Analysis of Disaster Preparedness and Response in North Carolina with a focus on the State Medical Assistance Team Program

By
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Abstract
Hazards threaten North Carolina every day and have the potential to harm people and disrupt vital health care infrastructure. North Carolina developed the State Medical Assistance Team (SMAT) program to make the state better equipped to prepare for, and respond to, these potential hazards. The SMAT program is a combination of local, regional, state, and federal resources. The majority of funding is provided by the Hospital Preparedness Program (HPP), a federal grant program managed by the U.S. Department of Health and Human Services (HHS). Oversight and guidance are provided by the North Carolina Office of EMS (NC OEMS), North Carolina’s 8 Regional Advisory Committees (RAC), and the 8 Lead Trauma Centers. Team personnel are volunteers with backgrounds in health care and various support areas and are employed by local EMS agencies and fire departments, counties, hospitals and health care organizations (HCO), private businesses, and nongovernmental organizations.

This paper reviews disaster preparedness and response in North Carolina, describes the design and structure of the SMAT program, and highlights both strengths and weaknesses of the program in order to identify opportunities for the program to enhance its ability to optimally deliver services in North Carolina. The paper uses three sources of data to develop this analysis: primary and gray literature, in-depth interviews with SMAT stakeholders, and a web-based survey of SMAT personnel. Results demonstrate that over the past decade the SMAT program has effectively responded to disasters and provided medical support at special events. The results also indicate that the program can enhance its presence and preparedness by continuing to improve training, oversight, and program management by the RACs and the NC OEMS.
Acknowledgements

Thank you to the SMAT personnel for thoughtfully and enthusiastically responding to my questionnaire, for donating your time and skills to the SMAT program, and for caring for your fellow citizens when they are in need. Thank you to Dr. Roy Alson, Debbie Gilbert, Dale Hill, Randy Hoffman, Sarah Seiler, Chris Starbuck, and Jessica Thompson for taking the time to speak with me. Your knowledge and enthusiasm about disaster preparedness and the SMAT program provided me with invaluable information and insights and pushed me to produce a paper that will, hopefully, be of some benefit to each of you. Thank you to the personnel at the North Carolina Office of EMS, in particular Mary Beth Skarote, for helping distribute the questionnaire. I know that the NC OEMS has many obligations and appreciate you taking the time to help me with the project.

Emily, thank you for your support, guidance, and transcription skills, for knowing when to push me and when to let me coast, and for telling me to stop analyzing and just start writing! Thank you to Dr. Jeff Williams for agreeing to be the Second Reader and for the guidance, the introductions, and the support throughout the process. Thank you to Dr. Sue Tolleson-Rinehart for being an amazing Advisor. Your seemingly limitless guidance and support throughout the process was instrumental in helping me complete this project. My TOCAs sit lined up on my desk and make me proud every time I look at them.
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Introduction

This paper provides a comprehensive review and evaluation of the North Carolina State Medical Assistance Team (SMAT) program using qualitative and quantitative methods of data collection including primary and gray literature review, in-depth interviews with key program stakeholders, and a web-based survey of SMAT personnel. The primary goals of the paper are to describe the design and structure of the SMAT program, including funding, training and response capacity and capabilities, and program management and oversight, and to highlight both strengths and weaknesses in order to identify opportunities for the program to enhance its ability to optimally deliver services in North Carolina.

Hazards and Disaster Planning

Hazards threaten individuals, communities, counties, states, and the nation every day. The Federal Emergency Management Agency (FEMA) defines a hazard as “an event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss” (1, pg. xxv). They are divided into 3 categories: natural hazards, such as hurricanes, tornadoes, ice storms, and floods; technological, or human-caused, hazards such as fires, hazardous materials (HazMat) events, and nuclear accidents; and intentional hazards, such as war and terrorist events (2).

The severity of a potential hazard depends on the geography, population density, infrastructure, industries, and ability of the affected area to manage the hazard, as well as any secondary problems that develop as a result of the primary event. A hazard causes an emergency when it “challenges the ability to rapidly and effectively respond…” (2, pg. 17) and stretches, but does not overwhelm, the capacity and/or capabilities of available resources. The same hazard,
occurring in a location with a different set of characteristics, causes a disaster when it overwhelms the capacity and/or capabilities of the local resources and stretches the population beyond their ability to effectively manage the effects of the hazard (3). Disasters that affect the health and well-being of individuals are also known as Catastrophic Health Events (CHE). Identifying hazards allows agencies to prepare for, and respond to, a potential event. This process is termed hazard vulnerability analysis (HVA). Once given hazards are identified, resources, including funding, equipment, training, and personnel, are allocated and an Emergency Operations Plan (EOP) is developed for a hazards based on the probability of occurrence and severity of the consequences. Individuals with experience in emergency management and an understanding of operational capabilities and emergency response are usually given this task.

HVAs can be integrated horizontally across other organizations and communities and vertically through expanding levels of oversight. For example, a health care organization (HCO) develops an HVA and shares it with the local government and affiliated HCOs in the community. The hospital also shares its HVA with a regional committee that oversees all of the HCOs and counties in its region. This committee develops a regional HVA based on information collected from the individual HCOs and its own regional assessment. Multiple regional HVAs are then shared with the state to develop a statewide HVA (2).

In North Carolina, regional oversight is provided by 8 Regional Advisory Committees (RAC, Appendix B). All HCOs, counties, and EMS systems are required to affiliate with a RAC, which develops a regional HVA, oversees regional disaster planning, and advises its member hospitals, counties, and EMS systems about these topics. The North Carolina Division of Emergency Management (NC EM), a division of the North Carolina Department of Public
Safety (NC DPS), manages the statewide HVA and the North Carolina Emergency Operations Plan (NC EOP), which outlines disaster planning for identified hazards (Appendix C).

The field of Emergency Management deals with mitigation, preparedness, response, and recovery, the four stages of disaster planning. These stages form a theoretical circle. Mitigation occurs prior to a disaster and reduces “the loss of life and property… by avoiding or lessening the impact of a disaster” (4, pg. 11) through improving existing infrastructure and educating and preparing the community for potential hazards. Recovery occurs after a disaster has occurred and includes cleaning up, rebuilding, and restocking (4). These stages are temporally removed from a disaster, in contrast to preparedness and response, which occur before, during, and immediately following a disaster (3).

Disaster preparedness is a continuous process that when a hazard is identified and continues until the moment a disaster occurs. It is a “combination of planning, resources, training, exercising, and organizing to build, sustain, and improve operational capabilities”. It includes “identifying the personnel, training, and equipment needed for a wide range of potential incidents, and developing jurisdiction-specific plans for delivering capabilities” and capacity to address the incident. Disaster response occurs during and in the aftermath of a disaster. It includes the “immediate actions to save lives, protect property and the environment, and meet basic human needs” as well as “the execution of emergency plans and actions to support short-term recovery” (4, pgs. 15-16).

Disaster preparedness and response must be flexible, scalable, and adaptable to address the unique threats and challenges posed by each hazard. An identified hazard may evolve into a disaster that exceeds the expected size and/or scope, and preparing for all potential hazards may
be difficult or impossible due to resource constraints. Disaster planning is performed by all levels of government, nongovernmental organizations, and the private sector (3).

Over the past decade, in large part due to the events of 9/11 and Hurricane Katrina, the Federal government has enacted legislation, produced guidelines, rules, and protocols, and developed and strengthened grants pertaining to disaster planning (Appendix D). North Carolina has also worked diligently to strengthen guidelines and develop new programs to enhance disaster preparedness and response (Appendix E). One of the state’s greatest achievements is the development of the SMAT program.

**SMAT Program**

*Introduction.* The SMAT program is a response system developed after the September 11th attacks that is scalable, flexible, and adaptable. It responds to local, regional, intrastate, and interstate events and is divided into 3 tiers that determine the size, responses, and capabilities of each team (Table 1). The 29 SMAT III are the local, rapid-response elements of the program. The 8 SMAT II are the regional response elements with more personnel, equipment, and capabilities than the SMAT IIIs, and the SMAT I/Special Operations Response Team (SORT) provides response, education, decontamination, and support capabilities to the other tiers. Team personnel are almost exclusively volunteers from public service departments (fire, EMS, law enforcement), hospitals and HCOs, private businesses, and nongovernmental agencies. The SMAT program is funded primarily by the Hospital Preparedness Program (HPP), a cooperative agreement (grant) managed by the Assistant Secretary for Preparedness and Response (ASPR) of the U.S. Department of Health and Human Services (HHS). The SMAT program is a component of North Carolina’s State Medical Response System (SMRS), which also includes the Medical Reserve Corps (MRC) and several other assets that provide a medical and public health response
during events that strain or overwhelm the health care system. The North Carolina Office of Emergency Medical Services (NC OEMS) manages the SMRS and the SMAT program and is the lead state agency tasked with managing Disaster Medical Services, or North Carolina Emergency Support Function-8A (NCESF-8A), in the NC EOP (5, 6).

Table 1. Missions, Capacity, and Capabilities of the 3 SMAT Tiers

<table>
<thead>
<tr>
<th>Mission</th>
<th>Capacity &amp; Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SMAT II</strong></td>
<td></td>
</tr>
<tr>
<td>Alternate Care Facility (ACF)/Medical surge</td>
<td>Establish 40-50 patient beds and necessary personnel to augment care at existing hospital</td>
</tr>
<tr>
<td>Mass gathering/Large-scale event standby</td>
<td>Provide medical care at a scheduled event to reduce burden on local hospitals and EMS system</td>
</tr>
<tr>
<td>Medical Field Station</td>
<td>Set up Western Shelter “M8” freestanding 40-50 bed medical field station/hospital to provide care</td>
</tr>
<tr>
<td>Disaster response</td>
<td>Transport personnel and resources to the scene of a disaster to provide care in austere environment</td>
</tr>
<tr>
<td>State Medical Support Shelter (SMSS)</td>
<td>Establish shelter in existing structure for individuals and patients with special medical needs (disabled, chronic conditions, etc.)</td>
</tr>
<tr>
<td>Medical Strike Team</td>
<td>Provide group of medical personnel during an event</td>
</tr>
<tr>
<td><strong>SMAT III</strong></td>
<td></td>
</tr>
<tr>
<td>Responder health and safety</td>
<td>Provide care for personnel from other agencies during events</td>
</tr>
<tr>
<td>Medical decontamination</td>
<td>Provide patient decontamination in response to HazMat or CBRN incident</td>
</tr>
<tr>
<td>Mass triage/Medical treatment</td>
<td>Triage and care for large number of patients at the scene of a MCI</td>
</tr>
<tr>
<td>Mass immunization or prophylaxis</td>
<td>Work with NC Division of Public Health to distribute the SNS during mass immunization</td>
</tr>
<tr>
<td><strong>SORT</strong></td>
<td></td>
</tr>
<tr>
<td>Medical decontamination</td>
<td>Provide patient decontamination in response to HazMat or CBRN incident</td>
</tr>
<tr>
<td>Medical support shelter</td>
<td>Establish shelter in existing structure for individuals and patients with special medical needs</td>
</tr>
<tr>
<td>Medical Strike Team</td>
<td>Provide group of medical personnel during an event</td>
</tr>
<tr>
<td>Augment SMAT II/III</td>
<td>Support the activities of the SMAT II and SMAT III teams</td>
</tr>
</tbody>
</table>

**History.** The creation of a system capable of responding to a terrorist attack or disaster in North Carolina was first envisioned in the 1990s. The assets in the North Carolina system were modeled on the Metropolitan Medical Response System (MMRS) and the Disaster Medical
Assistance Teams (DMAT) of the National Disaster Medical System (NDMS), and focused on providing capacity and capabilities at the local, regional, and intrastate level (7).

The SMAT program was established in 2002 after funding was secured through the National Bioterrorism Hospital Preparedness Program (NBHPP), subsequently renamed the HPP. The SMAT program was a collaborate effort of North Carolina Division of Public Health, which received the NBHPP funding, the NC OEMS, which oversees the program, NC EM, and the SORT. The initial goal of the NBHPP and the SMAT program was to improve the capacity to respond to bioterrorism through enhancing capabilities such as gross decontamination, pharmaceutical caches, and surge capacity (8, 9).

The SMAT program has evolved over the past decade in response to many factors. The most significant external influence is the HPP, which has created more benchmarks and guidelines that emphasize all-hazards preparedness, caring for medically fragile and special medical needs patients, and strengthening health care coalitions. Internally, the NC OEMS has performed program assessments and teams have completed after action reviews (AAR) and generated improvement plans (IP) following trainings and deployments. These internal and external factors have affected the capacity and capabilities of the SMAT program by influencing equipment purchases, mission plans, and training design (8, 10).

**Funding.** The SMAT program is funded primarily by the HPP. Some RACs and HCOs also receive funding from other programs, for example, Department of Homeland Security (DHS) grants. The HPP requires a 10% in-kind match from hospitals that receive funding and requires recipients to produce yearly reports indicating whether benchmarks are being achieved and maintained.
**Oversight.** Because the SMAT program is tiered, multiple agencies and jurisdictions oversee and manage the teams and the program. The 29 SMAT IIIs are managed and staffed by personnel from the municipality or county where the team is based and receives oversight from the RAC with which they are affiliated. Each SMAT IIIs is led by the RAC’s lead Trauma Center and managed by personnel from the RAC (Table 2, Appendix B). This includes a Hospital Preparedness Coordinator (HPC), previously known as a Regional Emergency Response and Recovery Coordinator (RERRC), and other support and logistics personnel, all of whom are employees of the lead Trauma Center. The HPC acts as the liaison between the state and the individual HCOs in the RAC, oversees the programs and projects funded by the HPP, and works with RAC members to develop their preparedness capabilities (8). The NC OEMS provides program guidance, organizes statewide exercises, manages HPP grant applications and distributes funds, and defines the mission requirements.

<table>
<thead>
<tr>
<th>RAC</th>
<th>Lead Trauma Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital RAC (CapRAC)</td>
<td>WakeMed Raleigh Hospital</td>
</tr>
<tr>
<td>Duke RAC</td>
<td>Duke University Hospital</td>
</tr>
<tr>
<td>Eastern RAC (ERAC)</td>
<td>Vidant Medical Center</td>
</tr>
<tr>
<td>Metrolina Trauma Advisory Committee (MTAC)</td>
<td>Carolinas Medical Center</td>
</tr>
<tr>
<td>Mid Carolina Trauma RAC</td>
<td>UNC Hospitals</td>
</tr>
<tr>
<td>Mountain Area Trauma RAC (MATRAC)</td>
<td>Mission Hospital</td>
</tr>
<tr>
<td>Southeastern RAC (SERAC)</td>
<td>New Hanover Regional Medical Center</td>
</tr>
<tr>
<td>Triad RAC</td>
<td>Wake Forest University Baptist Medical Center/Moses Cone Hospital/High Point Regional Hospital</td>
</tr>
</tbody>
</table>

Neither North Carolina nor the NC OEMS directly manages the teams or owns the equipment, which was purchased with HPP funds and is owned by the municipality, county, or lead trauma center. These entities and their teams agree to participate in the SMAT program and provide services through a Memorandum of Agreement with the NC OEMS. This simplifies
insurance and titling of equipment. It also helps satisfy the HPP requirement of a 10% in-kind contribution from organizations that receive funds. This in-kind contribution is usually in the form of donated employee time or may include the purchasing or donation of vehicles, which the HPP does not fund (5).

Teams are deployed either by the state or through a local or regional request. An intra- or inter-state activation or deployment occurs through NC EM and is managed by the NC OEMS. This request occurs in response to a declared disaster or emergency. Local or regional requests for resources, including SMAT II or SMAT III equipment or personnel, can also be made directly to a RAC. These requests are in response to an unexpected event or in preparation for a scheduled event, and are more common than a deployment in response to an official state request for a declared disaster. Only official deployments are reimbursed by the state or federal government, and are usually the only situation in which volunteers are reimbursed for their time. Teams often classify local and regional deployments as a training exercise which enables them to use HPP funding to offset some of the costs related to travel and supplies. Some teams provide triage and medical care for scheduled events on an annual basis (5)

**Capabilities.** The 29 county- and municipality-based SMAT IIIs provide a rapid, but limited, response. These teams consist of pre-hospital emergency services personnel – EMT-Basics, EMT-Intermediates, and EMT-Paramedics – that provide initial medical triage and treatment at a mass casualty incident (MCI), decontamination in response to a HazMat incident or bioterrorism, and medical care or rehabilitation for other responders.

More than 1,100 people are registered with a SMAT III. A team requires at least 2 Paramedics and 7 EMT-Basics to deploy. Other members and support staff may also deploy to augment the operational capabilities. The teams have a standard trailer package with the
equipment to respond to a mission request. Ideally, a team deploys within 30 minutes to a local event and statewide within 2 hours of a request. The teams can be activated by their local agency, the RAC, or by NC EM. Each team is affiliated with a RAC which should provide oversight, training opportunities, guidance, and grant development assistance (5, 11).

