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Characterizing Local EMS Systems

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16. Abstract

Emergency medical services (EMS) systems are configured differently depending on several factors, including the size, demographics, geography, and politics of the local communities they serve. Although some information exists about the organization, financing, and delivery of EMS in the Nation’s 200 largest cities, there is less information available about how services are organized outside large urban areas, in which 75 percent of the nation’s population resides. There is little evidence to support alternative system designs and configurations in terms of their impact on the effectiveness and efficiency of service delivery. To this end, there is a need to document the variation in system configurations so they may be evaluated on a common basis.

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EXECUTIVE SUMMARY

An important first step in studying the impact of EMS system design on quality and outcomes is a more systematic characterization of local EMS systems. While some data exist to characterize EMS services in 200 of the nation's largest cities, this information is incomplete and does not address how services are organized outside large urban areas. The present study was designed to address this gap in our information.

In a previous study, the Center for Injury Research and Policy collected data with State and local EMS directors to characterize:

- Overall size of EMS systems;
- Access to systems through 911;
- Provider and dispatch agency types;
- Response configurations, operating procedures, and use of volunteers;
- Mutual-aid agreements and response to calls outside the primary service area;
- Medical control; and
- Source of system funding.

For the current study, using the information gleaned from these surveys, we investigated the variation in systems by geographic region of the country, the rurality of the area serviced by the system and the overall size of the system as defined by the number of EMS calls responded to annually. The survey also contained a series of subjective assessments focusing on adequacy of resource levels and system support, extent to which bystanders were involved in EMS, and adaptation of the system to change.

In the broadest terms, the most obvious difference noted was how each State related our operational definition of a local EMS system to itself. States choose to organize local emergency medical services coordination in a variety of ways from hospital-centered models to county-based systems to larger regional entities. Fifteen States identified systems that were at either a county or equivalent level, although many States identified regional or multi-jurisdictional areas to survey. States were consistent in how their areas were divided (e.g., county versus regional), although a few States did provide contact information for both types of areas as well as independent cities, or miscellaneous systems such as hospitals or tribal authorities. It is important to note that there were areas identified in ten States where no systems existed according to our operational definitions. Conversations with the State EMS offices revealed that while there were EMS agencies operating in these areas, they did not operate under a coordinated, local administration.

In addition to documenting overall variation in the organization and delivery of EMS across systems, this study underscored the challenges faced by systems providing services in rural and wilderness areas of the country. Most apparent (and of potential concern) are low percentages in rural and wilderness areas of full-time versus part-time and career versus volunteer EMS providers, ALS versus BLS providers involved in transport, and dispatch agencies providing pre-arrival instructions. In addition, a higher percentage of systems in more rural/wilderness versus urban/suburban areas had no medical direction in place and or had some organized medical direction but with no one person with primary responsibility. System financing was clearly a challenge for all systems, but a slightly higher percentage of systems in rural and wilderness areas rely on fee for service as their primary source of funding.

Variation across States is a ubiquitous theme in EMS and is well supported by the results of this study. States have evolved quite differently in how they handle the oversight of EMS. With such contrasting approaches in State regulation and policy, along with differences in overall size, demographics and geography, it is not surprising that we saw variability in our data across these States.

Characterizing Local EMS Systems in the United States
Final Report

A. Introduction and Objectives

Modern Emergency Medical Services (EMS) systems are generally thought to have begun with the release of *Accidental Death and Disability: The Neglected Disease of Modern Society* by the National Academy of Sciences National Research Council in 1966 (also known as the "white paper"), which called attention to the lack of coordinated care for the injured (1). The early Federal response to this report was the establishment of the Highway Safety Bureau, including its critical EMS component and the development of National Standard Curricula for EMT's and Paramedics.

Increasing attention to the importance of EMS ultimately led to the passing of the Emergency Medical Services System Act of 1973 (2), which provided definition to the concept of a regionalized EMS system and planted the seed for development of infrastructure through increased Federal coordination and substantial funding to incentivize the creation of such systems. System development during this era focused largely on functional components but did not prescribe how the system was to be implemented or which individuals or organizations would take on this role (3).

The 1970s saw the rapid expansion of regional EMS systems and advances in some overarching standards but Federal oversight of EMS system development waned over the following decades as funding shifted to block grant programs in the early 1980s, placing oversight and prioritization efforts back in the hands of State and local authorities (4). Today, EMS systems are innately seen as local entities (5). The coordination of such systems, including the various roles of interdependent entities, is inherently difficult (6). The result of such decentralization along with the steadily reduced funding streams and lack of a coordinated infrastructure is a highly fragmented system of care throughout the country (4).

