National Biodefense Science Board (NBSB) Strategic Preparedness Goals Report

Introduction

The NBSB provides recommendations, through the Department of Health and Human Services (HHS) Office of the Assistant Secretary for Preparedness and Response (ASPR) and the HHS Public Health Emergency Medical Countermeasures Enterprise (PHEMCE), to the HHS Secretary on strategic preparedness goals that address particular threats and/or medical countermeasure (MCM) needs.

The PHEMCE is an interagency coordinating body, chaired by the HHS ASPR, and its membership includes the Centers for Disease Control and Prevention (CDC), the National Institutes of Health (NIH), the Food and Drug Administration (FDA), and interagency partners at the Departments of Veterans Affairs (VA), Defense (DoD), Homeland Security (DHS), and Agriculture (USDA). The PHEMCE coordinates the development, acquisition, stockpiling, and use of medical products needed to respond to a variety of potential high-consequence public health threats.

The *2012 HHS PHEMCE Implementation Plan* (Implementation Plan) states that by the end of Fiscal Year 2013, ASPR will lead PHEMCE agencies in defining preparedness goals[1] for all PHEMCE capabilities for addressing a range of threats and/or MCM needs.

In pursuit of the goals and objectives for MCM preparedness that are laid out in the Implementation Plan, an important activity is identification of gaps between (a) these goals and objectives and (b) what can realistically be accomplished in the face of finite resources. Although the preparedness goals should embody the ability to mitigate the consequences of any and all potential threats, complete realization is unlikely.

On May 22, 2013, the ASPR tasked the NBSB to make recommendations regarding methods and processes to define the preparedness goals, recognizing the importance of establishing methods to arrive at realistic goals across the diverse needs posed by various threat scenarios. In other words, based on the NBSB expert opinion, what is an acceptable level of preparedness in light of operational and fiscal limits? In addition, the ASPR, on behalf of the Secretary, asked the NBSB to consider how best to communicate levels of preparedness to the public. Specifically, these questions were posed to the NBSB:

- *What methodology or process should be used to assess the requirements for preparedness goals versus real resource capacity?*
- *How should we think about what levels of risk are acceptable given the trade-offs?*
- *How do we effectively communicate the levels of preparedness versus the level of risk tolerance to the public?*
- *What do we need to know to make decisions on future investments to achieve the next level of preparedness?*

In response to the request from the ASPR, the NBSB has developed a set of recommendations to help define preparedness goals for chemical, biological, radiological, and nuclear (CBRN) threats,

[1] The Implementation Plan refers to "strategic end-states," which are now being addressed as "preparedness goals."

as well as pandemics. These goals should serve as a context for the development, acquisition, and deployment of critical resources within HHS. The goals are to be provided with an understanding of CBRN and pandemic incident consequences in the context of realistic resource capacities. Suggestions are provided on communicating to Americans and others living in the United States the important role of the Secretary and the ASPR in ensuring preparedness, while highlighting the vital contributions of citizens, as well as state, local, tribal, and territorial (SLTT)[2] authorities, to successful preparedness and response. The recommendations, compiled to address each task question, are summarized below, followed by a discussion of the rationale leading to each recommendation.

Task question 1: What methodology or process should be used to assess the requirements for preparedness goals versus real resource capacity?

Recommendations:

1. **The NBSB recommends a broad characterization of preparedness and a whole-systems approach to goal-setting. The components of preparedness should include the various materials for use in a response, such as those procured for the U.S. Strategic National Stockpile (SNS), or held in sufficient quantity by commercial sources. Surveillance capability is required to know when and where these materials are needed. An effective planning system must be included to test preparedness strategies. An infrastructure is required to distribute them. Public and private resources are needed to use them effectively. Industrial capacity is required to resupply. The NBSB recommends that all material, infrastructure, and human components of preparedness be considered as an integrated and effective system.**

2. **The NBSB strongly supports the current PHEMCE methods being used to assess preparedness requirements for a broad range of specific and less-clearly-defined threats. We encourage continued development of advanced analytical tools and investment in training of expert analysts and decision-makers within the PHEMCE.**

Discussion

Components of preparedness

The NBSB considers an essential first step for characterizing preparedness goals to be to fully define the components of preparedness, and then to identify the metrics that one would use to assess the level of completion one has achieved within these components. We envision at least three important components.