The SMAT IIs are regional assets. At the beginning of the program, 7 teams corresponded to the 7 initial RACs. CapRAC was added in 2006 after WakeMed Raleigh received accreditation as a Level 1 Trauma Center and applied to form its own RAC. SMAT IIs have more personnel and equipment than do the SMAT IIIIs; more resources of all types permit them to have a broader set of missions and capabilities and to provide a larger and more sustained response. SMAT IIs can respond in their region within 6 hours, and can mount an intra- or inter-state response within 12 to 24 hours. Once deployed, SMAT IIs are self-sufficient for 72-hours and can operate beyond this window with appropriate re-supply. Requests for local or regional deployments are made through the RAC and statewide deployments for declared disasters are made through NC EM (5, 7).

Each team is prepared to provide a variety of responses based on its diverse array of equipment and specialized personnel. Equipment is stored in multiple trailers and on moveable pallets to provide flexibility and scalability. This allows a team to tailor its capabilities and response to each request. Each team can provide mass decontamination, support or augment existing medical facilities with equipment and personnel, establish a 40-50 bed Alternate Care Facility (ACF), set up a State Medical Support Shelter (SMSS) in an existing structure, deploy a 40-50 bed medical field hospital/station known as the “M8 Field Hospital”, or support mass immunization by using supplies from the Strategic National Stockpile (SNS). In addition, the NC OEMS has developed a set of pre-defined “mission packages” that the SMAT II and SMAT
III are capable of providing. Each package includes specific information regarding response capabilities, patient capacity, and necessary personnel and equipment. These packages are meant to streamline the process of requesting assets during a response (5, 12).

More than 1,600 volunteers are registered with the SMAT IIIs. Volunteers come from the local HCOs, EMS systems, private businesses, and nongovernmental agencies within the RAC. Many come from the lead trauma center, although every hospital within the RAC is required to provide personnel for the team. Team members have a diverse set of skills and knowledge. Medical support staff play a critical role in ensuring that the medical capabilities of the SMAT II are possible. The activities of physicians, mid-level providers, and nurses would not be possible without these individuals. Moreover, the SMAT program is mobile and potentially responds to austere environments with limited resources and interruptions in utility services such as electricity, water, and communications. For this reason, other types of support personnel such as IT specialists, mechanics, drivers, and security are also necessary. These non-medical volunteers are members of an MRC and affiliate with a RAC (5).

The SMAT I is combined with the SORT, which is a private, non-profit organization based in Winston-Salem. This team provides training, medical decontamination, special medical needs sheltering, and supplementation of the SMAT II and III capabilities (5, 13).

Training. SMAT training consists of an orientation and initial set of training modules followed by continuing education. The initial training is designed by the NC OEMS and executed by the teams independently. Initial training modules were recently revised by the NC OEMS and released to the teams for distribution to new members. The previous iteration of the initial training consisted of a set of online modules that cover hazmat operations, medical surge capacity, alternate care facilities, the SNS, mass immunization and prophylaxis, and the Incident
Command System (ICS). The online component is then followed by in-person training to familiarize new members with the equipment and the operating procedures.

SMAT II and SMAT III continuing education varies significantly by team. Some teams train on a monthly basis while others train quarterly. In addition, some teams frequently train with other teams and resources, such as USAR and HazMat teams and local fire departments, while others train independently. Teams do not seem to have any specific training guidelines to follow or topics that the NC OEMS requires them to cover during continuing education; some teams review equipment while others perform drills and exercises. The NC OEMS, in conjunction with NC EM and other state agencies, runs tabletop exercises (TTX), functional exercises (FE), and full-scale exercises (FSE) throughout the year that combine multiple teams and assets. In addition, some teams have multi-year training and exercise plans (TEP) that outline the activities over a multi-year period. Teams also receive just-in-time training immediately prior to a deployment to review and learn about mission-specific equipment, skills, and responsibilities (9).

**Deployments.** The SMAT program has deployed many times over the past decade. The longest and largest was to Waveland, MS after Hurricane Katrina where multiple SMAT IIs and IIIs provided care in a field hospital for over a month. A partial list of declared disaster deployments, local or regional responses, and scheduled events are included in Table 3 (5)

<table>
<thead>
<tr>
<th>Deployments</th>
<th>Local/Regional Responses</th>
<th>Scheduled Event Stand-by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hurricane Isabel</td>
<td>HazMat spill</td>
<td>Southeast Old Threshers Reunion</td>
</tr>
<tr>
<td>Hurricane Charley</td>
<td>Chemical plant fire</td>
<td>Lexington BBQ Festival</td>
</tr>
<tr>
<td>Hurricane Frances</td>
<td>Fire stand-by</td>
<td>Tall Ships Festival</td>
</tr>
<tr>
<td>Waveland, MS</td>
<td>Mercury spill</td>
<td>OBX Marathon</td>
</tr>
<tr>
<td>Kentucky ice storm</td>
<td>Overturned tanker</td>
<td>Beach 2 Battleship Triathlon</td>
</tr>
<tr>
<td>NC tornadoes</td>
<td>Post office suspicious package</td>
<td>Quintiles/Wrightsville Beach Triathlon</td>
</tr>
<tr>
<td>Hurricane Irene</td>
<td></td>
<td>Cherry Point Air Show</td>
</tr>
</tbody>
</table>
How well does the SMAT program meet the need of North Carolina and the goals set for it by the NC OEMS and by the program volunteers? The remainder of this paper answers that question by triangulating three sources of data: primary and gray literature, in-depth interviews with key SMAT observers and stakeholders, and a web-based survey of SMAT members.

**Methods**

**Qualitative Analysis**

I collected qualitative data about the NC SMAT program and disaster preparedness and response by reviewing primary literature, documents, and gray literature, and conducting in-depth interviews with elite stakeholders. These sources provided extensive information and pertinent details about my research question.

I identified the governmental and non-governmental agencies involved in disaster preparedness and response at the federal, state, and regional level and reviewed their websites to create a concept map of potentially relevant agencies and the interactions between them. I reviewed the Public Laws, the U.S. Code, and the North Carolina General Statutes pertaining to preparedness and response and searched for pertinent documents, reports, and presentations. The final step was to review the organizations involved in the SMAT program and the SMRS.

**Primary literature.** My search of the primary literature was inclusive to ensure that I captured as many resources as possible. I searched MEDLINE, Google and Google Scholar for scholarly articles, newspaper articles, documents on agency websites, and government documents. I reviewed the collected papers and performed follow-up literature searches based on these findings.
I performed comprehensive searches of pertinent websites of the federal and state government to ensure that any appropriate information and literature was identified. The Site Map of each potential agency was first analyzed for potentially relevant departments, divisions, offices, or other sections. Each potential website was then reviewed in detail, looking for publications, guidelines, or other documents pertinent to preparedness and response.


I reviewed the website for the United States Department of Health and Human Services (www.hhs.gov). I used an organizational chart to identify potentially relevant offices and departments. The US HHS is divided into Operating Divisions and Staff Divisions. Within the Operating Divisions I reviewed the websites for the Centers for Disease Control and Prevention (CDC), the Agency for Healthcare Research and Quality (AHRQ), and the Health Resources and Services Administration (HRSA), and within the Staff Division I reviewed the website for the Office of the Assistant Secretary for Preparedness and Response (ASPR).

Pertinent areas of the CDC website include the Preparedness and Planning section of the website, which includes the Office of Public Health Preparedness and Response. This office manages the Public Health Emergency Preparedness (PHEP) Cooperative Agreement through
the Division of State and Local Readiness (DSLR), and the Strategic National Stockpile (SNS) through the Division of Strategic National Stockpile (DSNS). The AHRQ and HRSA websites provided access to various publications. The ASPR website provided information on the National Disaster Medical System (NDMS), the Strategic National Stockpile (SNS), the Emergency System for Advance Registration of Volunteer Health Professions (ESAR-VHP), and the Hospital Preparedness Program (HPP), as well as links to various publications and guidelines including the Medical Surge Capacity and Capability (MSCC) handbook, HPP Funding Opportunity Announcements and Funding Tables from 2007 to present, and the report entitled Healthcare Preparedness Capabilities: National Guidance for Healthcare System Preparedness.

Pertinent state-level agencies and websites include the General Assembly, the Department of Health and Human Services (NC HHS), and the Department of Public Safety (NC DPS). Specific North Carolina General Statutes were identified and reviewed in full. From the NC HHS, the North Carolina Office of Emergency Medical Services (NC OEMS), which falls under the Division of Health Services Regulation, and the Public Health Preparedness and Response Branch of the Epidemiology Section of the Division of Public Health were reviewed. From the NC DPS, the Division of Emergency Management was reviewed. Each Regional Advisory Committee (RAC) website was also reviewed for pertinent information and literature.

**In-Depth Interview.** The interview protocol is available in Appendix F. Briefly, the protocol is for phone interviews with elite stakeholders. Elite stakeholders are individuals with a detailed and comprehensive knowledge of the SMAT program and/or disaster preparedness and response. I focused these interviews on the HPCs/RERRCs of each of the RACs, disaster preparedness coordinators at the lead RAC hospitals, or officials who worked with the NC
OEMS and were involved in the management or oversight of the SMAT program or disaster preparedness and response.

I contacted a group of potential interviewees by email. My message included a standardized email script describing my project and requesting their participation in a phone interview. I scheduled a date and time for the phone interview with those who responded and agreed to participate. The interview was conducted via cellphone and, if the interviewee agreed, I used a digital voice recorder to record the interview so that it could be transcribed in its entirety.

I developed a standardized interview script based upon questions that arose during review of the available literature. These questions generally focused on training, organization, management, operations, finances, and leadership of the SMAT program and disaster preparedness and response. I developed specific questions for the 3 types of elite stakeholders. These questions served as initial starting points for follow-up questions based on the responses of the individuals. The follow-up questions clarified the responses or asked the respondent to expand on their initial answer for a more detailed and comprehensive understanding of their initial response.

I transcribed interviews into Microsoft Word and reviewed by each of the interviewees. Responses were used as background material to describe the SMAT program and as results to be analyzed and included in the assessment of the SMAT program.

**Quantitative Analysis**

I developed a web-based questionnaire to assess the demographics, training, operations, and oversight of the SMAT program via the perceptions of SMAT members. I created a 74 question survey using the Qualtrics Research Suite (Qualtrics Labs, Inc., Provo, UT) available to
students and faculty of the University of North Carolina at Chapel Hill through its Odum Institute for Research in the Social Sciences. The content of the questionnaire is available for review in Appendix G. Briefly, the survey was divided into questions pertaining to team affiliation, training, operations/deployments, organization, finances, and demographics. I designed the survey with conditional logic so that specific responses trigger linked follow-up questions for clarification. Therefore, different respondents followed different flow paths through the questionnaire and not all questions were answered by all respondents.

The questionnaire was distributed for me by the NC OEMS. The NC OEMS maintains a responder database, mandated by the Emergency System for Advance Registration of Volunteer Health professionals (ESAR-VHP), called ServNC. All individuals who are affiliated with the SMAT program are registered with ServNC. They received an email from ServNC that alerted them to a new internal message on the ServNC website. The message explained the purpose of the questionnaire and included a brief message from me and a link to the Qualtrics questionnaire. A reminder email was sent 9 days after the initial message, and included the questionnaire link and a request for individuals to complete the questionnaire.

The questionnaire was closed to new responses 22 days after it was opened. I downloaded data from Qualtrics in Excel format and converted the spreadsheet to a Stata database; I performed all analyses using Stata/IC 12.1 (StataCorp LP, College Station, TX). Respondents who did not agree to participate were removed from the dataset prior to analysis. Incomplete surveys were included in the descriptive and bivariate analyses. Continuous variables were described using mean±standard deviation and median ±IQR. Categorical variables were described using percentage and count. Bivariate analysis of continuous variables was performed using the 2-Sample T Test or One-Way Analysis of Variance (ANOVA) and
bivariate analysis of categorical variables was performed using the Pearson’s Chi-Square test, Fisher’s Exact test, and Odds Ratio.

I developed a Capacity Index (CI) for various bivariate interactions to evaluate relationships between variables. This CI calculation first transformed a categorical variable into a continuous variable by multiplying the percentage of respondents in a category by an assigned ordinal value (1, 2, 3, etc) for that category, thereby returning a continuous numerical value termed an Average Score. The Average Score for all respondents was then subtracted from the score for each group, providing a CI that allows for comparisons between groups.

All differences were considered statistically significant at p < 0.05. I corrected for multiple comparisons using the Bonferroni correction.

Results

Demographics of team members responding to the survey

The online questionnaire was distributed to 2,550 individuals and the questionnaire was accessed 306 times, a response rate of 12%. Sixteen respondents who accessed the questionnaire did not agree to take the survey (by clicking an “agree” response) and were excluded from the analysis. The remaining 290 responses – 78.3% (227) of which were completed and 21.7% (63) of which were partially completed – provide the data I analyzed. Table 4 and Figures 1 and 2 provide respondents’ sex, ages, and educational levels.

Most respondents are on 1 type of team, with SMAT II and SMAT III membership account for over 75% of responses. Response rates varied significantly by RAC; an equal response distribution would be 12.5% of responses from each RAC, but CapRAC accounted for
only 1.5% (4) of responses, while MTAC and Triad RAC were overrepresented, with each accounting for approximately 20% of respondents (Table 5 and Figures 3 and 4).

Almost 40% of respondents have between 2 and 5 years of experience with the SMAT program, and almost 30% have between 5 and 10 years of experience (Table 6 and Figure 5). Most respondents know at least a few, if not many, most or all other team members. Years of experience is, as we would expect, significantly associated with knowing more of one’s fellow team members ($\chi^2=53.1$, $p<0.001$, Table 7 and Figure 6), but the relationship is not monotonic, and it also varies significantly by RAC ($\chi^2=45.9$, $p=0.001$).

Table 4. Demographic Characteristics

<table>
<thead>
<tr>
<th>Sex</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>62.3% (139)</td>
</tr>
<tr>
<td>Female</td>
<td>37.7% (84)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 21</td>
<td>0.45% (1)</td>
</tr>
<tr>
<td>21-30</td>
<td>11.2% (25)</td>
</tr>
<tr>
<td>31-40</td>
<td>28.1% (63)</td>
</tr>
<tr>
<td>41-50</td>
<td>33% (74)</td>
</tr>
<tr>
<td>51-60</td>
<td>22.8% (51)</td>
</tr>
<tr>
<td>61-70</td>
<td>4.5% (10)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Education</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>High School/GED</td>
<td>3.2% (7)</td>
</tr>
<tr>
<td>Some college</td>
<td>21% (46)</td>
</tr>
<tr>
<td>Associate’s degree</td>
<td>27% (59)</td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>27.4% (60)</td>
</tr>
<tr>
<td>Master’s Degree</td>
<td>15.1% (33)</td>
</tr>
<tr>
<td>Doctoral Degree</td>
<td>3.2% (7)</td>
</tr>
<tr>
<td>Professional Degree</td>
<td>3.2% (7)</td>
</tr>
</tbody>
</table>

Figure 1. Age Distribution of Respondents

Figure 2. Education Level of Respondents
Table 5. Affiliations

<table>
<thead>
<tr>
<th>SMAT Type</th>
<th>Percentage (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMAT I</td>
<td>9.7% (25)</td>
</tr>
<tr>
<td>SMAT II</td>
<td>46.3% (119)</td>
</tr>
<tr>
<td>SMAT III</td>
<td>31.5% (81)</td>
</tr>
<tr>
<td>SMAT I &amp; II</td>
<td>2% (5)</td>
</tr>
<tr>
<td>SMAT I &amp; III</td>
<td>0% (0)</td>
</tr>
<tr>
<td>SMAT II &amp; III</td>
<td>9.3% (24)</td>
</tr>
<tr>
<td>SMAT I, II, &amp; III</td>
<td>1.2% (3)</td>
</tr>
</tbody>
</table>

Table 6. Years of SMAT Experience

<table>
<thead>
<tr>
<th>Experience</th>
<th>Percentage (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1 year</td>
<td>12.3% (31)</td>
</tr>
<tr>
<td>1-2 years</td>
<td>14.3% (36)</td>
</tr>
<tr>
<td>2-5 years</td>
<td>39.7% (100)</td>
</tr>
<tr>
<td>5-10 years</td>
<td>29.4% (74)</td>
</tr>
<tr>
<td>Greater than 10 years</td>
<td>4.4% (11)</td>
</tr>
</tbody>
</table>
Table 7. Familiarity with Team Members by Years of SMAT Experience

<table>
<thead>
<tr>
<th>Years of Experience</th>
<th>Know Other Team Members?</th>
<th>Odds Ratio</th>
<th>$\chi^2$, p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None or A few</td>
<td>Many, Most, or All</td>
<td></td>
</tr>
<tr>
<td>&lt; 1 year</td>
<td>29.2% (26)</td>
<td>3.1% (5)</td>
<td>1</td>
</tr>
<tr>
<td>1-2 years</td>
<td>22.5% (20)</td>
<td>9.9% (16)</td>
<td>4.16</td>
</tr>
<tr>
<td>2-5 years</td>
<td>32.6% (29)</td>
<td>43.8% (71)</td>
<td>12.73</td>
</tr>
<tr>
<td>5-10 years</td>
<td>14.6% (13)</td>
<td>37.7% (61)</td>
<td>24.4</td>
</tr>
<tr>
<td>&gt; 10 years</td>
<td>1.1% (1)</td>
<td>5.6% (9)</td>
<td>46.8</td>
</tr>
<tr>
<td>All respondents</td>
<td>35.5% (89)</td>
<td>65.5% (251)</td>
<td></td>
</tr>
</tbody>
</table>

Figure 6. Linear Regression of Familiarity by Years of SMAT Experience

A disproportionately low percentage of respondents, only 19%, were recruited by a hospital (Table 8), even though almost 80% of respondents are employed by either a hospital system or a county, and over 50% of respondents are employed as either paramedics or nurses. Over 20% of respondents identify their primary employer as neither a hospital nor a county and indicated that their occupation is non-medical (Table 9).