Nearly half of a century after the creation of modern EMS systems, there is still little consensus as to what comprises the ideal EMS system. There are many approaches to EMS service delivery, each with notable advantages and disadvantages (7). Additionally, EMS systems continue to evolve in response to the overall changes within the health care system as well as in the marketplace (8). Overton and Stout (9) contend that there are more than 30 designs for providing EMS services and acknowledge the difficulty of more broadly comparing systems using traditional methods. They and others point to the need to better understand how different EMS configurations impact the quality and outcome of service delivery. Without the capability of determining what characteristics of EMS systems are most effective and efficient, the National Highway Traffic Safety Administration (NHTSA) is unable to establish effective guidelines for EMS best practices that could be used by EMS providers to assess and ultimately improve their performance.

An important first step in studying the impact of EMS system design on quality and outcomes is a more systematic characterization of local EMS systems. While some data exist to characterize EMS services in 200 of the nation's largest cities (25), this information is incomplete and does not address how services are organized outside large urban areas.

The present study was designed to address this gap in our information. Through interviews with the State EMS directors, we identified how EMS services were organized into systems of care at the local level. Surveys were sent contacts representing these local systems and information obtained to characterize:

- Overall size of the system;
- Access to the system through 911;
- Provider and dispatch agency types;
- Response configurations, operating procedures, and use of volunteers;
- Mutual-aid agreements and response to calls outside the primary service area;
- Medical control; and
- Source of funding for the system.

Using the information gleaned from these surveys, we investigated the variation in systems by geographic region of the country, the rurality of the area serviced by the system and the overall size of the system as defined by the number of EMS calls responded to annually.

The survey also contained a series of subjective assessments focusing on adequacy of resource levels and system support, the extent to which bystanders were involved in EMS, and adaptation of the system to change. These opinions on the outlook of the system were summarized and correlations with system characteristics explored.

B. Methods

In this section we describe the methods used to identify and survey local EMS systems (our unit of analysis). The approach used is similar to that used by MacKenzie et al.(10) in a pilot study designed to characterize EMS systems within the Mid-Atlantic region of the country (New Jersey, Pennsylvania, Delaware, Maryland, West Virginia, the District of Columbia, Virginia, and North Carolina). The pilot study was successful in gathering descriptive information regarding system organization, call volume, first response and transport agency types, 911 access, medical control, funding sources, and mutual aid agreements. Although the response rate was high (86%), several limitations of the survey were identified. In particular, terms were not well defined leading to ambiguity in some of the responses. In addition, the pilot study did not adequately characterize EMS agencies by their mission and their administrative home or ownership.

To create the survey used for the current analysis, a national panel of experts was convened to discuss the pilot study and its results, review the objectives of the current study, assist in operationalizing the definition of "local system," and assist in refining the survey and methods used for eliciting participation in the study. During the early stages of the project, (and upon recommendation of the expert panel), support for the project was sought from the National Association of State EMS Officials (NASEMSO). Additional guidance was garnered from the EMS Systems Subcommittee of the National EMS Advisory Council (NEMSAC). Members of the expert panel included:

- Robert Bass, M.D., FACEP – Executive director, Maryland Institute for Emergency Medical Services Systems
- Karen Halupke, R.N., MEd – Director, Office of Emergency Medical Services (New Jersey)
- Joseph Schmider – Director, Bureau of Emergency Medical Services (Pennsylvania)
- Dia Gainor, M.P.A., EMT-P (ret.) – Chief, Emergency Medical Services Bureau (Idaho)
- Jim DeTienne - Supervisor, EMS and Trauma Systems Section (Montana)
- Paul Patrick - Bureau director, Emergency Medical Services and Preparedness (Utah)
- Dan Manz – Director, Vermont Emergency Medical Services
- N. Clay Mann, Ph.D., MS – Principle investigator, NEMSIS Technical Assistance Center
- Drew Dawson – Director, National Highway Traffic Safety Administration Office of Emergency Medical Services
- Susan McHenry, M.S. – EMS Specialist, National Highway Traffic Safety Administration Office of Emergency Medical Services

B.1 Operationalizing the Definition of "System"

A first important step was the development of an operational definition of "local system." Traditionally, an EMS system has been defined as a comprehensive, coordinated arrangement of resources and functions organized to respond to medical emergencies in a timely manner (2). This definition performs well when looking at the broader functions or components of the system, but falls short when attempting to identify system entities at the jurisdictional level. For example, a single provider agency (e.g., for call taking, dispatch, first response, and transport) may be able to adequately act upon the 15 components originally outlined in the Emergency Medical Services Act of 1973 and later modified in the EMS Agenda for the Future (11), but this would only illustrate enough coordination to internally operate and often does not touch on broader issues such as policy development or regionalization of services.

