Chapter 1. Introduction

1.1 Purpose

The primary purpose of this study was to develop a Rocky Mountain Regional Care Model for Bioterrorist Events that addressed medical surge capacity needs in the event of a bioterrorist incident. The overarching purpose of this project was to develop an exportable surge capacity model that included tools for regional bioterrorism planners and decision makers at the national, state, local and provider level.

The specific goals of this project as outlined in the AHRQ contract were addressed in the following sections of the report:

1. **Examine the effects of regional care models and their impact on resource allocation and capacity in the event of a potential bioterrorist event.**

   Throughout the report, using references, reports and RMBT working group experiences.

2. **Examine the effect of a potential bioterrorist event on hospital and health system's outcomes and staffing.**

   Five chapters of this report address the impact of a bioterorrist event and surge resource needs for hospitals and health care systems:

   Chapter 3: Profile of Regional Medical Resource Capacity
   Chapter 4: Additional Resources to Meet Surge Needs
   Chapter 5: Measures of Preparedness
   Chapter 7: Other Surge Capacity Issues
   Chapter 8: Example of a Regional Exercise.

3. **Identify the facility characteristics necessary for establishing individual facilities as isolation or quarantine units for the region.**

   Chapter 6, Isolation/Quarantine, focuses on identifying the issues that were considered by the RMBT working group for establishing quarantine hospitals.

4. **Identify characteristics of the model that are exportable to regional, state and local policy makers.**

   The methodology and tools that were developed are exportable to any region, state or local policy maker. This will be outlined in the recommendations and conclusions.

1.2 Background

In October 2002, the Agency for Health Care Research and Quality (AHRQ) sponsored the establishment of the Rocky Mountain Regional Care Model for Bioterrorist Events (RMBT) Working Group as part of a task order through the Integrated Delivery System Research Network (IDSRN). The Working Group was charged with studying the issues associated with providing regional surge capacity medical response and identifying a consensus-based model to improve regional medical response. The RMBT Working Group Principal Investigators solicited participation from Federal, State, and Local agencies throughout Federal Region VIII. The concept of the need to collaborate with all levels of government when developing tools and models of bioterrorism preparedness is further strengthened by Tom Ridge, Secretary of the US Department of Homeland Security by stating, "We hope to change the old relationship—cities-state-federal model—into one based on mutual cooperation, collaboration and partnership."

The RMBT Working Group members represent providers and all levels of government:

Federal Level

- U.S. Air Force (USAF) Office of Surgeon General
- USAF Homeland Security Office
- USAF Development Center for Operational Medicine (DCOM)
- US Northern Command
- Colorado U.S. Air Force, Army and National Guard Bases
- US Public Health Service (PHS)
- National Disaster Medical System (NDMS)
- Department of Veteran Affairs Medical Center (DVAMC)

State Level

- Colorado Department of Public Health and Environment (CDPHE)
- Montana Department of Public Health
- North Dakota Department of Public Health
- South Dakota Department of Public Health
- Utah Department of Public Health
- Wyoming Department of Public Health
- Wyoming Office of Emergency Management
- Colorado Hospital Association
- Colorado Rural Health representative

County/City Level

- Tri-County Health Department
- Denver County Health Department
- Jefferson County Health Department
- Front Range Metropolitan Medical Response System (MMRS)

- Denver Center for Public Health Preparedness (DCPHP)
- Denver Mayor's Office of Emergency Management (OEM)

Providers

- Denver Health Medical Center (DHMC)
- University of Colorado Hospital
- The Children's Hospital Denver
- Exempla Healthcare
- HealthONE
- Centura Health
- Kaiser Permanente.

Complete information on Working Group members is provided in Appendix A.

Federal Region VIII is comprised of six states located in the Rocky Mountain region of the country: Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming. This area differs from other federal regions in that much of it is sparsely populated, representing only 3 percent of the U.S. population spread over 16 percent of the land area, with a population density only about one-fifth of the national average (Table 1). The region contains four Metropolitan Medical Response System (MMRS) cities (Appendix B), as specified in the Nunn-Lugar-Domenici Act: Salt Lake City, Utah and Denver, Aurora and Colorado Springs, Colorado and two National Disaster Medical System (NDMS) sites (Appendix C). The purpose of the 1996 Nunn-Lugar-Domenici Domestic Preparedness Initiative has been to train civilians and disaster workers to respond to an attack by a weapon of mass destruction (WMD), including any biological agents. The RMBT region is also home to US Northern Command (the new military command for homeland defense), the US Air Force Academy, and the North American Aerospace Defense Command (NORAD). These unique regional and strategic characteristics provided an ideal environment for the development of a regional health care system preparedness model for bioterrorist events.

Table 1. Population of Federal Region VIII

	Population	% Regional Total	% National Total	Total Area in Square Miles	Density per square mile
Colorado	4,301,261	46.1	1.5	104,093	41.5
Montana	902,195	9.7	0.3	147,042	6.2
North Dakota	642,200	6.9	0.2	70,699	9.3
South Dakota	754,844	8.1	0.3	77,116	9.9
Utah	2,233,169	23.9	0.8	84,898	27.2
Wyoming	493,782	5.3	0.2	97,813	5.1
Total Region VIII	9,327,451	100.0	3.3	581,661	16.3
Total US Population	281,421,906			3,537,441	79.6

Source: U.S. Census, 1999.

The Denver Health Emergency Department has been one of the early training groups for Nunn-Lugar-Domenici funded preparedness activities (e.g., chemical table top and full exercise, biological table top) for hospitals in advance of and subsequent to important high-profile visits and events in Denver. In May 2000, Denver Health and all its components were important

players in the national bioterrorism exercise, *Operation TOPOFF 2000*. During this largest ever, real-time, simulated exercise, local, state and federal officials along with staff of three metropolitan Denver hospitals had the opportunity to practice working together to address an epidemic caused by an infectious agent (plague, *Yersenia pestis*). Issues related to anti-microbial prophylaxis and infection control, isolation and quarantine, and surge capacity were essential learning points for those involved.

The State of Utah also has extensive experience in bioterrorism preparedness through preparations for and sponsoring of the 2002 Winter Olympics. The participants from Utah provided insight into collaborating and planning with multiple agencies.

Finally, the U.S. Department of Defense (in particular, U.S. Northern Command, Air Force, Army, and National Guard) played an integral role as members of the RMBT Working Group. They provided insight into what the military could offer the civilian population during a surge event and lessons learned for their preparations. The DoD also provided the RMBT Working group with documents and information they had developed for bioterrorism preparedness.

1.3 Defining a Region for Medical Response to Bioterrorism

When developing a regional model and tools for bioterrorism preparedness, it was useful to review the various regional concepts and structures that had already been developed. Webster's dictionary describes a region as a broad geographic area containing a population whose members possess sufficient historical, cultural, economic, or social homogeneity to distinguish them from others. Regionalism can be described as a sense of common interest and identity across an extended, if indeterminate space. When related to bioterrorism preparedness and surge capacity, the pooling of resources at a regional level distributes the burden of surge capacity planning and resource need. In a regional model, resource rich areas can share with resource poor area.

Most "regional" research and disaster planning models have been done within state boundaries (i.e. intra-state or local regionalism). The RMBT Working Group chose to define the "region" as an inter-state collaboration between six states: Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming. These states represent Federal Region VIII, as defined by the Federal Emergency Management Administration (FEMA) and the Public Health Service (PHS). The strengths for defining the region in this manner for developing surge capacity model in the event of a bioterrorist attack are:

- FEMA, NDMS and the Public Health Service (PHS) currently use these regions to define resource allocation and the provision of manpower assistance, therefore a communication infrastructure exists.

- These states represent a primarily rural population and therefore have common characteristics and infrastructure.

- These states have a history of sharing resources, particularly when it comes to hospital trauma and specialty services.

- Federal Region VIII states are relatively similar in land and population distribution.

- Characteristics of this model of regional bioterrorism preparedness can be exported to the other nine FEMA regions of the country.

Figure 1. Federal Region VIII
CO, MT, ND, SD, UT, WY

Note: The cities are the FEMA/PHS centers for each Federal Region.

There are many other definitions of inter-state regions. For example, the Centers for Disease Control (CDC) defines Federal Regions such as Mountain: MT, ID, NM, WY, NV, CO, AZ, UT and West North Central: ND, SD, NE, KS, MN, IA, MO. Other common definitions of a region used in disaster planning include Border States' agreements to share resources.

Many have noted that planning problems increasingly cross borders, both geographic and functional. This requires flexible institutional frameworks to address different planning problems and objectives depending on the scale at which problems are defined (Barbour 2001). All states and the healthcare systems face large fiscal constraints; to deal with surge capacity requires a more efficient use of infrastructure. Environmental effects such as attack by a bioterrorist agent are usually felt in the "bioregion" irrespective of state boundaries.

Some advocacy work has already begun regarding regional collaboration for disaster preparedness planning. A national organization called the Alliance for Regional Stewardship (ARS) http://www.regionalstewardship.org/ has realized that regional organizations can play an important role in developing and implementing emergency preparedness plans. If federal and state government and national private and civic leaders indicate support for regional compacts, regions have a unique opportunity to demonstrate an effective model of emergency preparedness through regional collaboration (Dodge 2002).

Other groups have examined regionalism in the West specifically related to resource management. In the Rocky Mountain West, where water is a constant necessity to support rapid population growth, groups have had to develop innovative strategies to share resources in the region. Resource sharing issues mirror surge capacity issues in the West. McKinney et al. advocate looking beyond political and jurisdictional boundaries to recognize "the natural

territory of public issues". In developing surge capacity, specifically in a resource poor area of the country such as Federal Region VIII it may be important to learn from resource sharing initiatives that have tried to create and sustain effective organizations that do not comfortably fit into established framework of local, state and federal governments. Regional initiatives should be viewed as long-term experiments (McKinney 2002).

Chapter 2. Methodology

The Working Group met four times during a twelve-month period (November 2002 to October 2003) to address medical surge capacity issues/needs for Federal Region VIII (Colorado, Montana, North Dakota, South Dakota, Wyoming and Utah). During the first meeting the members of RMBT identified surge capacity issues that were considered important and where solution development was necessary. The members also provided the RMBT investigators and staff with documentation and resources during the weeks between the RMBT meetings. Through this collaboration and the extensive experience of the RMBT members, surge capacity products and tools were developed as part of this report.

The methodology used for profiling current regional medical resources capacity (Chapter 3) was primarily descriptive through data gathering. The data sources for this chapter include the American Hospital Association, HRSA State Health Workforce Profiles, AHA Physician Characteristics and Distribution in the U.S. and results from each of the six state HRSA hospital preparedness surveys. Where data was available, Region VIII resources were compared to the United States as a whole.

The development of additional resources to meet surge needs (Chapter 4) was based on information and experience from the RMBT working group. This included the *US Army Soldier and Biological Chemical Command Concept of Operations for the Acute Care Center* report (Skidmore 2003) and other documents provided by the Department of Defense, RMBT members who had experience with planning for the Utah 2002 Summer Olympics, and members who had participated in Operation TOPOFF 2000. The alternative care site selection tool was created through collaboration with facility engineers at Denver Health and reviewed and edited by the RMBT working group.

Measures of preparedness (Chapter 5) were developed for hospital beds, equipment and infrastructure using the HRSA benchmarks as a measure of need and the data from the regional profile described above to measure current capacity. Hospital bed capacity was determined based on the average number of available beds in the region reported by participating hospitals to the National Disaster Medical System (NDMS). Staffing measures were created using the staffing requirements for a 50-bed alternative care site (Chapter 4, Table 7) and compared to current excess/shortage of staffing capacity from the HRSA State Health Workforce Profiles. For instance, the HRSA benchmark for hospital beds is 500 additional beds needed per million population to address a surge. The staffing for a 50-bed unit was multiplied by the appropriate state population factor to meet each state's need based on this HRSA benchmark. Current hospital capacity for equipment and infrastructure was difficult to obtain from the HRSA Hospital Preparedness surveys. The HRSA benchmarks for need require actual estimates of equipment and infrastructure, while most states were only able to report summary data of having a capability.

Isolation and quarantine (Chapter 6) was discussed by a small sub-committee at the first Working Group meeting. This group shared information; a summary of their discussion and issue areas are presented. The Other Surge Capacity Issues (Chapter 7)—risk communication, vulnerable and rural populations, and a comparison of bioterrorism to an all-hazards approach—were each presented to the Working Group at the meetings. A topic expert from the Working Group was asked to prepare a presentation on the issue to facilitate discussion among the group.

Working Group discussion regarding each topic area was then developed into a section for this report.

The example of a regional exercise (Chapter 8) was developed as a way to test one of the tools developed by the RMBT Working Group. An outside exercise expert from the Denver Office of Emergency Management was asked to facilitate this scoping exercise among the Working Group members. This exercise was developed by the Steering Committee to test hypothetical deployment of one of the caches across state lines. The alternative care site selection tool was also tested and validated as part of this orientation exercise.

Chapter 3. Profile of Regional Medical Resources

As a medical surge capacity study, it was necessary to identify the current regional medical resources (medical care facilities, infrastructure needs, hospital beds, staffing and equipment/supplies) available for responding to a bioterrorist event. Through data from the Health Resources and Services Administration (HRSA) state hospital preparedness surveys and state health workforce profiles and from the American Hospital Association and state professional associations, the RMBT Working Group developed a six–state regional profile of medical resources in Federal Region VIII. The identification of current regional resources (current capacity) is necessary in order to determine the gaps in regional preparedness as will be demonstrated in Chapter 5, *Measures of Preparedness*.

Many individual states, counties and healthcare facilities collect health data and this information can be pooled to develop a baseline regional profile of surge capacity resources. Combining this data provides a unique challenge to ensure that medical resource estimates are not replicated across state lines (e.g. a nurse licensed in two states counted as a resource by both). This chapter profiles Region VIII's medical resources as follows:

- **Medical Care Facilities:** Number, type, location, and total physical beds of hospitals in region.

- **Medical Staffing Resources:** Active/inactive status, in-state/out-of-state residency, primary and secondary medical staffing resources.

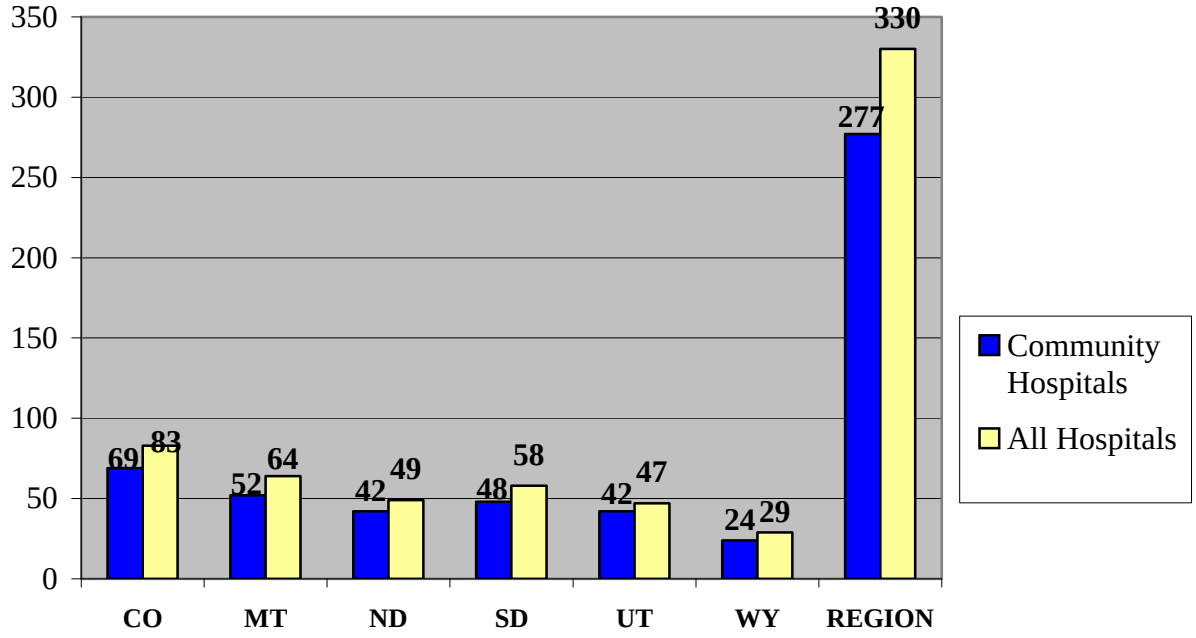
- **Hospital Preparedness:** Regional HRSA Hospital Preparedness Survey Summary—infrastructure needs, equipment and supplies.

3.1 Medical Care Facilities

The following is a description of the current hospital resources in the region: number of hospitals, location, and total physical number of beds. Figure 2 indicates that Region VIII has approximately 330 medical care facilities where 277 are community hospitals.

Not all medical care facilities identified by the AHA will be available or applicable to use in a surge event. The RMBT Working Group decided that community hospitals would more likely be available to assist with surge capacity needs than the other types of hospitals. For example, military or Veteran's Administration (VA) hospitals may not participate in a region's response efforts, based upon other obligations present at the time of the event. Mental health hospitals are also not an alternative resource for surge needs since the population they serve are not readily transferable. While TB hospitals are included in the "All Hospitals" count and would be applicable to a bioterrorist surge event, we have found that there are no actual TB hospitals in Federal Region VIII.

Figure 2. Number of Hospitals (Region VIII, 2000)

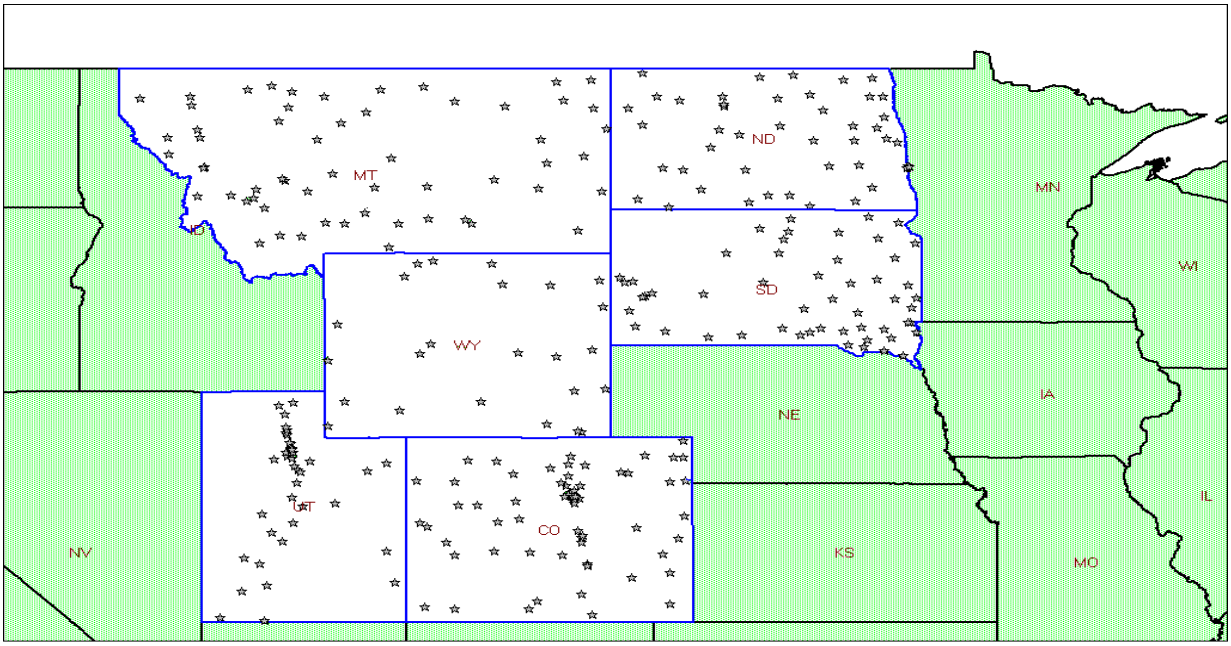


Source: "All Hospital" data was obtained from the American Hospital Association 2000 AHA Annual Survey also available at www.hospitalconnect.com.
"Community Hospital" data was obtained from Hospital Statistics, 2002 Health Forum LLC, an affiliate of the American Hospital Association.

Notes: Total number of "Community Hospitals" in the United States= 4,915.
"Community Hospitals" includes non-federal, short-term, general and other special hospitals.
Total number of "All Hospitals" in the United States= unable to obtain.
"All Hospitals" includes "Community Hospitals" and Federal, long-term, psychiatric, and tuberculosis (TB) hospitals.

Figure 3 is a map of the locations of community hospitals in Federal Region VIII. This map is useful in assisting planners and responders in identifying the hospitals that may be in close proximity to an area that has been exposed to a bioterrorist event.

Figure 3. Community Hospital Location (Region VIII, 2000) (N=277)

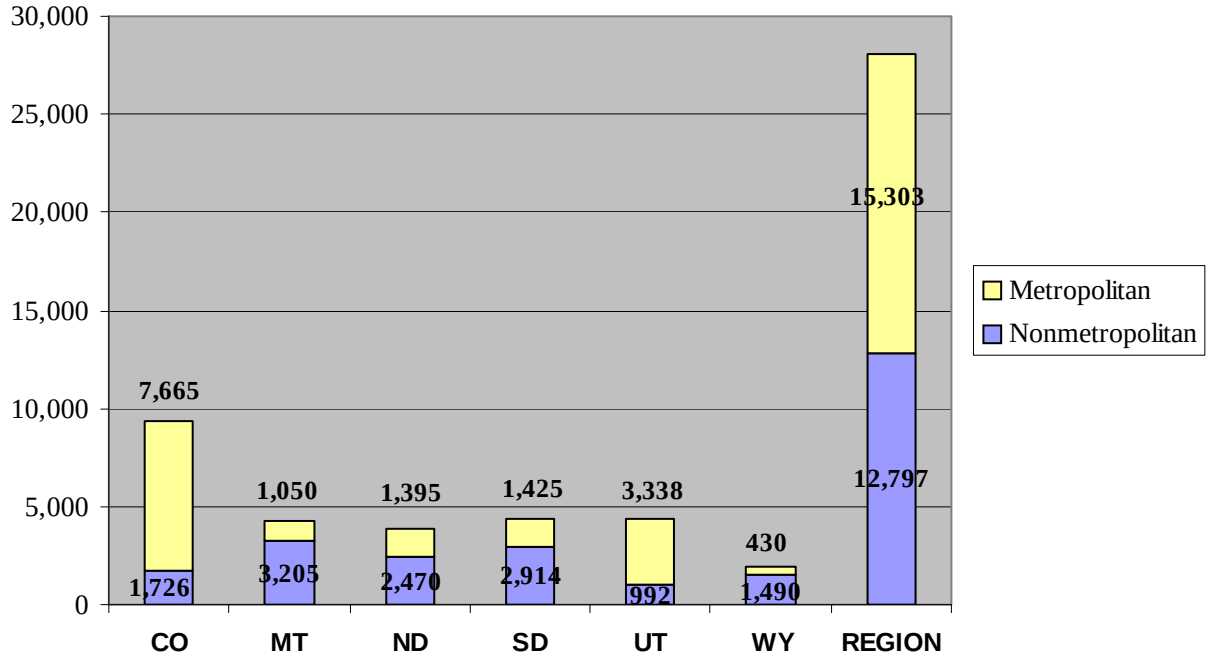


Source: American Hospital Association, 2000 AHA Annual Survey**.**

Note: The American Hospital Association database was accessed in January 2003 to obtain electronic spreadsheets of the facility zip codes in the six state region. Some states, such as North Dakota, do not have to supply facility location information to the AHA network database. Other states, such as Utah, did not have all zip codes for all facilities input into the network. For these cases, individual hospital zip code information for each hospital was obtained from the AHA Guide to the Health Care Field 2002-2003 and used to develop our own spreadsheets.

