Testimony

Homeland Security: Disease Surveillance Systems

Richard Platt, MD, MS
Professor and Chair,
Department of Ambulatory Care and Prevention,
Harvard Medical School and Harvard Pilgrim Health Care,
Boston, MA

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Good afternoon Mr. Chairman and members of the Subcommittee. My name is Richard Platt; I am a Professor at Harvard Medical School, where I chair the Department of Ambulatory Care and Prevention, a department that is unique in being jointly sponsored by a medical school and by a health plan, Harvard Pilgrim Health Care. I am also an infectious diseases specialist, an epidemiologist, and a member of the Board of Scientific Counselors of the Center for Disease Control and Prevention's (CDC) National Center for Infectious Diseases.

I am very excited about this opportunity to discuss our National Bioterrorism Surveillance Demonstration Program and the work we do daily to detect and respond to both bioterrorism and naturally occurring disease outbreaks. The National Demonstration Program is the product of an evolving three-way partnership between private health plans and physician groups, public health agencies, and the academic community. This partnership makes an important contribution to protecting the overall health of our nation by combining our unique strengths:

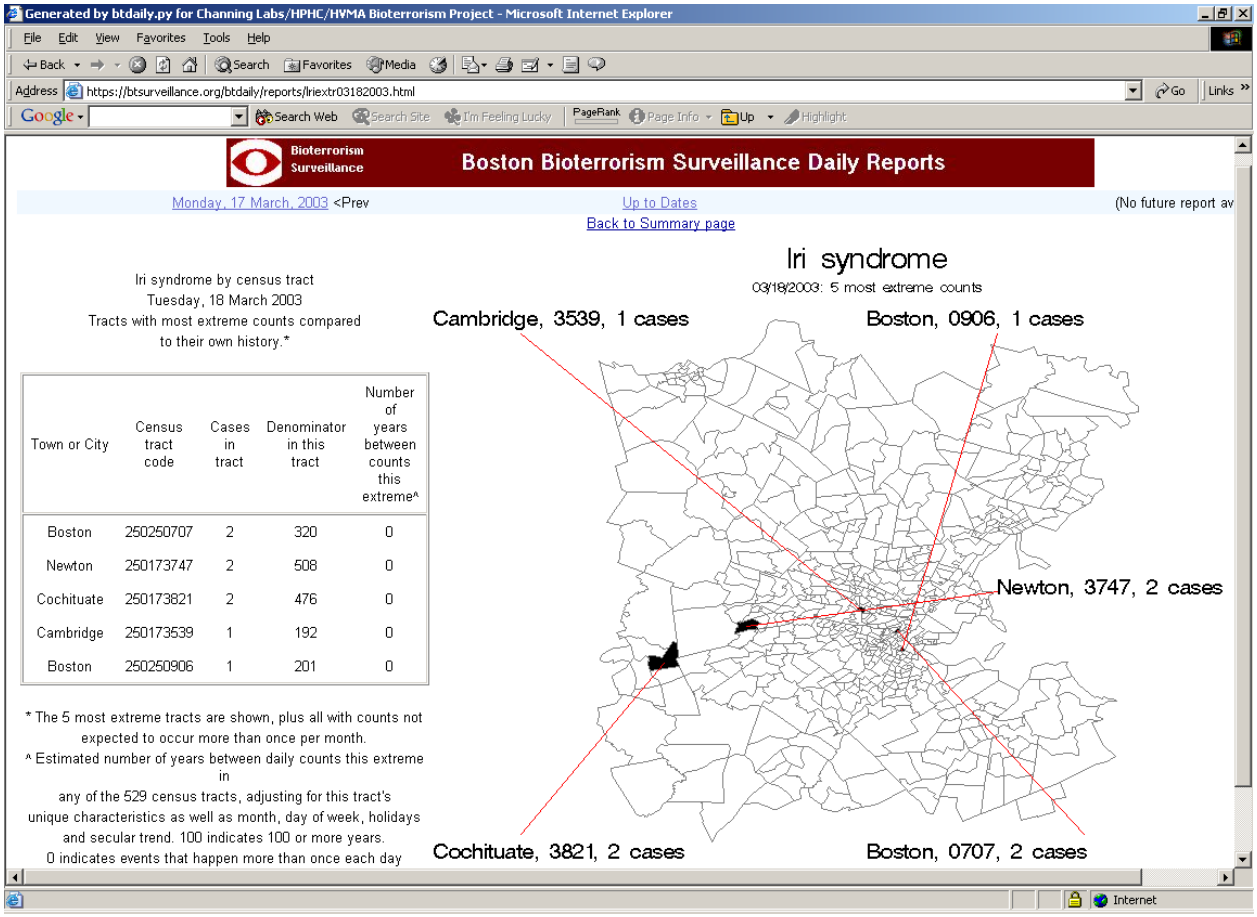
- the private health system's information infrastructure and its ability to communicate both with clinicians and with the people for whom they provide care;
- the public sector's ability to set major health priorities and coordinate a response; and
- the academic community's skills in developing the knowledge and tools to make the most of these capabilities.