For the purpose of this study, a local EMS system is operationally defined as being present when there is an identifiable local entity within a State EMS system's administrative hierarchy below the State level (if the State is sufficiently large enough) and immediately above the level of an individual provider agency. (See Figure 1.)

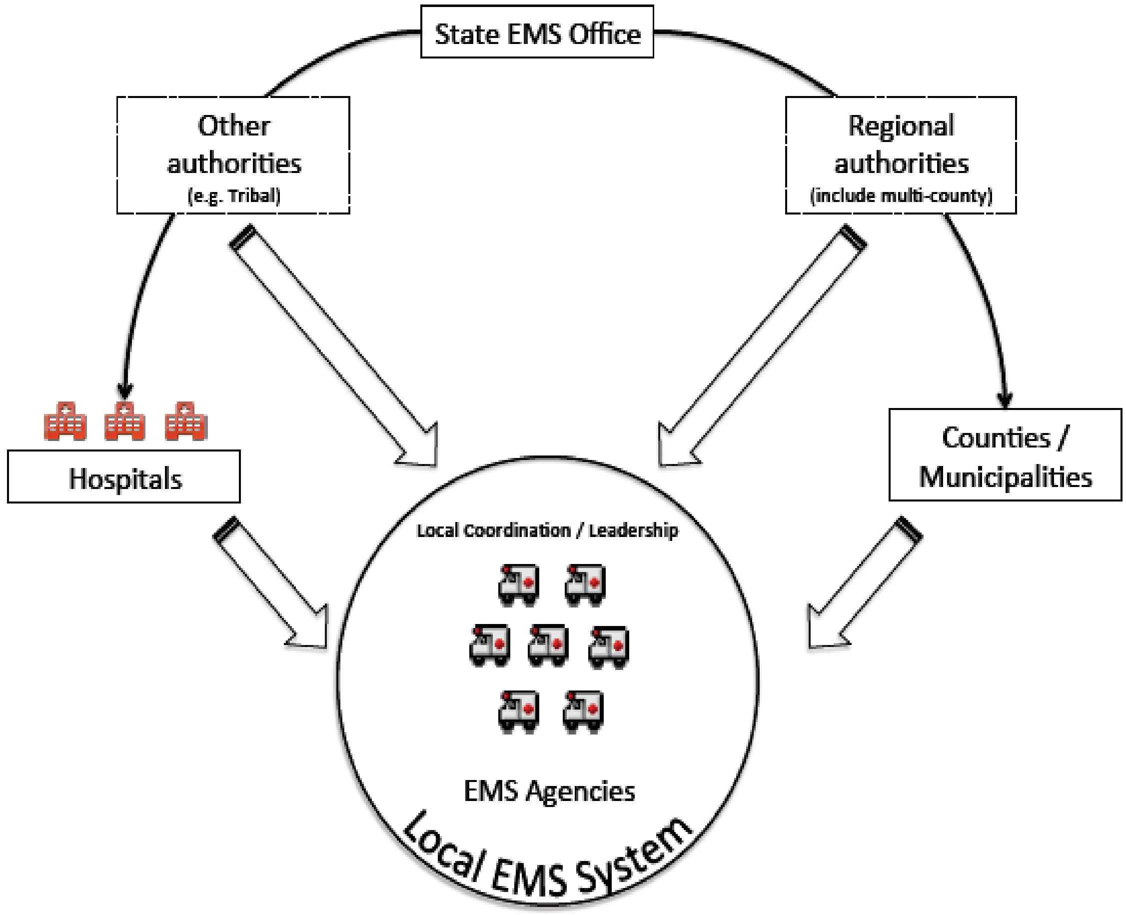

Figure 1: Local EMS Systems: A Framework

In instances where an agency is the sole provider for a jurisdiction and/or that agency serves in a leadership capacity to other services (i.e., there is not an independent administrative body for the jurisdiction), it is regarded as an EMS system. At the core of this particular definition is a desire to evaluate EMS at a level sufficiently close to the localities served by care personnel, but also a need to ensure that we could measure features that looked beyond the organizational boundaries of just a single provider agency. It should be noted that aeromedical and interfacility transport agencies were not considered as part of this study for the purposes of system identification or within the context of gathering survey data.