The total physical number of community hospital beds in the region is described in Figure 4. Although many hospitals are currently operating at capacity, it is important to have an estimate of total beds that could be made available if a bioterrorist event were to occur. Some patients may be able to be discharged and surgeries and procedures postponed.

Figure 4. Total Community Hospital Beds (Region VIII, 2000)



Source: Hospital Statistics, 2002 Health Forum LLC, an affiliate of the American Hospital Association.

Notes: US total beds = 823,560
US total beds metropolitan = 648,604; non-metropolitan = 174,956
A metropolitan area is defined as having >50, 000 population; a non-metropolitan area has <50,000 population.

Forty-six percent of the beds in the region are located in non-metropolitan areas compared with 21 percent nationwide. Almost half of the region's beds are located in Colorado and Utah; yet these states represent 70 percent of the region's population (Table 2).

Table 2. State Community Hospital Beds Compared to State Population

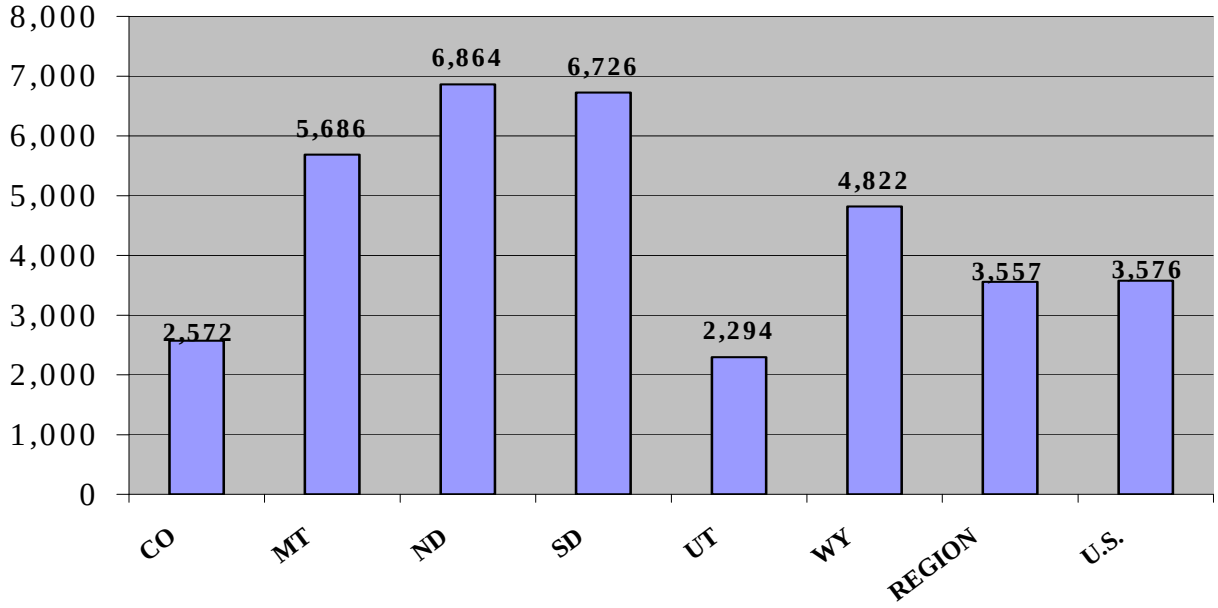
	Hospital Beds	Percent	Population	Percent
Colorado	9,391	33.4	4,301,261	46.1
Montana	4,255	15.1	902,195	9.7
North Dakota	3,865	13.8	642,200	6.9
South Dakota	4,339	15.5	754,844	8.1
Utah	4,330	15.4	2,233,169	23.9
Wyoming	1,920	6.8	493,782	5.3
Region Total	**28,100**	**100.0**	**9,327,451**	**100.0**

Source: Hospital Statistics, 2002 Health Forum LLC, an affiliate of the American Hospital Association.

Figure 5 indicates that the region as a whole currently has 3,557 hospital beds per million population, which is similar to the US average of 3,576 beds per million population. There is great variation in bed supply within the region, however, with beds that are scattered in the rural

areas of the most rural states (Montana, North Dakota, South Dakota, Wyoming). Figure 5 is deceiving in that it is based on *per million population* so that the states with less than 1 million population (Montana, North Dakota, South Dakota, Wyoming) appear to have a surplus of beds.

Figure 5. Community Hospital Beds per Million Population (Region VIII, 2000)



Source: Hospital Statistics, 2002 Health Forum LLC, an affiliate of the American Hospital Association.

3.2 Medical Staffing Resources

Current regional medical staffing resource capacity is described in this section. It is important to profile these resources in order to understand differences between the states and the national average. Some states in the region may have more medical personnel that can be transferred to a different state to enhance capacity during a surge. The medical personnel staffing resources described include: physicians, physician assistants, nurse practitioners, registered nurses, licensed practical nurses, certified nursing assistants, respiratory therapists, social workers, and secondary medical staff: dentists, podiatrists and pharmacists. This information was obtained from the HRSA State Health Workforce Profiles for each of the six states in Region VIII. Tables D1 and D2 in Appendix D provide detailed estimates of provider numbers for each of the above professions.

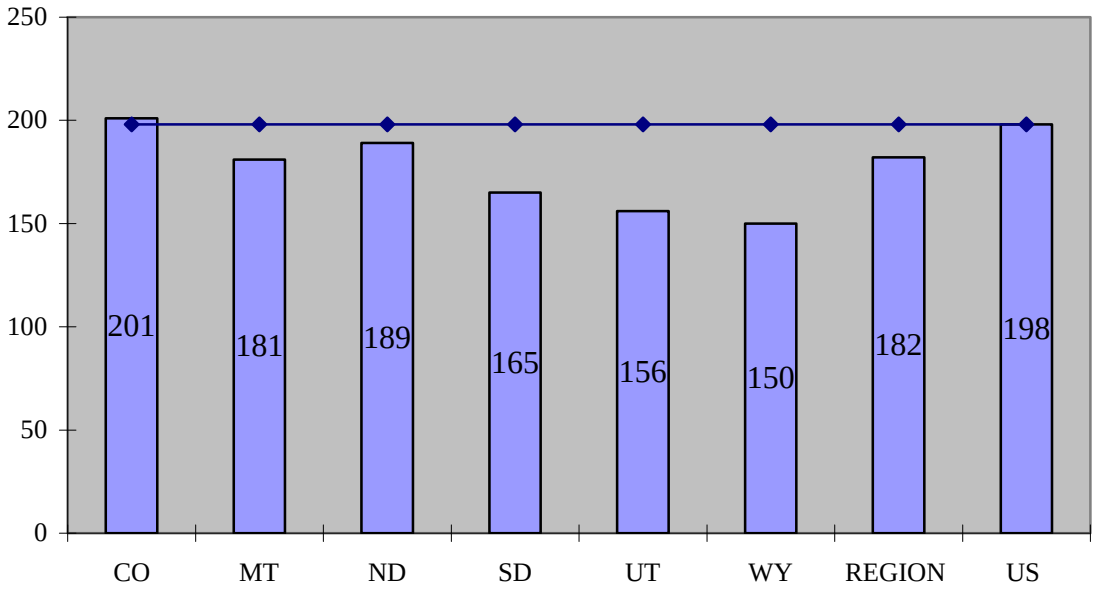
There are various approaches to identifying medical personnel resources. The challenge is ensuring that each state defines available and certified staff in the same way and that staff are not counted twice (dually state licensed). Therefore, Tables D3 and D4 in Appendix D describe the degree to which medical staff are dually licensed, although the state they are licensed in is not available. For instance, 24 percent of the physicians licensed in Colorado are licensed in another

state. These physicians may be licensed in another state located in Region VIII or a state outside of Region VIII. For the region as a whole, 25 percent of the physicians are licensed in another state, ranging from as high as 60 percent in Wyoming to as low as 24 percent in Colorado. Physicians are more likely to be dually licensed than any other medical profession. For instance, 3 percent of the physician assistants and 6 percent of the dentists are licensed out of state. Therefore, state licensing data will significantly over-estimate the regional medical staffing resources available to address meeting surge needs.

The following graphs describe the staffing resources available in the region compared to the U.S. average. The *HRSA State Health Workforce Profiles* for each of the six states in Region VIII provided the data used to create the graphs in Figure 6 and Figures 8-13. The data graphed in Figure 7 was obtained from the *AHA Physician Characteristics and Distribution in the US, 2000-2001*. If the state and/or region is less than the national average, then the state/region is considered to have a shortfall in staffing resources to meet current need. If the state and/or region is greater than the national average then there is an excess supply of staffing that could be used to address surge need. This is dependent upon the assumption that we are currently meeting our medical staffing needs; which is highly unlikely for nurses. There are comparability issues of this region to the rest of the country, particularly in that Region VIII is a sparsely populated region. There may be economies of scale and geographic scope in urban areas of the country from which rural areas cannot benefit.

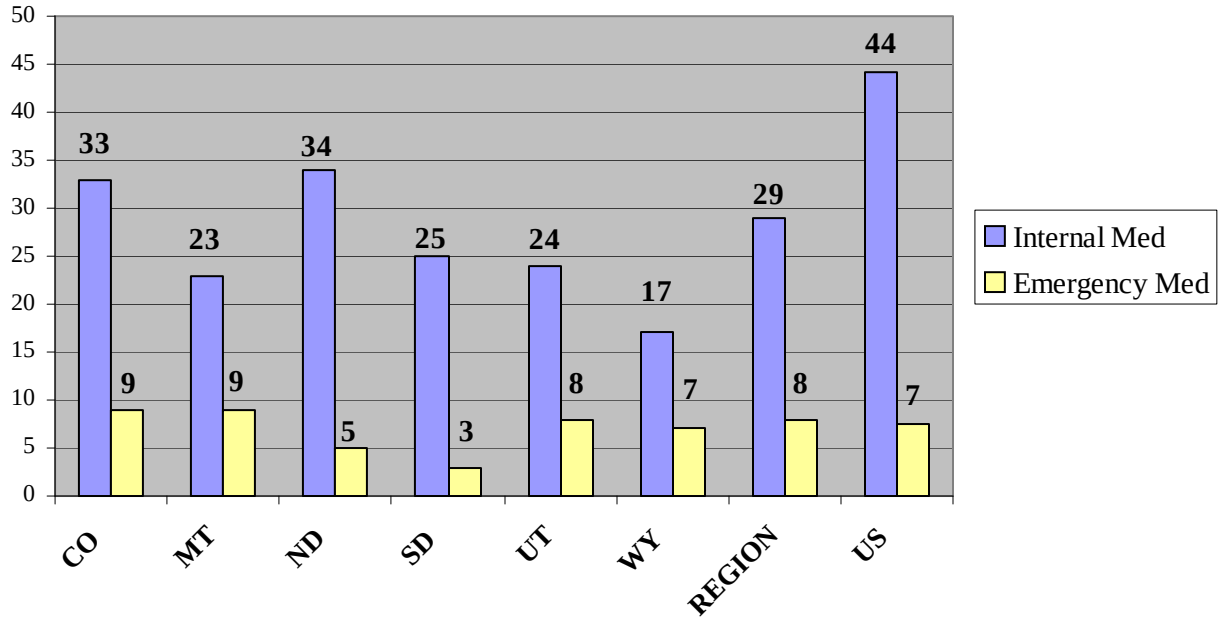
South Dakota, Utah and Wyoming average about 20 percent fewer physicians than the United States as a whole. The other three states in the region are at about the U.S. average (Figure 6). Emergency medicine and internal medicine physicians are arguably the most well trained to respond to a bioterrorist event. Figure 7 indicates that this region is at the national average for emergency physicians but is below the average for internal medicine physicians.

Figure 6. Physicians per 100,000 Population (Region VII, 1998)



Source: HRSA State Health Workforce Profiles, 2000.

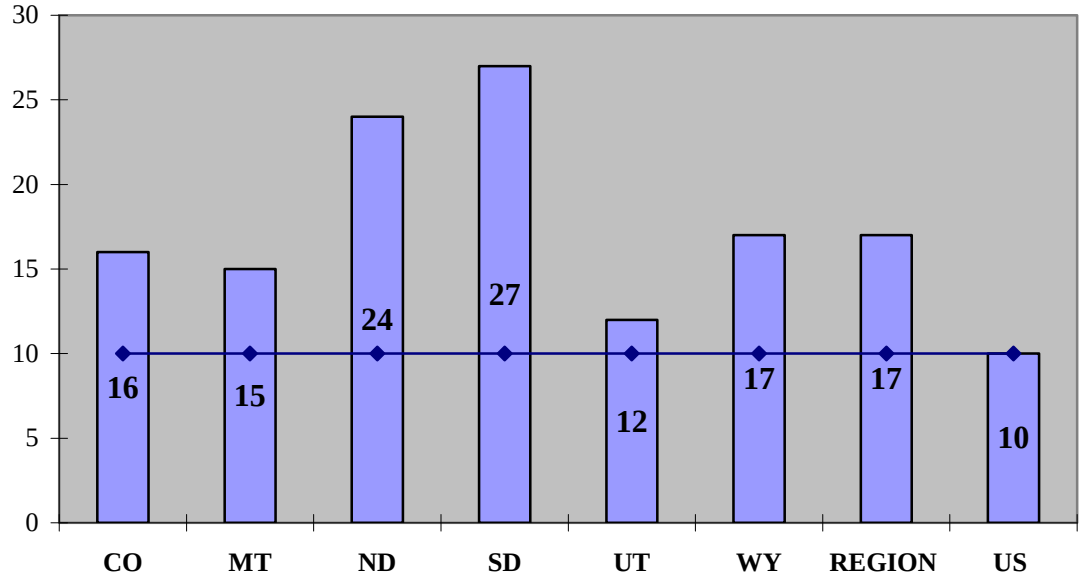
Figure 7. Internal Medicine and Emergency Medicine Physicians (Non-Federal) per 100,000 Population (Region VIII, 1998)



Source: AHA Physician Characteristics and Distribution in the US, 2000-2001.

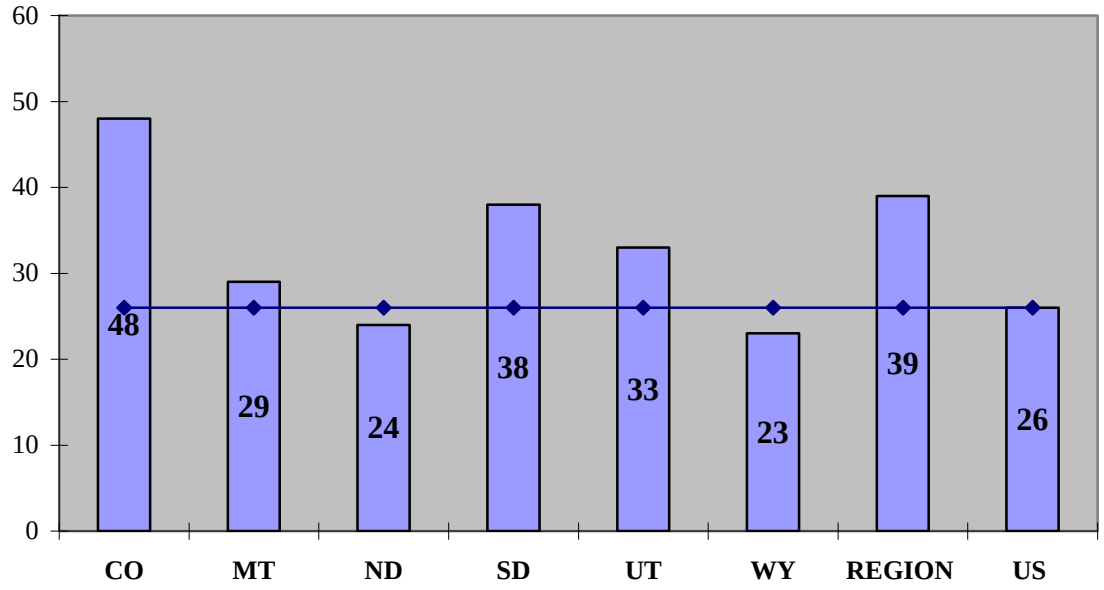
This region exceeds the national average in the availability of physician assistants and nurse practitioners. These professions may act as a substitute for physicians, particularly for North Dakota, South Dakota, and Wyoming, which are three of the most rural states in the country.

Figure 8. Physician Assistants per 100,000 Population (Region VIII, 1998)



Source: HRSA State Health Workforce Profiles, 2000

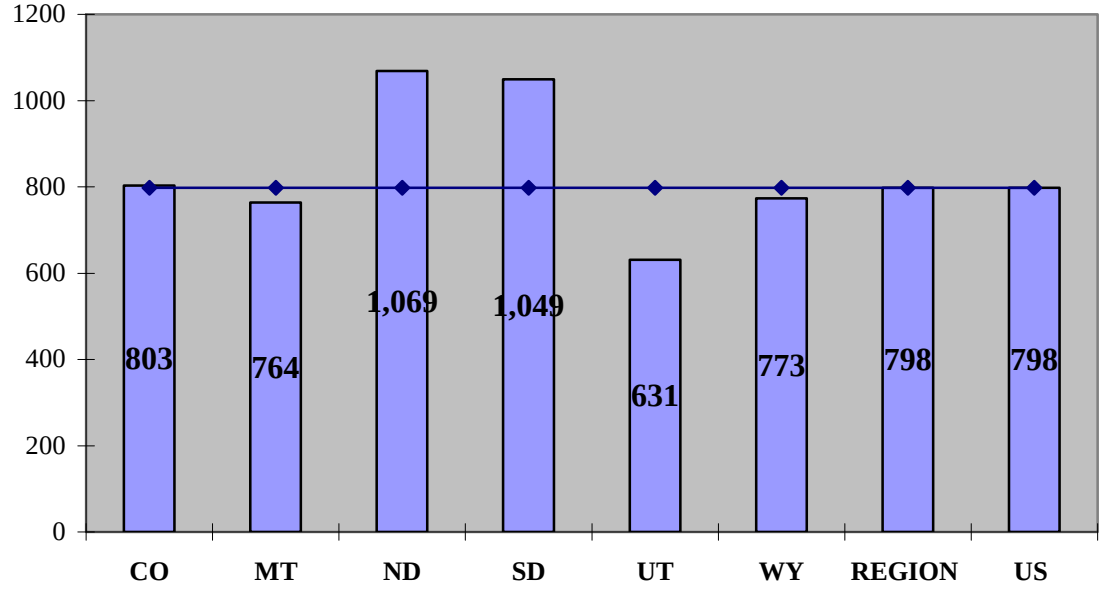
Figure 9. Nurse Practitioners per 100,000 Population (Region VIII, 1998)



Source: HRSA State Health Workforce Profiles, 2000

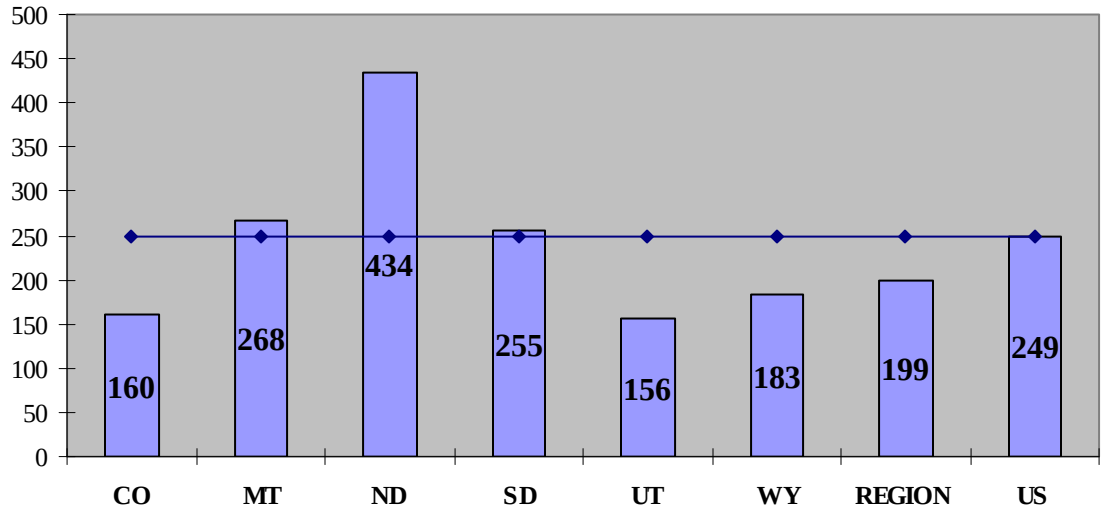
As a whole, this region has a number of nurses to serve the population similar to the rest of the country. Both North Dakota and South Dakota exceed the national average by 30 percent, although the number of nurses this represents is few since the population of these states is well under 1 million. Licensed practical nurses (LPNs) work side by side with Registered nurses (RNs) and their availability in the region is 20 percent less than the national average.

Figure 10. Registered Nurses per 100,000 Population (Region VIII, 1996)



Source: HRSA State Health Workforce Profiles, 2000

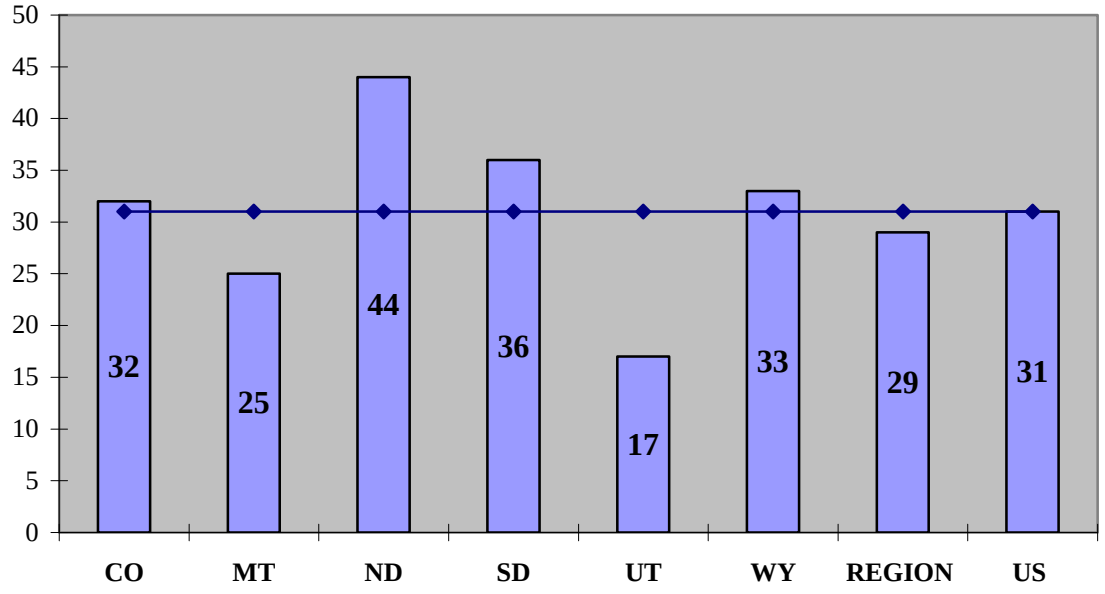
Figure 11. Licensed Practical Nurses per 100,000 Population (Region VIII, 1998)



Source: HRSA State Health Workforce Profiles, 2000

The skills of respiratory therapists will be useful in the event that the bio-agent affects the respiratory system. A partial list of agents that affects the respiratory system includes: plague, anthrax, and botulinum toxin. Other agents such as smallpox, hemorrhagic fevers, and ricin would require respiratory care as part of general supportive care. The resources in this region are close to the national average, where both North Dakota and South Dakota exceed the U.S. and the rest of the region.