The first component of preparedness includes materials. The strategic national stockpile (SNS) is but one of many sources of materials that can be used to respond to incidents. Furthermore, an assessment is required to evaluate the capacity of U.S. industry to maintain a sufficient supply or to quickly produce critical supplies within an acceptable just-in-time framework, as well as the ability to continue generating additional required supplies over an extended period of time.

[2] In the remainder of this document, the term "state" will be used to encompass state, tribal, and territorial entities, for conciseness.

Another essential aspect of this component of preparedness is the logistical infrastructure and human resources necessary to access the MCMs and other stockpiled materials and deploy them to specific locations in a timely manner.

A second essential and basic component of preparedness is our functional level of day-to-day readiness to *implement* – i.e., effectively use – MCMs. This would include the availability of appropriate healthcare system capacity, such as that provided by public health agencies and healthcare providers, including those needed to care for the injured in a mass-casualty incident. These range from pre-hospital emergency medical services (EMS) and emergency care personnel, to primary care and specialty medical services, to hospital care (including critical care), to inter-facility patient transport and mental health services. Depending on the MCM and injury type, the capacity to provide MCMs to victims may require skilled clinical staff, non-clinical support staff, medical or non-medical facilities, medical supplies and equipment, as well as sufficient infrastructure resources. Receipt of SNS stockpiles of MCMs by SLTT authorities or other parties need to be matched with the capability to dispense/administer them at the point of need in a timely and reliable manner. Also essential is an understanding of the baseline resources that are available and of the ability to generate surge capacity during an emergency.

Most CBRN incidents are "local" in the sense that a single location or set of locations will be involved. As such, local public health and emergency preparedness agencies are an essential component of any response. SLTT partners are critical to the success of any federal program. Local personnel must have the capability to provide life-saving MCMs available locally, and when local supplies are exhausted, obtain and dispense/administer additional MCMs, such as those provided by the SNS, as needed. The ASPR and PHEMCE are organized at the federal level to provide a coordinated, consistent, and accountable response in conjunction with SLTT authorities. Advanced planning, training, and collaborative preparedness exercises for CBRN and pandemic threats should be an integral part of the preparedness activities among local authorities, state partners, and federal partners, as well as their private-sector partners.

Non-governmental resources that may be essential for optimal emergency response and deployment of MCMs in affected areas include local healthcare organizations, as well as volunteer community organizations such as service and faith-based organizations. Non-governmental aid organizations such as the Red Cross can also provide much-needed support to public health officials during emergencies. School-based programs to support public health measures and education should also be leveraged. Many individuals and local service organizations are ready to help their neighbors, as has been demonstrated repeatedly in the event of natural disasters. These contributions should not be underestimated. Personal/family readiness is another necessary component of effective response, as a better-prepared public will be more resilient and more available to help. Federal and SLTT authorities should develop well-defined outreach programs to engage these organizations in case of CBRN incidents, natural disasters, or pandemic outbreaks.

A third and critical component of preparedness is our ability to identify a developing specific threat or an incident early in its time course. This includes our situational awareness capability to assess the threat or incident's scope and magnitude, and encompasses the extensive network of surveillance and detection capabilities by federal, state, and local security agencies, the DHS and DoD, and by public health authorities such as the CDC. These collaborations should produce essential background information that will contribute to a better understanding of the material

requirements and human resources required for achieving the appropriate level of readiness for plausible and likely mass-casualty incidents.

Methodology for requirements assessment

The consequences of CBRN threats and pandemic outbreaks are continually being assessed by components of the PHEMCE as part of national security and public health functions. The assessment of terrorist threats in particular is a difficult task as a substantial degree of uncertainty is associated with information regarding the character and likelihood of the threats as well as in the methods by which they may be executed. All plausible threats must be considered in order to protect lives, material assets, and national security. Interviews with PHEMCE experts as part of the information-gathering phase of this report made clear that advanced analytical modeling techniques are available and in use to integrate information for the assessment of threats across the entire spectrum of agents. Assessments of the potential impact of individual threat agents, and the response required to minimize impact are already in place. Although our understanding of the risks of any particular incident can never be sufficient, calculations can be made to provide estimates of damage inflicted (a financial construct) and people injured or killed (an ethical construct) with each type of incident. With the aid of these models and the substantial experience within the agencies that comprise the PHEMCE, experts can provide some approximation of the medical and public health consequences of particular types of incidents, serving as a basis for planning an appropriate response.

