of the pandemic. In addition, because the structure of the virus changes so rapidly, vaccine development could only start once the pandemic began, as manufacturers would have to obtain the new pandemic strain. It would then be at least another six months before mass production of the vaccine.

Even if the system functions to the best of its ability, influenza vaccine is produced commercially in just nine countries: Australia, Canada, France, Germany, Italy, Japan, the Netherlands, the United Kingdom, and the United States. These countries contain only 12 percent of the world's population. In the event of an influenza pandemic, they would probably nationalize their domestic production facilities, as occurred in 1976, when the United States, anticipating a pandemic of swine influenza (H1N1), refused to share its vaccine.

If a pandemic struck the world today, there would be another possible weapon against influenza: antiviral medicine. When taken daily during the time of exposure to influenza, antivirals have prevented individuals from becoming ill. They have also reduced the severity of illness and subsequent complications when taken within 48 hours of onset. Although there is no data for H5N1, it is assumed antivirals would also prevent H5N1 infection if taken before exposure. There is no evidence, however, that current antiviral influenza drugs would help if the patient developed the kind of cytokine storm that has characterized recent H5N1 infections. But barring this complication, H5N1 should be treatable with Tamiflu (oseltamivir phosphate), which is manufactured by the Roche pharmaceuticals company in a single plant in Switzerland.

In responding to a pandemic, Tamiflu could have a measurable impact in the limited number of countries with sizable stockpiles, but for most of the world it would not be available. Although the company plans on opening another facility in the United States this year, annual production would still cover only a small percentage of the world's population. To date, at least 14 countries have ordered Tamiflu, but the amount of these orders is enough to treat only 40 million people. The orders take considerable time to be processed and delivered -- manufacturing can take up to a year -- and in an emergency the company's ability to produce more would be limited. As with vaccines, countries would probably nationalize their antiviral supplies during a pandemic. Even if the medicine were available, most countries could not afford to buy it. Critical antibiotics, for treatment of secondary bacterial infections, would also be in short supply during a pandemic. Even now, supplies of eight different anti-infective agents are limited in the United States due to manufacturing problems.

Aside from medication, many countries would not have the ability to meet the surge in the demand for health-care supplies and services that are normally taken for granted. In the United States, for example, there are 105,000 mechanical ventilators, 75,000 to 80,000 of which are in use at any given time for everyday medical care. During a routine influenza season, the number of ventilators being used shoots up to 100,000. In an influenza pandemic, the United States may need as many as several hundred thousand additional ventilators.

A similar situation exists in all developed countries. Virtually every piece of medical equipment or protective gear would be in short supply within days of the recognition of a pandemic. Throughout the crisis, many of these necessities would simply be unavailable for most health-care institutions. Currently, two U.S.-based companies supply most of the respiratory protection masks for health-care workers around the world. Neither company would be able to meet the jump in demand, in part because the component parts for the masks come from multiple suppliers in multiple countries. With travel and transportation restricted, masks may not even be produced at all.

Health-care providers and managed-care organizations are also unprepared for an outbreak of pandemic influenza today. There would be a tremendous demand for skilled health professionals. New "hospitals" in high school gymnasiums and community centers would have to be staffed for one to three years. Health-care workers would probably get sick and die at the same rate as the general public -- perhaps at an even higher rate, particularly if they lack access to protective equipment. If they lack such fundamental supplies, it is unclear how many professionals would continue to place themselves in high-risk situations by caring for the infected. Volunteers who are naturally immune as a result of having survived influenza infection would thus have to be found and employed. That means that the medical community's strong resistance to using lay volunteers, which is grounded in both liability concerns and professional hubris, would need to be addressed.