B.2 Interviews of State EMS Directors

In a previous project conducted at Johns Hopkins University, the project staff conducted semi-structured phone interviews with each State's EMS director to collect contextual information to assist in defining local systems and evaluating the local data collected from their States. We began each interview with a brief description of the study and continued with questions about the State's role in overseeing the EMS system and the presence of a regional EMS structure. Additional questions prompted further description of the director's opinion on expected differences across his or her State and its regions as well as the role of local and regional authorities in EMS planning and evaluation. We continued the interview with more structured questions that asked about the responsibilities for 15 EMS system functions at 7 different EMS system levels within the State (State, regional, county/municipality, agency/service, hospital, tribal, and other) (see Attachment A: Structured Interview of State EMS Directors). Each interview concluded with a request for contact information to facilitate our follow up with local EMS systems meeting our definition. Interviews with State EMS directors lasted an average of 30 minutes.

Following the interview of each State EMS director, project staff worked with each State EMS office to gather a list of contacts for systems identified per the definition provided during the interview process. Contact information was collated as part of a Microsoft Access database used for the purposes of creating mailing lists for survey distribution as well as response tracking.

B.3 Survey of Local Systems

In the second phase of the data collection project we used the contact information provided by State EMS directors to survey local EMS systems. All EMS systems meeting our specified criteria were mailed a 24-question survey, along with a postage-paid return envelope. The survey was accompanied by a cover letter indicating the nature of the project, the support of the State EMS office, and contained a URL that allowed the system administrators to complete the survey via the Web instead of by hard copy. This package was sent to the contact identified by the State EMS office, typically the director of EMS for the system. The survey addressed the following topics:

- Overall size of the system, as characterized by the annual number of EMS responses and transports, as well as the total number of EMS personnel;
- Access to the system through 911;
- Provider and dispatch agency types;
- Response configurations, operating procedures, and use of volunteers;
- Mutual-aid agreements and response to calls outside the primary service area;
- Medical control; and
- Source of funding for the system.

The survey also contained a series of subjective assessments focusing on adequacy of resource levels and system support, extent to which bystanders were involved in EMS, and adaptation of the system to change. Finally, respondents were given the opportunity to provide additional narrative to better describe any unusual system structure, functions, or arrangements.

Non-respondents received up to three follow up mailings with pre-paid return envelopes as well as follow-up phone calls or faxes as needed. The survey used for this study was based on the initial draft used in the pilot study with the following refinements:

- Response categories were altered for several questions to provide more specificity in responses;
- When asked to describe a specific characteristic that pertains to the "majority" of services or personnel, a definition of "majority" was provided;
- When characterizing agency types for first responder and transport agencies present in the system, the survey allowed for a broader classification of both ownership and mission;
- A question was added to better distinguish between call taking and dispatch agencies;
- A single response configuration question was broken out into three separate questions to better evaluate common responses for first response and transport separately;
- A question was added on non-emergency assessments;
- A question was added to ascertain extent of out of area responses within own jurisdiction;
- Questions regarding types of volunteers, medical direction, and timely response problems were refined.

In the current project, we entered the previously collected data into a Microsoft Access database and analyzed the data using the SAS statistical software package. When necessary, a research assistant contacted survey respondents to clarify logical inconsistencies in the data collected or to ensure proper data entry (e.g., due to illegibility). Analyses were primarily descriptive, focusing on frequencies of characteristics and exploration of differences across the States.

System characteristics were summarized for the country overall and by region of the country, rurality of the area serviced by the system, and self-reported system size of the area serviced by the system as measured by the annual number of EMS responses.

- Regions of the country were classified as Northeast, Midwest, South and West as defined by the U.S. Census Bureau (12).
- The size of the EMS system was based on self-report and categorized into four groups based on the distribution of annual number of EMS responses as reported by the systems themselves (Low ≤ 999 calls; Moderate = 1,000 – 4,999 calls; High = 5,000 – 9,999 calls; Very High = 10,000 or more calls). Self-reported data on size were not available for 80 (10.0%) of the participating systems.
- Classification of rurality was based on 2003 urban influence codes (13) and divided into four categories used in other EMS applications such as NEMSIS. These data were obtained from the 2007 Area Resource File(14) and the categories defined as follows.