The utility of projections of probabilities and consequences of potential incidents is a function of the quality of the information provided to those who are performing the assessments. As noted above, these predictions for CBRN incidents come with a significant level of uncertainty. Placing numerical estimates on the economic damage and the potential for people injured and killed in an incident provides some idea of the urgency and scope of preparedness necessary to address particular types of incidents, as well as the rationale for integration of resources from the public and private sectors. Complete preparation for all threats at all times is not possible given the reality of finite resources at all levels of government and in the private community. Therefore, the recommended approach to preparedness requires a balance between the risk and nature of the threats and the realistic availability of the components of preparedness as noted above. We do not advocate a "management to budget" approach as a national strategy on dealing with preparedness in national policy, but it is understood that trade-offs will be required whenever conditions fall short of full allocation of resources to address the enormity of the need and the changing levels of risk.

Task Question 2: How should we think about what levels of risk are acceptable given the trade-offs?

Recommendations:

1. **Ethical considerations should weigh prominently in preparedness goal-setting to ensure effective preparedness for and response to incidents, especially those that may result in lives lost. Further, a determination of at-risk and vulnerable populations should be made to provide for a response that equitably supports the entire population.**

2. **Recognizing that 100% preparedness for every threat scenario at every scale is not likely achievable, the NBSB recommends the concept of establishing a *target* level of preparedness for the most important specific threats and a target level of *all-hazards* preparedness for a wide range of other threats.**

3. **The NBSB recommends that PHEMCE experts integrate threat information from available analytical tools and then exercise their experienced judgment to set target preparedness levels sufficient to mount an effective response. The response should be gauged at a scale deemed plausible in order for the populations involved in an incident to maintain access to basic necessities (food/ water/ shelter/ sanitation/ healthcare) and to preserve national security.**

4. **Having established both the specific and all-hazards target levels of preparedness, the NBSB recommends that achieving these target levels be the PHEMCE policy goal.**

Discussion

Ethical considerations

The NBSB members each bring personal beliefs to the discussion regarding the ethical components of preparedness for CBRN incidents, natural disasters, and pandemics. All recognize that 100% preparedness for every possible scenario is not realistic. The NBSB has consulted with national experts regarding the ethics of an acceptable level of preparedness. These discussions have brought the profound ethical issues surrounding disaster preparedness into sharp focus. Each individual on American soil who may be a target of an incident may have distinct personal views regarding the suffering, injury, and death that may result and how local, state, and federal governments should prepare for these incidents. These considerations include cultural, ethnic, religious, and political points of view, and each deserves thoughtful assessment.

During CBRN or pandemic incidents, the provision of traditional standards of medical care we have come to expect may be impossible; as a result, defined, prioritized, "crisis care" standards that match the severity and character of an incident should be implemented by governments, healthcare providers, and institutions. These should be communicated with the healthcare and provider communities in advance of actual incidents. As an example, during the H1N1 pandemic, temporary FDA Emergency Use Authorization of antiviral therapeutic agents allowed for the availability of these life-saving agents prior to their formal approval. In some locations, temporary shortages of mechanical ventilators existed for those with severe influenza pneumonia, requiring other nonstandard, but effective, methods of providing oxygen to those with respiratory failure.

The goal of any government entity that aspires to achieve preparedness is to create a program that will reasonably protect citizens from plausible CBRN terrorist attacks, natural disasters, and pandemics. A perfect assessment of the likelihood of all threats is not possible, and creating a state of preparedness and response to all situations is also not possible or practical, even if it is desired.

In the context of providing access to MCMs during an emergency, as balanced against ethically acceptable levels of preparedness, we encourage the Secretary to focus resource allocation

principally on those threats that present the greatest risk of mortality, are most likely to occur, and have the potential to affect the greatest number of people. Resources and their deployment must also address unique risks taken by first responders, as well as the unique needs of vulnerable, at-risk populations, such as those with underlying illnesses, infants and children, and the elderly. Our objective should be to ensure that all reasonable preparations are undertaken to allow equitable access to MCMs to all those affected in an incident.

Establishment of target levels of preparedness

The NBSB recommends a two-pronged approach for preparedness. First, establish a *target* level of preparedness for the threats judged to be most probable and most costly in terms of loss of life (exemplified by, but not limited to, anthrax and smallpox). These threats have the potential to result in extensive loss of life, cause immense economic damage, and impact national security.