Other unpleasant issues would also need to be tackled. Who would have priority access to the extremely limited antiviral supplies? The public would consider any ad hoc prioritization unfair, creating further dissent and disruption during a pandemic. In addition, there would not even be detailed plans for handling the massive number of dead bodies that would soon outstrip the ability to process them. Clearly, an influenza pandemic that struck today would demand an unprecedented medical and nonmedical response. This requires planning well beyond anything devised thus far by any of the world's countries and organizations.

A YEAR FROM NOW

Even if an H5N1 pandemic is a year away, the world must plan for the same problems with the same fervor. Major campaigns must be initiated to prepare the nonmedical and medical sectors. Pandemic planning must be on the agenda of every school board, manufacturing plant, investment firm, mortuary, state legislature, and food distributor in the United States and beyond. There is an urgent need to reassess the vulnerability of the global economy to ensure that surges in demand can be met. Critical heath-care and consumer products and commodities must be stockpiled. Health professionals must

learn how to better communicate risk and must be able to both provide the facts and acknowledge the unknowns to a frightened or panicked population.

If there is a year of lead-time before an H5N1 pandemic, vaccine could play a more central role in the global response. Although the world would still have a limited capacity to manufacture influenza vaccine, techniques that could allow scientists to get multiple doses from a current single dose may increase the supply. In addition to further research on this issue, efforts are needed to ensure the availability of syringes and equipment for delivering vaccine. There must also be an international plan for how the vaccine would be allocated. It is far better to struggle with the ethical issues involved in determining such priorities now, in a public forum, rather than to wait until the crisis occurs.

Prevention must also be improved. Priority should be placed on early intervention and risk assessment. And an aggressive and comprehensive research agenda must be launched immediately to study the ecology and biology of the influenza virus and the epidemiologic role of various animal and bird species.

TEN YEARS LATER

If developed countries begin to transform radically the current system of influenza-vaccine production, an influenza pandemic ten years from now could have a much less devastating outcome. The industrialized world must initiate an international project to develop the ability to produce a vaccine for the entire global population within several months of the start of a pandemic. The initiative must be a top priority of the group of seven industrialized nations plus Russia (G-8), because almost nothing could inflict more death and disruption than a pandemic influenza.

The current BioShield law and additional legislation recently submitted to Congress will act to enhance the availability of vaccines in the United States. This aim is laudable, but it does little to address international needs. The ultimate goal must be to develop a new cell-culture vaccine or comparable vaccine technology that works on all influenza subtypes and that can be made available on short notice to all the people of the world.

WHAT COURSE TO TAKE?

The world must form a better understanding of the potential for the emergence of a pandemic influenza strain. A pandemic is coming. It could be caused by H5N1 or by another novel strain. It could happen tonight, next year, or even ten years from now.

The signs are alarming: the number of human and animal H5N1 infections has been increasing; small clusters of cases have been documented, suggesting that the virus may have come close to sustained human-to-human transmission; and H5N1 continues to evolve in the virtual genetic reassortment laboratory provided by the unprecedented number of people, pigs, and poultry in Asia. The population explosion in China and other Asian countries has created an incredible mixing vessel for the virus. Consider this sobering information: the most recent influenza pandemic, of 1968-69, emerged in China, when its population was 790 million; today it is 1.3 billion. In 1968, the number of pigs in China was 5.2 million; today it is 508 million. The number of poultry in China in 1968 was 12.3 million; today it is 13 billion. Changes in other Asian countries are similar. Given these developments, as well as the exponential growth in foreign travel over the past 50 years, an influenza pandemic could be more devastating than ever before.

Can disaster be avoided? The answer is a qualified yes. Although a coming pandemic cannot be avoided, its impact can be considerably lessened. It depends on how the leaders of the world -- from the heads of the G-8 to local officials -- decide to respond. They must recognize the economic, security, and health threat that the next influenza pandemic poses and invest accordingly. Each leader must realize that even if a country has enough vaccine to protect its citizens, the economic impact of a worldwide pandemic will inflict substantial pain on everyone. The resources required to prepare adequately will be extensive. But they must be considered in light of the cost of failing to invest: a global world economy that remains in a shambles for several years.