In addition to the work I will describe today, this three-way partnership is currently making important contributions to our ability to prevent illness, treat disease, improve the safety of drugs and vaccines, and improve the delivery of health care.

Before I describe our National Demonstration Program, I think it will be helpful for you to know how it began. My work on detecting bioterrorism began in 2000 when the Massachusetts State Epidemiologist, Dr. Alfred DeMaria, and I developed a partnership between the Massachusetts Department of Public Health, Harvard Pilgrim Health Care, and Harvard Vanguard Medical Associates to enhance early-detection and public health communication capabilities. This project was supported by a bioterrorism preparedness grant from the CDC to the State of Massachusetts. We had three major goals: first to quickly gather the diagnoses made in everyday practice by hundreds of physicians in eastern Massachusetts; then to analyze this information for evidence of unusual disease activity; and finally to create a mechanism for public health officials to communicate rapidly with clinicians to follow up the outbreak signals we detected. Because of our

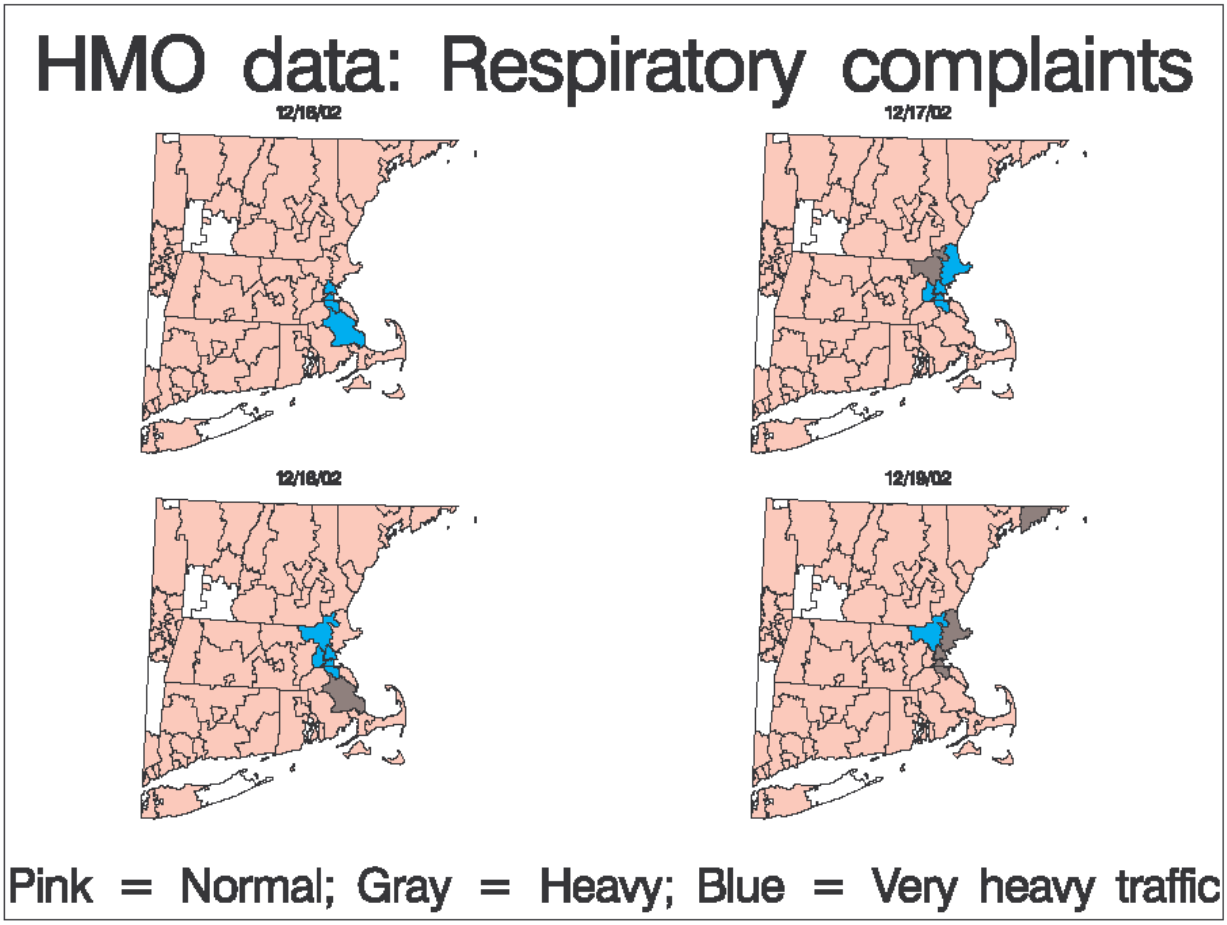
early start, our eastern Massachusetts detection system went "live" in October of 2001, within weeks of the anthrax attack that brought bioterrorism to prominence. This system is described in articles in Emerging Infectious Diseases (2002 Aug;8(8):753-60) and BMC Public Health (2001;1:9).