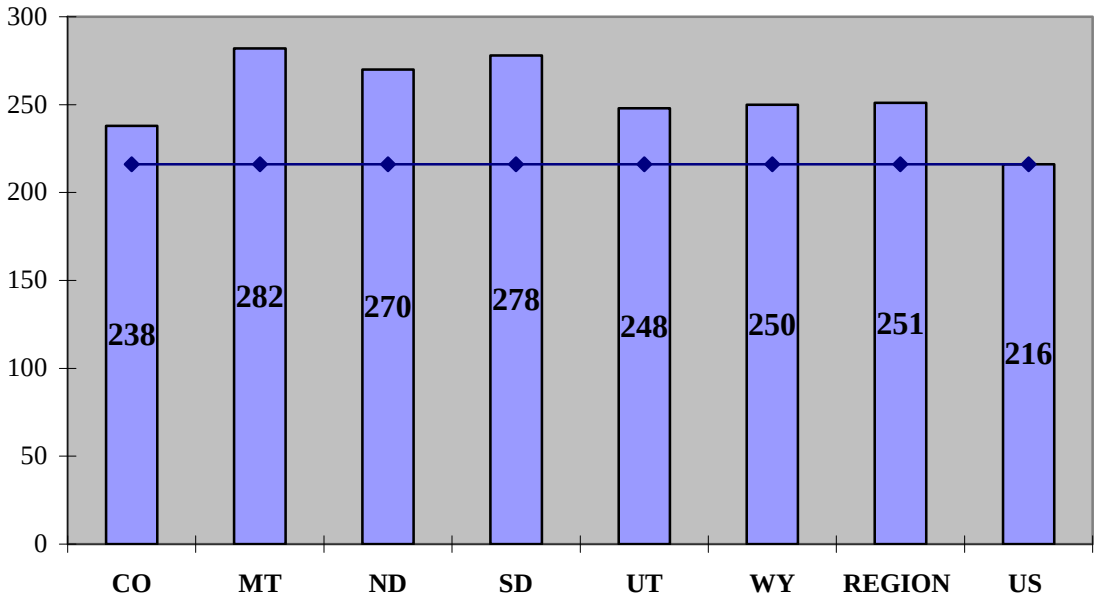
Figure 12. Respiratory Therapists per 100,000 Population (Region VIII, 1998)



Source: HRSA State Health Workforce Profiles, 2000

Supplementary health professionals such as social workers, certified nurse assistants, and laboratory workers will also be necessary to respond during a surge event. Figure 13 demonstrates that our region is above the national average for social workers.

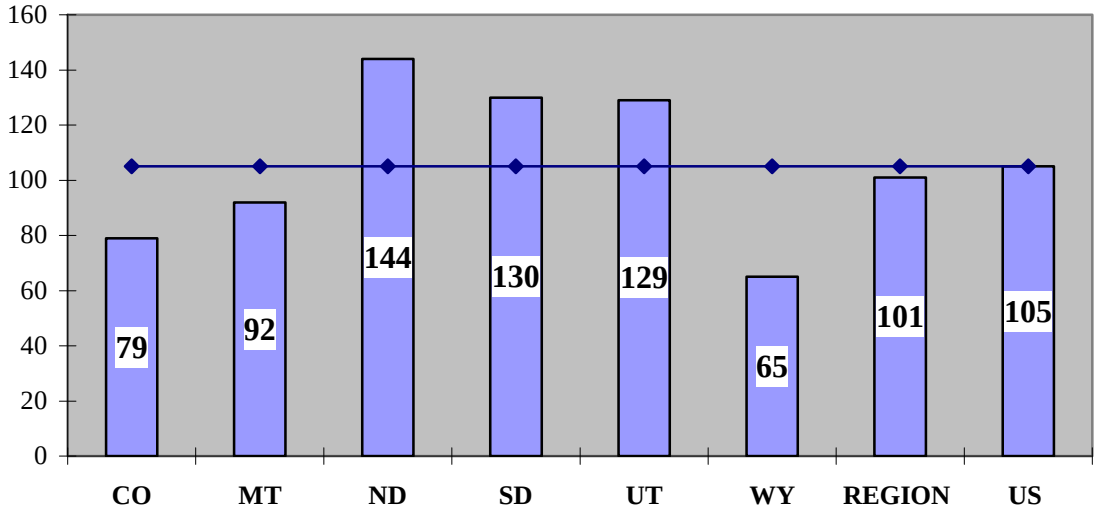
Figure 13. Social Workers per 100,000 Population (Region VIII, 1998)



Source: HRSA State Health Workforce Profiles, 2000

As a region, we are slightly below the national average for clinical laboratory staff (Figure 14). Colorado, Montana and Wyoming are below, while the other 3 states exceed the national average.

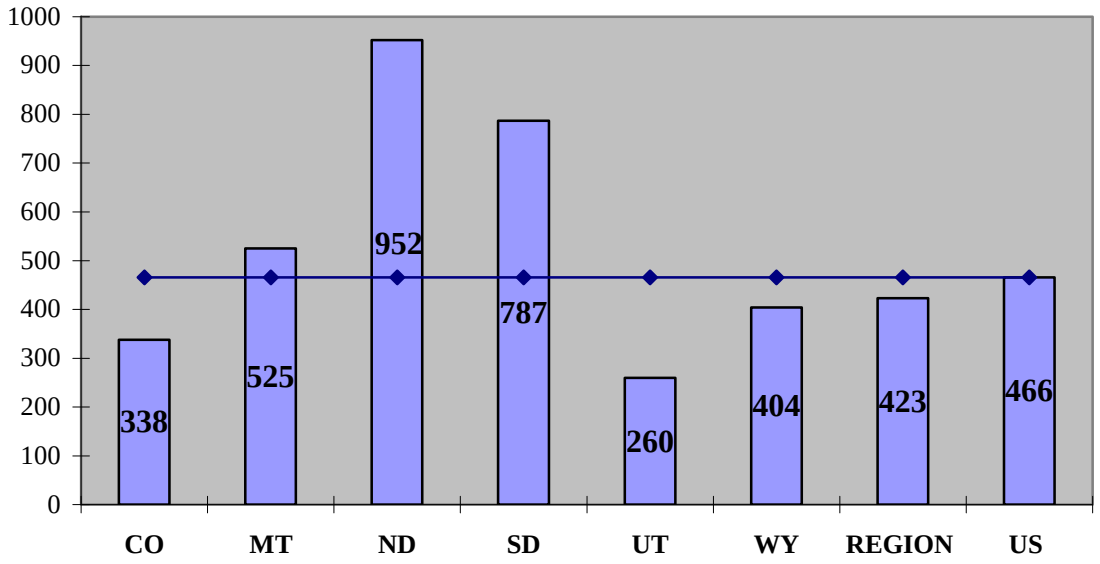
Figure 14. Clinical Laboratory Staff per 100,000 Population (Region VIII, 1998)



Source: HRSA State Health Workforce Profiles, 2000

As a region we are slightly below the national average for certified nurse assistants as well. Colorado, Utah and Wyoming fall short, while Montana, North Dakota and South Dakota exceed the national average.

Figure 15. Certified Nurse Assistants per 100,000 Population (Region VIII, 1998)



Source: HRSA State Health Workforce Profiles, 2000

3.3 HRSA Hospital Preparedness Survey Summary

A region may be able to collect state hospital preparedness survey results and examine them to understand particular regional capacities. Hospital infrastructure capacity and supply of relevant equipment was somewhat difficult to obtain via other sources. It was expected that some bioterrorism response relevant hospital infrastructure and equipment supplies could be determined through the HRSA Hospital Preparedness Surveys.[1] In Federal Region VIII, we were interested in addressing regional hospital decontamination ability, negative pressure isolation room and personal protective equipment (PPE) availability. Members of the RMBT Working Group included representatives from each of the six state HRSA grantees. The RMBT Working Group collected all six needs assessments from the Health Resources and Services Administration (HRSA) Hospital Preparedness Programs in the states represented by our region over the one-year project period (Appendix E).

[1] In January 2002, all states were offered funding from HRSA based on population size to improve healthcare system preparedness. One of the critical requirements for the 2002-2003 grant year was to conduct a needs assessment of acute care hospitals and pre-hospital entities. Phase 2 would require implementation of a plan to address those needs. The HRSA grantees were given issue areas for the assessments: primary (vaccines, PPE, communications, drills) and secondary (personnel, training, patient transfer) priority planning areas with specific benchmarks.

The survey instruments were examined to determine if there were common questions that would further contribute to profiling the region. Since the needs assessments were not required to be standardized across the states, all fifty states ask different questions and on different time schedules. In our region all six states distributed their surveys at different times: for example, Montana in September 2002, South Dakota in December 2002 and North Dakota in March 2003. Therefore, the data represents estimates roughly for the period of late 2002 to early 2003. There were varying numbers of questions from 48-194 and the format varied with some states offering open-ended questions, requesting particular counts and asking for names of contact personnel.

As of October 14, 2003, results have been collected and compiled for five of the six states in our region: Colorado, Montana, South Dakota, Utah and Wyoming. North Dakota is expected to provide their final data results in the near future. For this assessment we were only able to access partial data.

Table 3 outlines regional results in key topic areas where HRSA benchmarks have been developed (see Chapter 5, *Defining Measures of Preparedness*) including decontamination, PPE and isolation.

Table 3. HRSA Hospital Survey Results Selected Items (Region VIII, 2002)

	Colorado		Montana		North Dakota		South Dakota		Utah		Wyoming		Region VIII TOTAL	
Number of Hospitals Responding	**N=56**		**N=62***		**N=44**		**N=68**		**N=52**		**N=29**		**N=311**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
General														
Do you have a plan for BT response?	56	100.0	22	35.0	23	52.0	24	35.0	28	54.0	16	55.0	169	54.0
Equipment- Ventilators														
How many ventilators does your facility own?	643		203		94		>26		**		**		>966	
Equipment-Personal Protective Equipment (PPE)														
Do you have N95 (HEPA like) disposable masks?	56	100.0	32	52.0	27	61.0	40	59.0	27	52.0	20	71.0	202	65.0
Do you have any positive air purification respirators (PAPR)?	56	100.0	6	10.0	**		10	15.0	**		**			
Do you have protective suits?	**		16	26.0	**		9	13.0	7	13.0	**			
Infrastructure-Decontamination														
Does your hospital have patient decontamination capability?			22	36.0	†		23	34.0	>18	35.0	**			
Designed and installed internal			10	16.0			12	18.0	14	27.0				
Designed and installed external	**		2	1.0	**		0	0 .0	**		**			
Temporary/tent external			13	21.0			9	13.0	18	35.0				
Trailer mounted			2	3.0			0	0.0	**					
Infrastructure- Isolation														
Does your facility have negative airflow, isolation rooms?	56	100.0	29	52.0	15	34.0	>16	24.0	28	54.0	20	69.0	>164	54.0
How many negative pressure isolation rooms exist TOTAL in your facility?	305 rooms		98 beds		65 beds		‡		138 rooms		**		NA	
Does your hospital have isolation room in the ED?	28	50.0	**		5	11.0	16	24.0	**		**			

* some questions were only answered by 56 hospitals, other questions were answered by 62 hospitals

** question not asked

† will be able to obtain result in the future

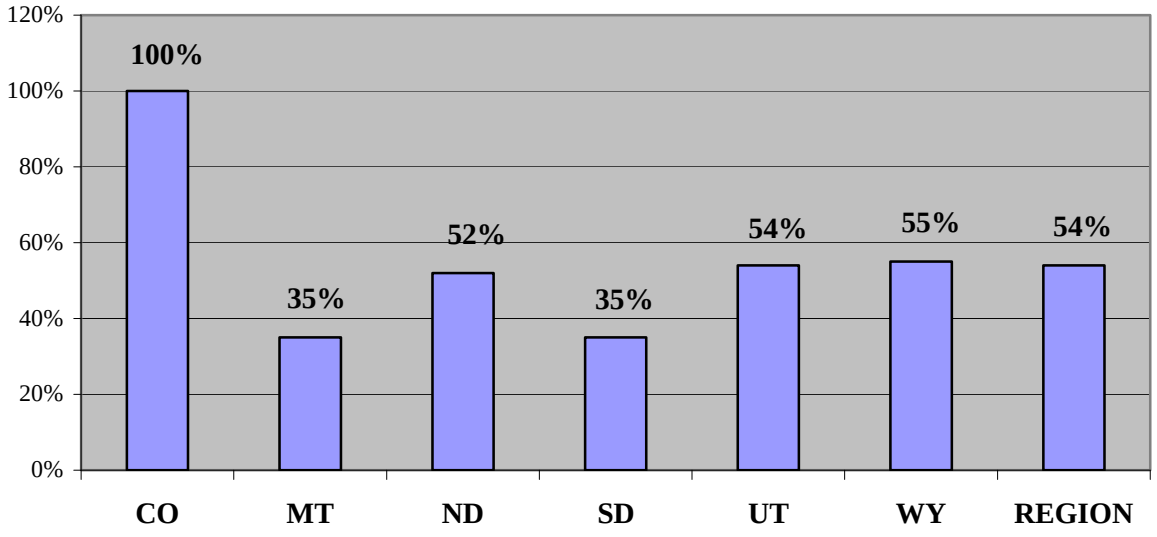
‡ question asked in survey, results could not be obtained from the State

Note: Questions that were asked by $\leq$ 3 states were not averaged or totaled for the region.

Bioterrorism Response Planning

All hospitals in the region were asked if they had a specific plan for bioterrorism response (Figure 16). Collectively, 54 percent of hospitals in the region had a plan at the time the surveys were distributed. In Colorado, 100 percent of hospitals had a plan by 2002 as part of the state's requirement at that time.

Figure 16. Percent of Hospitals with a Plan for Bioterrorism Response (Region VIII, 2002)

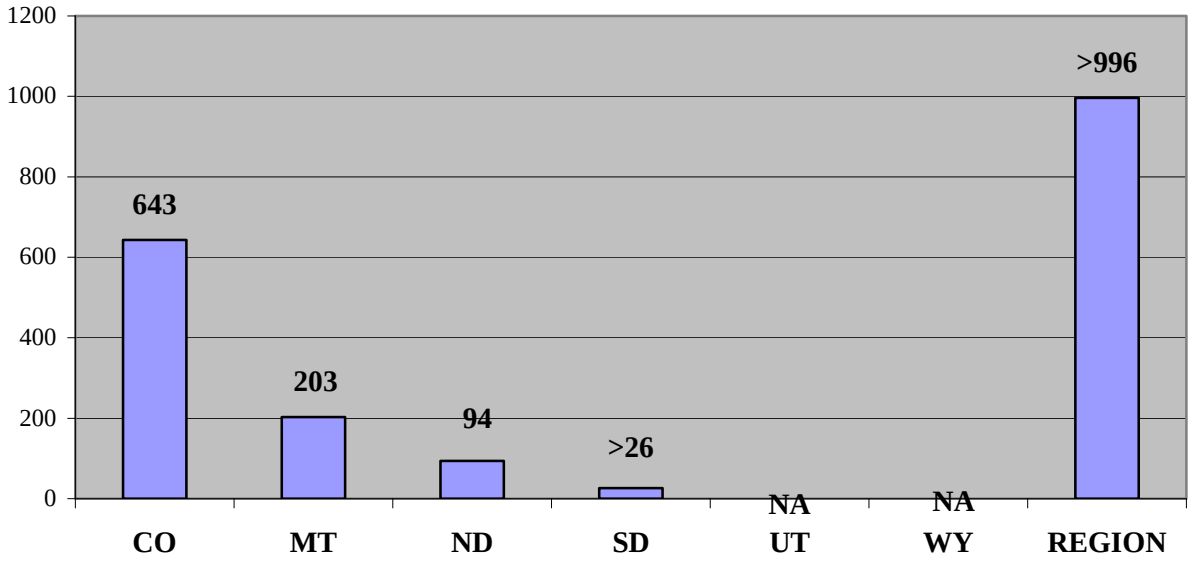


Source: State HRSA Hospital Preparedness Survey Results, 2002-2003

Equipment—Ventilators

Assessing the total amount of ventilators in Federal Region VIII is an important measure to estimate, particularly since many potential bioterrorist agents can affect the respiratory system. Figure 17 displays the number of ventilators in the region obtained from the HRSA surveys. Utah and Wyoming did not assess this in their surveys. The states that did address this question had issues in collecting an accurate count. For example, Colorado had too few facilities answer this question and feels their count does not accurately assess the status of the state. South Dakota had only one out of four regions answer this question, meaning their count is low as well. The regional total of ventilators available is a grossly low estimate of approximately 1,000 ventilators *owned* by hospitals in the region. It is important to note that many hospitals rent ventilator equipment and during a surge hospitals may be competing for this resource.

Figure 17. Number of Ventilators Owned by Hospitals (Region VIII, 2002)



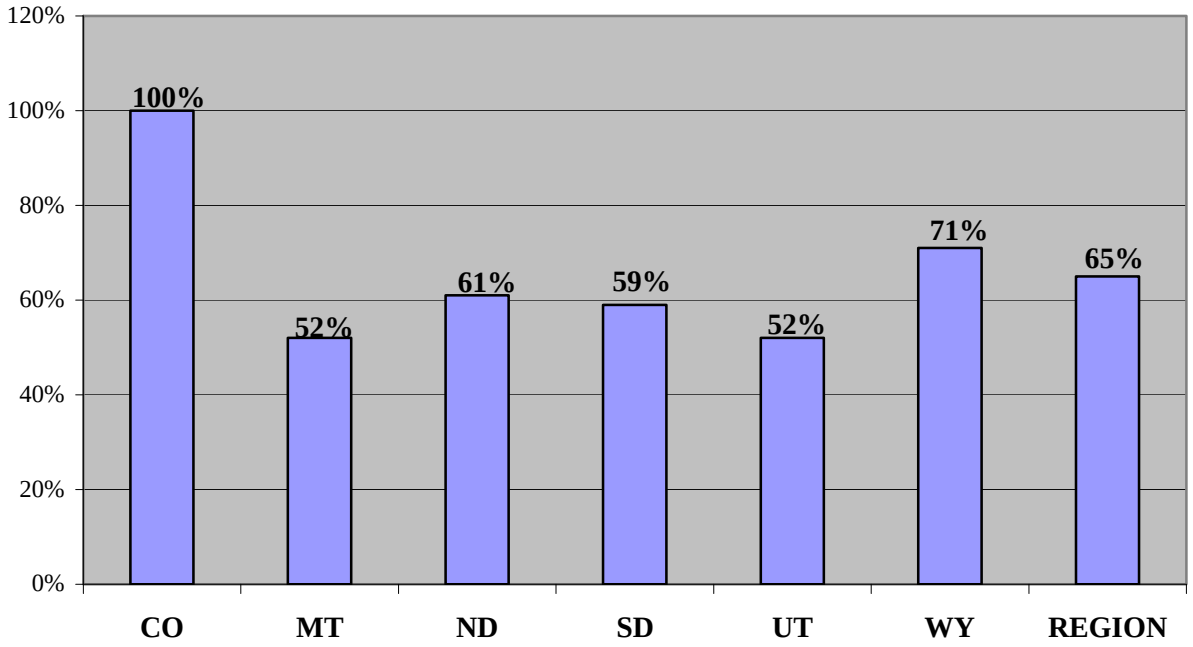
Source: State HRSA Hospital Preparedness Survey Results, 2002-2003

Equipment—Personal Protective Equipment (PPE)

OSHA requires the use of personal protective equipment (PPE) to reduce employees' exposures to hazards in the healthcare workplace environment. Issues surrounding use of PPE are particularly relevant when examining readiness to respond to a bioterrorist or chemical event. PPE necessary for bioterrorist response includes face shields, safety glasses, gloves, masks, respirators, and protective suits; these come in many different variations of durability, cost, and ease of usability. There is still debate surrounding the establishment of guidelines for appropriate PPE for the different bioterrorist and chemical agents.

All states in our region asked if hospitals had the most basic form of PPE: N95 disposable masks available. In Wyoming, the question was not as specific and was stated as: Do you have masks available *such as N95*? Approximately 65 percent of responding hospitals in the region had masks available (Figure 18).

Figure 18. Percent of Hospitals with N95 (HEPA like) Disposable Masks (Region VIII, 2002)



Source: State HRSA Hospital Preparedness Survey Results, 2002-2003

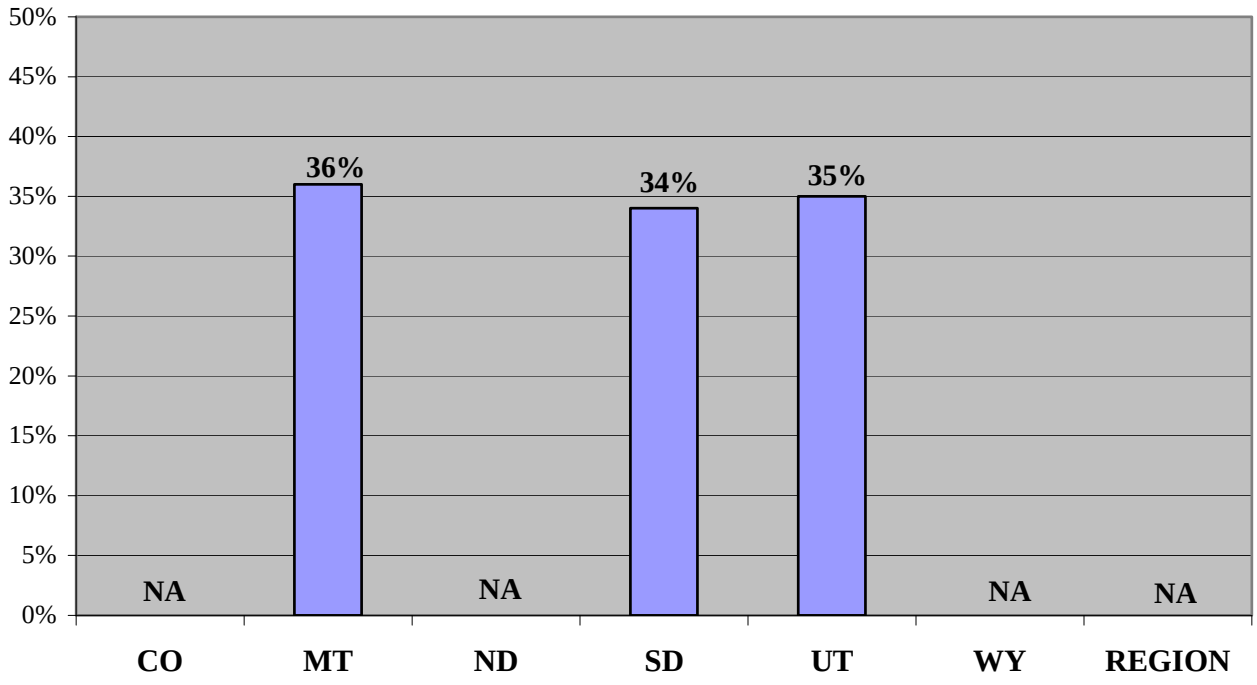
Three states asked if hospitals had positive air purification respirators (PAPRs). They ranged from 15 percent of hospitals in South Dakota to 100 percent in Colorado (Table 3). Approximately 17 percent of the responding hospitals in half the states in our region had protective suits available (Table 3).