In some RACs a plurality of respondents is affiliated with lead hospitals. In other RACs, responses are divided more evenly amongst the different employers. “Neither the hospital nor the county” is the most common response for 3 RACs.
Table 8. Method of Recruitment of Respondents

<table>
<thead>
<tr>
<th>Method</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital</td>
<td>19% (48)</td>
</tr>
<tr>
<td>Local Emergency Management Agency or County</td>
<td>41.5% (105)</td>
</tr>
<tr>
<td>Member-driven inquiry</td>
<td>39.5% (100)</td>
</tr>
</tbody>
</table>

Table 9. Employment Information

<table>
<thead>
<tr>
<th>Primary Employer</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital System</td>
<td>36.7% (93)</td>
</tr>
<tr>
<td>County ES/EM</td>
<td>41.5% (105)</td>
</tr>
<tr>
<td>Other</td>
<td>21.7% (55)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Job</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EMT-B</td>
<td>10.3% (27)</td>
</tr>
<tr>
<td>EMT-I</td>
<td>2.7% (7)</td>
</tr>
<tr>
<td>EMT-P</td>
<td>40.6% (106)</td>
</tr>
<tr>
<td>Nurse</td>
<td>16.1% (42)</td>
</tr>
<tr>
<td>NP</td>
<td>1.9% (5)</td>
</tr>
<tr>
<td>Pharmacist</td>
<td>1.5% (4)</td>
</tr>
<tr>
<td>Physician</td>
<td>1.9% (5)</td>
</tr>
<tr>
<td>PA</td>
<td>1.9% (5)</td>
</tr>
<tr>
<td>Resp. Therapist</td>
<td>1.2% (3)</td>
</tr>
<tr>
<td>Social Worker</td>
<td>0.4% (1)</td>
</tr>
<tr>
<td>Other</td>
<td>21.5% (56)</td>
</tr>
</tbody>
</table>

Training

More than 80% of respondents reported having received an initial orientation to their team, and respondents report having attended more than 13 training sessions on average, with about 9% of the sample reporting participation in 40 or more sessions.

The survey asked respondents to choose a number from 0 to 100, with corresponding ordinal guidance (Table 10), which corresponds to whether the initial orientation/training and the continuing education are effective or ineffective (Table 11). Evaluation of initial training (F=1.96, p=0.0623) and continuing education (F=2.00, p=0.0572) show no significant differences in effectiveness by RAC (Table 12), or by SMAT team (F=1.00, p=0.4217 for initial training and F=1.39, p=0.2294 for continuing education).
Respondents were asked how often training is offered, how often it should be offered, and how often they attend training. The original response options, never, yearly, quarterly, less than once a month, once a month, and 2-3 times a month, are merged into 3 categories for data analysis: yearly or less, quarterly to less than monthly, and monthly or more often. These 3 categories are given corresponding ordinal values of 1, 2, and 3, respectively, enabling the calculation of an Average Training Score for the 3 questions. Table 13 shows that respondents think training should be offered more frequently than it is, although they actually attend less frequently than training is offered, perhaps because the time spent in training is often unreimbursed.

Table 10. Continuous to Ordinal Value Conversion for Training Effectiveness

<table>
<thead>
<tr>
<th>Numerical Score</th>
<th>Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Very ineffective</td>
</tr>
<tr>
<td>30</td>
<td>Somewhat ineffective</td>
</tr>
<tr>
<td>50</td>
<td>Neither effective nor ineffective</td>
</tr>
<tr>
<td>70</td>
<td>Somewhat effective</td>
</tr>
<tr>
<td>90</td>
<td>Very effective</td>
</tr>
</tbody>
</table>

Table 11. Training Effectiveness on Continuous Scale

<table>
<thead>
<tr>
<th></th>
<th>Initial Training</th>
<th>Continuing Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>69.6±27.7</td>
<td>58.7±28.6</td>
</tr>
<tr>
<td>Median</td>
<td>79±40</td>
<td>69±42</td>
</tr>
</tbody>
</table>

The responses are also analyzed by RAC. The CapRac is excluded from the analysis because it only has 4 responses. The Average Training Score and a Training Capacity Index for how often training is offered (Table 14), should be offered (Table 15), and is attended (Table 16) are calculated for each RAC.
Table 12. Training Effectiveness by RAC (Mean±SD)

<table>
<thead>
<tr>
<th>Training</th>
<th>CapRAC</th>
<th>Duke RAC</th>
<th>ERAC</th>
<th>MTAC</th>
<th>Mid Carolina RAC</th>
<th>MATRAC</th>
<th>SERAC</th>
<th>Triad RAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Training</td>
<td>70±21.6</td>
<td>71±28.4</td>
<td>70.2±29.7</td>
<td>71.8±25.2</td>
<td>57.9±34.9</td>
<td>78.1±16.3</td>
<td>78.7±20.1</td>
<td>61.9±31.4</td>
</tr>
<tr>
<td>Continuing education</td>
<td>52.5±29.5</td>
<td>67±29.5</td>
<td>58.9±27.4</td>
<td>61.3±29.3</td>
<td>43.2±29.1</td>
<td>64.9±25.7</td>
<td>66.1±21.6</td>
<td>53.2±31.3</td>
</tr>
</tbody>
</table>

Table 13. Training Frequency and Average Training Score

<table>
<thead>
<tr>
<th>Training Frequency and Ordinal Value</th>
<th>How often training</th>
<th>Average Training Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>is offered (n=235)</td>
<td>should be offered (n=238)</td>
</tr>
<tr>
<td>Yearly or less: 1</td>
<td>19.6% (46)</td>
<td>6.7% (16)</td>
</tr>
<tr>
<td>Less than monthly to quarterly: 2</td>
<td>41.7% (98)</td>
<td>51.1% (119)</td>
</tr>
<tr>
<td>Monthly or more often: 3</td>
<td>38.7% (91)</td>
<td>43.3% (103)</td>
</tr>
<tr>
<td>Average Training Score</td>
<td>2.2</td>
<td>2.39</td>
</tr>
</tbody>
</table>

Table 14. Frequency that Training is Offered by RAC

<table>
<thead>
<tr>
<th>Training Frequency and Ordinal Value</th>
<th>Duke RAC (n=21)</th>
<th>ERAC (n=34)</th>
<th>MTAC (n=47)</th>
<th>Mid Carolina RAC (n=27)</th>
<th>MATRAC (n=30)</th>
<th>SERAC (n=23)</th>
<th>Triad RAC (n=48)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yearly or less often: 1</td>
<td>0% (0)</td>
<td>20.6% (7)</td>
<td>12.8% (6)</td>
<td>29.6% (8)</td>
<td>13.3% (4)</td>
<td>34.8% (8)</td>
<td>18.8% (9)</td>
</tr>
<tr>
<td>Less than monthly to quarterly: 2</td>
<td>14.3% (3)</td>
<td>32.4% (11)</td>
<td>38.3% (18)</td>
<td>44.4% (12)</td>
<td>70% (21)</td>
<td>60.9% (14)</td>
<td>39.6% (19)</td>
</tr>
<tr>
<td>Monthly or more often: 3</td>
<td>85.7% (18)</td>
<td>47.1% (16)</td>
<td>48.9% (23)</td>
<td>25.9% (7)</td>
<td>16.7% (5)</td>
<td>4.3% (1)</td>
<td>41.7% (20)</td>
</tr>
<tr>
<td>Average Training Score</td>
<td>2.86</td>
<td>2.26</td>
<td>2.36</td>
<td>1.96</td>
<td>2.03</td>
<td>1.7</td>
<td>2.23</td>
</tr>
<tr>
<td>Training Capacity Index (Offered)</td>
<td><strong>0.66</strong></td>
<td>0.06</td>
<td>0.16</td>
<td><strong>-0.24</strong></td>
<td>-0.17</td>
<td><strong>-0.5</strong></td>
<td>0.03</td>
</tr>
</tbody>
</table>
Table 15. Frequency that Training is Should be Offered by RAC

<table>
<thead>
<tr>
<th></th>
<th>Duke RAC (n=21)</th>
<th>ERAC (n=35)</th>
<th>MTAC (n=47)</th>
<th>Mid Carolina RAC (n=27)</th>
<th>MATRAC (n=32)</th>
<th>SERAC (n=22)</th>
<th>Triad RAC (n=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yearly or less often: 1</td>
<td>0% (0)</td>
<td>2.7% (1)</td>
<td>4.3% (2)</td>
<td>14.8% (4)</td>
<td>6.3% (2)</td>
<td>13.6% (3)</td>
<td>4.1% (2)</td>
</tr>
<tr>
<td>Less than monthly to quarterly: 2</td>
<td>33.3% (7)</td>
<td>48.6% (17)</td>
<td>36.2% (17)</td>
<td>55.6% (15)</td>
<td>68.8% (22)</td>
<td>63.6% (14)</td>
<td>53.1% (26)</td>
</tr>
<tr>
<td>Monthly or more often: 3</td>
<td>66.7% (14)</td>
<td>48.6% (17)</td>
<td>59.6% (28)</td>
<td>29.6% (8)</td>
<td>25% (8)</td>
<td>22.7% (5)</td>
<td>42.9% (21)</td>
</tr>
<tr>
<td>Average Training Score</td>
<td>2.67</td>
<td>2.46</td>
<td>2.55</td>
<td>2.15</td>
<td>2.19</td>
<td>2.09</td>
<td>2.39</td>
</tr>
<tr>
<td>Training Capacity Index (Should Offer)</td>
<td>-0.72</td>
<td>0.07</td>
<td>0.17</td>
<td>-0.24</td>
<td>-0.2</td>
<td>-0.3</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 16. Frequency that Training is Attended by RAC

<table>
<thead>
<tr>
<th></th>
<th>Duke RAC (n=20)</th>
<th>ERAC (n=34)</th>
<th>MTAC (n=46)</th>
<th>Mid Carolina RAC (n=28)</th>
<th>MATRAC (n=29)</th>
<th>SERAC (n=23)</th>
<th>Triad RAC (n=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yearly or less often: 1</td>
<td>15% (3)</td>
<td>55.9% (19)</td>
<td>26.1% (12)</td>
<td>75% (21)</td>
<td>31% (9)</td>
<td>39.1% (9)</td>
<td>38.8% (19)</td>
</tr>
<tr>
<td>Less than monthly to quarterly: 2</td>
<td>65% (13)</td>
<td>35.3% (12)</td>
<td>50% (23)</td>
<td>17.9% (5)</td>
<td>62.1% (18)</td>
<td>60.9% (14)</td>
<td>38.8% (19)</td>
</tr>
<tr>
<td>Monthly or more often: 3</td>
<td>20% (4)</td>
<td>8.8% (3)</td>
<td>23.9% (11)</td>
<td>7.1% (2)</td>
<td>6.9% (2)</td>
<td>0% (0)</td>
<td>22.4% (11)</td>
</tr>
<tr>
<td>Average Training Score</td>
<td>2.05</td>
<td>1.53</td>
<td>1.98</td>
<td>1.32</td>
<td>1.76</td>
<td>1.61</td>
<td>1.84</td>
</tr>
<tr>
<td>Training Capacity Index (Attended)</td>
<td><strong>0.31</strong></td>
<td><strong>-0.21</strong></td>
<td><strong>0.24</strong></td>
<td><strong>-0.42</strong></td>
<td><strong>0.02</strong></td>
<td><strong>-0.13</strong></td>
<td><strong>0.1</strong></td>
</tr>
</tbody>
</table>

**Deployments**

Slightly more than 35% of respondents have deployed with their team (Table 17), and deployment is positively and strongly correlated with years of experience on the team ($\chi^2=37.6$, 300x52}
p<0.0001) (Table 18), as one would expect. The probability of deployment is significantly greater for respondents with 5-10 years or greater than 10 years of experience than it is for those with <1 year, 1-2 years, or 2-5 years of experience using a corrected p<0.005 based on multiple testing (Table 19).

The average number of deployments is 3.62±3.34 and the median is 2±4. Only time with the SMAT program increases the probability of deploying. Neither differences between RACs ($\chi^2=10.8$, p=0.146; F=2.08, p=0.058) nor differences between SMAT types ($\chi^2=7.8$, p=0.169; F=1.21, p=0.312) affect the proportion of respondents that have deployed or the average number of deployments, respectively.

Table 17. Percentage of Respondents that have Deployed

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deployed</td>
<td>35.9% (83)</td>
<td>64.1% (148)</td>
</tr>
</tbody>
</table>

Table 18. Probability of Deployment by Years of Experience

<table>
<thead>
<tr>
<th>Deployed</th>
<th>SMAT Experience (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;1 (n=25)</td>
</tr>
<tr>
<td>Yes</td>
<td>16% (4)</td>
</tr>
<tr>
<td>No</td>
<td>84% (21)</td>
</tr>
</tbody>
</table>

Table 19. Difference in the Probability of Deploying by Years of Experience

<table>
<thead>
<tr>
<th></th>
<th>&lt;1 year</th>
<th>1-2 years</th>
<th>2-5 years</th>
<th>5-10 years</th>
<th>&gt;10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 year</td>
<td>*</td>
<td>NS</td>
<td>NS</td>
<td>$\chi^2=12.2$, p&lt;0.0001</td>
<td>$\chi^2=13.9$, p&lt;0.0001</td>
</tr>
<tr>
<td>1-2 years</td>
<td>*</td>
<td>*</td>
<td>NS</td>
<td>$\chi^2=21.5$, p&lt;0.0001</td>
<td>$\chi^2=22.1$, p&lt;0.0001</td>
</tr>
<tr>
<td>2-5 years</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>$\chi^2=9.9$, p=0.002</td>
<td>$\chi^2=9.9$, p=0.002</td>
</tr>
<tr>
<td>5-10 years</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>NS</td>
</tr>
</tbody>
</table>
Preparedness

Preparedness for different types of responses varies significantly, ranging from almost 85% of respondents feeling prepared to respond to a mass gathering or surge event while slightly greater than 28% feel prepared to respond to a nuclear, biologic or chemical attack. Overall Preparedness for all responses, calculated by averaging the percentage that feel prepared for each type of response, is approximately 65%. Training is consistently identified across all hazards as the area that needs the most improvement. A similar number of respondents feel that equipment, personnel, and financial support also need improvement for the team to become adequately prepared (Table 20).

Table 20. Overall and Response-Specific Preparedness and Domains to Improve

<table>
<thead>
<tr>
<th>Type of Response</th>
<th>Respondents that believe the team is adequately prepared</th>
<th>Domain that must improve to achieve preparedness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Respondents (%)</td>
<td>Training (%)</td>
</tr>
<tr>
<td>Decontamination/ HazMat</td>
<td>68.3% (155)</td>
<td>25.1% (57)</td>
</tr>
<tr>
<td>Health care facility evacuation</td>
<td>71.4% (162)</td>
<td>21.6% (49)</td>
</tr>
<tr>
<td>Hurricane</td>
<td>82.8% (188)</td>
<td>11% (25)</td>
</tr>
<tr>
<td>Mass gathering/ Surge event</td>
<td>85.9% (195)</td>
<td>7.9% (18)</td>
</tr>
<tr>
<td>Mass prophylaxis ID Outbreak</td>
<td>53.7% (122)</td>
<td>34.8% (79)</td>
</tr>
<tr>
<td>Nuclear/Biologic/ Chemical attack</td>
<td>28.2% (64)</td>
<td>60.4% (137)</td>
</tr>
<tr>
<td>Overall Preparedness</td>
<td><strong>65.1%</strong></td>
<td></td>
</tr>
</tbody>
</table>

Perception of preparedness for different events is evaluated by RAC (Table 21). Overall Preparedness varies by almost 12%, from a high of over 70% to a low of just over 58%. The RAC Preparedness Capacity Index compares each RAC to the Overall Preparedness of all
respondents, indicating how well respondents believe each RAC is prepared in comparison to how well respondents believe the entire program is prepared.

Preparedness is also evaluated by SMAT type. The SMAT Preparedness Capacity Index indicates that respondents on the SMAT I and SMAT IIIs feel better prepared, and SMAT III personnel feel slightly less prepared, than overall “whole sample” preparedness scores would suggest (Table 22).