Our system has been active since then, identifying the census tracts in our region with the most unusual number of new cases of respiratory, gastrointestinal, and several other categories of illness, which may indicate potential outbreaks. This information is displayed via maps and tables on a secure internet site that is accessible to the state health department. The following illustration shows the information that public health officials view on a typical day.



An important feature of this display is that it only highlights areas with the most unusual number of people who have a new episode of illness, after eliminating seasonal and other effects. On the majority of days, nothing unusual occurs. However, when we observe an unusually large number of cases in a specific locale, a clinician who works in the medical practice that provides the

information, and who is responsible for public health reporting, provides additional information to the health department. Fortunately, there have been no cases of bioterrorism since our program became active. However, we understood from the outset that this information would also serve a separate purpose of providing routine, high quality, timely, information to the public health department about naturally occurring illnesses in these communities - earlier than is possible with traditional physician reporting of diagnosed diseases. Using historical data from the health plan and state records, we were able to demonstrate that office visits for wintertime respiratory illness increased about two weeks before an increase in respiratory hospitalizations occurred. In addition, we have been able to identify unusual clusters of respiratory infections, as shown in the following figure, which illustrates a once-in-eight-year cluster involving hundreds of people that occurred last December.



Soon after we began providing routine reports to our colleagues in the Massachusetts Department of Health, the department's influenza tracking branch requested that we report a new disease category – *influenza-like illness* – and we added this feature without any additional resources from the clinical system or the state. We are currently discussing with CDC ways to adapt this system to

detect the occurrence of Severe Acute Respiratory Syndrome (SARS) if it appears in our region. The Institute of Medicine (IOM) described this detection system in Massachusetts as an example of the ability of the health care delivery system to play an important role in disease detection and reporting in its recent report, "The Future of the Public's Health in the 21st Century," (page 249).

Several critical elements contribute to the success of this program. The first is the fact that a large physician group, Harvard Vanguard Medical Associates, uses electronic medical records to provide routine patient care. Therefore, information about diagnoses, symptoms, and vital signs is available at the end of each day. Clinicians are not required to collect any additional information, to record it in any special way, or to take any additional steps to report needed information. Thus, we avoid burdening already overloaded clinicians and their support staff and we are confident that the clinical information is complete. In addition, since we focus on health plan members, we also know how many members are not sick. This provides added confidence that the detection system will alert us to problems that occur in the health plans' enrolled population.

The second important element was development of a method to identify potential outbreaks. We accomplish this using a computerized analysis program that takes into account historical patterns of illness and allows us to recognize when unusual numbers of events occur. Assessing patterns of illness is important because our system looks for clusters of individual cases that may not seem unusual to the clinicians who are providing care. The absence of distinguishing features is often the case for conditions like SARS. It causes severe symptoms in only a small fraction of infected people, yet detection of the larger number of people who develop mild symptoms and then recover may signal the arrival of the virus to an area. Additionally, even life-threatening illnesses like anthrax and smallpox typically begin with a few days of mild illness that cannot be distinguished in routine practice from common illnesses. Even highly experienced epidemiologists find it difficult to recognize unusual numbers of illnesses because of the difficulty of taking into account multiple factors - the day of the week, the season, whether it is the day after a holiday, the history of incidence over prior years, and the typical patterns of care in specific communities. An unusually high number of ill people on a Wednesday in August may be quite ordinary for a Monday in January, and a few cases in one community can be much more significant than a much larger number in a nearby community. Thus, our cluster detection analysis system is a key element in the system's effectiveness.