Infrastructure—Decontamination

Decontamination issues were covered by all six surveys in very different manners. In Wyoming, 52 percent of hospitals had a *plan* for decontamination. This does not actually address whether or not they have the capability. In Colorado, 54 percent of hospitals could decontaminate a non-ambulatory victim (i.e. have a decontamination table/stretcher), 77 percent had external access to water for mass casualty decontamination, and each hospital had an average of one shower head per hospital for decontamination. Montana asked if hospitals could increase their capacity for decontamination and asked them to rate this need. Montana, North Dakota, and South Dakota asked hospitals if they had arrangements with outside agencies to provide decontamination services.

Only four states addressed the topic of decontamination similarly with one question of having this ability (Figure 19). North Dakota's data is still being compiled by an outside contractor and was not available for this topic at the time of this report. Montana, South Dakota and Utah are similar in that over 1/3 of hospitals responding to their survey have decontamination capability. In addition, these states addressed the question in further detail by specifying if decontamination capability was internal or external, temporary or permanent (Table 3).

Figure 19. Percent of Hospitals with Decontamination Capability (Region VIII, 2002)

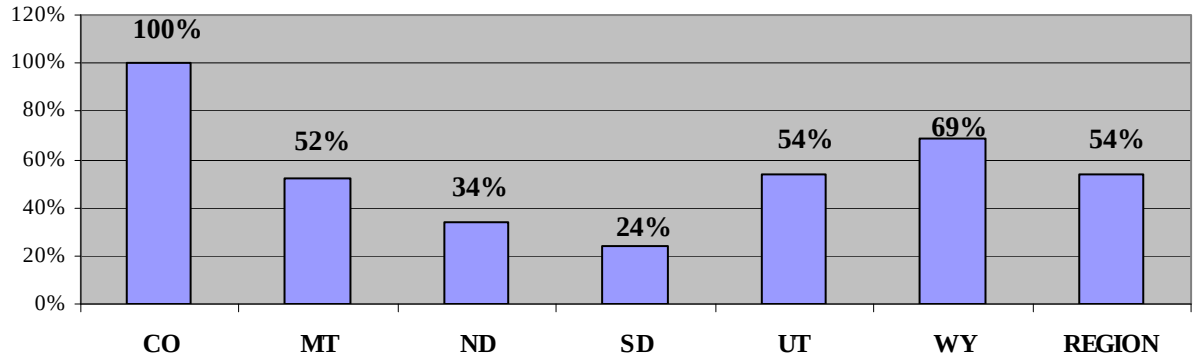


Source: State HRSA Hospital Preparedness Survey Results, 2002-2003

Infrastructure—Isolation

All six states asked hospitals if their facilities had negative airflow, isolation rooms (Figure 20). Over 54 percent of the region's hospitals that responded had this capability. In three states, an average of 28% of hospitals had isolation rooms specifically in the Emergency Department (Table 3).

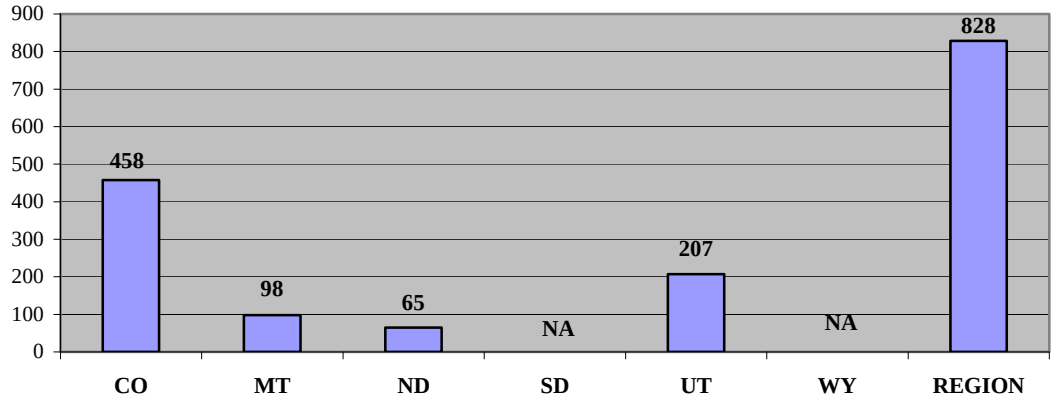
Figure 20. Percent of Hospitals with Negative Airflow, Isolation Rooms (Region VIII, 2002)



Source: State HRSA Hospital Preparedness Survey Results, 2002-2003

Five states asked for the specific total number of negative pressure isolation rooms or beds in the facility. Montana and North Dakota have 163 isolation *beds* total. Colorado and Utah have 443 *rooms* total; this figure was multiplied by 1.5 to determine a bed estimate based on the assumption that each room has either 1 or 2 beds. This region as a whole has over 828 beds available in negative pressure isolation rooms.

Figure 21. Number of Negative Pressure Isolation Beds (Region VIII, 2002)



Source: State HRSA Hospital Preparedness Survey Results, 2002-2003

Limitations Concerning Survey Data Comparison

There were several limitations in comparing the survey data across the six–state region. The major areas of concern include:

- **States in the region are at different levels of preparedness**

All states in the region are at different levels of preparing and the tailored surveys reflect this fact. For example, Wyoming's survey was constructed to obtain information about level of *planning* of hospitals; it fell short of identifying specifics about the *needs* of hospitals to enhance preparedness. Hospitals were asked to assess their planning as complete, substantial progress or incomplete in various topic areas.

- **Accuracy and reliability of survey data**

Many states reported that the data may not accurately reflect needs in their respective states. Issues surrounding data accuracy included: respondents using "bed" and "room" interchangeably when delivering counts which would not reflect the true capacity for cohorting; low response rate from hospitals which would not reflect a true picture of need across the state if hospitals were self-selecting due to common issues; issues surrounding exposing state vulnerabilities if sharing data with outside sources in the region.

- **Are the data current?**

Initiatives for equipment increases are being funded and implemented at a faster rate than the data is being collected. Therefore, survey results on counts may be inaccurate due to new funding streams from HRSA and the Department of Homeland Security. For example, hospitals may now have PPE available through this year's equipment initiatives. Data represents estimates collected in late 2002-early 2003.

Chapter 4. Additional Resources to Meet Surge Needs

4.1 Selecting an Alternative Care Site

Through discussions with General Lloyd Dodd, Command Surgeon for U.S. Northern Command[2] located at Peterson Air Force Base in Colorado Springs, and his staff, the RMBT Working Group found there was a need to develop a tool that assisted planners in identifying potential alternative care sites in the event of a bioterrorist attack (TAB 1). Using existing buildings and infrastructure is the most probable scenario should a surge medical care facility need to be opened. The RMBT Working Group determined that the use of existing buildings and infrastructure is feasible for this region and would meet the needs of frontier, rural, urban and suburban areas. The type of building that will need to be used is dependent upon its infrastructure.

There are many alternatives for equipping an alternative care site once selected. The Department of Defense presented and discussed many equipment concepts with the Working Group. DoD equipment and personnel resources include the Air Force Small Portable Expeditionary Aeromedical Rapid Response (SPEARR), Expeditionary Medical Support (EMEDS) and Army field hospitals. It is important to note that these are Federal resources and may not be available for use during the initial days of response to a bioterrorist attack. In addition, they require training in order for local medical personnel to set-up and use the equipment with design alterations. Another option included an 18-wheeler emergency response vehicle that could be purchased by private carriers and would operate as a high-level mobile medical care facility with an ambulatory surgical unit. This alternative is costly, over $2.4 million and provides a high level of care that may not be feasible or cost effective for a large-scale medical response effort.[3]

The RMBT Working Group concluded that an alternative care site would most likely be staffed and supplied by local and regional resources. Three levels of supply caches were developed and are presented in Section *4.2.1 Supply and Staffing Options for an Alternative Care Site.* In the event of a bioterrorist attack and when a region utilizes an alternative care site, it is probable that one of levels of these caches would be the asset deployed to equip the site to complete its functionality.

The RMBT Working Group agreed with the need to develop a simple tool that could be used by regional planners to predict an appropriate alternative care site from existing structures based on internal requirements. Hospital engineers and facility personnel were presented with the infrastructure requirements for an alternative care site outlined by the Department of Defense [4] and refined by the RMBT Working Group. This expert team assisted with the development of an alternative care site selection matrix tool. Through discussions with this team, they were able to identify additional factors that should be considered in selecting an alternative care site. When designing the tool, these factors

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[2] The Department of Defense Established U.S. Northern Command in 2002 to consolidate under a single unified command existing missions that were previously executed by multiple military units. The command's mission is homeland defense and civil support, specifically:

- Conduct operations to deter, prevent, and defeat threats and aggression aimed at the United States, its territories, and interests within the assigned area of responsibility; and
- As directed by the President or Secretary of Defense, provide military assistance to civil authorities including consequence management operations.

[3] Medical System Unit for Homeland Defense produced by the Mobile Medical International Corporation, St. Johnsbury, VT.

[4] Skidmore S, Wall W, Church J. Modular Emergency Medical System Concept of Operation for the Acute Care Center: Mass Casualty Strategy for a Biological Terror Incident, May 2003.

were transformed into a matrix with relative weights. The weights are based on a 5-point scale that compares the alternative care site factor to that of a hospital. For instance, if the potential alternative care site was a local high school, "Is the ventilation system similar to a hospital or less adequate than that of a hospital?"

The RMBT Working Group reviewed and tested the site selection tool matrix during one of the RMBT Working Group meetings. The group was separated into 5 breakout groups. Each group was provided with pictures and infrastructure descriptions of three potential alternative care sites, an event center, a church and a high school. Each group scored and ranked the three alternative care sites for use in the event that is described in Chapter 8, *Regional Surge Capacity Exercise.* Table 4 displays the scoring results from these breakout groups:

Table 4. Validating the Alternative Care Site Selection Matrix

	G1	G2	G3	G4	G5	(G=Group)
Event Center	57	65	56	60	52	
Church	75	59	56	65	54	
High School	84*	68*	61*	67*	61*	

The High School obtained the highest score (*) in all five groups and therefore was the best choice for that particular biological event.

Issue areas discussed by the RMBT Working Group while testing the tool included:

- Is each factor of equal weight?
- If a factor is not applicable to the type of event it can be skipped.
- What if another use is already stated for the building in a disaster situation? (i.e. a church may have a valuable community role)
- This tool may be useful to use in a planning team including: fire, law, Red Cross, security, hospital personnel such as the Local Emergency Planning Commission (LEPC)

The alternative care site selection matrix tool is also available as an Excel file in the electronic version of this report at www.ahrq.gov/research/altsites.htm.

Table 5. Alternative Care Site Selection Matrix

RMBT ALTERNATIVE MEDICAL CARE SITE SELECTION MATRIX

Potential Sites:	Aircraft Hangers	Churches	Community or Recreation Centers	Convalescent Care Facilities	Convention Facilities	Fairgrounds	Government Buildings	Hotels/Motels	Meeting Halls	Military Facilities	National Guard Armories	Same Day Surgical Centers/Clinics	Schools	Sports Facilities/Stadiums	Trailers/Tents (Military and other)	Other
Factors:																
Infrastructure																
Doors/corridors adequate size for gurneys																
Floors																
Loading dock																
Parking for staff and visitors																
Roof																
Toilet facilities/showers (#)																
Ventilation																
Walls																
Total Space and Layout																
Auxiliary spaces (Rx, counselors, chapel)																
Equipment/supply storage area																
Family area																
Food supply and prep area																
Lab specimen handling area																
Mortuary holding area																
Patient decontamination areas																
Pharmacy area																
Staff areas																
Utilities																
Air conditioning																
Electrical power (backup?)																
Heating																

Lighting																
Refrigeration																
Water (hot?)																
Communication																
Communication (# phones, local/long distance, intercom)																
Two-way radio capability to main hospital																
Wired for IT and internet access																
Other Services																
Ability to lock down facility																
Accessibility/proximity to public transportation																
Biohazard and other waste disposal																
Laundry																
Ownership/other uses during disaster																
Oxygen delivery capability																
Proximity to main hospital																
TOTAL RATING/RANKING (Largest number indicates best site)																

Rating System

5 Equal to or same as hospital.
4 Similar to that of a hospital, but has SOME limitations (I.e. quantity/condition).
3 Similar to that of a hospital, but has some MAJOR limitations (I.e. quantity/condition).
2 Not similar to that of a hospital, would take modifications to provide.
1 Not similar to that of a hospital, would take MAJOR modifications to provide.
0 Does not exist in this facility or is not applicable to this event.

4.2 Supplying and Staffing an Alternative Care Site

One of the primary needs identified by the RMBT Working Group was to develop supply and staffing recommendations for the operation of an alternative care site or to augment the capability of a fixed care site, commonly a hospital. It is unlikely that a hospital or alternative care site will have much of the equipment or supplemental staff necessary to provide care or support patient quarantine in the event of surge.

4.2.1 Supply Options

The concept of supplying an alternative care site was, interestingly enough, well developed five decades ago with the establishment by the US Federal Civil Defense Agency and the Department of Health, Education and Welfare of the "Packaged Disaster Hospitals". These units were available in 50 bed, 100 bed and 200 bed units and contained supplies and pharmaceuticals to provide reasonable medical care at an alternative site. These "PDH"s were also accompanied by "Hospital Reserve Disaster Inventory (HRDI)" for augmentation of hospital capacity. Unfortunately these units were dismantled and disposed of in the 1980's.

The recognition of ongoing lack of ability for the medical care system to quickly increase the capacity for patients that be cared for led us to investigate a similar approach in terms of having cached material that could be easily activated for increased surge capacity for patient care. Three levels of supply caches were developed based upon available resources and intent. These caches are similar to the old PDH model. Level I cache parallels the HRDI concept of augmenting hospital capacity and the Level II and III caches are a basic and advanced version of the PDH type supplies. The following three example lists of caches are included in TAB 2 and could be used to either augment hospital capacity or supply an alternative care site at varying levels. Costs can vary widely; for example, there is large variation in types of cots that can be purchased.

Level I: Hospital Augmentation Cache - approximately $20,000 (TAB 2-I)

This list of supplies represents a most basic unit of supply support for increased surge capacity of 50 patients, consisting only of items that have very extended shelf life: cots, linens, masks, gowns, gloves, IV poles, etc. No pharmaceuticals are included. This material is packed in a trailer for mobility. It could be used as additional stocking for an existent hospital (e.g. to set up a medical ward in a cafeteria, utilizing other items as necessary from the hospital) or could offer supplies for limited level care at an alternative care site. This list was created by the RMBT Steering Committee and approved by the RMBT Working Group. In our metropolitan area of 1,000,000 people and 11 hospitals, if each hospital acquired a single cache, we would have a basic supply surge capacity for 550 patients. Estimated cost for this cache (including trailer) is approximately $20,000. One of these units has been purchased and is currently being processed and positioned for potential use in our area.

Level II: Regional Alternative Site Cache - approximately $100,000 (TAB 2-II)

This list represents a more complete list of material to supply a regional alternative care site for 500 patients. This level cache, or medical armory, concept was developed by one of our partners, the Colorado Department of Public Health and Environment, and approved by its Hospital Preparedness Advisory Committee. This cache would be packaged in a modular fashion so material to support multiples of 50 or 100 beds could be easily extracted from the cache (similar in concept to the packaging of the Strategic National Stockpile). Note that the supply list for this cache is more complete, providing more expanded support for an alternative care site compared with the Level I cache. Approximate price for a single cache is less than $100,000. As with the Level I cache, pharmaceuticals are excluded and only items with an extremely long shelf life are included. It is assumed that the Strategic National Stockpile (SNS) would be requested at the recognition of an event and would arrive within 72 hours to augment these simple caches.

The list for the Level II cache is available from Robin Koons, Ph.D., at the Colorado Department of Public Health and Environment. Full contact information is provided in Appendix A.

Level III: Comprehensive Alternative Care Site Cache - no cost estimate currently available (TAB 2-III)

These comprehensive lists of equipment and consumables were adapted by the RMBT Working Group from work done by the US military and published in *The Concept of Operations for the Acute Care Center*[5], by the U.S. Army Soldier and Biological Chemical Command (SBCCOM) (available at: www.DenverHealth.org/BioTerror/Document.htm). These represent a specification for a completely supplied 50-bed alternative care site consisting of both long and short shelf life items. This represents a more complete level of cache than the caches above. An attempt has been made to differentiate, when possible, the needs of the unit when caring for infectious patients, non-infectious patients and a situation when the unit would be used as a simple quarantine unit. The initial specification also included pharmaceuticals, but we have elected to not include them here as separate national, regional and local planning efforts are addressing this issue.

This extensive list has been separated into: Equipment Considerations, Patient Care Related Consumables, Administrative Consumables and Oxygen and Respiratory Related Equipment Considerations. Note that this equipment and the consumables can be pre-acquired and stored in a "medical cache" as well. Consumable items may represent one of the greatest challenges for establishing an alternative care site due to the number and quantity of items. This comprehensive list also includes oxygen and respiratory-related supplies that should be considered to provide limited respiratory support.

Special Consideration: Supplemental Oxygen Supply- approximately $13K-$480K (TAB 3)

The majority of probable bioterrorism agents directly involve the respiratory system, making supplemental oxygen for patients very desirable. This is highly problematic from a logistical point of view, as even the larger oxygen cylinders (H cylinders) have a limited supply when having to service multiple patients. Providing liquid oxygen sources at alternative care sites has been proposed, but presents a significant financial and engineering challenge. Adequate supplemental oxygen supply

[5] Skidmore S, Wall W, Church J. Modular Emergency Medical System Concept of Operation for the Acute Care Center: Mass Casualty Strategy for a Biological Terror Incident, May 2003.

remains an unresolved issue at this point. One of the problematic concerns in establishing a surge capacity alternative care site is the supply of supplemental oxygen to patients. This need could conceivably be great since a significant number of bio-weapons directly attack the respiratory track, causing hypoxia. Oxygen is not on the supply list for any of the above caches. There are various alternatives to supplying oxygen at an alternative care site. Therefore, a separate description of the oxygen alternatives is presented.

As part of the RMBT Working Group discussions, a group of our Air Force partners developed some potential solutions to addressing oxygen needs. These may be viewed at www.DenverHealth.org/BioTerror/Document.htm under "Deployable Oxygen Solutions" or at TAB 3. Given the variables of cost, general availability, ease of use and sustainability, the most promising option is also the simplest: a rack of interconnected "H" oxygen cylinders, each supplying 7000 liters of oxygen. (A single "H" cylinder could only supply 50 patients at 2 liters of oxygen per minute for one hour). Even this most basic of setups would require the rapid installation of a rudimentary gas distribution system. Support for ventilated patients would significantly increase the rate of oxygen consumption, further complicating this issue and may not be possible.

4.2.2 Staffing Considerations

The creation and utilization of any alternative care site will obviously be successful only if a site can be staffed by necessary medical and ancillary personnel. This may be a serious issue for several reasons, two of which include: 1) there is no guarantee that normally available personnel would make themselves available to assist in a bioterrorist event and 2) the simple fact that alternative sites are being implemented implies that the normal health care system is running beyond capacity, stressing routine levels of staffing. Again, work done by the military and presented in *The Concept of Operations for the Acute Care Center* lists proposed staffing for a 50-bed unit per 12-hour shift. This proposal was adapted and augmented, including the addition of staffing levels for non-infectious patients and quarantine (only) patients, by the RMBT Working Group. Certainly, it is impossible to forecast absolute requirements without knowing the acuity of patient illness, whether the disease process is communicable or not, or if the unit is being used for quarantine only.

Advance regional planning could include establishment of a registry of backup healthcare providers, such as those who are licensed but retired, those working in an alternative line of work, or otherwise inactive. An additional degree of preparation, since healthcare licensing is largely a state issue, involves researching and drafting potential gubernatorial orders to set aside specific aspects of state licensing requirements for physicians, nurses and other health care providers. This would allow easier incorporation of out-of-state professionals into an expanded work core. Even with maximum planning, the establishment and maintenance of a healthcare workforce for an alternative care site during a bioterrorist event remains a daunting challenge.

A major problem in setting up and running an alternative care site would be the provision of appropriately trained staff to run the site. Staffing alternatives are best dealt with through advance planning. Some of the steps required to enable this advance planning will require specific state legal action, while other responsibilities will fall to local jurisdictions and/or institutions in the area. Table 6 lists several items that will facilitate obtaining and supporting additional staff for area hospitals and

alternative care sites. Table 7 lists estimated numbers of staff necessary for an alternative care site 50 bed unit.[6]

Table 6: General Considerations for Staffing

	State	Local	Institution
Establish legal authority to utilize out-of-state licensed personnel	X		
Establish supervision criteria for volunteer and out-of-state licensed personnel	X		
Establish/maintain list of retired individuals who could be called upon to staff	X	X	X
Availability of prophylaxis for employees and volunteers (? and their families) to guarantee workforce availability	X	X	X
Communication of institutional workforce plan in advance to employees			X
Develop, test and maintain emergency call-in protocol		X	X
Expectation and capacity for flexibility in roles	X	X	X
Establish linkages with community resources (e.g., hotel housekeeping)		X	X
Address specific needs of employees (transportation, single mother, pets)			X
Implement a reverse 911 or notification system for all employees			X
Establishment of institutional policies for credentialing of non-employees			X

Table 7: Staffing Considerations for Alternative Care Sites: Suggested Minimum per 12 hour shift for 50 bed Unit[5]

Class	Infectious	Non-Infectious	Quarantine
Physician	1	1	0
Physician extender (PA/NP)	1	1	0
RNs or RNs/LPNs	6	6	2
Health technicians	4	6	1
Unit secretaries	2	2	1
Respiratory Therapist	1	1	0
Case Manager	1	1	0
Social Worker	1	1	1
Housekeepers	2	2	1
Lab Personnel	1	1	0
Medical Asst/Phlebotomy	1	1	0
Food Service	2	2	2
Chaplain/Pastoral	1	1	1
Day care/Pet care	0	0	1
Volunteers	4	4	4
Engineering/Maintenance	0.25	0.25	0
Biomed-to set up equipment	0.25	0.25	0
Security	2	2	2
Patient transporters	2	2	0

[6] Adapted from *The Concept of Operations for the Acute Care Center*, the U.S. Army Soldier and Biological Chemical Command (SBCCOM), 2003, in press. Used by permission

Chapter 5. Measures of Preparedness

Understanding the degree to which a region is prepared for a bioterrorist event is important to understanding regional surge capacity needs. This chapter defines a specific set of measures for preparedness based on data that is currently collected. As part of the RMBT Working Group collaboration, data collection resources were identified that were available in the six state region and that provided information about the medical resource capacity of the region. Other measures of preparedness may not only address resource capacity but may also include measures for timeliness of response and effectiveness of the incident command system. As a surge capacity study, the measures of bioterrorism preparedness focus on identifying the gaps between resource capacity and resource needs.