This is a critical point in history. Time is running out to prepare for the next pandemic. We must act now with decisiveness and purpose. Someday, after the next pandemic has come and gone, a commission much like the 9/11 Commission will be charged with determining how well government, business, and public health leaders prepared the world for the catastrophe when they had clear warning. What will be the verdict?

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The Human-Animal Link

William B. Karesh and Robert A. Cook

From *Foreign Affairs*, July/August 2005

Summary: Recent outbreaks of avian flu, SARS, the Ebola virus, and mad cow disease wreaked havoc on global trade and transport. They also all originated in animals. Humanity today is acutely vulnerable to diseases that start off in other species, yet our health care remains dangerously blinkered. It is time for a new, global approach.

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ONE WORLD, ONE HEALTH

In recent years, outbreaks of diseases such as avian flu, severe acute respiratory syndrome (SARS), the Ebola virus, and mad cow disease have frightened the public, disrupted global commerce, caused massive economic losses, and jeopardized diplomatic relations. These diseases have also shared a worrisome key characteristic: the ability to cross the Darwinian divide between animals and people. None of these illnesses depends on human hosts for its survival; as a result, they all persist today, far beyond the reach of medical intervention.

Meanwhile, humanity has become vulnerable to cross-species illnesses, thanks to modern advances such as the rapid transportation of both goods and people, increasing population density around the globe, and a growing dependence on intensified livestock production for food. The global transport of animals and animal products, which includes hundreds of species of wildlife, also provides safe passage for the harmful bacteria, viruses, and fungi they carry, not to mention the prion proteins that cause insidious illnesses such as mad cow disease and chronic wasting disease in deer and elk.

Adding to the risks is the fact that while many people in the developed world would scarcely recognize meat if it did not come wrapped in clear plastic, the vast majority of people on the planet today still slaughter animals for meat themselves or buy it fresh, salted, or smoked in open-air markets. These markets generally go uninspected by health officials, and consumers rarely have access to good health care, education on hygiene, common vaccines, or antibiotics.

Not only is local and national health care often a problem; internationally, no agency is responsible for, or capable of, monitoring and preventing the myriad diseases that can now cross the borders between countries and species. More specifically, no organization has the mandate to pursue policies based on a simple but critically important concept: that the health of people, animals, and the environment in which we all live are inextricably linked.

Thus, for example, the U.S. Department of Agriculture works to protect only the U.S. livestock industry and has scaled back the attention it pays to animals outside the United States over the last two decades. Despite new concerns about terrorist attacks on the U.S. food supply, Washington has still made little attempt to research and reduce diseases overseas before they reach U.S. shores. Nor does the United Nations direct the resources necessary to do a better job. The UN Food and Agriculture Organization, for example, is mandated to monitor the production of livestock and crops but does little to track threats to and dangers from wild plants and animals. The World Animal Health Organization has a volunteer committee that considers wildlife-related diseases, but it consists of just six people and meets only three days a year. And the World Health Organization (WHO) can only get involved in a country if officially invited, leaving it helpless to intervene in countries with governments that either do not know about or do not want to reveal the presence of a disease within their borders. The . . .

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The Next Pandemic?

By Laurie Garrett

From *Foreign Affairs*, July/August 2005

Summary: Since it first emerged in 1997, avian influenza has become deadlier and more resilient. It has infected 109 people and killed 59 of them. If the virus becomes capable of human-to-human transmission and retains its extraordinary potency, humanity could face a pandemic unlike any ever witnessed.

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PROBABLE CAUSE

Scientists have long forecast the appearance of an influenza virus capable of infecting 40 percent of the world's human population and killing unimaginable numbers. Recently, a new strain, H5N1 avian influenza, has shown all the earmarks of becoming that disease. Until now, it has largely been confined to certain bird species, but that may be changing.