An additional reason to use computerized methods to identify unusual situations is to provide alerts to public health officials. Our public health colleagues have advised us that it is inefficient to examine the actual numbers of illnesses each day, especially when there is no special concern. In short, our detection system sifts and analyzes huge volumes of data and only in rare cases alerts public health officials to an unusual signal that requires attention.

A third important contributor to our success is the willingness of the health plan and physicians' practice to share this critical health information. One reason health plans and medical groups are willing to do this is that we constructed the system so that they continue to be custodians of their patients' health care data, providing only the information that is needed for tracking the public's health. The only information that health plans submit to us is the number of individuals in each zip code or census tract with visits for respiratory, gastrointestinal, or other types of medical problems. If the number of cases is unusually large, the health department requests the corresponding visit-by-visit information, which is stored at the health plan. The health department contacts a designated clinical responder in the health plan for any additional information that is needed. The clinician responds in a timely manner and has ready access to information about the individual and the details of the illness.

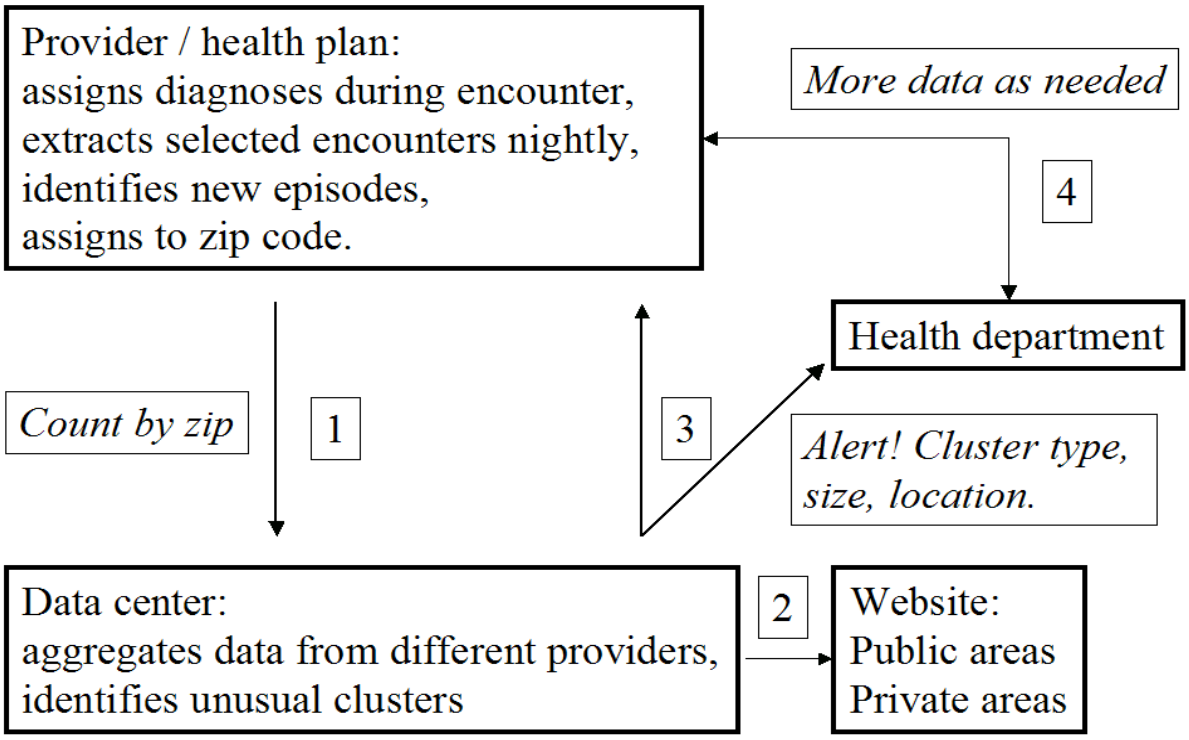
Organizing the system this way is appealing to the health plans and the public for two major reasons. First, it corresponds to the public's desire for health plans and physicians to keep information about their individual medical visits private unless there is a compelling public health need for such information. Second, health plans know that visit level information can be used for other purposes, such as litigation and competitive purposes, and so they want to be as certain as possible that the information they provide is accurate and used only for the intended purpose – public health. Several health plans have had recent experiences in which a public health agency has not been able to assure the confidentiality of data that they provided. While many health plans believe strongly in contributing actively to our nation's public health, they also want to minimize the possibility that doing so will breach confidentiality.