After the RMBT Working Group identified regional medical resource capacity, as outlined in Chapter 3, *Profile of Regional Medical Resources*, the next step to defining measures of preparedness was to determine medical resource need. Two approaches were used to identify resource need. One was through the Health Resources and Services Administration (HRSA) surge capacity benchmarks, and the second was to develop a benchmark through the staffing, supply, and equipment templates for a 50-bed unit developed by the Department of Defense[7] and refined through input from the RMBT Working Group in section 4.2.2. *Additional Resources to Meet Surge Needs: Staffing Considerations*, Table 7.

Based on these benchmarks, four resource areas for bioterrorism preparedness measures have been developed:

- **Hospital Beds**: Current resources based on NDMS available bed data, need based on HRSA benchmark of 500 beds necessary per 1 million population.

- **Medical Staffing**: Current resources based on HRSA health workforce profiles, need based on HRSA benchmark of 500 beds necessary per 1 million population combined with the staffing model for a 50 bed alternative care site described in Table 7.

- **Equipment**: Current resources based on HRSA state hospital preparedness surveys, need based on HRSA benchmarks.

- **Infrastructure:** Current resources based on HRSA hospital preparedness surveys, need based on HRSA benchmarks.

[7] Skidmore S, Wall W, Church J. Modular Emergency Medical System Concept of Operation for the Acute Care Center: Mass Casualty Strategy for a Biological Terror Incident, May 2003.

5.1 Hospital Beds

Current available regional hospital bed capacity was provided by the National Disaster Medical System (NDMS).[8] NDMS collects bi-weekly hospital bed availability data for hospital members, which is the actual number of beds available on any given day in the region. The NDMS agencies (DoD, VA, FEMA, HHS) have established voluntary partnerships between NDMS and civilian hospitals through a Memorandum of Understanding (MOU). One of the responsibilities of the participating hospitals is to provide bed availability information to the local NDMS Federal Coordinating Center (FCC).

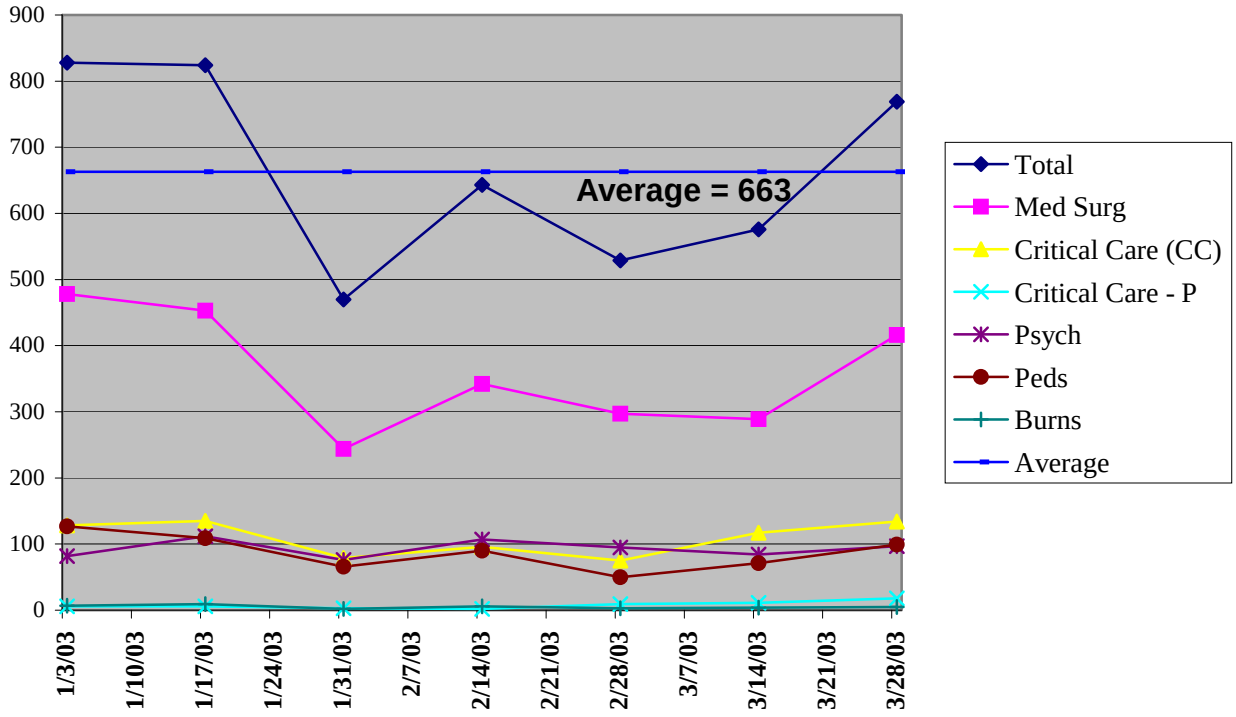
The NDMS has been tracking available hospital beds since January 2003. NDMS partners with approximately 2,000 non-federal hospitals concentrated in major metropolitan areas located in 65 FCCs with 82 reception sites (Appendix C). In Federal Region VIII, NDMS is tracking open beds in the Colorado Front Range (Greeley, Colorado Springs, Pueblo, Fort Collins, Boulder, and Denver) and Utah's Salt Lake City metro area. The FCC calls the hospitals periodically to obtain number of open beds for medical/surgery, critical care, psychiatric, pediatrics, and burns. This data was provided to the RMBT Working Group to determine current available hospital bed resource capacity.

Hospital bed resource need was based on the benchmarks defined by HRSA. In 2003, under the Bioterrorism Hospital Preparedness Program, HRSA provided regional surge capacity standards to guide regional planners. One of the standards or benchmarks was that there should be 500 surge capacity beds per 1 million population for acutely ill patients requiring hospitalization from a bioterrorist event. This 500 beds per million-population HRSA benchmark was used as a basis to define need in this study. In addition, bed need was assessed using a higher benchmark of 750 beds per million based on Working Group member suggestions that HRSA may increase this benchmark in the future.

In Region VIII, both Colorado and Utah have Federal Coordinating Centers for the National Disaster Medical Response System (NDMS). Figure 22 describes available beds over time for a 3-month period for the Colorado Front Range. Figure 23 describes available beds over time for a 6-month period for the Salt Lake City area in Utah. The average number of available beds in Colorado was 663 and in Utah was 406 for the respective time periods.

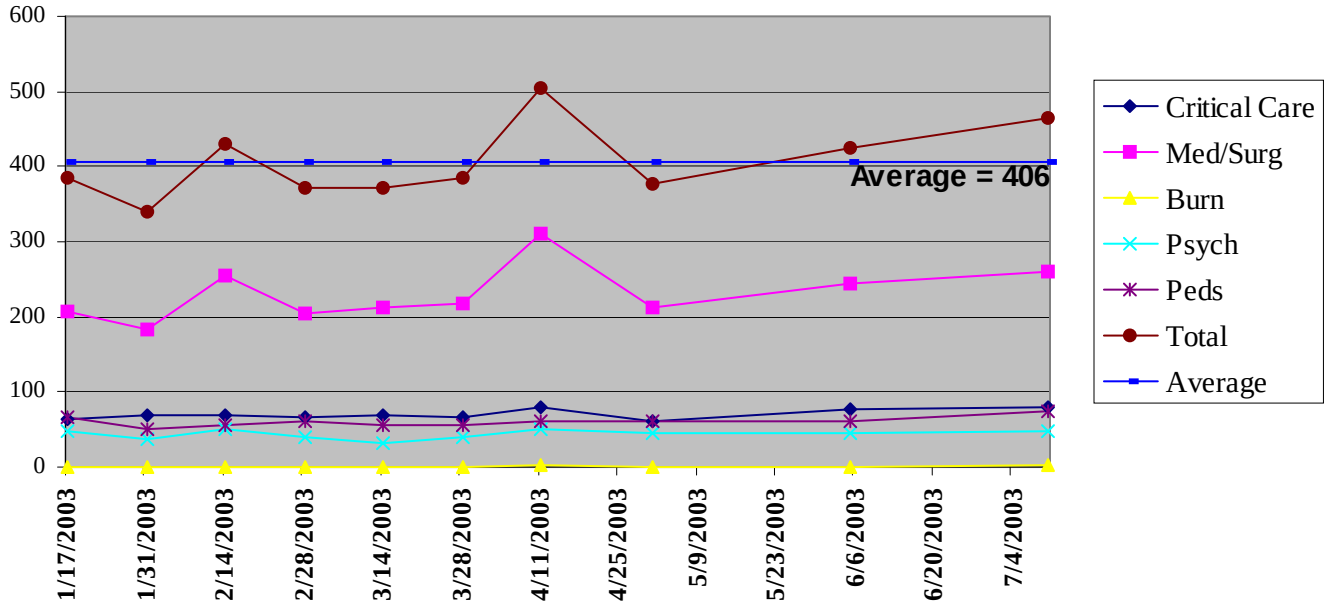
[8] The NDMS is a cooperative asset-sharing program among Federal government agencies, state and local governments, and private businesses and civilian volunteers to ensure resources are available to provide medical services following a disaster that overwhelms the local health care resources. The NDMS is a federally coordinated system that augments the Nation's emergency medical response capability. The overall purpose of the NDMS is to establish a single, integrated national medical response capability for assisting state and local authorities in dealing with the medical and health effects of major peacetime disasters and providing support to the military and Veterans Health Administration medical systems in caring for casualties evacuated back to the United States from overseas armed conflicts.

Figure 22. Available Hospital Beds (Colorado Front Range, 2003)



Source: NDMS FCC Colorado Front Range, Col Debra Tenney, Program Manager

Figure 23. Available Hospital Beds (Utah Salt Lake City area, 2003)

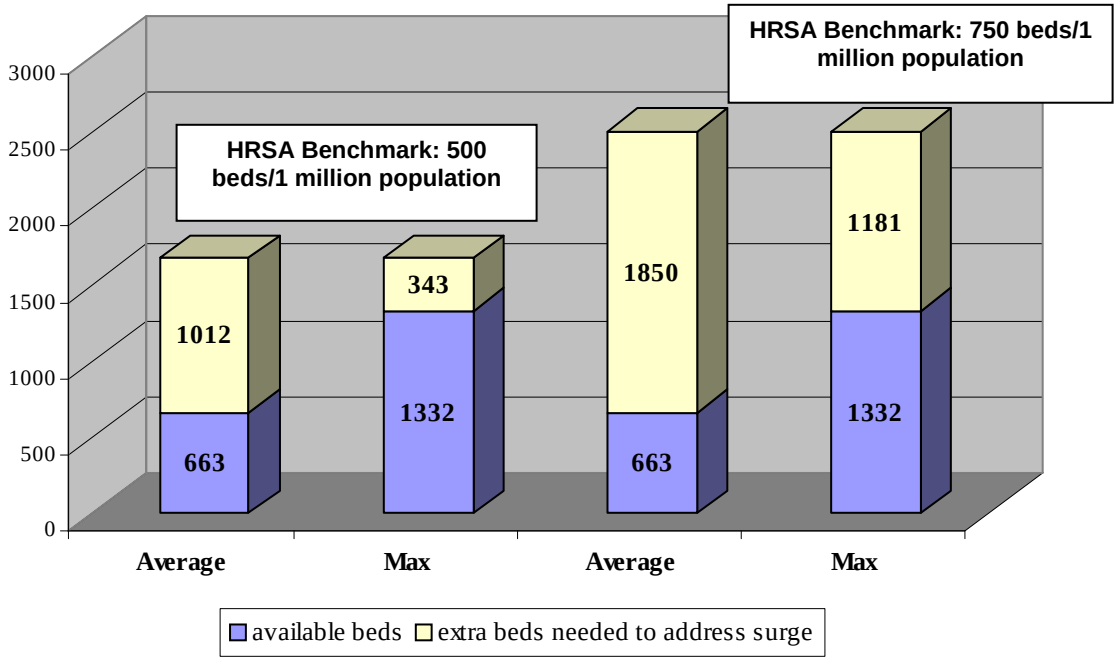


Source: NDMS FCC Utah Salt Lake City, Zane Shaw, Program Manager

Figure 24 indicates that the Colorado Front Range region would need to add between 343 and 1,012 beds for the 500 bed benchmark, depending upon how many beds they could vacate for elective conditions or less acute patients over time. For the 750 bed per million population benchmark, the Colorado Front Range region would need to add from 1,181 to 1,850 beds in the event of a bioterrorist attack. This range indicates how sensitive the measure is to the established benchmark.

Figure 25 indicates that the Utah Salt Lake City region would need to add 1, 269 beds based on the HRSA 500 bed per million population benchmark. Utah does not ask hospitals to provide maximum number of beds that can be vacated in 48 hours, and therefore cannot provide a range as reflected in the Colorado Front Range. For the 750 bed per million population benchmark, it is estimated that the Salt Lake City region would need to add 2,107 beds in the event of a bioterrorist attack.

Figure 24. Additional Hospital Beds Needed to Address Surge (Colorado Front Range, 2003)

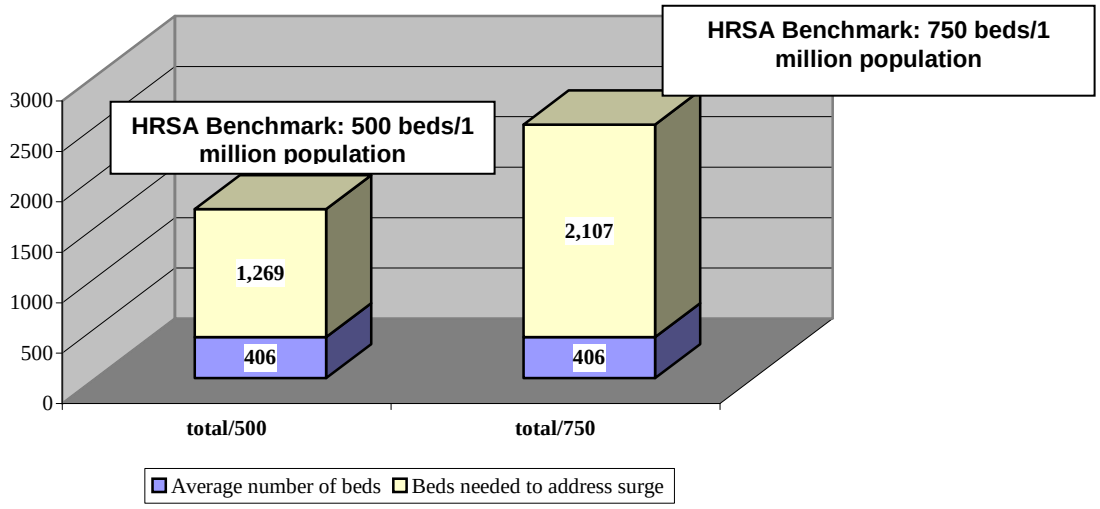


Source: NDMS FCC Colorado Front Range, Col Debra Tenney, Program Manager

Notes:

- Average is based on the average number of available beds from January through March 2003, as reported to NDMS.
- Maximum is based on the reported total number of beds that could be made available in 48 hours as reported to NDMS (as opposed to the average, which is based on number of beds that could be made available within 12 hours).
- Population for the Colorado Front Range was provided by 2000 US census data for Front Range counties.

Figure 25. Additional Hospital Beds Needed to Address Surge (Utah Salt Lake City area,2003)



Source: NDMS FCC Utah Salt Lake City, Zane Shaw, Program Manager

Notes:

- Average is based on the average number of available beds from January through July 2003, as reported to NDMS.
- Population for the Utah Salt Lake City Area was provided by http://www.lonelyplanet.com/destinations/north_america/salt_lake_city/

5.2. Medical Staffing

Current regional medical staffing resources were obtained from HRSA State Health Workforce Profiles for each of the six states in Region VIII (see Section 3.2).

Appendix F describes estimated needs for staffing alternative care sites based on the Department of Defense[9] Concept of Operations for the Acute Care Center staffing requirements for a 50-bed alternative care site (as outlined in Table 7) and the HRSA benchmark of 500 beds per million population. The requirements for a 50-bed unit were multiplied by 10 to obtain an estimate for the staffing necessary for 500 beds. It was assumed that there are fourteen 12-hour shifts per week and each professional would work 3 shifts per week. The number of shifts in a week (14) was multiplied by the staffing estimate for 500 beds per million population for each profession. It is estimated that it will require 14,777 staff to operate and support the 4,663 alternative care site beds needed in Region VIII based on the HRSA benchmark of 500 beds per million population. Of these 14,777 staff, 464 are physicians, 933 are registered nurses, and 1,865 are LPNs.

The 14,777 number could be less based on the beds available and that are currently staffed as described in section 5.1 above. Since available bed capacity is not available for all states and all regions of each state it is currently not possible to know to what extent this bed availability could offset alternative care site need for the six–state region. Consideration was given to whether there is an

[9] Skidmore S, Wall W, Church J. Modular Emergency Medical System Concept of Operation for the Acute Care Center: Mass Casualty Strategy for a Biological Terror Incident, May 2003.

excess/under supply of medical staff in the region. Some states and regions could have an excess supply of medical staff relative to current demand and other states and regions could have an under supply of personnel. This excess/under supply can also vary by type of personnel. Therefore, the next step was to determine a baseline for whether each state is meeting current demands for medical staffing. The national average of staffing levels per 100,000 population was the best estimate available at this time. This measure has its limitations, because some states may have a healthier population than others, there may be state regulatory requirements that impact state staffing levels, and studies have shown that medical practice behavior can vary by region.

Table 8 contains the expected staffing needs for alternative care sites ("ACS Need" in the table) in Region VIII, based on state population and current medical labor needs/surplus. Since HRSA data was used to determine current capacity, only those professions described in the HRSA Workforce profile are included in this table. For instance, secretaries and housekeeping personnel are not included in Table 8 but are included in Appendix F. Excess capacity was calculated by subtracting the U.S. average per 100,000 population profession estimate from the state per 100,000 population profession estimate (see Section 3.2). Staff need minus excess capacity results in the net need. On the "Net need/Surplus" line, negative numbers signify a surplus, while positive numbers signify a shortage.

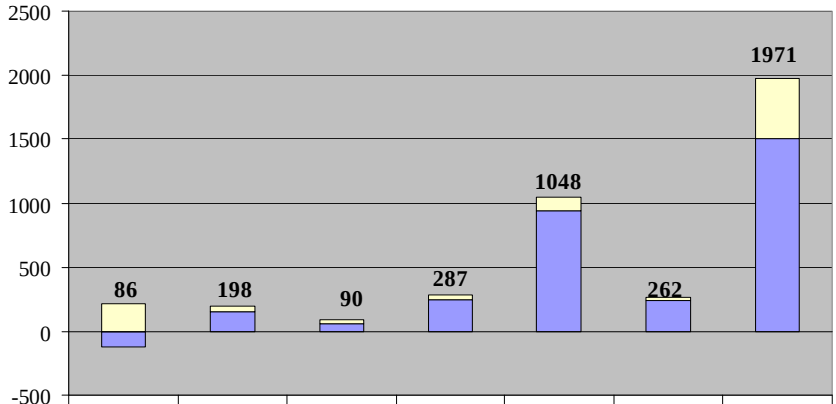
Table 8. Expected Staffing Needs for Alternative Care Sites, Region VIII
(Based on the HRSA benchmark of 500 additional beds necessary per million population)

		Colorado	Montana	North Dakota	South Dakota	Utah	Wyoming	Region VIII
Population	**1,000,000**	**4,301,261**	**902,195**	**642,200**	**754,844**	**2,233,169**	**493,785**	**9,327,454**
Physicians (MD/DO, 1998)	**50**							
ACS Need[b]		**215**	**45**	**32**	**38**	**110**	**25**	**465**
Current Capacity[c]		**129**	**-153**	**-58**	**-249**	**-938**	**-237**	**-1,506**
Net Need/Surplus		**86**	**198**	**90**	**287**	**1,048**	**262**	**1,971**
Physician Assistants (1999)	**25**							
ACS Need[b]		**108**	**23**	**16**	**19**	**55**	**13**	**234**
Current Capacity[c]		**258**	**45**	**90**	**128**	**45**	**35**	**601**
Net Need/Surplus		**-150**	**-22**	**-74**	**-109**	**10**	**-22**	**-367**
Nurse Practitioners (1998)	**25**							
ACS Need[a]		**107**	**22**	**16**	**19**	**55**	**12**	**231**
Current Capacity[b]		**946**	**27**	**-13**	**91**	**156**	**-15**	**1,192**
Net Need/Surplus		**-839**	**-5**	**29**	**-72**	**-101**	**27**	**-961**
Registered Nurses (1996)	**100**							
ACS Need[a]		**430**	**90**	**64**	**75**	**223**	**49**	**931**
Current Capacity[b]		**215**	**-307**	**1,740**	**1,895**	**-3,729**	**-123**	**309**
Net Need/Surplus		**215**	**397**	**-1,676**	**-1,820**	**3,952**	**172**	**1,240**
Licensed Practical Nurses (1998)	**200**							
ACS Need[a]		**860**	**180**	**128**	**150**	**446**	**99**	**1,863**
Current Capacity[b]		**-3,828**	**171**	**1,188**	**45**	**-2,077**	**-326**	**4,827**
Net Need/Surplus		**4,688**	**9**	**-1,060**	**105**	**2,523**	**425**	**6,690**
Nurse Assistants (1998)	**200**							
ACS Need[a]		**860**	**180**	**128**	**150**	**446**	**99**	**1,863**
Current Capacity[b]		**-5,506**	**532**	**3,121**	**2,423**	**-4,600**	**-306**	**-4,336**
Net Need/Surplus		**6,366**	**-352**	**-2,993**	**-2,273**	**5,046**	**405**	**6,199**
Respiratory Therapists (1998)	**50**							
ACS Need[a]		**215**	**45**	**32**	**38**	**110**	**25**	**465**
Current Capacity[b]		**43**	**-54**	**83**	**38**	**-313**	**10**	**-193**
Net Need/Surplus		**172**	**99**	**-51**	**0**	**423**	**15**	**658**
Clinical Laboratory Staff (1998)	**50**							
ACS Need[a]		**215**	**45**	**32**	**38**	**110**	**25**	**465**
Current Capacity[b]		**-1,118**	**-117**	**250**	**189**	**536**	**-198**	**-458**
Net Need/Surplus		**1,333**	**162**	**-218**	**-151**	**-426**	**223**	**923**
Social Workers (1998)	**50**							
ACS Need[a]		**215**	**45**	**32**	**38**	**110**	**25**	**465**
Current Capacity[b]		**946**	**595**	**347**	**468**	**715**	**168**	**3,239**
Net Need/Surplus		**-731**	**-550**	**-315**	**-430**	**-605**	**-143**	**-2,774**

[a]ACS Need = Alternative Care Site Need
[b]Current capacity is defined by the medical staffing capacity that is above or below the national average-based on staff per 100,000 population.
Source: HRSA State Workforce Profiles, 2000 and US Census, 2000

The following nine figures (26-34) depict the net need or surplus for each profession in Region VIII. Based on the HRSA benchmarks, all states in this region may need additional physicians (Figure 26). Region VIII as a whole is estimated to need an additional 1,971 physicians to address a surge based on the HRSA recommendation. The majority of this need is based on this region having an under supply of physicians, particularly in Utah.