Table 21. Overall and Response-Specific Preparedness by RAC

<table>
<thead>
<tr>
<th>Type of Response</th>
<th>Duke RAC (n=22)</th>
<th>ERAC (n=34)</th>
<th>MTAC (n=41)</th>
<th>Mid Carolina RAC (n=24)</th>
<th>MATRAC (n=30)</th>
<th>SERAC (n=22)</th>
<th>Triad RAC (n=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decontamination/HazMat</td>
<td>81.2% (18)</td>
<td>85.3% (29)</td>
<td>70.7% (29)</td>
<td>45.9% (11)</td>
<td>76.7% (23)</td>
<td>68.2% (15)</td>
<td>57.1% (28)</td>
</tr>
<tr>
<td>Health care facility evacuation</td>
<td>72.7% (16)</td>
<td>67.6% (23)</td>
<td>65.9% (27)</td>
<td>79.2% (19)</td>
<td>76.7% (23)</td>
<td>72.7% (16)</td>
<td>69.4% (34)</td>
</tr>
<tr>
<td>Hurricane</td>
<td>90.9% (20)</td>
<td>85.3% (29)</td>
<td>80.5% (33)</td>
<td>87.5% (21)</td>
<td>83.3% (25)</td>
<td>100% (22)</td>
<td>71.4% (35)</td>
</tr>
<tr>
<td>Mass gathering/Surge event</td>
<td>95.5% (21)</td>
<td>94.1% (32)</td>
<td>85.4% (35)</td>
<td>79.2% (19)</td>
<td>80% (24)</td>
<td>90.1% (20)</td>
<td>83.7% (41)</td>
</tr>
<tr>
<td>Mass prophylaxis/ID Outbreak</td>
<td>63.6% (14)</td>
<td>52.9% (18)</td>
<td>56.1% (23)</td>
<td>41.7% (10)</td>
<td>66.7% (20)</td>
<td>50% (11)</td>
<td>46.9% (23)</td>
</tr>
<tr>
<td>Nuclear/Biologic/Chemical attack</td>
<td>27.3% (6)</td>
<td>29.4% (10)</td>
<td>29.3% (12)</td>
<td>16.7% (4)</td>
<td>43.4% (13)</td>
<td>22.7% (5)</td>
<td>24.5% (12)</td>
</tr>
<tr>
<td>Overall Preparedness</td>
<td>72% (95/132)</td>
<td>69.1% (141/204)</td>
<td>64.6% (159/246)</td>
<td>58.3% (84/144)</td>
<td>71.1% (128/180)</td>
<td>67.4% (89/132)</td>
<td>58.8% (173/294)</td>
</tr>
<tr>
<td>RAC Preparedness Capacity Index</td>
<td>6.9</td>
<td>4</td>
<td>-0.5</td>
<td>-6.8</td>
<td>6</td>
<td>2.3</td>
<td>-6.3</td>
</tr>
</tbody>
</table>
Table 22. Overall and Response-Specific Preparedness by Type of SMAT

<table>
<thead>
<tr>
<th>Type of Response</th>
<th>SMAT I (n=23)</th>
<th>SMAT II (n=132)</th>
<th>SMAT III (n=96)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decontamination/ HazMat</td>
<td>69.6% (16)</td>
<td>62.1% (82)</td>
<td>82.3% (79)</td>
</tr>
<tr>
<td>Health care facility evacuation</td>
<td>82.6% (19)</td>
<td>81.8% (108)</td>
<td>61.5% (59)</td>
</tr>
<tr>
<td>Hurricane</td>
<td>91.3% (21)</td>
<td>93.9% (124)</td>
<td>75% (72)</td>
</tr>
<tr>
<td>Mass gathering/ Surge event</td>
<td>95.7% (22)</td>
<td>93.2% (123)</td>
<td>82.3% (79)</td>
</tr>
<tr>
<td>Mass prophylaxis/ ID Outbreak</td>
<td>60.1% (14)</td>
<td>60.6% (80)</td>
<td>49% (47)</td>
</tr>
<tr>
<td>Nuclear/Biologic/ Chemical attack</td>
<td>30.4% (7)</td>
<td>25% (33)</td>
<td>30.2% (29)</td>
</tr>
<tr>
<td>Overall Preparedness</td>
<td>71.3% (99/138)</td>
<td>69.4% (550/792)</td>
<td>63.4% (365/576)</td>
</tr>
<tr>
<td>SMAT Preparedness Capacity Index</td>
<td><strong>6.2</strong></td>
<td><strong>4.3</strong></td>
<td><strong>-1.7</strong></td>
</tr>
</tbody>
</table>

**Discussion**

Evaluating the SMAT program requires assessing the training of the teams, the ability to deploy effectively, the relationships between the teams and the state, and deciding if the funding and management of the teams are adequate.

**Recruitment and Retention**

Recruitment and retention of members is a perpetual difficulty faced by the teams. Much of the time donated to the SMAT program is not reimbursed. Training and deployments that are not for a declared disaster are often not reimbursed by employers. In addition, the training requirements are a significant time commitment. Training is also often done close to the lead hospital, which may pose a challenge for volunteers from outlying hospitals and counties who have to travel significant distances to participate. It can also be difficult for teams to maintain membership when declared deployments occur relatively infrequently and if teams don’t
participate in other scheduled events. Responses from the questionnaire indicate that almost 40% of respondents have been with their team between 2 and 5 years and another 30% have been with their team for between 5 and 10 years. This indicates that a majority of team members do feel a strong commitment to their team and to the mission. However, my in depth interviews indicate that some members may stay on the roster for a number of years, yet not be active participants or maintain their training. Other individuals questioned the ability of a team to fulfill a request for certain types of full deployments because of insufficient personnel.

Teams need to increase their recruitment efforts. While 40% of respondents indicated that they worked for a hospital system, only 19% indicated that their hospital recruited them. RACs need to work with their member hospitals to increase the visibility of the program and current members need to work on recruiting co-workers. One HPC advertises the program through occupational health which ensures that every new employee hears about the SMAT program during their initial physical. Another places pictures and information about the teams around nursing stations to increase the visibility. Recruitment drives have also been used at some hospitals.

Many volunteers are recruited from the lead hospital, with relatively few from the other hospitals. Identifying a “hospital liaison” to function as the lead recruiter or information officer for each hospital might help with recruitment efforts at the other RAC hospitals by giving interested individuals a contact person who can provide information about the SMAT program. Recruitment from non-hospital HCOs within a RAC is an even greater challenge. These potential volunteers don’t work in a hospital and may never interact with the RAC. The most obvious way to recruit these individuals is through word of mouth and overall increased visibility of the SMAT program. Recruitment for a volunteer organization is a challenge and may become
more of a challenge as overall volunteerism seems to be in a decline. That is why teams need to redouble their efforts on recruitment to bolster the number of volunteers in the SMAT program.

Retention of members has also been a challenge. Teams must make their volunteers feel invested in the program, which can be difficult when activities and opportunities to deploy or work at scheduled events are relatively infrequent. Offering multiple dates for training and ensuring that training occurs regularly is important for building that connection. Deployments, field exercises, and scheduled events also build camaraderie and increase volunteers’ feelings of connectedness with the team and the program. Teams should strive to schedule specific standby events to work throughout the year. These offer an opportunity for training and a chance to build connections between volunteers.

Training

Training is a dynamic process rather than a set of independent events. What has been effective in the past does not necessarily continue to be effective into the future. The SMAT program has revised its training doctrine various times during its existence as capabilities and responsibilities have evolved. Oversight and guidance is provided from the NC OEMS and from the RAC leadership. In addition, the different teams have varying capabilities depending on, for example, if they have a pharmacy trailer or other specialized equipment. However, the teams also have a core cache of equipment and similar responsibilities regardless of their geographic location or RAC affiliation.

Determining the appropriate mix of generic training occurring amongst all teams and team-specific training can be a challenge. Some survey respondents and interviewees argued for more centralized management from the state level. The argument for state-level oversight is that this provides consistency in the training being delivered, the skills being learned, and the
interoperability of teams and team members during a deployment. Other respondents thought that RACs should be responsible for developing and determining the types of training and schedule of topics being delivered during training because this approach can be tailored to specific weaknesses or team-specific topics that require extra training.

The NC OEMS, with the help of an outside consultant, has developed a new SMAT Initial Education Program for all new members to replace the existing core topics. This training is currently being deployed across the RACs. Close to 85% of questionnaire respondents said they completed the old initial training and orientation and gave it an average score of almost 70, which means they felt it to be somewhat effective. The goal should be for 100% of new members to complete the initial trainings and have a team orientation. All RACs should work to develop a consistent process of orientation to ensure that potential volunteers receive appropriate information. More than 15% of respondents haven’t received an initial orientation and gone through the initial training, which means that these volunteers aren’t eligible to deploy and may stop participating entirely, resulting in the loss of valuable personnel.

Continuing education (con-ed) is developed and managed at the RAC level or at the level of the individual SMAT III. This means that the frequency of con-ed and the topics being covered vary by team. Questionnaire respondents gave these trainings a mean score close to 60, between somewhat effective and neither effective nor ineffective on the scale, and lower than the score for the initial training. This difference between the score for the initial training and con-ed occurs at all RACs, although the disparity in the score varies. This indicates that overall, con-ed isn’t viewed to be as effective as the initial orientation. Perceived effectiveness also varies by RAC, with some having better effectiveness ratings, and others not performing as well. No RAC received a score over 70, so all have significant ability to improve their training.
One potential training issue is the frequency of the offered trainings. Another is the quality of the training being offered, and a third is the topic being covered during the training. The Average Training Score indicates a discrepancy between how frequently training is offered, how often it should be offered, and how often it is attended. Respondents from all RACs believe training should be offered between quarterly and monthly, but that it is currently offered closer to quarterly. More importantly, the average level of training attendance is less than quarterly. If respondents aren’t attending training because the content or topic isn’t appealing, then the quality of training should be addressed. If too few training sessions are offered or attendees have scheduling conflicts with the trainings then the RAC should work on increasing the available training dates, potentially offering multiple dates for the same topic. Volunteers may also have a problem with the time commitment required to participate on the team, which is more difficult to address and correct. There may be benefit in working with the NC OEMS to develop general guidelines about training topics to cover each year or over a multi-year training schedule. This would ensure all SMAT volunteers receive a similar set of topics to enhance interoperability but would provide the RACs with the autonomy to deliver the content as each sees fit and not burden the NC OEMS with developing topic-specific content. There is also the argument that the NC OEMS should be responsible for the development and delivery of training to all of the RACs to ensure consistency amongst the teams.

**Deployments**

The purpose of the SMAT program is to provide care during deployments, and there is a statistically significant correlation between years on a team and the probability of deploying. The questionnaire data do not show a statistically significant correlation between deployments and either RAC affiliation or SMAT Type. From the in-depth interviews and individual
comments in the questionnaire, it does seem that certain teams have had more opportunities to deploy for declared events or work at scheduled, non-declared events. As discussed previously, this discrepancy in opportunity may hinder recruitment and retention for those teams that aren’t as active. It may also affect how often a team offers training, how often members feel that training should be offered, and how often they attend training. Deployments and scheduled events also help prepare teams for the variety of responses that they may provide.

The NC OEMS, in conjunction with the RACs, might consider developing a deployment calendar that rotates which team is “active” during a set period of time. This team would serve as the first team out in the event of a deployment request. This system might help encourage training and participation because team members may be more likely to participate if they know their team is “active”. Similar systems are already employed for Federal USAR teams and other disaster response elements. The existing state divisions used by NC OEMS or NC EM could also be used to divide the system up so that there are 3 “active” teams providing coverage for the eastern, central, and western regions of the state. Another system, more complicated but also more inclusive, would be to divide up the types of responses and have teams rotate what response they are “active” for. This would keep more teams “active” and training could focus on either the current or upcoming “active” response designation.

**Overall Preparedness**

Responses indicate that overall preparedness varies significantly depending on the type of response. Preparedness for a nuclear, chemical or biologic attack was lowest, with just over 28% of respondents saying they felt prepared. At the other end of the spectrum, over 85% of respondents felt prepared for a mass gathering or surge event. Over 80% of respondents also feel prepared to respond to a hurricane. Just over 70% feel prepared to help evacuate a health care
facility, just over 68% are comfortable performing decontamination or responding to a hazmat event, and about 54% feel prepared to respond and provide mass prophylaxis during an infectious disease outbreak.

Respondents identified training as the most important issue to improve to become prepared across all types of responses. The specific changes to training that are necessary to improve preparedness were not explored in the questionnaire, so it is difficult to provide focused feedback. However, it is likely that the earlier suggestions about ways to enhance training would improve respondents’ sense of preparedness. Respondents identified improvements in equipment and personnel as the next two most important issues necessary to improve preparedness. In-depth interview responses provided similar results regarding the types of events that teams are most prepared for. The change in the focus of the program, with more emphasis on responding to hurricanes, establishing alternate care facilities, and setting up special needs sheltering, and decreasing emphasis on responding to terrorist attacks and performing mass decontamination is clearly supported by the questionnaire results. One difficult question that the SMAT program should consider is whether the teams are attempting to manage too many disparate responsibilities. It may be more logical for the SMAT III assets to focus on immediate mass decontamination, hazmat response, and triage, and for the SMAT II assets to emphasize health care evacuation, special medical needs sheltering, and establishing field hospitals and/or alternate care sites. This would be a significant change for the teams, but might allow training to be focused on fewer topics and potentially allow volunteers to become more proficient in fewer areas.

Preparedness for the different types of responses is also evaluated by RAC and by type of SMAT. Respondents from 5 RACs feel more prepared than average to respond while
respondents from 3 RACs feel less prepared than average based on the RAC Preparedness Capacity Index. Respondents on a SMAT I or SMAT II feel more prepared than average, while those on a SMAT III feel less prepared than average based on the Preparedness Capacity Index. A potential explanation for this disparity between the types of SMAT is that the SMAT IIIIs do not necessarily train for all of the types of responses included in the questionnaire and instead focus on decontamination and patient triage. It may also be that, as some of the in-depth interviewees stated, some SMAT III teams are more active in training than others and some train on their own, while others participate in joint trainings with their SMAT II team. Similarly, some RACs spend more time performing joint trainings and working at scheduled events than others. These may be two factors that influence the differences in preparedness between RACs. There may be other factors as well, such as time on the team, previous deployments and scheduled events worked, and quality of training, but it is difficult to evaluate how influential each of these potential factors is in making respondents feel prepared for a specific type of response.

Preparedness is also dependent upon the standard operating procedures and standard operating guidelines that are developed for each type of mission response. My impression from the in-depth interviews is that the responsibility for developing and maintaining these documents is not well defined. Some HPCs argue that the NC OEMS needs to take a more active role in developing SOPs and SOGs to distribute to the RACs. Each RAC can then take a standard set of procedures and guidelines and make adaptations or additions as necessary to address specific extenuating factors applicable to each team based on the regional HVA. And, as some interviewees noted, there have been attempts at developing these documents in the past but the current iteration of them is more a concept of operations rather than a finalized product. Recent
work on the North Carolina Burn Surge Disaster Program is evidence of progress towards the development of comprehensive plans. This plan was completed through the combined efforts of the NC OEMS and individuals at the state’s teaching hospitals. Similarly, comprehensive and detailed SOPs and SOGs will require coordination and cooperation between the NC OEMS, RAC leadership, and individuals at the member hospitals, counties, and EMS agencies. A revised set of these documents may help the teams standardize and improve their training to better fit the expected capabilities and tasks required during a mission.

Training may also benefit by increasing the frequency of exercises and drills. Some questionnaire respondents remarked that training focuses on equipment familiarization rather than how to use the equipment during a mission. Some HPCs believe that the SMAT program will emphasize exercises and drills over the next few years as more HPP funding goes to training and less to new equipment purchases. Teams should enhance their training exercises as they implement multi-year TEPs and integrate the HPP benchmarks related to training exercises and the requirement that programs follow the HSEEP guidelines into their trainings.

A multi-year TEP allows teams to implement the “crawl, walk, run” approach. In the crawl stage team members are introduced to programs and skills through basic learning sessions and tabletop exercises (TTX). The walk stage allows for drills and functional exercises (FE) where capabilities, procedures, and activities can be performed and evaluated under controlled conditions. The run stage is the culmination of the TEP evolution, and includes full-scale exercises (FSE) where all aspects of the team’s capabilities are implemented and exercised. The final two stages are amenable to an after action review (AAR) and improvement plan (IP) to help identify deficiencies and guide necessary changes or improvements. While the teams and the state already plan and conduct some of these activities on a yearly basis, increasing funding for,
and frequency of, these training exercises may improve volunteers’ confidence in the capabilities of their team. They do not have to be state-level trainings, but instead can be at the RAC level or between multiple RACS and their SMAT IIs and IIIs. The quality, quantity, and type of training are the three most important variables in improving the SMAT program preparedness for responding to an event.

**Funding**

The SMAT program should also assess the financial viability and funding of the program. The reliance on federal assistance through the HPP places the program at risk of having funding shortfalls or difficulties if HPP funding is reduced or stopped. The public’s memory for large events like 9/11 and Hurricane Katrina is relatively short and this collective short-term memory in conjunction with an economic recession puts pressure on the federal government to reduce funding for preparedness and response programs. The SMAT program and the SMRS should develop contingency plans for funding and potential restructuring of assets if financial difficulties were to be encountered in the future due to changes to the HPP.