The havoc such a disease could wreak is commonly compared to the devastation of the 1918-19 Spanish flu, which killed 50 million people in 18 months. But avian flu is far more dangerous. It kills 100 percent of the domesticated chickens it infects, and among humans the disease is also lethal: as of May 1, about 109 people were known to have contracted it, and it killed 54 percent (although this statistic does not include any milder cases that may have gone unreported). Since it first appeared in southern China in 1997, the virus has mutated, becoming heartier and deadlier and killing a wider range of species. According to the March 2005 National Academy of Science's Institute of Medicine flu report, the "current ongoing epidemic of H5N1 avian influenza in Asia is unprecedented in its scale, in its spread, and in the economic losses it has caused."

In short, doom may loom. But note the "may." If the relentlessly evolving virus becomes capable of human-to-human transmission, develops a power of contagion typical of human influenzas, and maintains its extraordinary virulence, humanity could well face a pandemic unlike any ever witnessed. Or nothing at all could happen. Scientists cannot predict with certainty what this H5N1 influenza will do. Evolution does not function on a knowable timetable, and influenza is one of the sloppiest, most mutation-prone pathogens in nature's storehouse.

Such absolute uncertainty, coupled with the profound potential danger, is disturbing for those whose job it is to ensure the health of their community, their nation, and broader humanity. According to the Centers for Disease Control and Prevention (CDC), in a

normal flu season about 200,000 Americans are hospitalized, 38,000 of whom die from the disease, with an overall mortality rate of .008 percent for those infected. Most of those deaths occur among people older than 65; on average, 98 of every 100,000 seniors with the flu die. Influenza costs the U.S. economy about $12 billion annually in direct medical costs and loss of productivity.

Yet this level of damage hardly approaches the catastrophe that the United States would face in a severe flu pandemic. The CDC predicts that a "medium-level epidemic" could kill up to 207,000 Americans, hospitalize 734,000, and sicken about a third of the U.S. population. Direct medical costs would top $166 billion, not including the costs of vaccination. An H5N1 avian influenza that is transmittable from human to human could be even more devastating: assuming a mortality rate of 20 percent and 80 million illnesses, the United States could be looking at 16 million deaths and unimaginable economic costs. This extreme outcome is a worst-case scenario; it assumes failure to produce an effective vaccine rapidly enough to make a difference and a virus that remains impervious to some antiflu drugs. But the 207,000 reckoning is clearly a conservative guess.

The entire world would experience similar levels of viral carnage, and those areas ravaged by HIV and home to millions of immunocompromised individuals might witness even greater death tolls. In response, some countries might impose useless but highly disruptive quarantines or close borders and airports, perhaps for months. Such closures would disrupt trade, travel, and productivity. No doubt the world's stock markets would teeter and perhaps fall precipitously. Aside from economics, the disease would likely directly affect global security, reducing troop strength and capacity for all armed forces, UN peacekeeping operations, and police worldwide.

In a world where most of the wealth is concentrated in less than a dozen nations representing a distinct minority of the total population, the capacity to respond to global threats is, to put it politely, severely imbalanced. The majority of the world's governments not only lack sufficient funds to respond to a superflu; they also have no health infrastructure to handle the burdens of disease, social disruption, and panic. The international community would look to the United States, Canada, Japan, and Europe for answers, vaccines, cures, cash, and hope. How these wealthy governments responded, and how radically the death rates differed along worldwide fault lines of poverty, would resonate for years thereafter.

WHAT ONCE WAS LOST

Nearly half of all deaths in the United States in 1918 were flu related. Some 675,000 Americans -- about 0.6 percent of the population of 105 million and the equivalent of 2 million American deaths today -- perished from the Spanish flu. The average life expectancy for Americans born in 1918 was just 37 years, down from 55 in 1917. Although doctors then lacked the technology to test people's blood for flu infections, scientists reckon that the Spanish flu had a mortality rate of just less than one percent of