Figure 26. Additional Physicians Needed for 500 Beds Per Million Population (Region VIII, 1998)

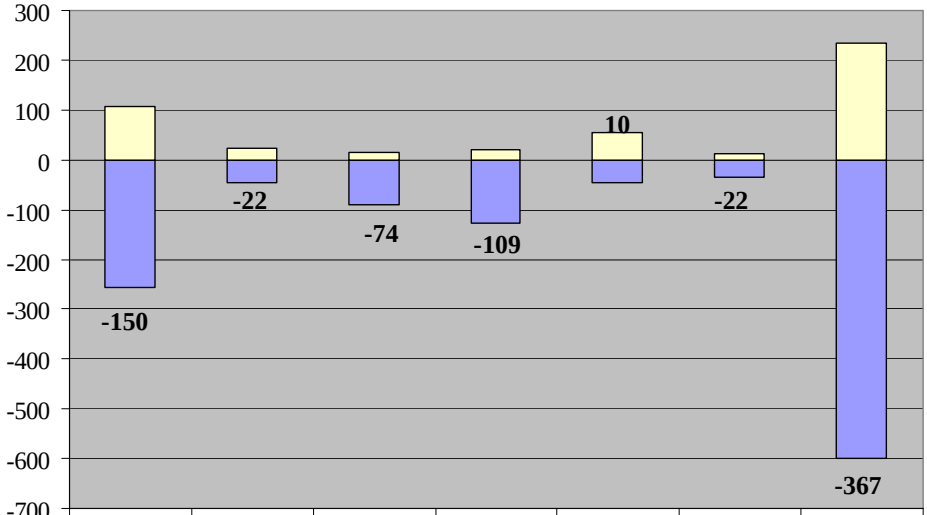


	CO	MT	ND	SD	UT	WY	REGION
Alternative Care Site Need	215	45	32	38	110	25	465
Current (excess/shortage) Capacity	-129	153	58	249	938	237	1506
Net Need to Meet Capacity and Address Surge	86	198	90	287	1048	262	1971

Note: Net Need-A negative number indicates an excess while a positive number indicates a shortage.
Source: HRSA State Health Workforce Profiles, 2000

Figures 27 and 28 indicate that there is a surplus supply of physician assistants and nurse practitioners in the region, compared to the national average. During a surge event there may be enough people currently in these professions to address surge need. For states such as Utah, North Dakota and Wyoming, other states in the region could potentially supplement their limited needs.

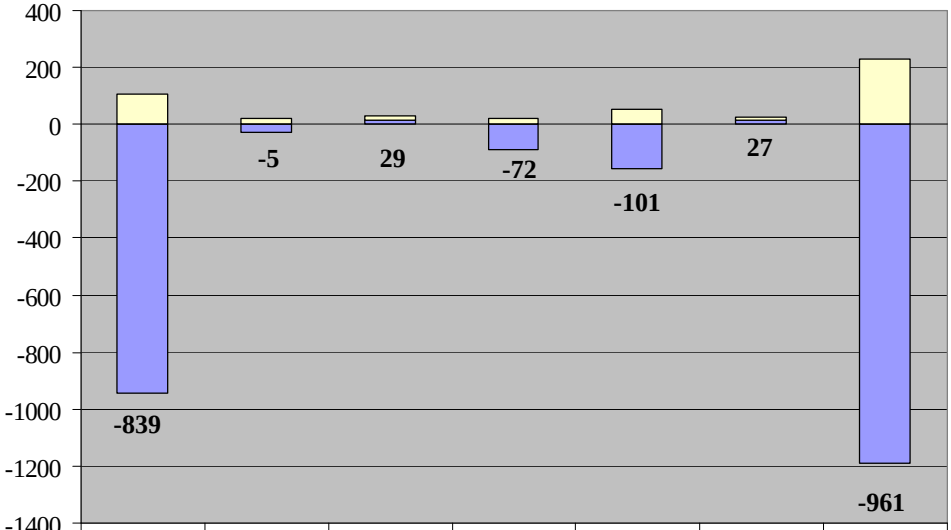
Figure 27. Additional Physician Assistants Needed for 500 Beds Per Million Population (Region VIII, 1999)



	CO	MT	ND	SD	UT	WY	REGION
Alternative Care Site Need	108	23	16	19	55	13	234
Current (excess/shortage) Capacity	-258	-45	-90	-128	-45	-35	-601
Net Need to Meet Capacity and Address Surge	-150	-22	-74	-109	10	-22	-367

Note: Net Need: A negative number indicates an excess while a positive number indicates a shortage.
Source: HRSA State Health Workforce Profiles, 2000

Figure 28. Additional Nurse Practitioners Needed For 500 Beds Per Million Population (Region VIII, 1998)

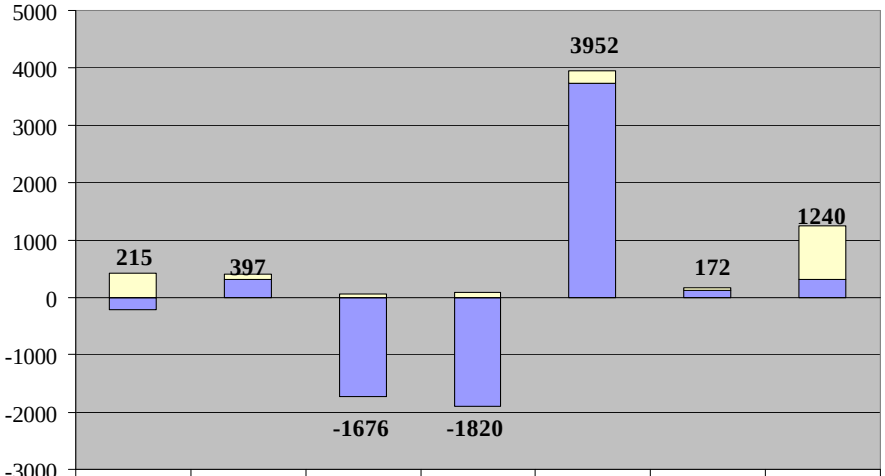


	CO	MT	ND	SD	UT	WY	REGION
Alternative Care Site Need	107	22	16	19	55	12	231
Current (excess/shortage) Capacity	-946	-27	13	-91	-156	15	-1192
Net Need to Meet Capacity and Address Surge	-839	-5	29	-72	-101	27	-961

Note: Net Need- A negative number indicates an excess while a positive number indicates a shortage.
Source: HRSA State Health Workforce Profiles, 2000

Figures 29 and 30 indicate that the region as a whole would need 1,240 additional RNs and 6,690 LPNs to address a surge. There is wide variation between the states and their current supply of RNs and LPNs. For instance, Utah has a great need for RNs to address current demands, while North Dakota and South Dakota have a surplus supply of RNs that could help offset this regional need. For LPNs, Colorado and Utah lead all states in need, while North Dakota has a surplus of LPNs when compared to the national average. The majority of the LPN need is based on a current need, where there is a regional excess demand for this profession.

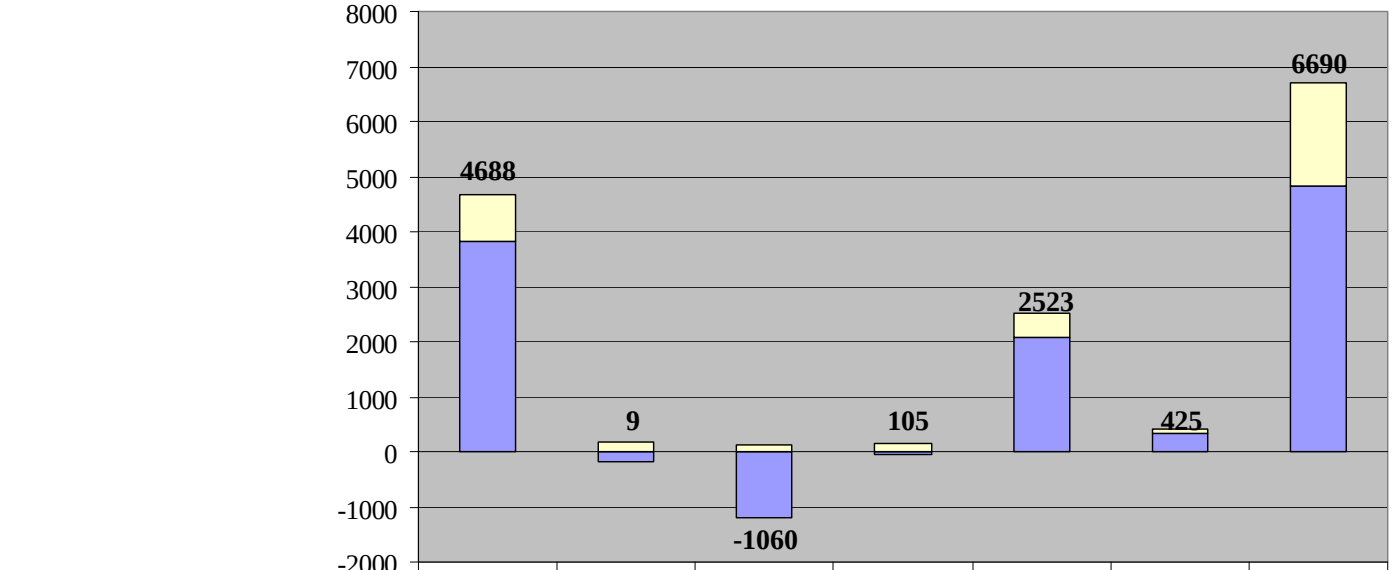
Figure 29. Additional Registered Nurses Needed For 500 Beds Per Million Population (Region VIII, 1996)



	CO	MT	ND	SD	UT	WY	REGION
Alternative Care Site Need	430	90	64	75	223	49	931
Current (excess/shortage) Capacity	-215	307	-1740	-1895	3729	123	309
Net Need to Meet Capacity and Address Surge	215	397	-1676	-1820	3952	172	1240

Note: Net Need- A negative number indicates an excess while a positive number indicates a shortage.
Source: HRSA State Health Workforce Profiles, 2000

Figure 30. Additional Licensed Practical Nurses Needed For 500 Beds Per Million Population (Region VIII, 1998)

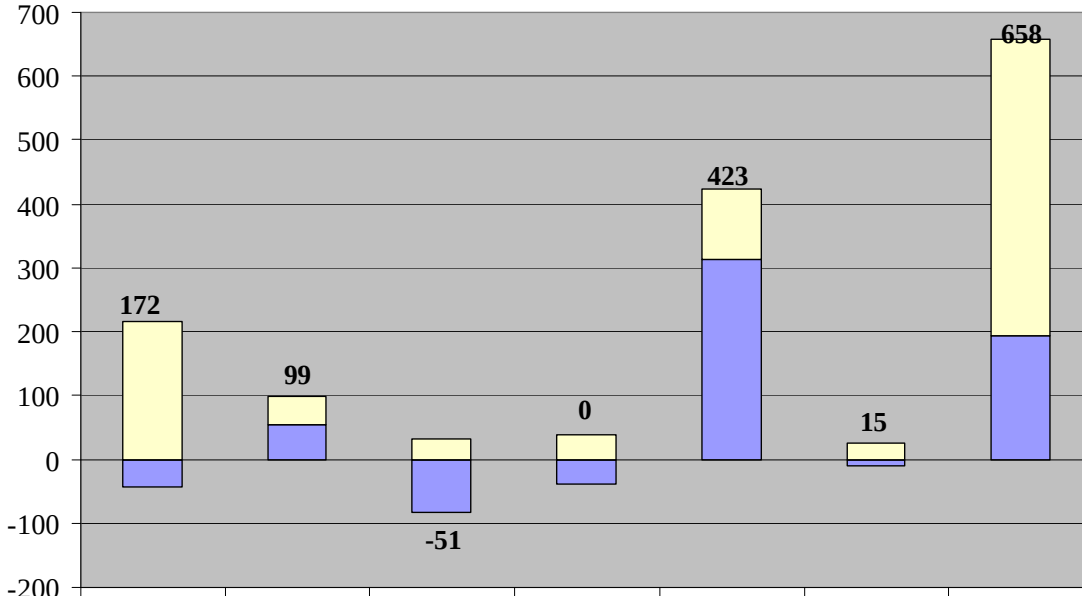


	CO	MT	ND	SD	UT	WY	REGION
Alternative Care Site Need	860	180	128	150	446	99	1863
Current (excess/shortage) Capacity	3828	-171	-1188	-45	2077	326	4827
Net Need to Meet Capacity and Address Surge	4688	9	-1060	105	2523	425	6690

Note: Net Need: A negative number indicates an excess while a positive number indicates a shortage.
Source: HRSA State Health Workforce Profiles, 2000

Figures 31-34 depict additional staff shortage or surplus for each of the supplemental health professions: respiratory therapists, social workers, clinical lab staff, and nurse assistants. Our region will need an additional 658 respiratory therapists, 923 lab staff, and 6,199 nurse assistants to address a regional surge. For respiratory therapists, only North Dakota has a surplus based on the national average, and South Dakota is expected to be able to meet its surge needs based on the HRSA benchmarks. Utah has a significant need for respiratory therapists because it already has a major shortage based on the national average. Colorado has a substantial need for clinical lab staff, while Utah may have an oversupply. The majority of the need for nurse assistants is based on a current environment of an excess demand to meet current medical needs. For social workers, the region has a large surplus for all states compared to the national average.

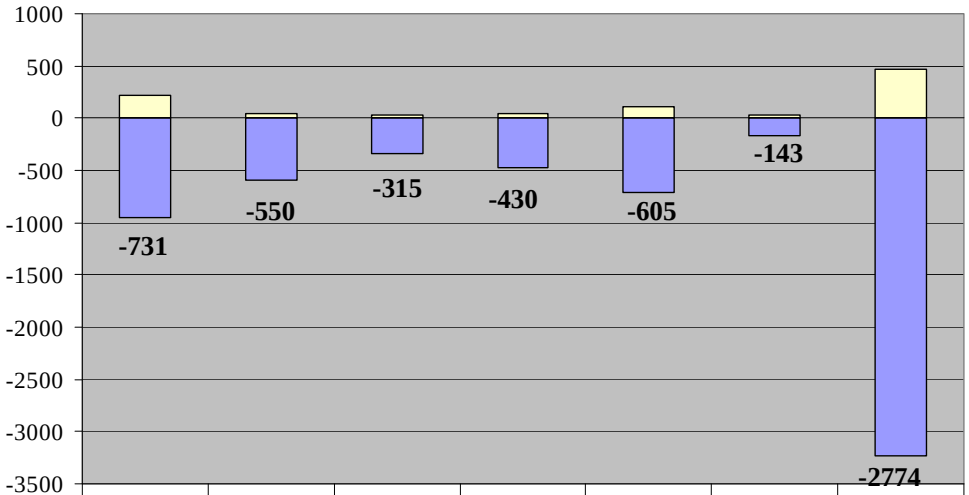
Figure 31. Additional Respiratory Therapists Need For 500 Beds Per Million Population (Region VIII, 1998)



	CO	MT	ND	SD	UT	WY	REGION
Alternative Care Site Need	215	45	32	38	110	25	465
current (excess/shortage) capacity	-43	54	-83	-38	313	-10	193
Net Need to Meet Capacity and Address Surge	172	99	-51	0	423	15	658

Note: Net Need: A negative number indicates an excess while a positive number indicates a shortage.
Source: HRSA State Health Workforce Profiles, 2000

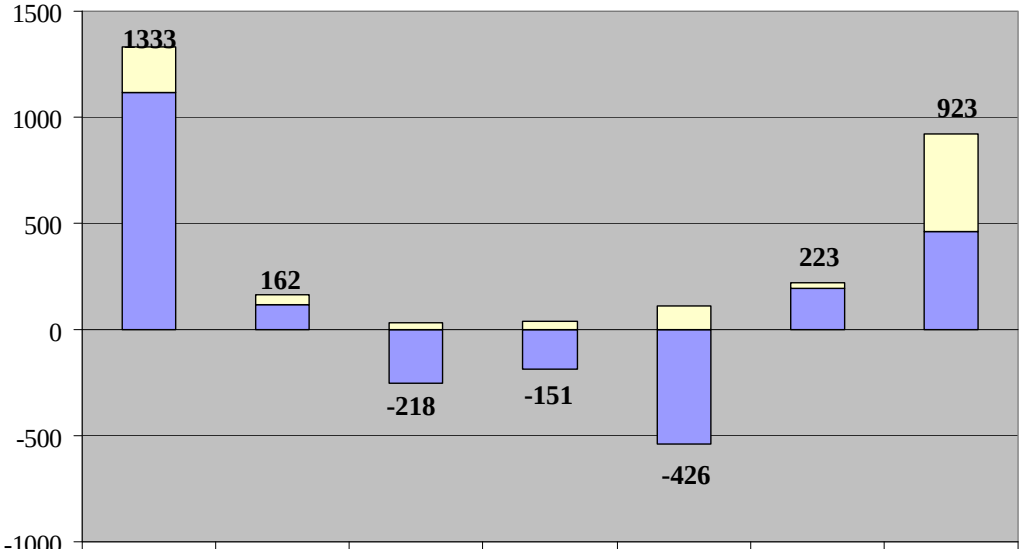
Figure 32. Additional Social Workers Needed for 500 Beds Per Million Population (Region VIII, 1998)



	CO	MT	ND	SD	UT	WY	REGION
Alternative Care Site Need	215	45	32	38	110	25	465
Current (excess/shortage) Capacity	-946	-595	-347	-468	-715	-168	-3239
Net Need	-731	-550	-315	-430	-605	-143	2774
Address Surge							

Note: Net Need- A negative number indicates an excess while a positive number indicates a shortage.
Source: HRSA State Health Workforce Profiles, 2000

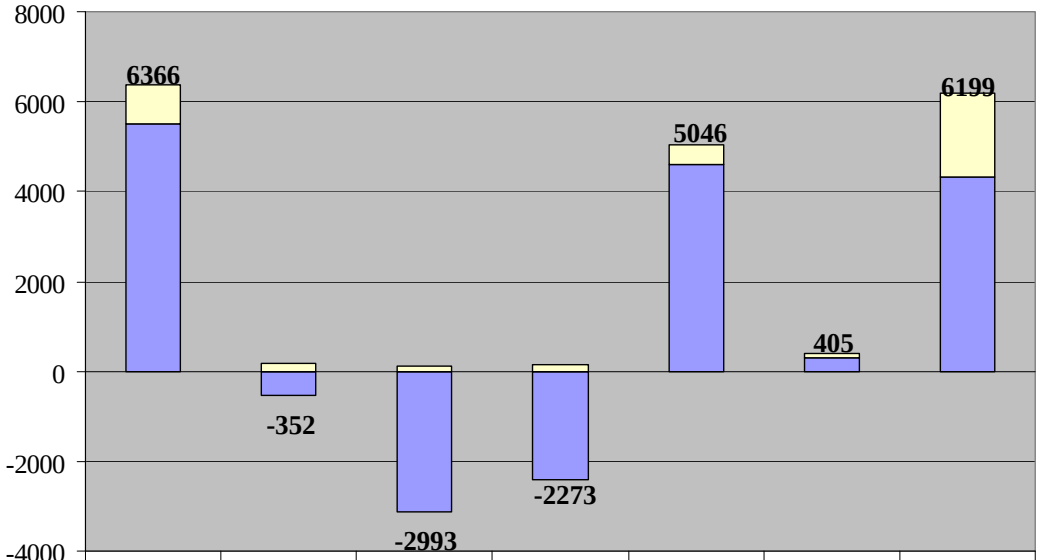
Figure 33. Additional Clinical Laboratory Workers Needed for 500 Beds Per Million Population (Region VIII, 1998)



	CO	MT	ND	SD	UT	WY	REGION
Alternative Care Site Need	215	45	32	38	110	25	465
Current (excess/shortage) Capacity	1118	117	-250	-189	-536	198	458
Net Need to Meet Capacity and Address Surge	1333	162	-218	-151	-426	223	923

Note: Net Need: A negative number indicates an excess while a positive number indicates a shortage.
Source: HRSA State Health Workforce Profiles, 2000

Figure 34. Additional Nurse Assistants Needed for 500 Beds Per Million Population, (Region VIII, 1998)



	CO	MT	ND	SD	UT	WY	REGION
Alternative Care Site Need	860	180	128	150	446	99	1863
Current (excess/shortage) Capacity	5506	-532	-3121	-2423	4600	306	4336
Net Need to Meet Capacity and Address Surge	6366	-352	-2933	-2273	5046	405	6199

Note: Net Need: A negative number indicates an excess while a positive number indicates a shortage.
Source: HRSA State Health Workforce Profiles, 2000

5.3. Equipment

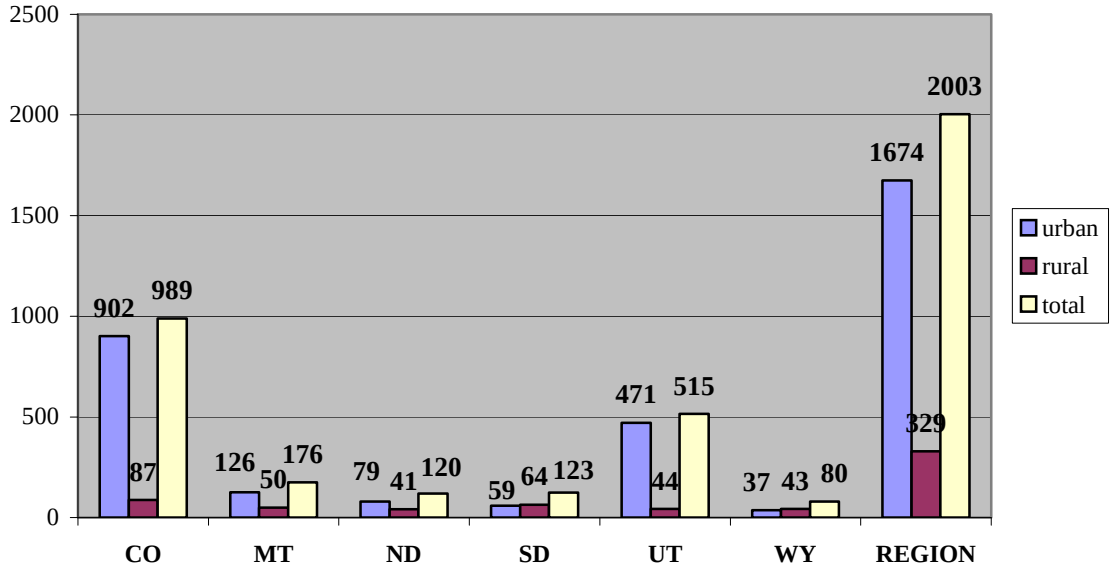
Current regional medical equipment resources are difficult to assess, particularly for a multi-state region. It was expected that the HRSA Hospital Preparedness Surveys would provide information describing the number of ventilators, personal protective equipment (PPEs) and other resources. The data from the hospital surveys from the six states was evaluated to determine whether these questions were asked and answered by the region's hospitals.

In developing measures of preparedness, equipment need was determined using the HRSA benchmarks. There is no HRSA benchmark for ventilator need. For PPE, the benchmark is 250 per million population in an urban area and 125 PPE per million population in a rural area.

Figure 35 displays the additional PPE figures that would be necessary in our region to meet the HRSA benchmarks. Urban areas would need 1,674 and rural areas would need 329 for a total of 2,003 additional PPE necessary to address the HRSA guidance. The difficulty with this need measure is that it is unclear what types of PPE are necessary in this number. Our region's HRSA Hospital Surveys only assess whether each hospital had PPE; specific counts were not requested by most states and when this information was requested it was not reliable. In order to assess regional preparedness for

equipment it is necessary for hospitals to accurately assess their PPE counts and types and for HRSA or other groups to provide benchmarks on ventilator and specific PPE needs.