**Limitations**

The questionnaire and in-depth interviews have provided a glimpse into the SMRS and the SMAT program. It must be emphasized that questionnaire responses were collected from approximately 10% of the potential respondents who received the initial email invitation, and not all HPCs were interviewed. There was also only one interview with a representative of the NC OEMS. There is a potential for selection bias due to the voluntary nature of the questionnaire. Respondents that elected to complete the questionnaire may have felt more strongly about the program or had more polarized opinions than those volunteers who did not respond, and the results may therefore not reflect the overall opinion of all volunteers affiliated with the SMAT
program. The in-depth interviews were with individuals in leadership positions rather than with volunteer personnel of the SMAT program. It is possible that the responses might vary if a random sampling of volunteers were interviewed rather than program leadership. In addition, the responses from the in-depth interviews were not graded or scored, and no attempt was made to compare respondents’ answers. However, even with these limitations, I believe that the questionnaire and in-depth interviews provide valuable information to help evaluate and improve the SMAT program.

Conclusion

Hazards constantly threaten North Carolina and a decade ago state agencies, HCOs, and citizens came together to create a program to enhance preparedness for, and response to, these potential disasters. The SMRS and the SMAT program provide North Carolinians and citizens of neighboring states with a unique and valuable set of assets to address the medical and public health needs of individuals and communities affected by a catastrophic health event. The program has shown its utility in its responses to both disasters and scheduled events over the years.

This analysis demonstrates that the SMAT program is of great value to North Carolina. It also identifies potential adjustments and improvements that can increase the effectiveness of the training, capabilities, and oversight of the program. This process depends on the involvement and participation by both the RACs and the NC OEMS. Some program changes, such as the new orientation and initial training modules, have already been implemented and will need further evaluation in the future. Others, such as moving to a multi-year TEP with more emphasis on
drills and exercises, improving the SOPs and SOGs, and redoubling recruitment and retention efforts, are currently being implemented or should be goals for the future.

These processes are dynamic and will change as the SMAT program continues to mature and develop. The first decade has been a period of development, growth, and establishing capabilities. The next phase entails maturation and refinement of current capabilities, adjusting to fit changing demands, and continued alignment with evolving HPP benchmarks and guidelines. These goals require oversight and direction about training and operations from the NC OEMS, cooperation and coordination from the HCOs, counties, and EMS systems at the RAC level, and adequate participation from the individual volunteers. Periodic assessments of the program should be undertaken to help provide direction and guidance. These should elicit feedback from both program leadership and program volunteers. The SMAT program has proven its value over the past decade and, as it continues to evolve, will remain an indispensable asset for North Carolina in the future.
References


4. Skarote MB. Deployable Medical Assets. PowerPoint presented at: The IAEM-USA Region 4 Conference: 2012 Apr 16-20; Myrtle Beach, SC.


10. State Medical Assistance Team Description. Charlotte (NC): MTAC State Medical Assistance Team.


27. State Climate Office of North Carolina [Internet]. Raleigh (NC): State Climate Office of
North Carolina, North Carolina State University. 2012. Available from: http://www.nc-
cclimate.ncsu.edu/climate/ncclimate.html.
28. Charlotte (city), North Carolina [Internet]. Washington (D.C.): United States Census Bureau,
29. Raleigh (city), North Carolina [Internet]. Washington (D.C.): United States Census Bureau,
30. North Carolina Trauma Centers, February 2012 [Internet]. Raleigh (N.C.): North Carolina

**Interviews**

2. Jessica Thompson, Director of Emergency Preparedness and Trauma for Duke University
Hospital, Duke RAC. May 29, 2012.
3. Randy Hoffman, Regional Hospital Preparedness Coordinator, Mid Carolina RAC. June 4,
2012.
5. Roy Alson, Medical Advisor to the State Medical Response System, NC OEMS. June 5,
2012.
6. Dale Hill, Manager, Emergency Services Institute, WakeMed Health and Hospitals,
CapRAC. June 7, 2012.
Appendices

Appendix A - Systematic Review

Introduction. I performed a systematic review of the literature pertaining to disaster preparedness and response in North Carolina. The review is meant to identify the set of potential articles that will add to the knowledge and understanding of the history, structure, function, personnel, and deployments of the State Medical Assistance Teams (SMATs) and the State Medical Response System (SMRS). I conducted the initial search and article review on PubMed and then performed a second search on Google Scholar. I am only interested in articles that focus specifically on the SMAT or SMRS, rather than articles that tangentially discuss these programs or other less specific content about disaster preparedness and response.

Methods. The PubMed search strategy is based on identifying appropriate MeSH terms. Using MeSH terms ensures that the results are be more specific to my question of interest, reduces the number of inappropriate or unrelated articles, and speeds the process of sorting through potential articles. I identified and reviewed several potential MeSH terms. I limited my search to just results pertaining to North Carolina by using the MeSH term “North Carolina”. I entered the term “disaster”, which produced 4 subject heading results: Disasters, Disaster Planning (introduced in 1978), Disaster Medicine (introduced in 2008), and Chernobyl Nuclear Accident. The MeSH subject heading Disasters has 6 narrower subject headings in the MeSH Hierarchy: Disaster Planning, Emergencies, Emergency Shelter, Mass Casualty Incidents, Relief Work, and Rescue Work. Each of these subject headings is at a terminal position in the MeSH hierarchy, and Emergencies, Mass Casualty Incidents, and Relief Work exist as subject headings in multiple MeSH hierarchies. Each of these 6 terms is included in the search when the term “disasters” is in the search string, so it’s not necessary to add these to the string. The heading Disaster Planning was in the initial 4 search results when the term Disaster was used, but also exists as a narrower subject heading so it also doesn’t need to be in the search string. Disaster Medicine is a terminal subject heading but isn’t a narrower heading in the MeSH hierarchy of the Disaster subject heading, so it is included in the search string. The terms State Medical Assistance Team, State Medical Response System, SMAT, and SMRS are not in the MeSH database. Therefore, the final search string includes the MeSH terms Disasters, Disaster Medicine, and North Carolina. The string was entered as (“Disasters”[Mesh] OR “Disaster Medicine”[Mesh]) AND “North Carolina”[Mesh]. This returned 147 results. A date filter was added to restrict results to articles published after 1/1/2001, resulting in 84 potential articles. A species filter using the term “humans” reduced the results to 72 articles.

These 72 articles represent the initial group of potential articles to review. The articles were sorted first by their title, and then by an abstract review. If the title appeared to potentially be relevant to my topic, then it was kept and went to a full abstract review to better assess its suitability and relevance. Thirty-eight articles were potentially relevant based on their title. Titles had to include text that was relevant to disaster preparation or response, responses to an actual disaster that occurred after January 1, 2001, or a discussion of potential disasters and how the hospital, individuals, or the state was prepared to manage these events. Twenty-five articles were selected for abstract review based upon these requirements. Articles that did not discuss the SMRS, the SMAT, disaster preparedness in North Carolina, or regional or state response to a specific disaster were excluded. Articles that focused on preparedness or response within the
professions of public health, law enforcement, or nursing were also excluded. Eleven of the 25 articles did not have an abstract and couldn’t be excluded based upon any of the predetermined exclusion criteria, so they were included in the final full-article review. Three additional articles with abstracts were also included in the final full-article review.

Fourteen articles were read in full to determine if they were pertinent to the research question. Two of the 14 articles discussed the SMAT program, the SMRS, and/or disaster preparedness in North Carolina with a focus on medical needs in a moderate to significant capacity. The other articles were either not pertinent, not specific enough, or discussed other aspects of disaster response. One article had a single reference which, based on a title review, was not pertinent to the research question. The two articles were Hoffman H, 2007 (13) and Strickler J, Murtaugh L, Hoffman R, 2010 (14).

A second literature review was performed on Google Scholar. The search string “State Medical Assistance Team” and “North Carolina” was used first and returned 14 articles. Titles and excerpts or abstracts were assessed for their applicability to the research question. Two of the 14 articles were applicable to the research question; 1 was unique, and one was also found in the PubMed search. The one unique article was Brice J, Alson RL, 2007 (15). The article found on both Google Scholar and PubMed was Hoffman H, 2007 (13).

The Google Scholar search did not uncover the article Strickler J, Murtaugh L, Hoffman R, 2010 (14), which I initially found in the search of Pub Med. I considered this to be a sentinel article because it contained the phrase “State Medical Assistance Teams” in the title and the body of the article. Therefore, I decided to conduct a second search on Google Scholar using the search phrase “State Medical Assistance Teams”. The difference in phrasing is the use of ‘teams’ rather than ‘team’. Nine articles, including the sentinel article, appeared and two of the nine were relevant but had already been found in prior searches.

**Results.** The combined PubMed and Google Scholar searches returned a total of 3 articles that were relevant to the initial research question.

Hoffman H. 2007

The response by State Medical Assistance Teams (SMAT) to Waveland, MS after Hurricane Katrina provided an opportunity for these assets to be tested in a coordinated manner for a prolonged period of time. Through use of the Emergency Management Assistance Compact (EMAC), over 500 providers treated more than 8000 patients in a K-Mart parking lot, and North Carolina received over $4 million in reimbursement for deployment costs. A variety of personnel including physicians, nurses, paramedics, radiologic technologists, pharmacists, and respiratory therapists were deployed to provide care. Issues identified include multiple issues with communications between providers on-site, with other assets, and with government representatives, logistics issues pertaining to fuel, food, water, sleeping quarters, and information technology, mental and physical fatigue of the responders, and appropriate protection of patient confidentiality. The deployment was an opportunity for the SMAT program to be utilized to its potential and identified deficiencies in the SMAT program that should be addressed with a Corrective Action Plan.

This article provides a concise description of the operational capabilities of the SMAT program and describes program limitations that were identified during the deployment. The
author is knowledgeable about the SMAT program, but this familiarity may bias her assessment, potentially leading to an overestimation of the capabilities and effectiveness or an underestimation of the limitations or areas that can be improved. The overall interpretation of the article is that it provides quality information in a concise manner without obviously overstating or exaggerating the capabilities; therefore I consider the overall quality of the article to be good.

Strickler J, Murtaugh L, Hoffman R. 2010

The SMAT program has helped to build medical resources in North Carolina to respond to many threats, which is important because there have been a large number of them since 9/11. UNC Hospitals runs the Mid Carolina Region’s team. This team is part of the SMRS and provides numerous capabilities for the surrounding hospitals and counties including mass patient technical decontamination for up to 250 patients per hour, alternate care sites to expand bed capacity, a 50 bed mobile field hospital, and an 80 bed medical support shelter for fragile populations. The team is designed to be self-sufficient for 72 hours. These services are funded by ASPR and the NC OEMS with in-kind support from UNC hospitals and the regional partners. Training requirements include attending at least 2 sessions per year that cover the core capabilities and at least 1 exercise or deployment every 2 years. The team has over 150 volunteers and uses the ServNC system for registration, tracking, and notification of volunteers.

This article provides a very good description of the capabilities and training requirements of the SMAT program and, in particular, the Mid Carolina team. The authors are very involved in the program (Randy Hoffman is the HPC for Mid Carolina) which gives them credibility when speaking about the technical details of the program. The only subjective statement that the article makes is that North Carolina is the state with the most robust medical response system. It is difficult, if not impossible, to appropriately assess this statement. Overall, this article provides excellent information about the capabilities and training requirements of the SMAT program and the Mid Carolina team. I consider this article’s quality to be good.

Brice JH, Alson RL. 2007

North Carolina is susceptible to a variety of natural hazards and its hospitals and emergency departments are short on beds and overcrowded. This situation means that North Carolina is at risk of being unprepared to respond to a medical surge event. In response to this threat, local, regional, and state-level assets have worked together to develop all-hazard response plans that are comprehensive, scalable, and flexible and able to meet the response demands of a disaster or large-scale event. The collaboration between the NC Office of EMS, the NC Office of Emergency Management, and the NC Department of Health produced the State Medical Response System (SMRS), and the State Medical Assistance Teams (SMAT) to respond to any potential event. The SMAT program is a tiered system involving county, state-level resources to provide decontamination services or increased capacity through field hospitals able to serve from 50 to 400 patients. The funding is provided by the Health Resources and Services Administration, and personnel are from each of the participating hospitals. The teams have already shown their utility in numerous deployments to the Tall Ships sail, Hurricane Katrina, and the Apex chemical plant fire, among other events. The SMAT program provides North Carolina with a unique system to prepare and respond effectively to an event. North Carolina is a leader in the field of disaster preparedness and response and other states in the southeast have emulated the model.
This article provides a strong overview of the SMAT program and discusses the importance of the program in providing medical services to North Carolina during both scheduled events and unexpected disasters. Both authors are very knowledgeable about disaster preparedness and response as well as the SMAT program. The article also discusses potential future investments and changes to the program, some of which have been completed and others that have moved in a slightly different direction. The article provides very good information and the quality is good.

Discussion. This systematic review identifies the primary literature that discusses disaster preparedness and response and focuses on the SMAT program and the SMRS. The results indicate that there is very little primary literature about these topics. The literature that exists is of good quality but all of the articles are similar, focusing mostly on operational capabilities and training. There are no articles that try to evaluate the programs or provide evidence-based suggestions for improvements or changes to the program.

Many of the other articles that were found during the search were tangentially related to the program or briefly discussed the program but were not specific enough in the description. Some were minimally useful for providing a single piece of information while others were completely irrelevant and unrelated to the research question. There were no articles related to the research question that contained data that could be analyzed for internal or external validity.
Appendix B - Regional Advisory Committee (RAC)

The RACs provide guidance for trauma care and disaster preparedness and response. They are overseen by the NC OEMS. All hospitals, EMS systems, and counties without a hospital are required to affiliate with a RAC. These members have the ability to switch their RAC affiliation on a yearly basis. The RAC also works with other HCOs in the geographic area including skilled nursing facilities, private physicians’ offices, health centers, and other medical facilities to develop preparedness capabilities.

The RACs are distributed across all regions of the state. However, counties and EMS systems are not required to affiliate with the same RAC as contiguous counties or with the closest RAC, which results in geographically-isolated counties with a RAC affiliation that is different from surrounding counties. The square mileage and population density, number of counties, and number of hospitals and health care facilities varies greatly across the RACs. North Carolina is generally divided north-south into 3 geographic regions. The variation present within these regions has wide-ranging effects on potential hazards and the subsequent disaster planning that is RAC-specific.

The 8 RACs also vary slightly in how they are affiliated with the Lead Trauma Center. However, each RAC has a Disaster Planning Committee (DPC) to facilitate the development of preparedness plans (16). Many of the organizations involved in the RAC are represented on this committee. A Hospital Preparedness Coordinator (HPC), previously the Regional Emergency Response and Recovery Coordinator (RERRC), is tasked with overseeing the daily management of the HPP and the disaster preparedness operations of the RAC.
Appendix C - North Carolina Emergency Operations Plan (NC EOP)

Disaster planning in North Carolina is outlined in the State of North Carolina Emergency Operations Plan (NC EOP) which was published in April, 2009, and amended in September, 2010. The NC EOP is authorized by G.S. 166A and identifies the Secretary of the North Carolina Department of Crime Control and Public Safety (now the Department of Public Safety) as the lead agent for implementing and utilizing the NC EOP. The Division of Emergency Management (NC EM), within the Department of Public Safety, developed the NC EOP and is the lead agency in managing and responding to an event. The NC EOP is designed to provide a “systematic, coordinated, and effective response to and recovery from” any emergency or disaster and follows the principles of the NIMS (6, pg. 1).

The NC EOP is a collaborative effort between more than 30 state, volunteer, and nongovernmental agencies that are involved in preparing for, responding to, and recovering from potential hazards. Representatives from many of these agencies compose the State Emergency Response Team (SERT) which assembles during an emergency or disaster to oversee and direct the response and recovery efforts. The NCEOP is activated when either the Governor, through a proclamation of state of emergency or executive order, or the Director of Emergency Management identifies that an emergency or disaster has occurred or will occur imminently (6).

The NC EOP is divided into 2 Annexes. Annex A details the functions and responsibilities of departments and agencies in fulfilling the North Carolina Emergency Support Functions (NCESF), which mirror the federal ESFs described in the National Response Framework (NRF). Each ESF is assigned to 1 of 7 SERT Sections, and outlines the Purpose, Mission, Organization, and Concept of Operations of the ESF (6).

NCESF-8A, Disaster Medical Services, is covered by the Emergency Services Branch within the SERT Operations Section. The Department of Health and Human Services (NC DHHS), Division of Health Service Regulation (DHSR), Office of Emergency Medical Services (NC OEMS) is the Lead State Agency tasked with managing ESF-8A, overseeing all actions under ESF-8A and coordinating with the Emergency Services Branch of NC EM and the state and non-governmental Support Agencies. Among these Support Agencies are the RACs and the SMATs. In addition, all hospitals, EMS agencies, and licensed health care organizations and facilities fall under ESF-8A (6).