    Urban:
    - UIC1: In large metro area of 1+ million residents

- UIC2: In small metro area of less than 1 million residents

Suburban:

- UIC3: Micropolitan adjacent to large metro
- UIC5: Micropolitan adjacent to small metro

Rural:

- UIC4: Noncore adjacent to large metro
- UIC6: Noncore adjacent to small metro with own town
- UIC8: Micropolitan not adjacent to a metro area
- UIC9: Noncore adjacent to micro with own town

Wilderness:

- UIC7: Noncore adjacent to small metro with no own town
- UIC10: Noncore adjacent to micro with no own town
- UIC11: Noncore not adjacent to metro or micro with own town
- UIC12: Noncore not adjacent to metro or micro with no own town

(A Metropolitan Area is defined as having at least one urbanized area of 50,000 or more population, plus adjacent areas socially and economically tied to the core; a Micropolitan Area as having at least one urban cluster of at least 10,000 but less than 50,000 population, plus adjacent areas socially and economically tied to the core; and a Noncore Area is defined as neither metropolitan nor micropolitan).

In instances where more than one urban influence code was associated with a participating system, the system was classified according to the most urban value.

C. Results

In this Section we begin with a characterization of States to provide context for the results. We then proceed in summarizing the identification of local systems by the State EMS offices and the extent to which local systems agreed to participate in the study and complete the survey. We summarize the results of the survey with particular attention paid to variations in system characteristics by rurality and geographic region. We end with summarizing the subjective assessments of the respondents on a number of factors relating to resource levels, system support, bystander involvement, and adaptability to system change and exploring the correlates of these subjective assessments.

The statistical significance of differences across geographic region, rurality and system size were examined using chi-square analysis and Fisher's exact tests for dichotomous and categorical variables, and t-tests and analysis of variance (ANOVA) for continuous variables. In instances where ANOVA results showed significant differences, Duncan's multiple range test (p = 0.05) was applied for post-hoc comparison of the means among the groups. Regression analysis techniques were used to summarize the opinion data as a function of organizational and system level variables collected as part of the survey. Additionally, principal component analysis was used to reduce the opinion question data into summary scores for use in further regression analyses. Maps were generated using ArcMap GIS software (15).

C.1 Characterization of States

Tables A1 and A2 provide a summary of general State characteristics, including geographic size, population and demographics as well as age-adjusted estimates of mortality, both overall and for the three major causes associated with a large percentage of EMS calls (injury, stroke and heart disease). Data to characterize the States and their counties come from the 2007 Area Resource File (14). State mortality rates were obtained from the Centers for Disease Control and Prevention through its Web-Based Injury Statistics Query and Reporting System (WISQARS) (37) and the Wide-Ranging Online Data for Epidemiologic Research (WONDER) (38) reporting systems.

The total percentage of the population who live in urban areas ranges across States from 100% (District of Columbia, New Jersey and Rhode Island) to less than 40% (Montana, Vermont and Wyoming). Twenty-one States have less than 1% of its population living in wilderness counties, however, there are 9 States where this percentage is greater than 10% and 4 States where it is greater than 20% (Montana: 39 of 56 counties are categorized as wilderness, 20.2% population; South Dakota 41 of 66 counties, 21.8% population; Alaska 21 of 27 counties, 24.4% population; North Dakota 38 of 53 counties, 24.8% population). A total of 1,090 counties in the United States are categorized as urban, 393 as suburban, 963 as rural, and 695 as wilderness.

One-half of the States have no counties categorized as persistent poverty counties (defined as 20% or more of residents measured as poor in each of the 1970, 1980, 1990 and 2000 censuses), although this rate is as high as 62.2% in Mississippi and 50.0% in Louisiana. Four States (District of Columbia, Kansas, Nebraska and North Dakota) have more than half its counties demonstrating population loss (defined as a decline in residents between the 1980 and 1990 censuses and between the 1990 and 2000 censuses), which is in contrast to 15 States where none of the counties meet this definition.

Age-adjusted mortality rates due to injury range from 37.3 per 100,000 population in New York to 100.9 per 100,000 population in New Mexico (Table A2). Deaths due to cerebrovascular disease are lowest in New York (27.4 per 100,000 population) and highest in Alabama (55.4 per 100,000 population). Minnesota has the lowest rates of deaths due to heart disease (126.6 per 100,000 population) but the rate is more than double this (260.2 per 100,000 population) in Mississippi. Overall age adjusted mortality ranges from 590.6 per 100,000 population in Hawaii to 958.5 per 100,000 population in West Virginia.

As indicated above, we contacted State EMS representatives from all 50 States as well as the District of Columbia and asked them to participate in the study, beginning with a brief personal interview. Forty-nine of 51 (96.1%) State EMS officials participated in the interview process (neither Georgia nor Wyoming participated). Each interviewee provided an overview of EMS operations in his or her State as well as answered a set of questions outlining the levels within the State where responsibilities for 15 EMS system functions resided. All States but Oregon provided contact data for a survey of local EMS systems. Figure 2 provides an overview of system function responsibilities, as reported by the State EMS director or his /her designee.