Figure 35. Additional PPE Needed Per Million Population Based on HRSA Benchmarks



Source: US Census, 2002 and HRSA Hospital Preparedness Grant Guidance, 2003

5.4. Infrastructure

Infrastructure needs related to bioterrorism preparedness could range from basic facility functions, such as heating and ventilation and water supply, to parking capacity. For the purposes of this study we focused on infrastructure needs that are directly related to a bioterrorist event and for which HRSA has developed benchmarks. These include adequate decontamination systems and negative pressure and/or HEPA-filtered isolation facilities. It was hoped that the HRSA Hospital Preparedness Surveys from the six-state region would provide information on the hospital's current infrastructure related to decontamination and negative pressure/isolation capabilities.

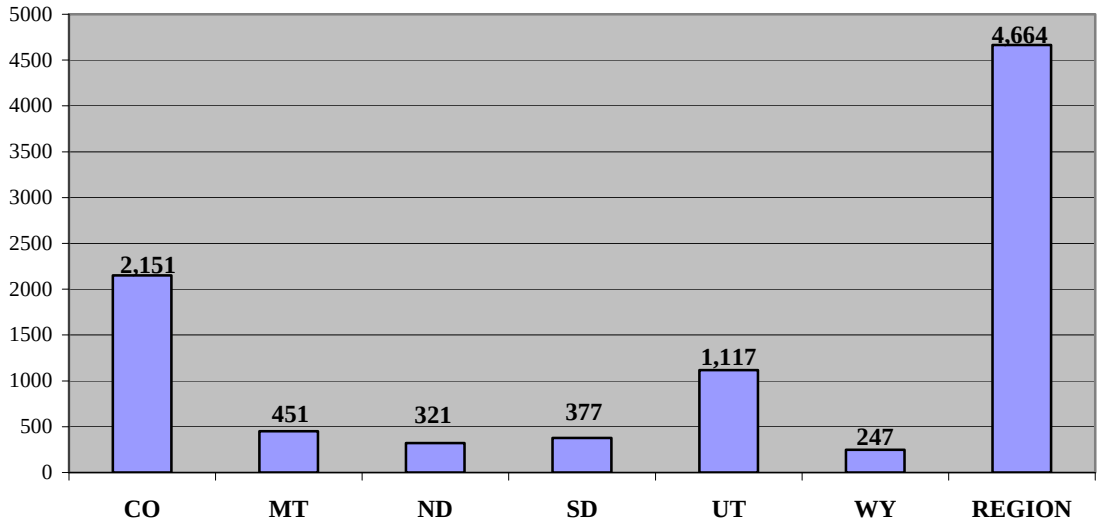
The HRSA benchmarks for infrastructure are:

- Adequate portable or fixed decontamination systems for 500 patients per million population
- At least one negative pressure, HEPA filtered isolation facility per health system able to support 10 patients at a time

Based on the HRSA benchmark, 4,664 patients would require adequate decontamination for a surge in our region (Figure 36). The HRSA hospital surveys asked if facilities had decontamination capability; they did not address how many patients each hospital with capability could handle. Roughly 1/3 of hospitals in three states that addressed this issue had this capability (Section 3.3, Figure 19). Even if we assume that this is representative of the region, it is still unclear exactly how many patients could be handled by these systems. The hospitals may need to be questioned as to the number

of patients they are able to decontaminate in a 24-hour period for this measure to be developed further to assess need using the HRSA guidance.

Figure 36. Number of Patients Requiring Adequate Decontamination for a Surge, Region VIII



Source: US Census, 2002 and HRSA Hospital Preparedness Grant Guidance, 2003

In order to measure current capacity of isolation beds in our region, we calculated a total of 828 isolation beds for the four states in the region (Section 3.3, Figure 21) who asked the question on the HRSA hospital surveys. To begin to address the HRSA benchmark need for at least one negative pressure, HEPA filtered isolation facility per health system able to support 10 patients at a time, we calculated the approximate number of isolation beds per hospital in Table 9. We were not able to access individual level data for each hospital, and therefore made an assumption by dividing total number of isolation beds by total number of hospitals responding to obtain an *average number of isolation beds per hospital estimate*. The region as a whole averages 2.7 isolation beds per hospital. It is probable that most of the isolation beds counted in the surveys are in urban facilities and therefore it hard to assume an "average per hospital", especially in our very rural region of the country. In addition, the HRSA benchmark is unclear as to how many isolation beds are needed, the guidance calls for one facility per health system to support 10 patients. Further clarification of a health system is necessary in order to accurately measure our region's need.

Table 9. Isolation Beds per Hospital (Region VIII, 2002)

	Colorado	Montana	North Dakota	South Dakota	Utah	Wyoming	Region VIII
Number of responding hospitals	56	62	44	68	52	29	311
Number of isolation beds	458	98	65	Did not ask question	207	Did not ask question	828*
Average number of isolation beds per responding hospital	8.2	1.6	1.5		4.0		2.7*

*Calculations are based on available data. South Dakota and Wyoming did not address question and are therefore not included in regional totals.

Source: State HRSA Hospital Preparedness Survey Results, 2002-2003, Federal Region VIII.

Chapter 6. Isolation/Quarantine

Patient isolation and population quarantine comprise two methods that have been used intermittently through history to deal with outbreaks of infectious disease. Unfortunately, historical data would lead us to believe that frequently they were inappropriately or unsuccessfully utilized (Barbera 2001). Both of these techniques, in varying degrees of application, may play a significant role in controlling communicable transmission following a large-scale bioterrorist attack or a naturally occurring infectious pandemic. Unfortunately, knowledge and experience in the large-scale utilization of these techniques has fallen into disuse, with no large-scale quarantine being implemented in recent US history and large-scale patient isolation not being practiced since the advent of antibiotic treatment for tuberculosis. These concepts are rarely studied by the healthcare community today, although the recent outbreaks of severe acute respiratory syndrome (SARS) have rekindled some interest. Because of the potential importance of these techniques in helping combat a large-scale bioterrorist attack, these concepts were discussed by the RMBT Working Group in an effort to develop characteristics and identify unresolved issues associated with having facilities successfully serve as isolation or quarantine units.

6.1 Definitions

Historically there has been much confusion about and misuse of the terms “isolation” and “quarantine”. Useful and coherent definitions of these terms are offered by Barbera, et al. (Barbera 2001).

- **Isolation:** Separation and confinement of individuals known or suspected (based upon signs, symptoms or laboratory findings) to be infected with a contagious disease to prevent them from transmitting the disease to others

- **Quarantine:** Compulsory physical separation, including restriction of movement, of populations or groups of <u>healthy</u> individuals who have potentially been exposed to a contagious disease.

These definitions were used in the discussion of these topics by the RMBT Working Group.

6.2 Identified Issues

As would be expected, there was much discussion (and little agreement) about the overall feasibility and utility of large-scale facility-based quarantine. There is a need for states to research current statutes providing legal authority for the public health sector to establish and enforce quarantine, and to establish enabling legislation or draft gubernatorial orders when current statute authority is found wanting. There were also issues identified concerning the physical enforcement of anything other than a voluntary quarantine, the medical decision-making

process to decide on a large-scale quarantine and the lack of appreciation of the severity of some of the potential adverse consequences versus the benefits of a large-scale quarantine. There was also discussion that home-based quarantine may be desirable over facility-based quarantine (as been demonstrated in dealing with SARS), although this creates problems for some vulnerable populations such as the homeless, the disabled, and the chronically ill.

Discussion of facility-based isolation (and treatment) also revealed several issues. Surveys of hospitals in four of the Region VIII states (Colorado, Utah, Montana, North Dakota) revealed that there is a maximum of 828 isolation beds, total, to serve these four states. It was also found that in three states, an average of only 28 percent of the emergency departments had isolation rooms. It is the general conclusion that this number of isolation beds would be inadequate in the face of a large-scale bioterrorist attack or a wide spread pandemic and would require conversion of entire hospitals, units of hospitals or outside facilities to support isolation.

The willingness of any hospital to become a designated isolation facility has become an issue. Utah, in their survey, found that 23 percent of their hospitals would be willing to be so designated, but this number, in reality, might be smaller, based upon the fear associated with the agent in question. Some institutions may be willing to be an isolation facility when dealing with plague (which is treatable and can be prophylaxed against with antibiotics) although the number might decline if dealing with smallpox (which has very limited treatment options). Some institutions would be willing to be designated as an isolation facility if they were offered ongoing monetary support to enhance infrastructure and operations. It is clear that many hospitals fear the lasting stigma associated with being an isolation facility for a communicable agent, even after that agent has been controlled. There was some discussion of home-isolation for certain agents (such as smallpox), since little definitive treatment can occur in a hospital, although this brings forward several issues regarding family protection and support.

There was much concern expressed about the impact of the federal Emergency Medical Treatment and Active Labor Act (EMTALA) during a bioterrorist event. EMTALA requires a hospital to provide a medical screening examination for any patient presenting to the hospital's emergency department for care. This would be very problematic in the situations of a contagious patient showing up at a non-isolation institution, a non-contagious patient appearing at an isolation hospital or patients appearing at an over-crowded hospital rather than an active alternative care site. In these situations, EMTALA would actually be an impediment to best possible medical care. This issue can be addressed through state-level enabling legislation or draft gubernatorial orders. Recent rule interpretations by the Centers for Medicare and Medicaid Services (CMS) have made this less of an issue by allowing some flexibility during a bioterrorist event.

It was repeatedly emphasized that any large-scale quarantine or isolation effort mandates very close cooperation between local, state and federal officials during both the planning and implementation stages. There have been some efforts in these areas, but much remains to be done.

Facility Characteristics

The following facility characteristics/capabilities were identified to establish a facility as a <u>quarantine</u> unit:

- Willingness of facility owner to allow structure to be used as a quarantine facility

- Ability to provide basic human needs on an ongoing basis: food, water, shelter, heat, light, waste disposal, laundry

- Ability to provide other types of support, as indicated (low level medical care for those with chronic disease, counseling, etc.)

- Ability to provide protection for support workers as decided by public health experts, based upon the agent in question (PPE, vaccination, prophylactic antibiotics)

- Ability (in terms of physical layout and personnel) to limit access and enforce (if necessary) a lockdown procedure

- Communication capability

- Ability to deal with extensive media exposure.

Potential sites for a quarantine unit could include nursing homes, schools, churches, hotels, convention/event centers, portable tents/trailers, unused hospital areas (unlikely in a large-scale outbreak), meeting halls, military facilities, and government buildings.

The following facility characteristics/capabilities were identified to establish a facility as an isolation unit:

- Willingness of facility owner to allow structure to be used as an isolation facility – this may include reimbursement for costs associated with returning the facility to its previous use and a predefined plan to accomplish this

- Ability to provide basic human needs on an ongoing basis: food, water, shelter, heat, light

- Waste disposal – this may be complicated by much of the waste being of biohazard status

- Laundry – this may include capability to autoclave dirty linen prior to washing as is the current recommendation for smallpox-contaminated linen (Henderson 1999)

- Ability to isolate facility air flow to keep it from any nearby or attached non-isolation structure

- Ability to support designated level of care for ill patients (suction, oxygen, etc. if deemed necessary components)

- Ability to provide other types of support, as indicated (low level medical care for those with chronic disease, counseling, etc.)

- Ability to provide protection for care providers and their families as decided by public health experts, based upon the agent in question (PPE, vaccination, prophylactic antibiotics)

- Ability (in terms of physical layout and personnel) to limit access and provide appropriate entry/exit of infectious patients (based upon agent in question) and enforce (if necessary) a lockdown procedure

- Communication capability

- Ability to deal with extensive media exposure.

Potential non-hospital sites for an isolation unit become quite limited if the assumption is made that they will be able to support the same level of care as a hospital. If a lower level of care is accepted, sites could include clinics, day surgery centers, medical office complexes, nursing homes, schools, churches, hotels, convention/event centers, portable tents/trailers, meeting halls, military facilities, and government buildings.

Note: These characteristics are further delineated in the site-selection scoring tool (TAB 1).

6.3 Conclusion

The ability to adequately provide for quarantine and isolation facilities presents many difficult challenges and mandates close cooperation between public health and acute medical care sectors at local, state, regional and federal levels. Financial compensation may be an issue in establishing these facilities and would best be dealt with in advance. Advance institutional and alternative site evaluation should be performed to determine abilities/weaknesses for the facility to support quarantine and patient isolation issues.

Chapter 7. Other Surge Capacity Issues

The RMBT Working Group meetings also discussed additional issue areas that relate to surge capacity development. The issues may affect a region's planning efforts and could be taken into consideration when using the above tools. It is up to each area to decide if they want to address these issues in their surge capacity planning.

7.1 Risk and Crisis Communication

In October 2001, thousands of "worried-well" flocked to Washington, DC area hospitals for perceived anthrax concerns. This surge in demand overwhelmed the healthcare delivery system and impacted its ability to maintain services. Unprecedented demands for healthcare services related to anthrax also occurred in Florida, New Jersey and New York, and to some degree across the United States. The primary reason for these surges involved communication, more precisely inadequate health information and risk communication capacity. The Assistant US Surgeon General, Edward Baker, MD, MPH, in December 2001 summarized this weakness as:

> "...the major public health challenges since 9/11 were not just clinical, epidemiological, technical issues. The major challenges were communication. In fact, as we move into the 21st century, communication may well become the central science of public health practice."

There must be communication resources to inform the public about health emergencies, to provide them information about potential health impacts and to help them determine the most appropriate actions, if any, for their particular situation. Without such information and decision-support resources that are easily accessed, preferably for ones own home, the public's only alternative is to seek out information from healthcare systems thereby creating a greater need for surge capacity. A surge capacity system that includes both a risk communication component to inform the public via the media and a health information component where questions and concerns from the public can be addressed via contact centers or hotlines will ultimately minimize the need for surge capacity elsewhere in the healthcare delivery system.

It is therefore important for any surge capacity system to incorporate risk communication and health information components to more efficiently and effectively handle surges related to public health emergencies, rather than trying to accommodate them solely with surge capacity planning at hospitals and health departments. Though surge capacity planning and resources will still be needed for health emergencies, the objective of providing the public with accurate, consistent and up-to-date information is to reduce the overall surge demand. In order to better understand what constitutes these two additional components, basic principles about risk communication and potential solutions for providing health information with established community resources are addressed in this section.

During times of crisis people become stressed and upset. They tend to focus more on the negative aspects of a situation than on the positive. In addition, they often have very different concerns and perceptions of threat than those of the experts. Because of this, effective

communication with the public is crucial to overcome these barriers to information exchange and comprehension. When people are under stress they tend to have difficulty hearing, understanding, and remembering information. Even when the information being relayed is understood and remembered, the fear associated with the event can cause feelings of distrust. This distrust can result in people losing confidence in those in charge. Feelings that leaders are not listening, that 'experts' are not really competent, or that the 'whole' truth is not being told can arise during times of crisis.

Because of these factors, risk communication during a crisis is vital. Vincent Covello, of the Center for Risk Communication, defines risk as "a threat to that which we value or the probability of loss of that which we value". Risk communication is defined as "a science-based approach for communicating effectively in high-concern, high stress, emotionally charged, or controversial situations." According to the National Academy of Science, "risk communication is successful to the extent that it raises the level of understanding of relevant issues or actions and satisfies those involved that they are adequately informed within the limits of available knowledge." The objectives of risk communication are first, to provide knowledge and understanding of the situation at hand, second to enhance trust and credibility between the public and responders, and third to encourage constructive dialogue. Above all else, the goal is to avoid communication regret.

When trying to reach any goal or objective there are always challenges involved. Several challenges arise when dealing with the issue of risk communication. Both intra- and inter-organizational concerns come into play. Does your institution have an internal communication chain during a time of crisis? What other institutions do you need to be in contact with during this time? Other challenges arise in communication between the public and community organizations. How are these organizations going to relay information to the public? How is the public to contact the organizations with questions and to receive information? As stated by Monica Schoch-Spana, a Senior Fellow at the Johns Hopkins Center for Civilian Biodefense Strategies:

> "The general public should be approached as true allies in managing bioterrorism, and not as the problem to be managed."

No matter whether communicating within an organization or to the public, there are some basic tenets and four theories common to all types of risk communication. Understanding these theories and their associated strategies can improve communications in high-stress, high-concern situations. The four major risk communication theories are:

- Mental Noise Theory
- Trust Determination Theory
- Negative Dominance Theory
- Risk Perception Theory.

Mental noise theory. When people are stressed or upset, they have difficulty hearing information, understanding information, and remembering information. Providing messages to the public that are brief, concise, and clear while still providing all necessary information is a way to overcome this challenge.

Trust determination theory. When people are stressed or upset, they often distrust that others are: listening, caring, empathetic, honest, open, hard working, competent, and expert. Winston Churchill, by all accounts an effective risk communicator, suggested that you can establish trust by demonstrating compassion, empathy, conviction, courage, hope and optimism. While being informative, he suggests that speakers convey belongingness by using pronouns such as "we, our, us" versus "I, me, my" and that both listening and perseverance are practiced. Distrust can often cause people to take the position opposite of what others demonstrate. In a situation where little information is known, the "Seesaw Effect" (Peter Sandman, PhD) allows you to take the seat you don't want others to occupy. If you are worried and concerned your audience will likely take a wait and see stance. As more information becomes known it allows both seats to move to the fulcrum.

Negative dominance theory. When people are stressed or upset, they often focus more on the negative than the positive. A good rule to overcome this challenge is to follow every negative statement with three positive ones. Positive statements that direct the public to do something and give them some control greatly help counter negative statements. In addition, speakers must be careful to ensure that their non-verbal communication (gestures and physical positioning) is consistent with what they are saying.

Risk perception theory. When people are stressed or upset, their concerns and perceptions of threat are often different from those of experts. In a crisis, perception is reality for someone. Perception of a risk includes both the hazard and the outrage associated with it. A person's outrage is based on many factors that weigh upon perceived trust, control and benefits. The best way to address outrage is to accept it, understand that it is not the same for everyone, and provide information that will help people understand the situation and feel they have control. Perceptions of control are gained by knowledge, trust, input and participatory actions.

It is important to remember that while providing necessary information is essential during a time of crisis, listening is a fundamental component in gaining the trust of the community. Those who are in a position of leadership need to be understanding of the needs, wants, and feelings of the community they serve. Hearing and understanding prior to speaking to the public will create feelings of trust between the community and the experts, breaking down the barriers that arise during times of stress. One-on-one communication becomes very important when broader risk communication strategies fall short.

A way to address public concerns that may not be recommended even by the best risk communication efforts is to listen to individuals and then provide specific answers to their questions. This two-way communication or dialogue can greatly ease community concerns and help reinforce trust and credibility. A common way to provide this resource is to establish a contact center or hotline. Another AHRQ grant, the Rocky Mountain Regional Health Emergency Assistance Line and Triage Hub (HEALTH), has developed a model for surge capacity in providing public information that can decrease patient surges to the healthcare delivery system during bioterrorism or health emergencies.

There are many Internet resources for obtaining more information about risk communication and strategies for improving it. A partial listing follows:

Center for Risk Communication - New York City, NY (Vincent Covello, PhD)
- www.centerforriskcommunication.org

Peter Sandman Risk Communication Web Site
- www.psandman.com

Centers for Disease Control and Prevention – Emergency and Risk Communication
- www.cdc.gov/communication/emergency/curtools.htm

Harvard Program on Public Opinion and Health and Social Policy (Robert Blendon, PhD)
- www.researchmatters.harvard.edu/story.php?article_id=326

Agency for Toxic Substances and Disease Registry
- www.atsdr.cdc.gov/hec/primer.html

Agency for Healthcare Research and Quality
- www.ahrq.gov

7.2 Preparedness Considerations: Special Populations that are Vulnerable

In the event of a bioterrorist incident, special populations may be at increased medical risk compared to the general population. Special population categories can include people with a variety of characteristics, but for the purpose of bioterrorism preparedness the focus is on those segments of the general population who:

- Are more susceptible to disease
- Require special approaches to care
- Have difficulty with access to care
- May lack support structures to provide the individual with lower, non-hospital-based levels of care (e.g. home care).

The special populations of people that may have any of the above characteristics and are vulnerable include:

- Children and adults with disabilities
- Children
- Elderly
- Rural Residents
- Low income, including the homeless
- Immunocompromised
- Chronically ill, particularly with chronic respiratory illness
- Non-English Speaking.

This section describes the issues related to bioterrorism preparedness for some of the special populations listed above and the extent to which they are represented in Region VIII. A large portion of the population may be considered vulnerable according to the characteristics listed. The degree of risk will be highly variable not only between each of the groups of these special populations but also among those within each group. For instance, some members of the rural

population have greater access to health care than other rural population members depending on whether they live close to a rural hospital or clinic. In addition, the isolation and immobility of some disabled and elderly people may provide a lower medical risk compared to those mobile, younger groups during the event of a communicable incident.

One option for addressing the specific needs of these groups is to do nothing to specifically target special programs for preparedness, but insure that the needs of these groups can be supported through the general planning process. The other option is to identify and develop specific plans and programs that will address the needs of those most vulnerable to a bioterrorist incident.

Children and Adults with Disabilities

The American Disability Association (ADA) definition of disability is an individual who:

- Has a physical or mental impairment that substantially limits one or more major life activity.
- Has a record of such impairment.
- Is regarded by the covered entity as having such impairment.

The U.S. Census Bureau definition of disability is an individual who has:

- Difficulty performing certain functions, seeing, hearing, talking, walking, climbing stairs, lifting, and carrying.
- Difficulty with certain social roles: working at a job and around the house.

The types of disabilities include sensory, physical, mental, self-care, ability to go outside of the home, and employment disability. Some disabilities may require special approaches to care, such as those who are obese with limited mobility or those with an uncontrolled mental impairment. If obese patients are located at an alternative care site with cots, these cots may not be adequate for a larger patient. The majority of disabilities may have an effect on access to care and others in society who may help with lower, non-hospital-based levels of care. For example, there are limits in communication for the hearing impaired that may affect their access to care.

According to the U.S. Census 2000, 1 in 5 persons in the U.S. have some type of disability. Table 10 indicates that in the states in Region VIII, 1 in 6 persons are disabled, slightly less than the country as a whole.

Table 10. Disabilities (Region VIII, 2000)

	Population	Any Disability		Sensory Disability		Physical Disability		Mental Disability		Self-Care Disability	
		N	%	N	%	N	%	N	%	N	%
Colorado	3,926,325	639,991	16.3	129,569	3.3	263,064	6.7	164,906	4.2	74,600	1.9
Montana	831,694	145,546	17.5	36,595	4.4	80,126	9.6	40,753	4.9	17,466	2.1
North Dakota	586,289	97,910	16.7	21,639	3.7	41,627	7.1	24,624	4.2	11,140	1.9
South Dakota	686,094	144,578	21.1	26,072	3.8	52,143	7.6	26,758	3.9	13,036	1.9
Utah	1,998,373	297,758	14.9	61,950	3.1	117,904	5.9	83,932	4.2	33,972	1.7
Wyoming	451,175	77,151	17.1	18,949	4.2	34,740	7.7	19,852	4.4	8,121	1.8
Region VIII	8,479,950	1,372,934	16.2	294,828	3.5	589,604	7.0	360,825	4.3	158,335	1.9

Source: U.S. Census 2000

Children and Elderly

Children and elderly may require special approaches to care depending on their age and health status. Some believe that "children can be treated like small adults" and that no special approaches are necessary. However, this can be refuted by the clear needs for specialized airway equipment, IV equipment, and drug types and dosages needed for the appropriate treatment of children. The elderly also can be at various levels of health, which can vary dramatically from person to person of the same age. Beyond a certain age that has not been defined, all humans become frail and more susceptible to disease. For some of the frail elderly there may not be support structures available to provide lower, non-hospital-based levels of care. The following table describes the children and elderly population in Region VIII. Thirty percent of the population in the region are children and 12 percent are age 65 and over. Therefore, 42 percent of the regional population would be considered vulnerable under this category of special populations.