ESF-8A provides “coordinated State assistance to supplement local resources in response to medical care needs following a declared disaster event or at the request of Emergency Management” (6, pg. A-3-G-2). A request for activation of ESF-8A may originate from county or regional Emergency Management following a disaster or from the Governor or NC EM. The specific types of medical needs of an area and event are identified. These needs are then developed into a Medical Support Mission through the ESF-8A function and the OEMS, in conjunction with NC EM, assigns the mission to medical assets outside of the affected area. These assets include the SMRS with the SMAT program. The NC OEMS also coordinates with federal resources including the NDMS and national resources from other states through the EMAC as necessary (6).

ESF-8A describes the role of the SMRS when activated. It is tasked with providing mobile medical facilities, overseeing responder health and safety, helping to distribute the SNS,
and augmenting levels of health care personnel working at existing HCOs. Among the mobile medical facility abilities are field medical services and coordination including field hospitals, HazMat medical units, alternate care facilities and medical support shelters, mass prophylaxis distribution, mass casualty triage, and assisting the NDMS (6, pg. A-3-G-17).

Annex B of the NC EOP contains detailed preparedness and response plans for some of the potential hazards identified by North Carolina’s HVA. There are 16 principal natural, technological, and intentional hazards that threaten North Carolina: tornadoes, hurricanes, flooding, winter storms, droughts, wildfire, earthquakes, fixed nuclear facility accidents, hazardous materials, nuclear threat/attack, energy emergency, mass casualty/fatality, terrorism, foreign animal/livestock disease, landslides, and dam failure. These hazards do not all pose the same level of risk, and some have a greater probability of occurring than others, but many have the potential to strain or overwhelm the resources of HCOs, create mass casualties, require the evacuation of HCOs and the establishment of alternate care facilities, or necessitate the deployment of resources for mass immunization and prophylaxis (6).
Appendix D - Federal Agencies, Laws & Regulations

There are a multitude of federal agencies, laws, and directives which apply to disaster preparedness and response. Beginning in the late 1990’s the Federal government began developing comprehensive plans for terrorism and natural hazards. This process continued in earnest after the September 11th attacks with dramatic increases in funding for new and existing programs and a multitude of new laws and directives that address all stages of disaster planning.

The United States Department of Homeland Security (DHS) is charged with identifying and protecting the United States from threats, and helping the nation prepare, respond, and recover from natural disasters and other emergencies. DHS provides these services through numerous agencies, programs, and laws and regulations. The Federal Emergency Management Agency (FEMA) is tasked with helping the nation, states, tribal areas, and local communities with preparation, response, and recovery from disasters. The Homeland Security Exercise and Evaluation Program (HSEEP) provides structure and guidance on planning and evaluating large-scale preparedness exercises to ensure that they are relevant, targeted, and effective at improving the capabilities of agencies and identifying deficiencies that require improvement.

The United States Department of Health and Human Services (HHS) is tasked as the lead agency for the federal public health and medical response to public health emergencies and incidents as granted under the Public Health Services Act. The Centers for Disease Control and Prevention (CDC) and the Health Resources and Services Administration (HRSA) are Operating Divisions and the Office of the Assistant Secretary for Preparedness and Response is a Staff Division within US HHS managing preparedness and response.

The CDC oversees the Office of Public Health Preparedness and Response (PHPR), which leads preparedness and response activities within the CDC by providing “strategic direction, support, and coordination for activities across CDC as well as with local, state, tribal, national, territorial, and international public health partners” (17, pg. 2). The Division of State and Local Response (DSLR) within the PHPR oversees the Public Health Emergency Preparedness (PHEP) cooperative agreement, which began in 1999 and funds preparedness at the state and local level through local public health departments. The PHEP developed capability-based performance measures in 2011 that help define and monitor the progress made at the local and state level in preparing for, and responding to, public health emergencies (18, pgs. 1-2).

The Division of Strategic National Stockpile (DSNS) within the PHPR operates and maintains the Strategic National Stockpile (SNS), a “national repository of large quantities of medical countermeasures, vaccines, and other medical supplies stored in strategic locations around the nation” (19, pg. 1). The DSNS maintains 12 strategically located 12-Hour Push Packages throughout the United States which each contain 50 tons of medical assets and can be delivered anywhere in the United States within 12 hours, as well as a Managed Inventory of additional or alternative items which can be delivered within 24 to 36 hours (19, pg. 1).

ASPR oversees the Office of Preparedness and Emergency Operations (OPEO) which manages the Emergency System for Advance Registration Volunteer Health Professionals (ESAR-VHP), the National Disaster Medical System (NDMS), and the Hospital Preparedness Program (HPP).
ESAR-VHP is a national system of state-based registries “designed to verify the credentials, licenses, accreditations, and hospital privileges of such professionals” so that these individuals can be mobilized and integrated into the health care system during public health emergencies (24). Created in 2002 by the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (the Bioterrorism and Act, described later), ESAR-VHP was first implemented in April, 2004 and administered by HRSA’s Division of Health Care Emergency Preparedness (DHCEP). The program was moved to ASPR in 2006 through Pandemic and All-Hazards Preparedness Act (PAHPA, described later) (78). Implementation of ESAR-VHP by all 50 states has been a priority for the Federal government, particularly in the aftermath of Hurricane Katrina when multiple reports identified the problems with effectively identifying, credentialing, and moving volunteer health professionals to areas in need of help (21).

Each state is tasked with maintaining its own database of health care volunteers. States use the system to identify, notify, and deploy volunteers with specific licenses or credentials for events that occur on the local, state, or national level. Deployments are not mandatory and providers have no obligation to participate in the system (22). The system must allow users to register electronically and list all of their local, state, and federal affiliations, licenses, and credentials. If a deployment occurs, whether intrastate, interstate, or Federal, states must be able to track the volunteers during the event and maintain a history of deployments. ServNC is the ESAR-VHP program in North Carolina. Using the web portal, individuals sign up for the SMAT program, receive updates and messages, and are notified of deployment opportunities.

United States law pertaining to disaster planning is codified in Public Health Service and Disaster Relief, Chapters 6A and 68, respectively, of Title 42, Public Health and Welfare, of the United States Code. These two chapters, colloquially known as the Public Health Service Act (PHS Act) and the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), have been amended multiple times by Public Laws which were enacted to better address current concerns of disaster planning.

Since 9/11 several Public Laws have amended the PHS Act. These laws have created new programs, restructured existing guidelines, and helped direct oversight of disaster planning. The Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (P.L. 107-188, the Bioterrorism Act) was enacted into law on June 12, 2002 “to improve the ability of the United States to prevent, prepare for, and respond to bioterrorism and other public health emergencies” (17, pg. 594). The Bioterrorism Act amends portions of the PHS Act related to grant programs and funding for preparedness and response, creates a system for registration and tracking of volunteer health professionals called the Emergency System for Advance Registration Volunteer Health Professionals (ESAR-VHP), and guidelines for planning, preparedness, and response activities, oversight, and management.

The Bioterrorism Act created and funded the National Bioterrorism and Hospital Preparedness Program (NBHPP/HPP), administered by HRSA, to provide grants “to improve community and hospital preparedness for bioterrorism and other public health emergencies” (23, pg. 624). The NBHPP began to receive funding in fiscal year 2002 to enhance the regional coordination and cooperation between recipients, which includes partnerships consisting of hospitals and other health care organizations, local and regional subdivisions of states, and/or states. Activities funded by the grant include preparation of a plan for the triage and transport of
patients, enhancing the training of health care professionals to recognize, diagnose, and treat a large number of patients exposed to, or affected by, bioterrorism or other public health emergencies, and developing and implementing trauma and burn care (23, 24).

The NBHPP developed a set of benchmarks to provide guidance, measure improvements, and determine compliance with grant guidelines. Initial guidelines included 3 Critical Benchmarks: identification of an individual to coordinate preparedness planning, designation of a hospital preparedness planning committee, and development of a state- and regional-response plan (25). This was later expanded to 16 critical benchmarks spread between 6 Priority Areas. The program also required that 80% of funds awarded to states be “passed through” to hospitals, emergency medical systems, and other healthcare entities (25, pg. 47). The NBHPP has funded the SMAT program since its inception in 2002, and the SMAT program has adapted and evolved over the past decade due, in part, to changes in the guidelines and benchmarks over the NBHPP’s grant cycles.

The Pandemic and All-Hazards Preparedness Act (P.L. 109-417, PAHAP), enacted on December 19, 2006, amends significant portions of the PHS Act. The PAHAP address the deficiencies identified in the aftermath of Hurricane Katrina and the threat of pandemic influenza and clarifies the myriad existing guidelines by restructuring the management of, and creating new oversight for, existing programs, strengthening and refining the reporting benchmarks and standards of grant programs, and requiring the development of a national strategy for health. The Assistant Secretary for Preparedness and Response (ASPR) is created within HHS to oversee the Office of Preparedness and Emergency Operations (OPEO), which manages the HPP, the NDMS, the MRC, the SNS, the Public Health Preparedness and Response for Bioterrorism Program grants, and the ESAR-VHP (26).

The PAHAP requires the development of a National Health Security Strategy (NHSS). The NHSS, updated every 4 years, aligns with existing national preparedness and response guidelines including the NPG, the NIMS, and the NRF, and describes the plans for developing and implementing preparedness and response specifically for health care and public health (26, 27). The NHSS also evaluates progress made on preparedness from the local level to the Federal level using the same “evidence-based benchmarks and objective standards that measure levels of preparedness” of the HPP (26, pg. 2835).

The PAHAP establishes 6 specific Preparedness Goals used to evaluate existing grant programs and general preparedness. These Goals include Integration, Public Health, Medical, At-Risk Individuals, Coordination, and Continuity of Operations. Integration of “public health and public and private medical capabilities with other first responder systems” is to be achieved through periodic drills and exercises testing preparedness and response capabilities at all levels of government as well as through improving the integration of “public and private sector public health and medical donations and volunteers” (26, pg. 2836). The Medical goal is to increase “the preparedness, response capabilities, and surge capacity of hospitals, other health care facilities (including mental health facilities), and trauma care and emergency medical service systems”. The 5 actions to achieve the goal are strengthening medical management and treatment, enhancing medical evacuation and fatality management, speeding up the distribution of medical countermeasures, effectively using available public and private mobile medical assets, and protecting health care workers and first-responders from occupational exposures. At-Risk Individuals including “children, pregnant women, senior citizens and other individuals”
with specific medical conditions, such as dialysis patients, patients with mobility issues, and patients on ventilators, have unique public health and medical needs that must be addressed in an emergency. Coordination emphasizes that planning, preparedness, and response activities should minimize duplication and encourage coordination between the levels of government and should take into consideration the State Emergency Management Assistance Compact (EMAC) and existing preparedness and response guidelines (26).

The PAHPA greatly enhanced the oversight of the HPP. It requires grant recipients to address the Integration, Medical, At-Risk Individuals, Coordination, and Continuity of Operations NHSS Preparedness Goals and developed “measureable evidence-based benchmarks and objective standards” (26, pg. 2839) meant to evaluate progress towards achievement and implementation of these NHSS Preparedness Goals. Recipients must also conduct tests, exercises, and evaluations of their ability to provide adequate and appropriate “public health and medical emergency preparedness and response capabilities” and report the results to HHS (26, pg. 2839). States that fail to meet the guidelines receive an opportunity for corrective action which, if insufficient, results in withholding of funding for the following fiscal year. This penalty starts at 10% and increases by 5% for each subsequent non-compliant year up to a maximum of 25% withholding (26, 27).
Appendix E - North Carolina Hazards, Laws, and Regulations

Every state has unique characteristics that combine to define the set of potential hazards. Some of the characteristics that affect the potential hazards include climate, soil, natural topography, natural resources, industry, economic activity, population density, and urban areas. All of these must be addressed by disaster planners and Emergency Managers when performing a HVA and developing a local, regional, or state EOP.

North Carolina measures 52,712 square miles, stretching from the Atlantic Ocean to the Appalachian Mountains, with elevations moving from sea-level to a peak of 6,684 feet on Mt. Mitchell, the highest point east of the Mississippi River. The state is divided into three physiographic regions: a Coastal Plain composing almost half the area of North Carolina, which is further divided into a flat and swampy tidewater, and a sloping, well-drained interior portion; the Piedmont, which composes about one-third of the state’s square mileage and is mostly transitional foothills between the flat eastern portion and the mountainous west; and the Mountains, the smallest geographic area at only about 1/5 of the state’s square mileage, but the region with the most dramatic elevation changes. Peaks at over 6,000 feet drop down into valleys which are barely 1,000 feet above sea level. North Carolina also has a (6, 28)

The state’s elevation variations and its exposure to both mountains and the ocean create wide climatic variations. Average rainfall and temperature vary significantly between the mountains and lower-lying coastal plains, with ranges of at least 20 degrees and 40 inches, respectively. Precipitation falls as rain, snow, and ice and tropical storms and hurricanes threaten North Carolina almost every hurricane season. The entire state is susceptible to flooding, particularly the low-lying Coastal Plains, and the valleys in the Mountains are susceptible to flash flooding and high, fast running rivers. Winter storms may cause flooding and dangerous ice accumulation capable of disrupting utility services for days or weeks, and tornadoes can be generated from thunderstorms (6). Summer months may be extremely hot and humid with temperatures averaging in the 80’s throughout most of the state and frequently reaching into the 90’s and even higher, with an average relative humidity of 65-75% (28). HVAs address all of these potential natural hazards.

North Carolina is the 10th most populous state, with over 9.5 million people distributed unequally throughout the state’s 100 counties. Over half of the state’s residents are concentrated in the Piedmont Crescent, encompassing Charlotte and Statesville, the Piedmont Triad, which includes Winston-Salem, Greensboro, High point and Burlington, and the Triangle Area, which includes Raleigh, Durham, and Chapel Hill. The Coastal Plain is the next most populous region, where residents are concentrated in the southern portion, and the Mountain region is the least populous, making up only 15% of the state’s population (6). Charlotte is the 17th largest city in the United States, with over 730,000 residents, and is a major banking center (29), and Raleigh, the state capital and its 2nd largest city, has a population of almost 404,000 (30). There are also over 116,000 active duty military personnel, the third most among the 50 states, working at the 8 military installations in the state including Fort Bragg, Camp Lejune, Marine Corps Air Station Cherry Point, Seymour Johnson Air Force Base, and Coast Guard Air Station Elizabeth City, among others. The Triangle is home to a large number of information technology, biotechnology and chemical companies which produce important pharmaceuticals, chemical products, and other
products. All of these characteristics are important when identifying potential hazards and developing a HVA.

North Carolina residents are served by 13 Trauma Centers. These Trauma Centers are accredited by North Carolina (through G.S. 131E-162 and NC OEMS Rules 10A NCAC 13P .1100 and .1101) and potentially the American College of Surgeons (ACS) if they meet the accreditation requirements. These Trauma Centers are not distributed evenly throughout the state. The Coastal Plain is served by Vidant Medical Center (Level I, previously Pitt County Memorial Hospital), in Greenville, and New Hanover Regional Medical Center (Level II), in Wilmington. These two hospitals are the only Trauma Centers east of I-95. Mission Hospitals (Level II), located in Asheville, is the only Trauma Center in the Mountain region. The other 10 Trauma Centers are located in the Piedmont. The Triangle area has 3 Level I Trauma Centers: Duke University Medical Center, WakeMed Raleigh Hospital, and UNC Hospitals. Wake Forest University – Baptist Medical Center (Level I, WFU-BMC), Moses H. Cone Memorial Hospital (Level II), and High Point Regional Hospital (Level III) serve the Piedmont Triad area. The Charlotte metropolitan area and surrounding counties are served by Carolinas Medical Center (Level I, CMC), and 3 Level III Trauma Centers, Cleveland Regional Medical Center, Gaston Memorial Hospital, and CMC-NorthEast (31). Some of these hospitals serve as the Lead Trauma Center for the state’s 8 RACs which oversee trauma care and disaster planning, regulated by G.S. 131E-162 and 166A of the North Carolina General Statutes.

G.S. 131E-162 Article 7A is entitled the Statewide Trauma System Act of 1993 and calls for the establishment and maintenance of a program for the development of a statewide trauma system (32). G.S. 166A is entitled the North Carolina Emergency Management Act of 1977 and is the main portion of the General Statutes that provides legislative authority for disaster preparedness and response. The Governor is the lead agent in managing a disaster, with the Secretary of Public Safety responsible for reporting to the Governor, activating local and state response plans, and deploying resources to respond as appropriate. State Emergency Management, which is overseen by the Secretary of Public Safety, is responsible for numerous activities including coordinating agencies’ activities during a disaster, preparing and maintaining the state EOP, establishing a registry of medically fragile individuals who may need assistance during a disaster, and working as the lead agency for hazard risk mitigation (33).