	Level						
System Function	State	Region	County / Municipality	Agency / Service	Hospital	Tribal	Other
Technical Assistance	★ 87.8	✢ 42.9	☼ 12.2	☼ 14.3	☼ 12.2	☼ 0.0	☼ 8.2
Provider Licensure	★ 81.6	☼ 2.0	☼ 2.0	☼ 6.1	☼ 2.0	☼ 0.0	☼ 6.1
Provider Certification	★ 81.6	☼ 2.0	☼ 2.0	☼ 6.1	☼ 2.0	☼ 0.0	☼ 6.1
Medical Direction	★ 79.6	✢ 38.8	✢ 40.8	★ 81.6	☼ 24.5	☼ 16.3	☼ 0.0
Patient Care Report Design	★ 75.5	☼ 8.2	☼ 10.2	✢ 61.2	☼ 6.1	☼ 0.0	☼ 0.0
Funding Sources for Local EMS	✢ 63.3	☼ 12.2	★ 89.8	★ 91.8	☼ 18.4	☼ 6.1	☼ 2.0
Communications System	✢ 61.2	☼ 4.1	☼ 14.3	☼ 20.4	☼ 4.1	☼ 0.0	☼ 2.0
Quality Improvement	✢ 57.1	☼ 28.6	☼ 22.4	★ 81.6	☼ 10.2	☼ 0.0	☼ 0.0
Treatment Protocol Development	✢ 49.0	☼ 2.0	☼ 6.1	✢ 42.9	☼ 4.1	☼ 0.0	☼ 0.0
Provider Credentialing	✢ 49.0	☼ 4.1	☼ 8.2	✢ 38.8	☼ 4.1	☼ 0.0	☼ 0.0
Triage Protocol Development	✢ 46.9	☼ 12.2	☼ 8.2	☼ 28.6	☼ 2.0	☼ 0.0	☼ 0.0
Provider Education	☼ 28.6	☼ 14.3	☼ 6.1	✢ 44.9	☼ 6.1	☼ 0.0	☼ 6.1
Call Taking	☼ 24.5	☼ 4.1	✢ 55.1	☼ 18.4	☼ 0.0	☼ 0.0	☼ 0.0
Dispatching	☼ 12.2	☼ 4.1	✢ 57.1	☼ 28.6	☼ 0.0	☼ 0.0	☼ 0.0
Coordinating Aero Dispatch	☼ 10.2	☼ 10.2	☼ 20.4	✢ 49.0	☼ 12.2	☼ 0.0	☼ 2.0

Key
- ★ 67-100%
- ✢ 33-66%
- ☼ 0-32%

Table 1: Percentage of States reporting responsibility for system functions by level within the State.

Overall, State EMS offices engaged in wide variety of activities with more than half the responding States indicating that 11 of the 15 system functions listed occurred at their level. At the State level, the overwhelming majority of States indicated their offices had responsibilities in the areas of providing technical assistance as well as certifying and licensing EMS providers. However, most States did not have responsibilities directly related to the education of providers, call taking, dispatching or coordination of aeromedical dispatch. A large majority of States (89.8%) reported that counties or municipalities have responsibilities related to EMS funding. Approximately two-thirds noted that dispatching (69.4%) and call taking (67.3%) also occur at this level. Most States did not report having EMS agencies or services responsible for provider certification or licensure (both 30.6%) and only 14.3% indicated that services in their States engage in providing technical assistance. As expected, most States indicated that their agencies or services have responsibilities related to funding (91.8%), medical direction (81.6%), and quality improvement activities (81.6%).

Nationwide, the majority of States indicated that a regional authority did not have responsibility for any of the system functions listed, although a moderate number of

States indicated regions took on responsibilities for providing technical assistance (42.9%) and medical direction (38.8%). Similarly, less than one quarter of the responding States indicated that hospitals had a role in any of the system functions and only medical direction and funding activities occur at the tribal level, but in very few States.

Most States indicated that EMS medical directors are identified primarily at the agency/service and State levels. Similarly, these levels also had the largest roles in establishing treatment and triage protocols. Both provider certification and licensure reside primarily at the State level for most States with agencies and services also taking on such roles in nearly one third of States. Provider credentialing occurs in the majority of States at either the State or agency/service level. The education of EMS providers is often realized through the agencies or services they work for, although nearly half the States indicated that the State also plays a role here.

Three-quarters of responding States indicated that the State itself has responsibility for the creation and maintenance of the communications system, although these functions also reside at other system levels for approximately 20 to 40% of the respondents. Approximately two-thirds of the respondents indicated that dispatching functions occur through either the county/municipality or agency service levels. Over 60% of States indicated that EMS agencies and services had responsibilities for call taking activities and coordination of aeromedical dispatch.