Second, we recommend that federal and local and state authorities should collaboratively establish a target level of preparedness for any incident – an *all-hazards* level of preparedness. A basic emergency response capability should be established and maintained that can be deployed for any threat including a CBRN incident, a natural disaster, or a pandemic deemed to be less probable or of lower consequence. For these threats, the all-hazards preparedness target should be established using a framework of appropriate medical, public health, and ethical considerations. The all-hazards target should reflect practical realities, such as actual availability of specific MCMs (e.g., mechanical ventilators) and the ability to deliver and use these MCMs, based on an accurate assessment of local infrastructure limitations. Similar to preparedness for specific threats, 100% all-hazard preparedness is also not realistic. Establishing a basic emergency all-hazard response capability is realistic. Therefore our goal is a target level of preparedness for a basic emergency response over a wide range of incidents. Again, the recommendation does not advocate that the U.S. should sacrifice preparedness planning and capability to a level below the ultimate goal of fulfilling our overall requirements based on risks, but that the realities of resource limitations are likely to require compromises to achieve some acceptable target levels.

To determine the target level of MCM product required for the SNS (in case local and state resources are exhausted), analysis by the PHEMCE should consider the practicality of stockpiling large amounts of materials (such as mechanical ventilators) in the context of the available capacity to use these materials effectively on a local level (e.g., having sufficient medical care providers to manage victims, facilities that have sufficient available space and reliable access to those skilled in the use of needed MCMs and equipment, and reliable access to infrastructure support for essential resources such as oxygen and electrical power). In other words, to determine the target level for all-hazard response capability, the components of preparedness described above should be evaluated from a whole-systems perspective, considering all components from stockpiling to distribution to individual dispensing/administration of MCMs to those in need. As such, the target level of all-hazards preparedness should be based on an analysis of what is needed to provide MCMs and care to victims of most public health emergencies based on past experience with natural disasters and pandemics, as well as best possible projections of the impact of CBRN incidents, balanced by what can be practically provided in a real-world setting. This will be dependent on developing valid metrics for understanding what current vs. target capabilities are across the determinants defined above. A

good-faith effort should be made to achieve 100% of the desired, realistic target level of readiness for these threats.

Threats are likely to change over time, as are the sophistication and diversity of MCMs that can be provided in response to incidents. While annual assessments of preparedness can be matched to real and perceived threats, substantial changes in threats and response capabilities may be anticipated to occur within a five-year time period. Therefore, long-term rebalancing of PHEMCE resources against threats will help ensure that resources are matched appropriately to each threat at the local, state, and national levels. An evaluation every five years of the ability of SLTT and federal partners to effectively collaborate in preparedness planning and execution should ensure that as PHEMCE resources are allocated, their availability can be appropriately and effectively implemented by SLTT authorities and public/private partners.

In summary, every decision and action must account for the perspectives of MCM end-users (persons in need of the product). To maximize effectiveness, the MCM must be delivered in a timely fashion and must be made available at the targeted level of need. We recommend continuing to evaluate the capacity of public-private sector partnerships to comprehensively assess the potential resources that may be available to leverage the federal government's capabilities for surveillance and response.

The NBSB recommends that PHEMCE experts use their experienced judgment to set preparedness targets sufficient to mount an effective response to threats at the level deemed realistic. Having established both the specific and *all-hazards* target levels of preparedness, the NBSB recommends that achieving these target levels be the PHEMCE policy goal.

Task Question 3: How do we effectively communicate the levels of preparedness versus the level of risk tolerance to the public?

Recommendation:

The NBSB recommends that the Secretary consider mechanisms of <u>actively</u> promoting threat and preparedness messaging. These communications should use modern social media vehicles and involve designation of a federal spokesperson (such as the Surgeon General) to convey appropriate preparedness and public responsibility messages. The NBSB recommends that communication with the public focus on several key messages:

1. **Provide an understanding of the process used by ASPR and the Secretary to define threats as critical and the methods used to determine the appropriate nature and level of preparedness in response to these threats**

2. **Communicate that, even under the best of circumstances, the federal government cannot identify all threats, accurately determine their probability or time of occurrence, or achieve a 100% preparedness and response capability level**

3. **Communicate the importance of local and state government partnerships and of partnerships with industry and service-based organizations in response preparedness**

4. **Communicate the vital role of individual and family preparedness and accountability, and provide informational resources and practical guidance for how to achieve individual and community preparedness**

5. **This report should be considered for widespread circulation to SLTT partners as it communicates a sound approach to understanding risk and preparedness.**

Discussion

Communication to the public should include the perspective that the federal government uses a good-faith effort to define and achieve target readiness for the most devastating incidents, as well as to create a robust *all-hazards* level of preparedness for any incident. The concept of having a *realistic* level of preparedness for any CBRN or pandemic incident should be communicated to the public.