Government agencies and emergency management workers acting under the authority of G.S. 166A are not liable for death or injury to persons “except in cases of willful misconduct, gross negligence or bad faith” (33, pg. 15). The term “emergency management worker” is as any full or part-time paid, volunteer or auxiliary employee of any level of government, as well as “health care workers performing health care services as a member of a hospital-based or county-based State Medical Assistance Team” (33, pgs. 16-17). In addition, the Act protects members of volunteer fire departments, rescue squads, and emergency medical services agencies who have been activated through a disaster declaration by allowing them to take a leave without pay for their job without using sick or accrued leave time (33).

Article 4 of G.S. 166A is entitled the Emergency Management Assistance Compact (EMAC). It guarantees mutual assistance and cooperation between states in managing a declared emergency or disaster and during training activities and exercises, and outlines licensure, liability, and reimbursement. During any requested assistance, the applicable Emergency Support Function (ESF) should be identified along with “the amount and type of personnel,
equipment, materials and supplies needed, and a reasonable estimate of the length of time they will be needed” (33, pg. 21). To allow these personnel to function in different states and to protect them against litigation, the EMAC guarantees the licenses, certificates, and other permits issued by a responding state will be deemed valid by the requesting state for the duration of the emergency or disaster. It also defines responding personnel as “agents of the requesting state for tort liability and immunity purposes” (33, pg.25).
Appendix F - Interview protocol

Hello, my name is Danny Willner. Thank you for taking the time to speak with me. I am a MD/MPH student from the University of North Carolina at Chapel Hill conducting a telephone interview about disaster preparation and response in North Carolina with a focus on the State Medical Assistance Team program and how it fits into regionalization of care. This research is part of the work required to complete my Master’s of Public Health degree. Your participation in this survey is completely voluntary. This means that you do not have to participate in this survey unless you want to.

I’ve asked to speak with you today because of your knowledge about this subject. The following questions will help me to better understand the history, organization, training, capabilities, oversight, and funding routes of the NC SMAT program, determine how the SMAT program fits into a regionalized model for disaster preparation and response, and perform a critical assessment of the program with recommendations for improvements.

We estimate that approximately 20 people will be interviewed in the interview portion of this study, and approximately 1500 people will be involved in the entire study. The interview is estimated to take between 20 minutes and 1 hour depending on your availability to talk and how the questions are answered. If at any point you feel uncomfortable, you have the option to not answer any or all of the questions for any reason. You may ask to skip any question for any reason and we will move onto the next one. With your permission, I will record the interview on a digital recorder and transcribe the interview to ensure the accuracy of your responses. You may revoke this permission at any time. After being transcribed, the digital copy of the interview will be destroyed. You will receive a copy of the final interview transcript. Whether you choose to participate or not will have no effect on your job or relationship with anyone at UNC-Chapel Hill.

All the information I receive from you by phone, including your name and any other identifying information, will be strictly confidential and will be kept under lock and key. If it is okay with you, I might want to use direct quotes from you. You can choose to not allow me to use any quotes, to allow me to use quotes but have them attributed to “a person”, or to allow me to use quotes and identify you by your name and/or job position.

There are no expected risks or benefits to you for participating in this study. Do you have any questions?

You may contact me at dwillner@med.unc.edu or 917-628-1139. You may also contact my project advisor, Dr. Sue Tolleson-Rinehart, suetr@unc.edu or 919-843-9477, a professor in the UNC Gillings School of Global Public Health and the UNC School of Medicine if you have questions about the research study. All research on human volunteers is reviewed by a committee that works to protect your rights and welfare. If you have questions or concerns about your rights as a research subject you may contact, anonymously if you wish, the Institutional Review Board at 919-966-3113 or by email to IRB_subjects@unc.edu.

Do you agree to participate in this study?  
Do I have permission to record this interview with a digital voice recorder?  
Do I have permission to quote you?
Do I have permission to use your name?  Yes  No
Do I have permission to use your job title? Yes  No

Interview Script
I know that your time is very important so I am going to start with the most important questions first.

**SMAT Leadership**
1. I’d like to ask you about these 3 important domains: Resources, personnel, and training.
   We’ll start with resources:
   a. Do you think that the team has adequate resources its responsibilities,
   b. Do you think that the team has adequate personnel for its responsibilities?
   c. Do you think that the team has adequate training for its responsibilities?
   • What would the team need to do to improve its capabilities?
2. What entity is responsible for purchasing and maintaining the equipment and supplies?
   a. Where does the money for these purchases come from?
3. Next, I’d like to ask you about how the team integrates with other resources. Can you please talk about how the team is integrated with:
   a. other disaster preparation and response resources in the hospital,
   b. in the region, and in the
   c. state?
4. Now I’d like to ask you your view on RAC organizational structure?
   a. Would you suggest any changes that you could envision to improve it?
5. What are your thoughts on the number of teams located in NC?
   a. What about the location of these teams?
6. In your view, what types of responses are the teams most prepared for, 
   a. The least prepared for?
7. Have you trained or interacted with other SMAT teams?
   • Can you talk about the multi-team training a little more?
8. What changes do you see happening to the SMAT program going in 5 years?
9. Where do you think the SMAT teams fit into a state-level response, a national response?
10. My research suggest that the field of Emergency Medicine is moving towards a goal of regionalized care, what are your thoughts about how the SMAT system integrates into a regionalized structure for disaster preparedness and response?
11. What opportunities exist for the SMAT teams to improve?
12. Have I left anything out that you think my research ought to include?

**Hospital Preparedness Personnel**
1. In what ways is the hospital integrated into the RAC system?
2. How has the hospital developed programs or plans with the SMAT team & the State Medical Response System (SMRS)?
3. Does the hospital have a role in planning for the SMAT teams and trainings?
4. Does the hospital have a role in working with the NC DHHS & NC OEMS to oversee the SMAT system?
5. What entity is responsible for purchasing and maintaining the equipment and supplies?
   a. Where does the money for these purchases come from?
6. Have you discussed with the SMAT team how many employees the hospital could deploy if there was a disaster?
7. What other resources does the hospital utilize to prepare for disasters?
8. Is the SMAT system beneficial for the region?
   a. The state?
9. In what ways could the SMAT system be changed or improved to enhance its mission and responsibilities?
10. Where do you see disaster preparedness going in 5 years for the hospital?
    a. For the state?
    b. For the teams?
11. My research suggest that the field of Emergency Medicine is moving towards a goal of regionalized care, what are your thoughts about how the SMAT system and hospital integrate into a regionalized structure for disaster preparedness and response?
12. What are the greatest threats for causing a disaster in the hospital’s catchment area?

   **State level**

1. I know from my research so far that the SMAT program began as a collaboration across state agencies. Could you tell me about your views of how that cross agency collaboration helps or hinders disaster preparedness & response?
2. Can you discuss the role of the SMAT teams including:
   o The types of incidents that they respond to?
   o Their structure?
   o Their composition?
   o The number of members?
   o Types and number of trainings?
3. Now I’d like to ask you about the ideal geographic distribution if you could change the way the teams were distributed
4. How does the SMAT program integrate with hospital disaster preparedness?
5. My reading suggests that regionalization of care in Emergency Medicine is a very timely topic, do you think this is the case and do you think disaster preparedness and response in NC is moving towards a regionalized approach to preparation and response?
6. Are there other ways to regionalize disaster preparation & response?
7. How has funding for the teams fared in the recent economic climate?
8. What entity is responsible for purchasing and maintaining the equipment and supplies?
   o Where does the money for these purchases come from?
9. Does the state oversee training or is it a RAC responsibility?
   o How standardized do you think the training is?
10. Where do you see the teams, and statewide disaster preparedness and response going in 5 years?

If time allows, ask before close:
1. From what I’ve learned, it seems that NC is advanced in its utilization of technological resources, could I ask you about?
   a. ServNC
   b. EMSPIC
   c. NCDETECT
2. Greatest threat for disasters in North Carolina?
Appendix G - SMAT Team Survey

Q1.1 Hello! My name is Danny Willner. I am a 4th year medical student at UNC who is completing a Master of Public Health degree. I am also an Emergency Medical Technician-Basic, and emergency preparedness is the subject of my MPH research. This brief survey, which is expected to take between 15 and 30 minutes to complete, is a part of that research. Approximately 1500 people will be asked to participate in this study. Its questions are about the formation, and performance of the SMAT program. The survey has been reviewed by the UNC IRB (IRB # 12-0843). If you have any questions about this research, you can contact the IRB at IRB_Subjects@unc.edu or at 919-966-3113. You can also speak to my adviser, Dr. Sue Tolleson-Rinehart, at suetr@unc.edu or 919-843-9477. I am asking questions about your membership in the SMAT program only to understand team performance. I will be using the information from all surveys only in aggregate form and will make no attempt to identify individuals. Your participation is entirely voluntary. You are not obligated to answer any questions, and you can stop the survey at any time. It is unlikely that there are any risks or benefits to you for participating in this study. I welcome your feedback or questions; you may contact me at dwillner@med.unc.edu or 917-628-1139. Thank you for your time! To begin the survey, please choose one of the responses below.

If I don't agree to take this ... Is Selected, Then Skip To End of Survey

Q2.1 Please select the type(s) of SMAT(s) that you participate on from the list below. (Select all that apply)

- SMAT III (1)
- SMAT II (2)
- SMAT I (3)

Q2.2 Please choose your team's RAC from the list below.

- Capital RAC (1)
- Duke RAC (2)
- Eastern RAC (3)
- Metrolina RAC (4)
- MidCarolina RAC (5)
- Mountain RAC (6)
- Southeastern RAC (7)
- Triad RAC (8)

Q2.3 What is your primary role or job title on your team?

- EMT-Basic (1)
- EMT-Intermediate (2)
- EMT-Paramedic (3)
- Interpreter (4)
- Nurse (5)
- Nurse Practitioner (6)
- Pharmacist (7)
- Physician (8)
- Physician Assistant (9)
- Psychologist (10)
Q2.4 Please indicate your medical specialty or specialties
- Anesthesiology (1)
- Emergency Medicine (2)
- Family Medicine (3)
- Infectious Disease (4)
- Internal Medicine (5)
- Obstetrics (6)
- Pediatrics (7)
- Radiology (8)
- Psychiatry (9)
- Surgery (10)
- Other (11)

Q2.5 You selected "Other" as your medical specialty, please describe your specialty
Answer If What is your primary role or job title on your team? Other Is Selected

Q2.6 You selected "Other", please describe your primary role, job title, and responsibilities

Q2.7 Thinking of all your SMAT experience, even if that is on more than one team, about how many years of SMAT experience do you have?
- Less than a year (1)
- 1 to 2 years (2)
- 2 to 5 years (3)
- 5 to 10 years (4)
- more than 10 years (5)

Q2.8 How were you recruited to the team you are on NOW?
- My hospital recruited me (1)
- My local Emergency Management Agency/county recruited me (2)
- I inquired about joining the team (3)

Q2.9 Do you know the other members of your SMAT?
- I know most or all of the other members (1)
- I know many of the other members (2)
- I know a few of the other members (3)
- I don't know other members (4)

Q2.10 Please select your primary employer from the drop down list:
- Hospital or hospital system (1)
- County emergency services/emergency management (2)
- Other (3)

Answer If First, please choose your team from the list below. Capital RAC Is Selected And Please select your primary employer from the drop down list: Hospital or hospital system Is Selected

Q2.11 Please select the primary hospital that you work for
- Betsy Johnson Regional Hospital (1)
- Central Carolina Hospital (2)
- Franklin Regional Medical Center (3)
- Johnston Memorial Hospital Authority (4)
Answer If First, please choose your team from the list below. Capital RAC Is Selected And Please select your primary employer from the drop down list: County emergency services/emergency management Is Selected

Q2.12 Please select the primary county that you work for
- Franklin (1)
- Harnett (2)
- Johnston (3)
- Lee (4)
- Wake (5)

Answer If First, please choose your team from the list below. Capital RAC Is Selected And Please select your primary employer from the drop down list: Other Is Selected

Q2.13 You selected "Other", please describe your current employer and your job

Answer If First, please choose your team from the list below. Duke RAC Is Selected And Please select your primary employer from the drop down list: Hospital or hospital system Is Selected

Q2.14 Please select the primary hospital that you work for
- Duke Raleigh Hospital (1)
- Duke University Hospital (2)
- Durham Regional Hospital (3)
- Granville Health System (4)
- North Carolina Specialty Hospital (5)
- Person Memorial Hospital (6)
- Southeastern Regional Medical Center (7)
- VA Medical Center - Durham (8)

Answer If First, please choose your team from the list below. Duke RAC Is Selected And Please select your primary employer from the drop down list: County emergency services/emergency management Is Selected

Q2.15 Please select the primary county that you work for
- Caswell (1)
- Durham (2)
- Granville (3)
- Person (4)
- Robeson (5)
- Wake (6)

Answer If First, please choose your team from the list below. Duke RAC Is Selected And Please select your primary employer from the drop down list: Other Is Selected

Q2.16 You selected "Other", please describe your current employer and your job

Answer If First, please choose your team from the list below. Eastern RAC Is Selected And Please select your primary employer from the drop down list: Hospital or hospital system Is Selected

Q2.17 Please select the primary hospital that you work for
- Albermarle Hospital (1)
- Beaufort County Medical Center (2)
- Bertie Memorial Hospital (3)
- Carolina East Medical Center (4)
- Carteret General Hospital (5)
- Chowan Hospital (6)
- Duplin General Hospital (7)
- Halifax Regional Medical Center (8)
- Heritage Hospital (9)
- Lenoir Memorial Hospital (10)
- LifeCare Hospitals of North Carolina (11)
- Martin General Hospital (12)
- Nash General Hospital (13)
- Nash Health Care Systems (14)
- Our Community Hospital (15)
- Pitt County Memorial Hospital (16)
- Pungo District Hospital (17)
- The Outer Banks Hospital (18)
- Washington County Hospital (19)
- Wayne Memorial Hospital (20)
- Wilson Medical Center (21)

Answer If First, please choose your team from the list below. Eastern RAC Is Selected And Please select your primary employer from the drop down list: County emergency services/emergency management Is Selected

Q2.18 Please select the county or counties that you currently work for
- Wayne (1)
- Lenoir (2)
- Jones (3)
- Carteret (4)
- Palmico (5)
- Craven (6)
- Greene (7)
- Wilson (8)
- Nash (9)
- Edgecombe (10)
- Pitt (11)
- Beaufort (12)
- Hyde (13)
- Dare (14)
- Tyrrell (15)
- Washington (16)
- Martin (17)
- Halifax (18)
- Northampton (19)
- Bertie (20)
- Hertford (21)
- Gates (22)
- Chowan (23)
- Perquimans (24)
- Pasquotank (25)
Answer If First, please choose your team from the list below. Eastern RAC Is Selected And
Please select your primary employer from the drop down list: Other Is Selected
Q2.19 You selected "Other", please describe your current employer and your job
Answer If First, please choose your team from the list below. Metrolina RAC Is Selected And
Please select your primary employer from the drop down list: Hospital or hospital system Is
Selected
Q2.20 Please select the primary hospital that you work for
  o Anson Community Hospital (1)
  o Carolinas Medical Center - Lincoln (2)
  o Carolinas Medical Center - Northeast (3)
  o Carolinas Medical Center - University (4)
  o Carolinas Medical Center - Pineville/Mercy (5)
  o Carolinas Medical Center - Union (6)
  o Carolinas Medical Center/Centre for Mental Health (7)
  o Carolinas Rehabilitation (8)
  o Carolinas Rehabilitation - Mt Holly (9)
  o CaroMont Health/Gaston Memorial (10)
  o Catawba Valley Medical Center (11)
  o Cleveland Regional Medical Center (12)
  o Crawley Memorial Hospital (13)
  o Grace Hospital (14)
  o Kings Mountain Hospital (15)
  o Lake Normal Regional Medical Center (16)
  o Presbyterian Hospital (17)
  o Presbyterian Hospital - Huntersville (18)
  o Presbyterian Hospital - Matthews (19)
  o Sandhills Regional Medical Center (20)
  o Scotland Memorial Hospital (21)
  o Stanley Regional Medical Center (22)
  o Valdese Hospital (23)
Answer If First, please choose your team from the list below. Metrolina RAC Is Selected And
Please select your primary employer from the drop down list: County emergency
services/emergency management Is Selected
Q2.21 Please select the primary county that you work for
  o Anson (1)
  o Burke (2)
  o Cabarrus (3)
  o Catawba (4)
  o Cleveland (5)
  o Gaston (6)
  o Iredell (7)
  o Lincoln (8)
  o Mecklenburg (9)
  o Richmond (10)
Scotland (11)
Stanly (12)
Union (13)

Answer If First, please choose your team from the list below. Metrolina RAC Is Selected And
Please select your primary employer from the drop down list: Other Is Selected

Q2.22 You selected "Other", please describe your current employer and your job

Answer If First, please choose your team from the list below. MidCarolina RAC Is Selected And
Please select your primary employer from the drop down list: Hospital or hospital system Is
Selected