Funding sources to support local EMS operations included the agencies themselves (presumably from billing and fees), counties and municipalities (supported by a tax base), and State-level funding (State funds generated through fees and other programs). Development of patient care reports took place primarily at the State level although more than half of the States indicated that this also occurs at the service level.

Quality improvement efforts occurred in more than 80% of States at the agency/service level; however, States and regions also took on this role in 57.1% and 28.6% of responding States, respectively. The provision of technical assistance, as expected, was largely a State and regional responsibility in most States.

Although several questions from the structured portion of the interview inquired about differences that might be present for a given system function when considering ALS and BLS levels of care, only California, New Jersey, and South Dakota indicated any such differences existed. In New Jersey, these were in the areas of treatment protocol development, provider education, as well as the creation and maintenance of a communications system. California indicated EMS agencies/services had secondary responsibilities for BLS licensing and certification of providers. In South Dakota, the only reported differences were for treatment protocol development.

On the whole, responsibilities for many functions at particular system levels did not vary much. However, there were a few statistically significant differences observed across regions. Reported rates of medical direction at the county/municipality level were higher in both the South and West (68.8% and 50.0%, respectively, versus 18.4% and

8.3% in the Northeast and Midwest). Responsibilities for provider credentialing and dispatching functions at the regional level were higher in the Northeast and West (33.3% and 16.7% for credentialing; 22.2% and 25.0% for dispatching, respectively), while absent (0.0%) in the other regions. Similarly, regional quality improvement responsibilities ranged from 25.0 to 55.6% of States from all regions except the Midwest, where it was absent at the regional level.

Treatment protocol development at the agency/service level varied widely by geographic region, with this function occurring in only 11.1% of Northeast States versus 91.7% of Midwest States. Similarly, triage protocol development ranged from 22.2% in the Northeast to 75.0% in the Midwest. All States in the Northeast indicated the State had responsibilities for triage protocol development while this was only the case in one third of Midwestern States. Call taking functions at the State level were lowest in the South at 6.3% while other regions noted this was a responsibility in 41.7 to 66.7% of States. Finally, medical direction at the tribal level was notably low in all regions (and completely absent in the Northeast) but present in 50% of the States in the West.

When considering the number of system functions engaged in by the various system levels, States and agencies seemed to have responsibility for many of the functions in the responding States (mean number of functions with State responsibility = 9.16, mean number of functions with agency/service responsibility = 8.27). Conversely, most States did not report many functions being conducted at tribal or other levels (mean number of functions 0.22 and 0.59, respectively). The number of functions by level was also explored by region of the country. Statistically significant differences were observed in the number of functions engaged in at the State (Northeast higher than other regions), regional (Midwest below other regions) and tribal (West and Midwest have higher means than South and Northeast regions) levels.

C.2 Identification of Local Systems and Rate of Response to the Survey.

Table B1 summarizes by State the number of local systems identified, the number of surveys distributed and the rate of response to those surveys (i.e., rate of system participation in the study). Also indicated is the percentage of land in each State that is covered by the participating systems, the percentage of the population in a State that is covered by the participating systems, as well as both land and population coverage for the United States overall.

Fifteen States identified systems that were at either a county or equivalent level, although many States identified regional or multi-jurisdictional areas to survey. States were consistent in how their areas were divided (e.g., county versus regional), although a few States did provide contact information for both types of areas as well as independent cities, or miscellaneous systems such as hospitals or tribal authorities. Rhode Island and Hawaii (respectively the first and fourth smallest States measured by land area, not counting the District of Columbia) indicated the appropriate place for the local survey using our definition would be the State EMS office itself. It is important to note that there were areas identified in 10 States where no systems existed according to our operational definitions (therefore *potential* land mass coverage would be less than

100%). Conversations with the State EMS offices revealed that while there were EMS agencies operating in these areas, they did not do so under a coordinated, local administration. As a result, these EMS agencies operated almost completely independent of each other and would interact directly with the State EMS agency on any matters (e.g., protocols, certification) that was outside the scope of its organizational walls.

Overall, 1,268 local EMS systems in 48 States and the District of Columbia were identified and 1,257 surveys were distributed for those systems where contact information was confirmed (note: Oregon, Wyoming, and Georgia did not provide contacts for local systems). Of the 1,257 surveys distributed, 800 (63.6%) were completed (Table B2). Participation rates varied by State, with 64.6% of the States having response rates of more than 50% and 12 (25.0%) States having response rates exceeding 75% (Table B2 and Figure 3).