Information on the types of MCMs that may require deployment following a CBRN incident should also be shared with the public. This is especially important as some MCMs, including antidotes for bioterror agents and radiation, come with significant side effects, particularly for infants and children, the elderly, and those with underlying medical conditions who are often at the highest risk of complications following these exposures. Information regarding the risks and benefits of MCMs should be easily accessible by the public before an incident occurs. This information is needed so that both medical personnel who will provide the MCMs and potential recipients can understand the benefits and risks of MCMs.

Sharing accurate information with the public whenever possible will allow the public to be informed about potential threats and be knowledgeable regarding the extensive preparedness measures SLTT and federal partners have already undertaken, as well as those proposed for the future. PHEMCE, as the interagency enterprise that coordinates federal MCM preparedness efforts under the direction of the ASPR, and the Secretary are uniquely positioned to educate the public on both the activities being made to prepare for various threats and on the expected responses to various types of disasters. These activities can be conceived of as public health measures to protect those who live on American soil, much as the CDC functions to prevent or ensure proper response to food-borne diseases, such as salmonellosis, and naturally occurring contagious infectious diseases, such as meningococcemia. Sharing information on threats to the extent possible is a tangible way of validating expenditures both of funds and of human resources to achieve desired objectives, particularly in this era of severely limited financial resources.

We should also communicate our admiration of the people of the United States, regardless of whether they live in populated or rural areas of the country, for their remarkable resiliency and for the community-based responses to natural disasters and intentional threat incidents that have occurred over the past several decades. Their grassroots contributions in responses to emergencies ranging from terrorist bombs to tornadoes to hurricanes should be properly recognized and acknowledged. An engaged and empowered public that understands and is reasonably prepared for natural disasters (e.g., tornados, earthquakes) and public health threats (e.g., influenza) will likely be more resilient and less affected when an incident occurs. The same approach should be taken for even greater mass-casualty incidents (terrorism, acts of mass

violence). Leveraging public-private sector partnerships, we can empower both the general public and specific key public assets (e.g., clinicians, teachers) to be reasonably prepared and supportive of disaster response and recovery plans.

One mechanism for communication and education of the public is through the ASPR website. For example, the site could present a thoughtful overview of the preparedness efforts of the PHEMCE in a fashion similar to that used by the CDC to communicate information on infectious diseases and food-borne hazards. Although much of this information is already publicly available in the published PHEMCE Strategy and Implementation Plan and in the National Health Security Strategy, a simplified and quickly assimilated version could be communicated via the ASPR and/or CDC web sites. We encourage a close alignment of ASPR's communication efforts with those of the CDC, as their web site is widely used and respected by the lay public. In addition, the NBSB recommends that the Secretary consider mechanisms of *actively* promoting threat and preparedness messaging. These mechanisms could include appropriate public service messages through the use of modern social media vehicles, and/or a designation of a federal spokesperson (such as the Surgeon General) to convey appropriate preparedness and public responsibility messages.

In addition, whenever feasible to promote ASPR's message, opportunities should be sought to collaborate with private-sector partner organizations, including those representing key sources of information trusted by the public (e.g., professional medical societies, clergy, academic institutions), as well as with those primarily involved in communication (e.g., news broadcast organizations). These collaborations can be established prior to an incident, and can be pursued as a means to promote the educational goals for public and personal preparedness.

Task Question 4: What do we need to know to make decisions on future investments to achieve the next level of preparedness?

Recommendation:

The NBSB recommends that the government continue to encourage and provide motivation for innovation to develop materials and methods to facilitate rapid and effective responses to both intentional and naturally occurring threats.

Discussion

The next "level" of preparedness will depend on technological advancements from private, academic, and government partnerships across the many aspects of the preparedness enterprise. These include advances in MCMs that address both all-hazards and specific threat-based needs (with regard to efficacy, delivery, ease of use, etc.). Just as important is the goal of increasing effective partnerships and communication on preparedness within and among all levels of government and the public. Government/private partnerships should provide for implementation of advances in logistical support as well as support training for mass-casualty response. Also critical are advances in threat assessment intelligence and modeling to establish the likelihood and potential scope of CBRN and pandemic incidents.

