

# THE EVOLVING PUBLIC HEALTH CHALLENGE

The beginning of the 20th Century was marked by significant advances in the treatment of infectious disease in America and around the world. Advances in immunology led to better control of epidemics through vaccination while the discovery of antibiotics reduced the toll and spread of disease through direct treatment. The evolution of Franz Lister's "Germ Theory of Disease" led to basic hygiene measures being adopted by the health care industry, resulting in improved medical treatment and population longevity. As medical technology continued to improve after World War II, with broader spectrum antibiotics, anti-hypertensives, and other therapeutic agents, the focus of health care shifted to curative medicine, widening the chasm between large-scale public health preventive measures and practical medicine.

The modern era of public health, from the 1970s to today, has brought emphasis back to disease epidemiology and prevention with a new focus on chronic diseases such as Diabetes and heart disease. Studies on health promotion and the prevention of these killers have played a significant role in improving morbidity and mortality rates. In order to support this ongoing research, hospitals and research institutions have become increasingly technologically oriented and costly to operate. Under the influence of rising costs, incentives for alternative forms of care have led to the development of home care, ambulatory services, and linkages with long term care. As the health care resources available to Americans have become more diverse and spread out, the task of integrating them to act as one in an emergency has become more challenging.

As is evidenced by the multiple emphasis shifts within the field in the past century, tremendous change in the science and delivery of public health in the United States has come about in response to wars, epidemics, and natural disasters. Today it must evolve again, only the stimulus is the threat of attack with a biological agent that could easily overwhelm our fragile system.

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In addition to dealing with the health implications of this new threat, the public health system must now fulfill a new National Security Role, one that is far beyond its current available resources. The challenge facing public health in the 21st Century is arguably the most demanding in history and will require a comprehensive approach linking private industry with local, state and national government to promote the security of the population.

Since the tragic events of September 11th, in the midst of nationwide efforts toward greater preparedness for disaster, a new vision of the nation's public health structure has emerged. The vision encompasses a scope of expansive capabilities including planning, preparation, surveillance, and the integration of defensive efforts across multiple fronts. This vision combined with large-scale public awareness and support has generated both the public opinion climate and the governmental funding necessary to create the public health system these times demand. The opportunity currently available is unparalleled in history, and the resources available must be leveraged to their full extent to provide the robust improvements needed to protect our population.

Our basic healthcare capabilities need to be expanded. Research is needed on bioterror agents, their properties, treatments, and vaccines. There is a need for collaboration on these efforts to organize and public availability of resultant information. These needs are being addressed by the nation's research institutions as the funding, equipment, and information is gained to move knowledge in the field of bioterror forward.

In order to maximally leverage our capabilities, broad-based partnerships between public and private industry must be formed to design comprehensive prevention and response plans, build integrated communication systems, and find ultra-sensitive ways to monitor the public's state of health. These accomplishments will be impossible with less than full participation from the government, the health care industry, and all stakeholders in emergency response.

To this end, the Federal Government has released approximately 3.3 billion dollars in aid for strengthening of all aspects of the public health infrastructure. As sudden as the events of September 11th were, the release of Government funding was equally swift. The plans for this money, while they must be produced quickly, must incorporate careful perspective on the needs of the country's population and a new level of local, state, and national coordination to effect public health security. While the public health system has always planned to meet the country's health needs, the massive coordination required for anti-bioterrorism surveillance and national health security is a task demanding much greater consideration.

In addition to new levels of interagency and public-private coordination, a new depth of resource analysis is needed. It is not enough to have information regarding how many beds are available in which counties. Today's planning needs require knowledge and analysis of the resources on which those beds depend. Not only must they be staffed by physicians and nurses, but the facilities must also have primary and secondary sources of electrical power, telecommunications, waste management (especially contingencies for large scale infectious waste management) and other essential services. In turn, the resources on which these essential services depend must be assessed. In this planning, state and local organizations must take full advantage of the level of detailed analysis today's technology is capable of, namely through the identification and decentralization of critical resources and the constant logistical planning for their loss and replacement.

Another example is the Telecommunications Industry itself. Many Emergency Operations Centers are equipped with so-called "redundant" communications systems. These include landlines, cellular telephones, and Internet access among other means. While this is a form of redundancy, what has not been taken into account is that many of these different methods of communication all rely on common resources. It is not uncommon for landline, cellular, and Internet for a given area to all be dependant on a common switch, or a common long-haul carrier line. As such, they can all be simultaneously deactivated by an attack on that switch, or the power supply to that switch, which can easily be planned using information that is currently publicly available. Decentralization and true multi-level redundancy of resources is essential to prevent this type of scenario.

By looking at each system involved in the public health infrastructure as a critical link, or "node" on the service network it becomes possible to assess the true impact of that system's damage or loss and also the support systems required to keep it functioning. In the era of modern health and advanced technology the interconnectedness of hospitals, public health offices, EMS systems, and other public health and emergency response stakeholders is a complex maze. While understanding the implications of all its components seems a daunting task, with the proper tools and support it is quite possible. Once accomplished, it will yield an understanding of the true vulnerabilities of the public health system and allow them to be addressed. Without this knowledge, any structural improvements on the current public health infrastructure will be akin to building an additional story on a building with a crumbling foundation.

In addition to yielding information on the key support services and vulnerabilities of the current public health system, the "nodes on a network" perspective will guide information security needs for the future. By understanding that there are vulnerable links in the network of telecommunications or regional power supply it then becomes possible to safeguard information regarding their location and their strategic importance. Without this understanding it is impossible to know which pieces of information should truly be classified.

This kind of in-depth resource analysis reveals both critical infrastructure weaknesses and critical security lapses. By taking these resource assessment, decentralization, and security requirements into account at the planning level, it will be possible to design response to function around the loss of almost any of the network pieces. This is the true aim of redundancy, and once it has been achieved it will be possible to design the new public health system on a solid footing to face the future of bioterrorist threats.