Table 11. Children and Elderly (Region VIII, 1999)

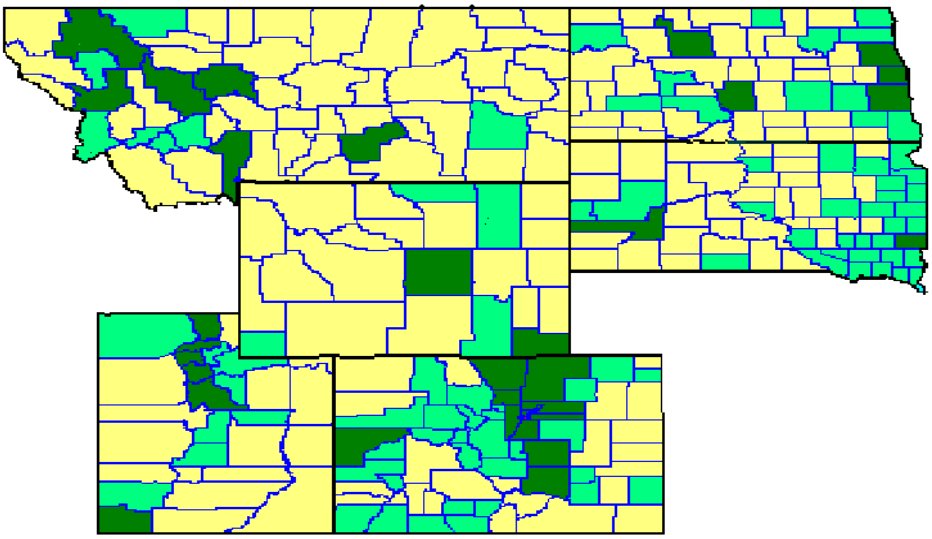
	Children (0-17 years)		Elderly (>65 years)		Total Vulnerable		Population
	N	%	N	%	N	%	
Colorado	1,151,118	29.3%	434,472	11.1%	1,585,590	40.4%	3,926,325
Montana	216,320	26.0%	122,806	14.8%	339,126	40.8%	831,694
North Dakota	146,812	25.0%	94,076	16.0%	240,888	41.1%	586,289
South Dakota	195,625	28.5%	1,083,212	157.9%	303,947	44.3%	686,094
Utah	713,012	35.7%	199,041	10.0%	912,053	45.6%	1,998,373
Wyoming	122,344	27.1%	59,222	13.1%	181,566	40.2%	451,175
Region VIII	2,545,231	30.0%	1,017,930	12.0%	3,563,170	42.0%	8,479,950

Source: U.S. Census 2000

Rural

As described in the Background section of the report, Region VIII is the most rural region of the country. Figure 38 indicates that 58 percent of the counties in Region VIII are frontier and 89 percent are rural counties. Table 12 describes the regional rural/frontier population. Over 38 percent of the population live in rural counties and 23 percent in frontier counties. The most frontier state is Wyoming and the most rural state is South Dakota.

Figure 37. Frontier, Rural and Urban Counties (Region VIII)



Frontier county is defined as having 6 or few persons per square mile.
Rural county has a population fewer than 50,000. A frontier county is also a rural county.
Urban county has a population greater than 50,000.

Table 12. Frontier, Rural and Urban Population (Region VIII, 1999)

	Frontier		Rural		Urban		Total Persons
	N	%	N	%	N	%	
Colorado	473,139	11.0	1,039,292	24.2	3,261,969	75.8	4,301,261
Montana	488,087	54.1	617,983	68.5	284,212	31.5	902,195
North Dakota	305,687	47.6	494,793	77.0	147,407	23.0	642,200
South Dakota	317,789	42.1	701,775	93.0	53,069	7.0	754,844
Utah	158,348	7.1	348,979	15.6	1,884,190	84.4	2,233169
Wyoming	364,905	73.9	364,905	73.9	128,877	26.1	493,782
Region VIII	**2,107,955**	**22.6**	**3,567,727**	**38.2**	**5,759,724**	**61.8**	**9,327,451**

Source: U.S. Census (2000)
Note: The frontier population is a subset of the rural population.

Populations in rural areas are at increased medical risk for various reasons. Rural areas often lack the capacity to address a surge event and therefore the population could lack access to medical services and trained personnel. Health care is often not available 24/7 as it is in urban areas, and communication technology is generally not as sophisticated. In the event of a communicable incident, rural populations could expose wide geographic areas since this population generally travels far distances as a way of life. Rural areas also lack the resources for surveillance. Finally, a bioterrorist incident could be confusing to rural populations since some agents (e.g. anthrax) are generally available in rural areas. For instance, the Montana Department of Public Health reported that during the anthrax cases of 2001 on the East Coast, farmers in Montana were giving animal anthrax vaccine to their families. If a bioterrorist event

occurred in an urban area, rural areas could also experience an influx of urbanites, overwhelming rural health care systems.

On the other hand, if a bioterrorist case was identified in a rural area, rural providers could provide advance warning to more populated areas. If the event was contained in an urban area, rural area providers could help supplement urban medical resources.

Others

The homeless are at a higher medical risk because of lack of access to care and, because of their living conditions, are more susceptible to disease. They also lack support structures that would provide lower, non-hospital-based levels of care. The homeless are also highly mobile, which can cause greater harm to an urban area if there is a communicable event.

About 10.4 percent of the population in Region VIII live below poverty (Table 13); that is lower than the national average of 12.4 percent. The poor are considered to have lower access to care, although with government programs such as Medicaid and the state child health insurance plan (SCHIP) the gap in access to health care for the poor is decreasing.

Table 13. Poverty Rates (Region VIII, 1999)

		N	Percent
Colorado	4,202,140	388,952	9.3
Montana	878,789	128,355	14.6
North Dakota	619,197	73,457	11.9
South Dakota	727,425	95,900	13.2
Utah	2,195,034	206,328	9.4
Wyoming	479,485	54,777	11.4
Region VIII	**9,102,070**	**947,769**	**10.4**

Source: U.S. Census 2000

Table14 describes the percent of the population that are uninsured. The uninsured may not have a primary care provider, and have reduced access to care. Over 13 percent of the region's population is uninsured, compared to 14 percent of the nation as a whole.

Table 14. Uninsured (Region VIII, 2000-2001 average)

	Population	2 Year Average w/o Health Insurance	Percent
Colorado	3,926,325	565,391	14.4
Montana	831,694	126,417	15.2
North Dakota	586,289	61,560	10.5
South Dakota	686,094	69,982	10.2
Utah	1,998,373	273,777	13.7
Wyoming	451,175	71,286	15.8
Region VIII	**8,479,950**	**1,168,413**	**13.3**

Source: U.S. Census

Those who do not speak English as their primary language may also have reduced access to care. This represents 11.7 percent of the regional population compared to 17.9 percent nationally (Table 15).

Table 15. Primary Language Other than English Spoken at Home: Population 5 and Over (Region VIII, 1999)

	Total	N	%
Colorado	4,006,255	604,019	15.1%
Montana	847,362	44,331	5.2%
North Dakota	603,106	37,976	6.3%
South Dakota	703,820	45,575	6.5%
Utah	2,023,875	253,249	12.5%
Wyoming	462,809	29,485	6.4%
Region VIII	**8,647,227**	**1,014,635**	**11.7%**

Source: U.S. Census 2000 Summary File 3 (Table P19)

Those who are more susceptible to disease and who require special approaches to care include people who are immuno-compromised and the chronically ill, particularly those with chronic respiratory illness. It will be important to identify these patients during the early stages of a bioterrorist incident so that their medical needs can be addressed.

7.3 The Relationship between Bioterrorism and an All Hazards Approach

The focus of this project is on developing a model for surge capacity and preparedness in the event of a *bioterrorist* attack; however, most discussions by experts in emergency response focus on an "all hazards approach" to preparedness. To demonstrate the degree to which a bioterrorism preparedness model can apply to an "all hazards" approach, a comparative table was created listing the factors to be addressed for each type of event (Table 16). This table provides an overview of the primary factors that need to be considered in developing a model or plan for emergency preparedness across the four traditional types of potential events: biological, chemical, nuclear and conventional. Biological events include those caused by infectious agents, both viruses and bacteria (which may or may not be communicable), and bacterial/plant derived toxins. Chemical events include those caused by chemical agents that directly cause injury/illness to the body (e.g. chlorine, sarin, mustard gas). These are not communicable, but can be spread to a limited degree by contamination and person-to-person contact. Nuclear events include those caused by radioactive contamination ("dirty bomb") or by nuclear explosion. Conventional events include those caused by natural disasters such as floods, tornadoes and hurricanes, and accidents such as plane and train crashes.

The primary findings from this broad overview for each type of event include:

- Comparing a biological event to the other three potential events, the only major differences in the factors considered lie in the area of decontamination and isolation/quarantine

- In a broad overview of factors considered for a plan, while the messages to the public, who is in command, how the event was identified etc. would vary, many issues and methods to address these events are similar regardless of the hazard type

- Because biological, chemical and nuclear events are not dealt with on a routine basis, knowledge and skills acquisition and retention represent a special preparedness challenge.

Table 16. Comparison of Bioterrorism to an "All Hazards" Approach

	Factors to Be Considered When Developing Preparedness Plan	Biological	Chemical	Nuclear	Conventional
1. Command and Control	Medical Operations Center	X	X	X	●
	Predictable Chain of Management (HEICS)	X	X	X	X
	Centralize and Coordinate Command to Maximize Use of Assets	X	X	X	X
	Common Language (HEICS)	X	X	X	X
	Streamline Decision Making	X	X	X	X
	Accountability of Position Function (HEICS)	X	X	X	X
	Documentation of Accountability (HEICS)				
2. Communications	How to keep all players current	X	X	X	X
	Early detection and communication/warning	X	X	X	●
	Specific preplanned messages	X	X	X	
	Physical communication systems	X	X	X	X
	Scalable communication systems	X	X	X	X
	Prevent/address mass hysteria	X	X	X	X
	Risk communication	X	X	X	
	Practice and test communication methods	X	X	X	X
	Public information	X	X	X	X
3. Mobilization	Local resources	X	X	X	X
	How to mobilize civilian response teams	X	X	X	X
	How to utilize civilian responders/volunteers	X	X	X	X
	Process to track/validate skills	X	X	X	X

	Factors to Be Considered When Developing Preparedness Plan	Biological	Chemical	Nuclear	Conventional
4. Operational Sustainability	How to plan for sustained staffing and support	X	X	X	X
	What to do when maxed out	X	X	X	X
5. Isolation/Quarantine	Quarantine and isolation plans	X			
	Quarantine levels—room, building, local, state	X			
	Education—public, law enforcement	X			
6. Resources Inventory	Define region and assets	X	X	X	X
	Maintain inventory of assets	X	X	X	X
	Tracking of resources during incident	X	X	X	X
	Distribution of resources	X	X	X	X
7. Knowledge Use and Sharing	Overcome reluctance to share info/expertise	X	X	X	●
	Widespread knowledge sharing-don't reinvent the wheel	X	X	X	●
	Share and disseminate best practices	X	X	X	●
	Coordinate with others-don't duplicate effort	X	X	X	X
	Learn language and implement emergency management	X	X	X	X
8. Decontamination	Decontamination	●	X	●	
	Personal Protective Equipment	X	X	X	

	Factors to Be Considered When Developing Preparedness Plan	**Biological**	**Chemical**	**Nuclear**	**Conventional**
9. Financial	Reimbursement	**X**	**X**	**X**	**X**
	Liability	**X**	**X**	**X**	**X**
	Employee Compensation	**X**	**X**	**X**	**X**
	Infrastructure limitations/crowding	**X**	**X**	**X**	**X**
	Cost Effective Activation (HEICS)	**X**	**X**	**X**	
10. Evaluation	Determine Measures of Preparedness	**X**	**X**	**X**	**X**
	Ability to Test Measures of Preparedness (drills, exercises)	**X**	**X**	**X**	**X**

Note: X = Primary
● = Secondary

Chapter 8. Example of a Regional Exercise

The unique characteristics of this project were the driving factors for creating and implementing a regional bioevent-based disaster orientation exercise. The members of the RMBT Working Group had collaborated for 8 months discussing regional issues related to bioterrorism surge capacity. Some of the issues were unique to this region, where the population is widely dispersed and the majority of the medical resources are centralized in a few locations.

The collaboration from all levels of government and from various programs also offered unique insight into some of these regional issues. For instance, the Department of Defense members were able to share their specialized expertise in mobile disaster medical surge capacity development. These DoD resources may or may not be available for civilian use during a bioterrorist event, based upon other resource obligations the military would be under at the time of the event

Since medical response will be local during the initial period after an attack, the RMBT Working Group decided to test the mobilization of medical resources across state lines through an orientation exercise during the final phase of the project. This exercise would address some of the concerns by the six states in meeting surge needs in the event of a bioterrorist attack and initially test some of the ideas/solutions developed by the Working Group.

One of the solutions proposed by RMBT to address surge needs was to equip a medical cache or armory that could be mobilized. As discussed in Section 4.2.1 *Supply Options*, three levels of supply caches were recommended (hospital augmentation cache, regional alternative care site cache and a comprehensive cache). These caches of medical supplies can be stored in various locations and mobilized to urban or rural areas and across state lines.

8.1 Objectives

The exercise was an "orientation exercise" (i.e., scoping type exercise) since many of the roles, issues and caches are still being defined and tested. An outside expert exercise coordinator from the Denver Office of Emergency Management was invited to develop and facilitate the exercise for the Working Group.

The five primary objectives of this exercise were to:

1. Determine the appropriate command and control procedures for deploying a mobile medical cache across state lines.

2. Using the 3 different levels of supply caches, determine which cache should be deployed and the factors considered.

3. Identify the legal limitations to deploying staff and supplies across state lines and potential solutions.

4. Determine the level of staffing that will be required and how and from where they will be mobilized.

5. Identify the additional supplies and equipment that will be needed, where they will come from, and how they will be mobilized.

8.2 Exercise Scenario

The RMBT Working Group based this exercise on a simple scenario of a biological event occurring in a rural area of our region. Aid was requested from a neighboring state with available caches.

"On August 8, 2003 at 10:15am, Colorado OEM has received a request from a neighboring state to possibly lend assistance under the EMAC agreement to a small community in their state. The 50-bed Medical Center in the community has become overwhelmed with an outbreak of an unknown diarrhea agent in a large group of motorcycle enthusiasts on their way to Sturgis, South Dakota. Public Health is investigating the possibility of a contaminated water supply. Despite the Medical Center's full status, patients complaining of chills, fever, and diarrhea are still seeking admission to the facility, with many existing patients becoming angry at the long delays and staff shortage. The state's Department of Public Health decides to set up an alternative care site in town to triage and treat suspected cases. The state does not have the resources readily available to quickly supply/staff this alternative medical facility and requests regional assistance. At 11:15am, Colorado OEM solicits medical assistance from the Denver OEM. Denver OEM has suggested the possible use of one of Colorado's medical caches such as Denver Health's due to proximity of the surge event."

One of the resources used for this exercise was the Colorado Gubernatorial Executive Orders developed by the State of Colorado (TAB 4). These orders address the issue of licensure requirements for physicians, nursing and emergency medical technicians. This exercise also utilized the Emergency Management Assistance Compact (EMAC), an agreement that can be utilized between states to share resources in disaster response. Of the 50 states, only California and Hawaii do not participate. This resource can be used by states in regional disaster response and coordinates with the Federal Response Plan (FRP).

8.3 Main Issues and Potential Solutions

1. Determine appropriate command and control procedures for deploying a mobile medical cache across state lines.

Issue #1: Who will ask and who will give permission to deploy the asset?

The group agreed that in the case of a *state owned asset*, the request and permission should be governor to governor through the EMAC or with mutual aid agreements between County Managers within each state for Border States. If it is a *locally owned asset*, mutual aid agreements should be developed in advance. If it is a *privately owned asset*, the receiving state's governor and the private entity should undertake negotiations.

Issue #2: Which entity "breaks down" and distributes the deployed cache?

The RMBT Group consensus was that this is a local responsibility. The asset should be sent to a centralized point and then it is up to the receiving state and local government to distribute. Local receiving authorities should decide what they want and need, where the people should go and what they should do.

Issue #3: What is the hierarchical structure for cache utilization?

This should be locally determined, but would likely mirror concepts put forward in Hospital Emergency Incident Command (HEICS).

2. Using the 3 different levels of supply caches, determine which cache should be deployed and the factors considered.

Issue #1: Which factors should be considered in requesting a *level* of cache?

There are 3 possible levels of cache developed by the RMBT Working Group. These assets may be owned by state or private entities. The requesting state could request the asset from either type of institution depending on what they need to address their surge requirements. Factors that should be considered include: Communicable or non-communicable event, access to medical supply resources at site, variation in deployment for each of the 3 caches, and acuity and number of patients.

Issue #2: Who will transport the cache?

The Working Group consensus was to contract with a local trucking company that can dispatch at anytime, or the local law enforcement. Caches should be in pre-positioned locations. Vehicles that pull the cache may be multi-use for efficiency purposes and availability issues.

3. Identify the legal limitations to deploying staff and supplies across state lines and potential solutions.

Issue #1: Licensing for health care providers from another state?

a. Investigate and potentially utilize National Reserve Corps concept.
b. Create enabling legislation re: licensing.
c. Develop gubernatorial orders (TAB 4).
d. Utilize Disaster Medical Assistance Teams (DMATs); they are federally credentialed.

Issue #2: When can the resources be deployed?

The Working Group debated whether resources should be deployed when the formal contract is signed or when the verbal agreement is made in the interest of time sensitivity. It is very likely that some resources may deploy on their own.

Issue #3. Who will be legally responsible for costs?

EMAC specifies that the recipient state will reimburse the providing entity for cost of supplies and staffing. If a private entity is providing the asset, an MOU should be signed during the requesting period.

4. Determine the level of staffing that will be required and how and from where they will be mobilized.

Issue #1: Does the cache come with staff?

May depend upon source of cache and any agreements made in advance or at time of deployment.

Issue#2: What will staffing needs be?

This is again a function of number of patients and severity of illness.

5. Identify the additional supplies and equipment that will be needed, where it will come from and how it will be mobilized.

Current caches are largely shelf-life-insensitive in terms of supplies and oriented towards basic level care in terms of equipment. Any expectations beyond that will require supplementation from additional resources (such as the Strategic National Stockpile) or entertaining concept of transporting patients to distant hospitals for ongoing care (e.g. utilizing the National Disaster Medical System).

Chapter 9. Conclusion

9.1 Limitations

Some of the limitations relate to the data that are presented in the profile of the region and measures of preparedness. The HRSA surveys used in profiling regional resources (Chapter 3) provided limited data on hospital equipment and infrastructure capacity. Since the surveys were not standardized instruments, the ability to profile the region and compare states was restricted. As state bioterrorism preparations are ongoing and dynamic, the data from the survey may not reflect current preparedness status. The hospital response rate for the surveys was less than 100 percent, which may have resulted in selection bias. The concern for hospital data confidentiality varied from state to state. This did limit the amount of data that was received from some states.

In Region VIII, the NDMS periodically gathers available bed data from hospitals in two geographic areas of the region. These data have been very helpful is evaluating day-to-day bed availability in these areas, but this type of data collection is not occurring in four of the states in this region.

When developing measures of bioterrorism preparedness (Chapter 5), staffing needs were defined by available healthcare personnel compared to national averages. The assumption that the national average for medical staffing is adequate to meet current needs may underestimate or overestimate the measures, although this is useful for relative comparisons between states and between regions. This is further complicated by the HRSA recommendation of being able to create and staff 500 surge capacity hospital beds per one million population. This recommendation represents a good starting point, but the justification for the 500 bed number is unclear, untested, and may be overly optimistic depending upon the biological agent and the scenario of exposure of a bioterrorist event.

The caches and site selection matrix (Chapter 4) lack actual demonstration of their validity in the field. While the alternative care site matrix was tested via an orientation exercise, further real time testing at the local level will help to validate this tool. The Level I and Level II caches will still need to be deployed in the field to determine their adequacy. There is a need for supplemental oxygen to be available at alternative care sites, although given the current economic environment it is not feasible for states and providers to purchase and store the necessary components. The engineering logistics for installation at an alternative care site are complicated and labor intensive.

Developing a model/tool for isolation quarantine is challenging. There have not been any large-scale isolation or quarantine events in recent history, so providers lack experience in dealing with these issues. It is also unknown as to whether medical and support staff would be willing to work in an isolation/quarantine environment; this issue can not be assessed through an exercise.

Addressing the special needs of vulnerable populations (disabled, elderly, poor, children, immuno-compromised, chronically ill, homeless) during the event of a bioterrorist incident is challenging with fixed resources and time constraints, particularly since the characteristics of these groups widely vary. The medical needs for these patients may need to be incorporated into current preparedness plans.

In developing a model to address medical resource needs in the event of a bioterrorist incident, monetary resources are a constraint when developing practical potential solutions. Exercises and equipment are expensive and are often not a priority for funding by providers or government.

9.2 Recommendations

The RMBT Working Group recommends the following:

- HRSA and other partners work together to clarify benchmarks for decontamination and isolation infrastructure requirements. The current guidance makes it difficult for states to assess their need.

- Any future hospital preparedness survey should be standardized across states to facilitate regional assessments of preparedness.

- States should investigate the development of an information system to report snapshot or real time hospital bed availability.

- The medical cache and regional assistance concepts should be tested through actual cache deployment across state lines via a real time field exercise.

- State and local bioterrorism planners can use the site selection matrix tool at the local level to identify and rank alternative sites for care and isolation/quarantine facilities in advance of actual need. (Current plans are for this tool to be used in Athens, Greece, to assist in the support for the Summer Olympic Games.)

- The military should continue to work with the civilian population on bioterrorism preparedness since they have the knowledge, experience and technology to enhance civilian efforts.

- Relationships between neighboring states should be strengthened through joint planning and exercises.

- Other regions of the country may benefit by applying a similar methodology in developing regional measures of preparedness.

- States should do advanced planning to enable and facilitate medical personnel crossing state borders to provide care in the event of a bioterrorist event through state legislation or draft order creation.

- In our region, use of physician assistants and nurse practitioners as physician extenders may assist in dealing with a possible physician shortage during a bioterrorist event.

- Regional advance planning should be encouraged for issues of patient isolation and quarantine.

Participants from all parts of the region benefited from this project by learning through collaboration from those with knowledge and experience in bioterrorism preparedness. The RMBT working group also did not have the solutions to all of the difficult issues that were raised. One issue that was repeated throughout the time frame of this project is that healthcare providers will need to lower the bar for acceptable care during a bioterrorist event and the public will not be able to expect "care as usual". Much was gained by the civilian sector and the military joining in information sharing and preparedness planning, resulting in a potent partnership. This project allowed for the development of tools that have applicability and usefulness to others involved in preparedness planning. Region VIII, through the implementation of many of the ideas developed by this project, has improved its preparedness to deal with a bioterrorist event.