During the past year, we have developed the capacity to integrate real-time bioterrorism and disease detection information from many health plans. This National Demonstration Program has been

supported by the CDC through a grant to one of its Prevention Epicenters, which I lead. The design of this program has been guided by our work in Massachusetts, as well as the considerable experience of health plans in Minnesota and Colorado. Our major partner in this work is the American Association of Health Plans, which is the principal national organization representing more than 1,000 health plans that provide coverage for more than 170 million Americans nationwide. Additional participants are four health plans or physician groups – Harvard Pilgrim Health Care/Harvard Vanguard Medical Associates (Massachusetts), HealthPartners (Minnesota), Kaiser Permanente Colorado, and UnitedHealthcare's nurse call center, Optum. The coordinating center is at Harvard Medical School's Channing Laboratory.

We also recently began working with three health providers in Texas, Scott and White Healthcare System, the Austin Regional Clinic, and Austin Diagnostic Clinic, after a local health officer asked us to help him develop a disease surveillance system. The health officer secured necessary funding from the Texas Association of Local Health Organizations to support their participation. All of our health plan partners have some form of electronic health information. Detailed information about this program has been described in articles in the Journal of Urban Health (2003;80 #2, Supplement 1:i25-i31) and the National Journal (April 19, 2003, p 1238-9).

We are making excellent progress and are enthusiastic about the prospects of this detection program. We have created computer programs that allow the health plans to automate the large majority of their activities. These programs analyze daily clinical information and group together visits with different diagnoses, for instance "cough" and "bronchitis", identify new episodes of illness so that repeat visits for the same illness are not counted twice, assign the new episodes to the zip codes where the patients live, count the number of new episodes in each zip code, and then transmit only this summary information automatically over a secure internet connection to the coordinating center at Harvard. At the coordinating center, we combine the information from different health plans and search for unusual patterns of illness. The computer programs we have developed for the health plans also maintain detailed lists of the clinical information that underlies the numbers provided to the coordinating center. These detailed lists are kept by the health plan and are immediately accessible to the clinical responders when a public health department seeks additional information for investigation of a possible outbreak. The information flow is shown in the following diagram.



We are currently working with our state and local health department partners to evaluate our surveillance system's capabilities by comparing the clusters that we identify through health plan data to confirmed past outbreaks that health departments have detected through their usual method of identification. Our preliminary comparison indicates that our system identifies the large majority of recognized outbreaks that occurred during the past two years, and it also highlights potential clusters that the public health system may not have detected.

We are also developing the ability to notify health departments automatically of clusters that they wish to know about, through pagers or e-mail. We expect this will be the most efficient method of ensuring that needed information is used by public health agencies at the earliest possible opportunity. At present, we are waiting for the public health departments to provide the specifications for these automatic notifications.

In all of our activities, we try to use definitions and methods that are consistent with evolving public health practice, with the goal of making our information compatible with other detection and

response systems, including the ESSENCE system developed by the Department of Defense, and the CDC's BioSense initiative. We are currently discussing with CDC the contributions we can make to BioSense, both in adapting our signal detection methods to the broad range of data types in BioSense, and making data from our health plans available to the public health community through BioSense. We look forward to working with CDC and are certain that a continued public-private partnership provides the greatest opportunity for improved homeland security.

We have just been notified that we will receive funding to continue this program beyond its first year. Our goals include making the transition from program development and testing to a stable, ongoing system and collaborating with BioSense, as described above. We especially want to work with CDC to improve public health departments' ability to communicate quickly and effectively with the large majority of practicing clinicians in this country and with over 170 million individuals for whose care the health plans are responsible. We are convinced there is important additional work to do in acquiring new types of data, for instance emergency room visit information, additional information from health plans, and in developing more sophisticated mathematical models that will allow us to do a better job combining information from different data sources within a single health plan (for instance, regular office visits and emergency room visits) and aggregate information from several plans that serve a single area. We are also talking with other health plans and physician groups that are interested in contributing their information to this system. We also look forward to working with our public health partners to creating a wide array of new uses for health plans' data and their ability to communicate with clinicians and the people for whom they provide care. We believe the framework we have created will facilitate this development.

In conclusion, I want to thank you again for the opportunity to discuss our work with you. My colleagues and I believe this system can make a valuable contribution to the public health system's ability to identify and respond to bioterrorism and other emerging threats at the earliest possible moment and it can be expanded to report health plan data nationally. I also believe it is even more important as an example of the partnerships we can create between the private health care delivery system, the public health sector, and the academic community. I believe this three-way partnership has the potential to transform the health of our society during the coming years if we take the right steps to nurture it.