The "next level" of preparedness will, by its very nature, continue to evolve given that the nature and awareness of threats will change over time. To be well-prepared today is no guarantee of preparedness in the future. The importance of preparedness is such that the NBSB strongly recommends that the Secretary fully support ongoing and future activities that will bring improved capabilities to bear.

Unfortunately, preparedness is not only a difficult concept to reduce to a set of simple metrics, but is also volatile, depending on the nature of evolving threats and risks. What is made clear from a continuous analysis of threats vs. capabilities conducted by the PHEMCE and ASPR, as they prepare for and respond to naturally occurring disasters and intentional and emerging disease threats, is that future investments must be focused on providing as much flexibility and operational efficiency as possible. For example, planned product improvements in currently available MCMs can provide a means to address some existing deficiencies in operational capabilities.[3]

Game-changing improvements in technology or products, such as the creation of new, safe, orally bioavailable MCMs or self-administered vaccines, all underscore the critical importance of investment in long-term fundamental and translational research that will lead to new product development – these are foundations of improved preparedness. Investments today in new technology for preparedness will have profound effects on products that will be available for use in the future for CBRN or pandemic incidents. Notably, a number of these products may soon benefit the public in everyday life. PHEMCE investments that have been made in antimicrobial therapy active against drug-resistant bioterror and emerging infectious disease pathogens may soon be available to treat antibiotic-resistant bacteria that cause infections in patients in our healthcare institutions.

A critical activity for the PHEMCE is to continue to provide motivation for innovation to produce more active, more efficient, and more cost-effective MCMs. Equally important is building a flexible manufacturing and distribution infrastructure that is adaptable to new threats as they emerge.

Recommendations Summary

1. The NBSB recommends a broad characterization of preparedness and a whole-systems approach to goal-setting. The components of preparedness should include the various materials for use in a response, such as those procured for the U.S. Strategic National Stockpile (SNS), or held in sufficient quantity by commercial sources. Surveillance capability is required to know when and where these materials are needed. An effective planning system must be included to test preparedness strategies. An infrastructure is required to distribute them. Public and private resources are needed to use them effectively. Industrial capacity is required to resupply. The NBSB recommends that all material, infrastructure, and human components of preparedness be considered as an integrated and effective system.

[3] For example, development of an effective oral MCM where the current one is an injection, particularly if it is an intravenous injection, could enhance operational capabilities that would be limited by limitations in personnel and other resources to administer injections.

2. The NBSB strongly supports the current PHEMCE methods being used to assess preparedness requirements for a broad range of specific and less-clearly-defined threats. We encourage continued development of advanced analytical tools and investment in training of expert analysts and decision-makers within the PHEMCE.

3. Ethical considerations should weigh prominently in preparedness goal-setting to ensure effective preparedness for and response to incidents, especially those that may result in lives lost. Further, a determination of at-risk and vulnerable populations should be made to provide for a response that equitably supports the entire population.

4. Recognizing that 100% preparedness for every threat scenario at every scale is not achievable, the NBSB recommends the concept of establishing a *target* level of preparedness for the most important specific threats and a target level of *all-hazards* preparedness for a wide range of other threats.

5. The NBSB recommends that PHEMCE experts integrate threat information from available analytical tools and then exercise their experienced judgment to set target preparedness levels sufficient to mount an effective response. The response should be gauged at a scale deemed plausible in order for the populations involved in an incident to maintain access to basic necessities (food/ water/ shelter/ sanitation/ healthcare) and to preserve national security.

6. Having established both the specific and all-hazards target levels of preparedness, the NBSB recommends that achieving these target levels be the PHEMCE policy goal.

7. We expect that an informed and empowered public will support resiliency in our population. The NBSB recommends that the Secretary consider mechanisms of actively promoting the messaging regarding government's preparedness efforts, including goals and limitations. These mechanisms could include appropriate public service messages through the use of modern social media vehicles and designation of a federal spokesperson (such as the Surgeon General) to convey appropriate preparedness and public responsibility messages.

8. A report should be considered for widespread circulation to SLTT partners that communicates a sound approach to understanding risk and preparedness.

9. The NBSB recommends that the government continue to encourage and provide motivation for innovation to develop materials and methods to facilitate rapid and effective responses to both intentional and naturally occurring threats.