Q2.23 Please select the primary hospital that you work for
- Alamance Regional Medical Center (1)
- Cape Fear Valley Medical Center (2)
- Chatham Hospital (3)
- FirstHealth Montgomery Memorial Hospital (4)
- FirstHealth Moore Regional Hospital (5)
- FirstHealth Richmond Memorial Hospital (6)
- Highsmith-Rainey Memorial Hospital (7)
- Maria Parham Medical Center (8)
- Rex HealthCare (9)
- Sampson Regional Medical Center (10)
- UNC Hospitals (11)
- Womack Army Medical Center - Fort Bragg (12)

Answer If First, please choose your team from the list below. MidCarolina RAC Is Selected And
Please select your primary employer from the drop down list: County emergency
services/emergency management Is Selected

Q2.24 Please select the primary county that you work for
- Alamance (1)
- Chatham (2)
- Cumberland (3)
- Hoke (4)
- Montgomery (5)
- Moore (6)
- Orange (7)
- Richmond (8)
- Sampson (9)
- Wake (10)

Answer If First, please choose your team from the list below. MidCarolina RAC Is Selected And
Please select your primary employer from the drop down list: Other Is Selected

Q2.25 You selected "Other", please describe your current employer and your job

Answer If First, please choose your team from the list below. Mountain RAC Is Selected And
Please select your primary employer from the drop down list: Hospital or hospital system Is
Selected

Q2.26 Please select the primary hospital that you work for
- Angel Medical Center (1)
- Asheville Specialty Hospital (2)
- Blue Ridge Regional Community Hospital (3)
- CarePartners Rehabilitation Hospital (4)
- Charles A. Cannon, Jr. Memorial Hospital (5)
- Cherokee Indian Hospital (6)
- Harris Regional Hospital (7)
- Haywood Regional Medical Center (8)
- Highlands-Cashier Hospital (9)
- Margaret R. Pardee Hospital (10)
- Mission Hospital (11)
- Murphy Medical Center (12)
- Park Ridge Hospital (13)
- Rutherford Hospital (14)
- St. Luke's Hospital (15)
- Swain County Hospital (16)
- The McDowell Hospital (17)
- Transylvania Regional Hospital (18)
- VA Medical Center - Asheville (19)

Q2.27 Please select the primary county that you work for
- Avery (1)
- Buncombe (2)
- Cherokee (3)
- Clay (4)
- Graham (5)
- Haywood (6)
- Henderson (7)
- Jackson (8)
- Macon (9)
- Madison (10)
- McDowell (11)
- Mitchell (12)
- Polk (13)
- Rutherford (14)
- Swain (15)
- Transylvania (16)
- Yancey (17)

Q2.28 You selected "Other", please describe your current employer and your job

Q2.29 Please select the primary hospital that you work for
- Brunswick Community Hospital (1)
- Cape Fear Valley - Bladen County Hospital (2)
Columbus Regional Healthcare System (3)
J. Arthur Dosher Memorial Hospital (4)
Naval Hospital - Camp Lejune (5)
New Hanover Regional Medical Center (6)
Onslow Memorial Hospital (7)
Pender Memorial Hospital (8)

Answer If First, please choose your team from the list below. Southeastern RAC Is Selected And Please select your primary employer from the drop down list: County emergency services/emergency management Is Selected
Q2.30 Please select the primary county that you work for
  - Bladen (1)
  - Brunswick (2)
  - Columbus (3)
  - Duplin (4)
  - New Hanover (5)
  - Onslow (6)
  - Pender (7)

Answer If First, please choose your team from the list below. Southeastern RAC Is Selected And Please select your primary employer from the drop down list: Other Is Selected
Q2.31 You selected "Other", please describe your current employer and your job

Answer If First, please choose your team from the list below. Triad RAC Is Selected And Please select your primary employer from the drop down list: Hospital or hospital system Is Selected
Q2.32 Please select the primary hospital that you work for
  - Alleghany Memorial Hospital (1)
  - Annie Penn Hospital (2)
  - Ashe Memorial Hospital (3)
  - Blowing Rock Hospital (4)
  - Caldwell Memorial Hospital (5)
  - Davie County Hospital (6)
  - Davis Regional Medical Center (7)
  - Forsyth Medical Center (8)
  - Frye Regional Medical Center (9)
  - High Point Regional Health System (10)
  - Hugh Chatham Memorial Hospital (11)
  - Iredell Memorial Hospital (12)
  - Kindred Hospitals - Greensboro (13)
  - Lexington Memorial Hospital (14)
  - Medical Park Hospital, Inc. (15)
  - Morehead Memorial Hospital (16)
  - Moses Cone Health System (17)
  - Northern Hospitals of Surry County (18)
  - Randolph Hospital (19)
  - Rowan Regional Medical Center (20)
  - Stokes-Reynolds Memorial Hospital (21)
  - Thomasville Medical Center (22)
  - W.G. Hefner VA Medical Center - Salisbury (23)
- Watauga Medical Center (24)
- Wesley Long Community Hospital (25)
- WFU Baptist Medical Center (26)
- Wilkes Regional Medical Center (27)
- Yadkin Valley Community Hospital (28)

Answer If First, please choose your team from the list below. Triad RAC Is Selected And Please select your primary employer from the drop down list: County emergency services/emergency management Is Selected

Q2.33 Please select the primary county that you work for
- Alexander (1)
- Alleghany (2)
- Ashe (3)
- Caldwell (4)
- Catawba (5)
- Davidson (6)
- Davie (7)
- Forsyth (8)
- Guilford (9)
- Iredell (10)
- Randolph (11)
- Rockingham (12)
- Rowan (13)
- Stokes (14)
- Surry (15)
- Watauga (16)
- Wilkes (17)
- Yadkin (18)

Answer If First, please choose your team from the list below. Triad RAC Is Selected And Please select your primary employer from the drop down list: Other Is Selected

Q2.34 You selected "Other", please describe your current employer and your job

Q3.1 Did you receive an initial orientation to the team?
- Yes (1)
- No (2)

Q3.2 How many SMAT trainings have you attended?
_____ Number attended (1)
Q3.3 The following questions are about training. Please select the choice that most closely matches what you believe to be the truth.

<table>
<thead>
<tr>
<th></th>
<th>Never (1)</th>
<th>Yearly (2)</th>
<th>Quarterly (3)</th>
<th>Less than once a month (4)</th>
<th>Once a month (5)</th>
<th>2-3 times a month (6)</th>
<th>Once a week (7)</th>
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<tbody>
<tr>
<td>How often is training offered? (1)</td>
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<tr>
<td>How often do you attend training? (2)</td>
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<tr>
<td>How often should training be offered? (3)</td>
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</tbody>
</table>

Q3.4 When you think about your SMAT responsibilities, has your training been effective or ineffective? Please choose the category below that comes closest to your view of your training.

______ Initial orientation/training (1)
______ Continuing education (2)

Q3.5 What types of trainings are offered? (Select all that apply)
- Classroom (1)
- Deployment debrief/review (2)
- Field exercise (3)
- Equipment familiarization (4)
- Online (5)
- Scenario (6)
- Tabletop exercise (7)
- Other (8)

Answer If What types of trainings are offered? (Select all that apply) Other Is Selected

Q3.6 You selected "Other" for types of training, please tell us about the other types of training

Q3.7 Does your team train with other SMATs and SMAT partners at the local, regional or state level?
- Yes (1)
- No (2)

Answer If Does your team train with other SMATs and SMAT partners at the local, regional or state level? Yes Is Selected

Q3.8 Who are the other local, regional, or state SMAT partners your team has trained with?

Answer If Does your team train with other SMATs and SMAT partners at the local, regional or state level? Yes Is Selected

Q3.9 Please describe the type(s) of training that occur at these group trainings.

Q3.10 Please tell us what additions or changes to training would be beneficial for the team?

Q4.1 Have you deployed with your team?
- Yes (1)
- No (2)

If No Is Selected, Then Skip To How many days are you able to deploy ...

Q4.2 How many times have you deployed?

______ Deployments (1)
Q4.3 Please choose your deployments? (Select all that apply)
- Hurricane Isabel (2003) (1)
- Hurricane Alex (2004) (2)
- Waveland Mississippi/Hurricane Katrina (2005) (6)
- Hurricane Irene (2011) (7)
- Mass gathering stand-by (8)
- Other (9)

Answer If Please choose your deployments? (Select all that apply) Mass gathering stand-by Is Selected Or Please choose your deployments? (Select all that apply) Other Is Selected

Q4.4 Please list the other events that you've deployed for.

Q4.5 These questions are about your deployment(s). Please look at each statement and choose the response that comes closest to your own view.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Definitely yes (1)</th>
<th>Probably yes (2)</th>
<th>Maybe (3)</th>
<th>Probably not (4)</th>
<th>Definitely not (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your actual responsibilities matched your anticipated responsibilities (1)</td>
<td></td>
<td></td>
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<tr>
<td>Your training with the SMAT prepared you for your deployment (2)</td>
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<tr>
<td>Your team was a benefit to the area to which you deployed (3)</td>
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<td>The team was able to adequately care for patients (4)</td>
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<tr>
<td>The team was adequately trained for the deployment (5)</td>
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<tr>
<td>The team had adequate and appropriate personnel (6)</td>
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<td></td>
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<tr>
<td>The team had adequate and appropriate equipment (7)</td>
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</tbody>
</table>
Q4.6 These questions are also about your deployment(s). Please look at each statement and choose the response that comes closest to your own view.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Very Ineffectively</th>
<th>Ineffectively</th>
<th>Somewhat Ineffectively</th>
<th>Neither Effectively nor Ineffectively</th>
<th>Somewhat Effectively</th>
<th>Effectively</th>
<th>Very Effectively</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>The team integrated with local hospital resources. (1)</td>
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<td>The team integrated with local and county Emergency Management and/or Emergency Services resources. (2)</td>
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<tr>
<td>The team integrated with other regional or state resources. (3)</td>
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<tr>
<td>The team integrated with federal resources. (4)</td>
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</tbody>
</table>

Q4.7 Please tell us anything else about your deployments that you think is important.

Q4.8 In the case of a deployment, how many days on average would you be able to deploy for, considering your other obligations?

______ Days available (1)

Q4.9 On a deployment, would you be comfortable with your:

<table>
<thead>
<tr>
<th></th>
<th>Definitely yes (1)</th>
<th>Probably yes (2)</th>
<th>Maybe (3)</th>
<th>Probably not (4)</th>
<th>Definitely not (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsibilities (1)</td>
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<tr>
<td>Knowledge (2)</td>
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<tr>
<td>Skills and abilities (3)</td>
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</tbody>
</table>
Q4.10 Does your employer have a mechanism to cover your job and responsibilities while you're deployed?
- Definitely yes (1)
- Probably yes (2)
- Probably not (3)
- Definitely not (4)
- I don't know (5)

Q5.1 These questions pertain to the general public's knowledge about state resources and disaster preparedness. Please look at each statement and choose the response that you believe most closely matches the public's level of understanding.
- _____ About the SMATs (1)
- _____ About the NC State Medical Response System (SMRS) (2)
- _____ About other statewide disaster resources (3)
- _____ About disaster preparedness (4)

Q5.2 The following questions are about the SMAT program in general. Please choose the category below that comes closest to your view of the program.

<table>
<thead>
<tr>
<th>The SMATs are an asset for the state of NC (1)</th>
<th>Definitely yes (1)</th>
<th>Probably yes (2)</th>
<th>Maybe (3)</th>
<th>Probably not (4)</th>
<th>Definitely not (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The SMATs are appropriately located within the state (2)</td>
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<td>The SMATs ARE NOT the appropriate size (3)</td>
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<td>The SMATs have the appropriate response capabilities (4)</td>
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<td>The SMATs have adequate support from the participating hospitals (5)</td>
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<td>The SMATs DO NOT have adequate support from the participating counties (6)</td>
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<tr>
<td>The SMATs have adequate support from the Regional Advisory Committee (RAC) (7)</td>
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<td>The SMATs have adequate support from the state government (8)</td>
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<tr>
<td>The SMATs have adequate support from the North Carolina Office of EMS (NC OEMS) (9)</td>
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</tbody>
</table>

Q5.3 How many SMAT I/SMAT IIs are there in North Carolina?
- Not enough (1)
- The right number (2)
- Too many (3)

Q5.4 How many SMAT IIIs are there in North Carolina?
- Not enough (1)
- The right number (2)
Q5.5 What type(s) of response(s) is your team adequately prepared to respond to? (Select all that apply)
- Decontamination/Hazardous Materials (HazMat) (1)
- Health care facility evacuation (2)
- Hurricane (3)
- Mass gathering/Surge event (4)
- Mass prophylaxis/Infectious disease outbreak (5)
- Nuclear/Biologic/Chemical attack (6)

Q5.6 Of the type(s) of response(s) that your team is not adequately prepared to respond to, improvements in which area(s) would make your team better prepared to respond?
Answer: If of the type(s) of response(s) that your team is not adequately prepared to respond to, improvements in which area(s) would make your team better prepared to respond?

Q5.7 You selected "Other", what other areas of improvement would make your team better prepared to respond?

Q6.1 Where do you believe funding for your SMAT comes from? (select all that apply)
- Hospital (1)
- County (2)
- State (3)
- Federal government (4)

Q6.2 Does your employer pay for your training time with SMAT?
- Yes (1)
- Maybe (2)
- No (3)

Q6.3 Does your employer pay for your deployment time with SMAT?
- Yes (1)
- Maybe (2)
- No (3)

Q6.4 How many days of training and/or deployment will your employer pay for?
- 1-3 (1)
- 3-7 (2)
- 7-14 (3)
- 14-30 (4)
- >30 (5)
- No limit (6)
- Not certain (7)

Q7.1 Are you...
- Male (1)
- Female (2)

Q7.2 Please select your age range.
- Under 21 (1)
- 21-25 (2)
- 26-30 (3)
Q7.3 Please select the highest level of education that you have completed.
- Some high school (1)
- High school/GED (2)
- Some college (3)
- 2-year college degree (Associates) (4)
- 4-year college degree (BA, BS) (5)
- Master's Degree (6)
- Doctoral Degree (7)
- Professional Degree (8)

Q7.4 Please choose your certifications from the list below. (Select all that apply)
- CPR (1)
- BLS (Basic Life Support for the Healthcare Provider) (2)
- ACLS (Advanced Cardiac Life Support) (3)
- PALS (Pediatric Advanced Life Support) (4)
- ITLS (International Trauma Life Support) (5)
- PHTLS (Prehospital Trauma Life Support) (6)
- AMLS (Advanced Medical Life Support) (7)
- EPC (Emergency Pediatric Care) (8)
- ICS-100 (Introduction to Incident Command System) (9)
- ICS-200 (ICS for Single Resources and Initial Action Incidents) (10)
- ICS-300 (Intermediate ICS for Expanding Incidents) (11)
- ICS-400 (Advanced Incident Command System, Command and General Staff) (12)
- ICS-700 (National Incident Management System (NIMS), An Introduction) (13)
- ICS-800 (National Response Framework, An Introduction) (14)
- Firefighter I/II (15)
- Technical Rescuer (TR) (16)
- HazMat Operations/Technician (17)
- Other (18)
- ICS-701 (NIMS Multiagency Coordination System (MACS) Course) (19)
- ICS-702 (National Incident Management System (NIMS) Public Information Systems (20)
- ICS-703 (NIMS Resource Management Course) (21)
- ICS-704 (NIMS Communications and Information Management) (22)
- ICS-706 (NIMS Intrastate Mutual Aid - An Introduction) (23)

Answer If Please choose your certifications from the list below. (Select all that apply)
- Other (18)

Q7.5 You selected "Other", please describe the other certifications do you have.
Q7.6 Please choose your professional accreditations/degrees. (Select all that apply)
  o MLS/CLS (Medical/Clinical Laboratory Scientist) (1)
  o OT (Occupational Therapist) (2)
  o Pharmacy Technician (3)
  o PT (Physical Therapist) (4)
  o RT (Respiratory Therapist) (5)
  o Radiologic Technologist (6)
  o CRNA (Certified Registered Nurse Anesthetist) (7)
  o DDS (Doctor of Dental Surgery) (8)
  o DMD (Doctor of Dental Medicine) (9)
  o DO (Doctor of Osteopathic Medicine) (10)
  o LPN (Licensed Practical Nurse) (11)
  o MD (Doctor of Medicine) (12)
  o NP (Nurse Practitioner) (13)
  o PA-C (Physician Assistant) (14)
  o PharmD (Doctor of Pharmacy) (15)
  o RN (Registered Nurse) (16)
  o EMT-B (EMT-Basic) (17)
  o EMT-I (EMT-Intermediate) (18)
  o EMT-P (EMT-Paramedic) (19)
  o MR (Medical Responder) (20)
  o MPH (Master of Public Health) (21)
  o BSW/MSW (Bachelor/Master of Social Work) (22)
  o MPA (Master of Public Administration) (23)
  o Other (24)
  o MS Emergency Management/Emergency Services (25)

Answer If Please choose your professional accreditations/degrees. (... Other Is Selected
Q7.7 You selected "Other", please describe your professional accreditation(s)/degree(s).
Q8.1 Thank you very much for your time! Please send any questions or comments to
dwillner@med.unc.edu -- or if there is anything that I should have asked or if you have any
comments please tell me in the box below.