While the responding systems covered only 44.0% of the land in the United States, they represented 63.6% of the U.S. population. Response rates did not differ significantly by geographic region of the country (X^2= 3.31, p=0.35) or by rurality (X^2= 1.86, p=0.60). Figure 4 displays the areas represented by the local EMS systems participating in the survey. Figure 5 exhibits the percent of the population covered by the participating systems by State. The distribution of participating systems by rurality and size is summarized in Table B3 and geographic region and size is summarized in Table B4.

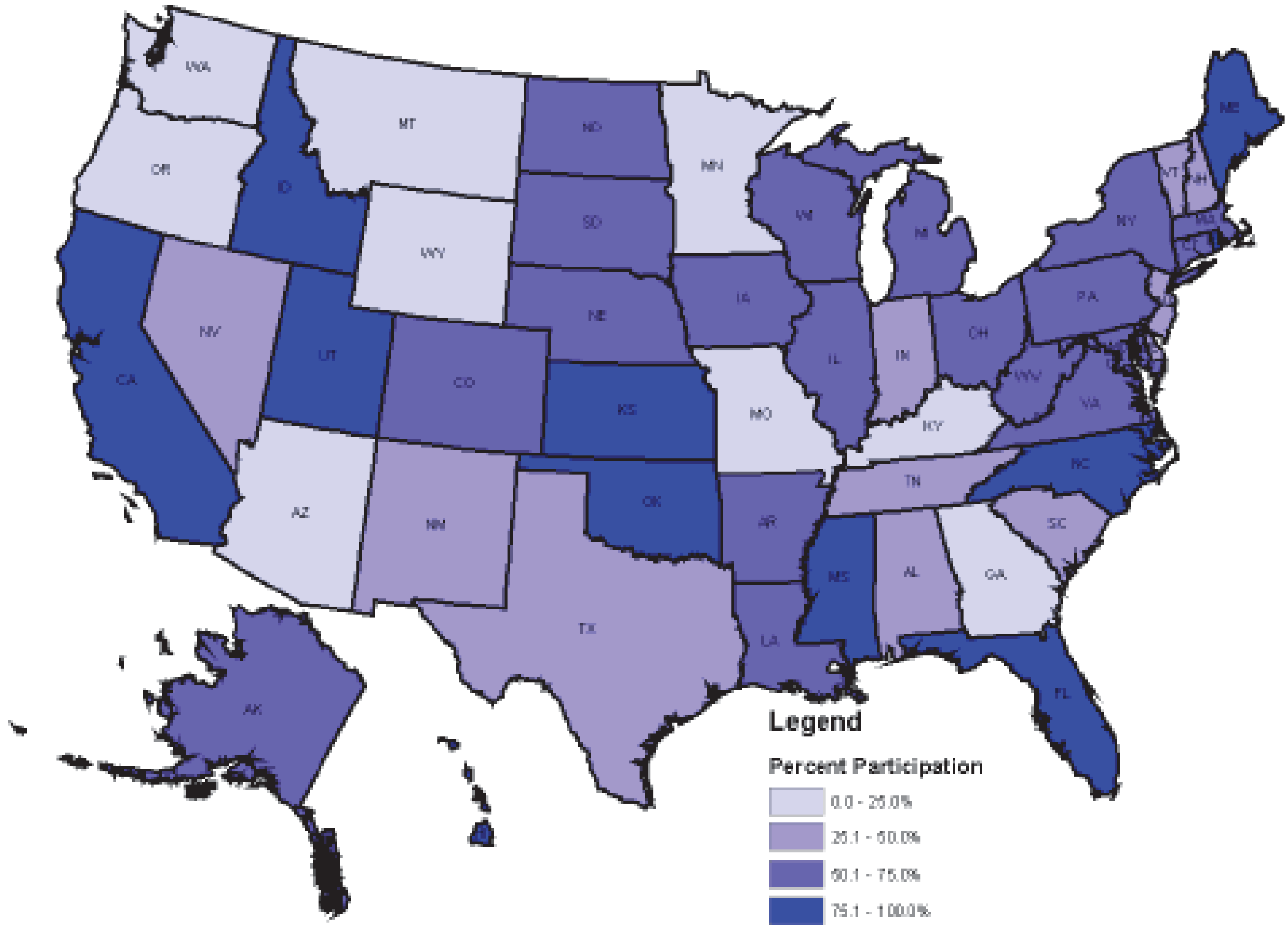

Figure 2: Percentage of systems participating in the survey by State

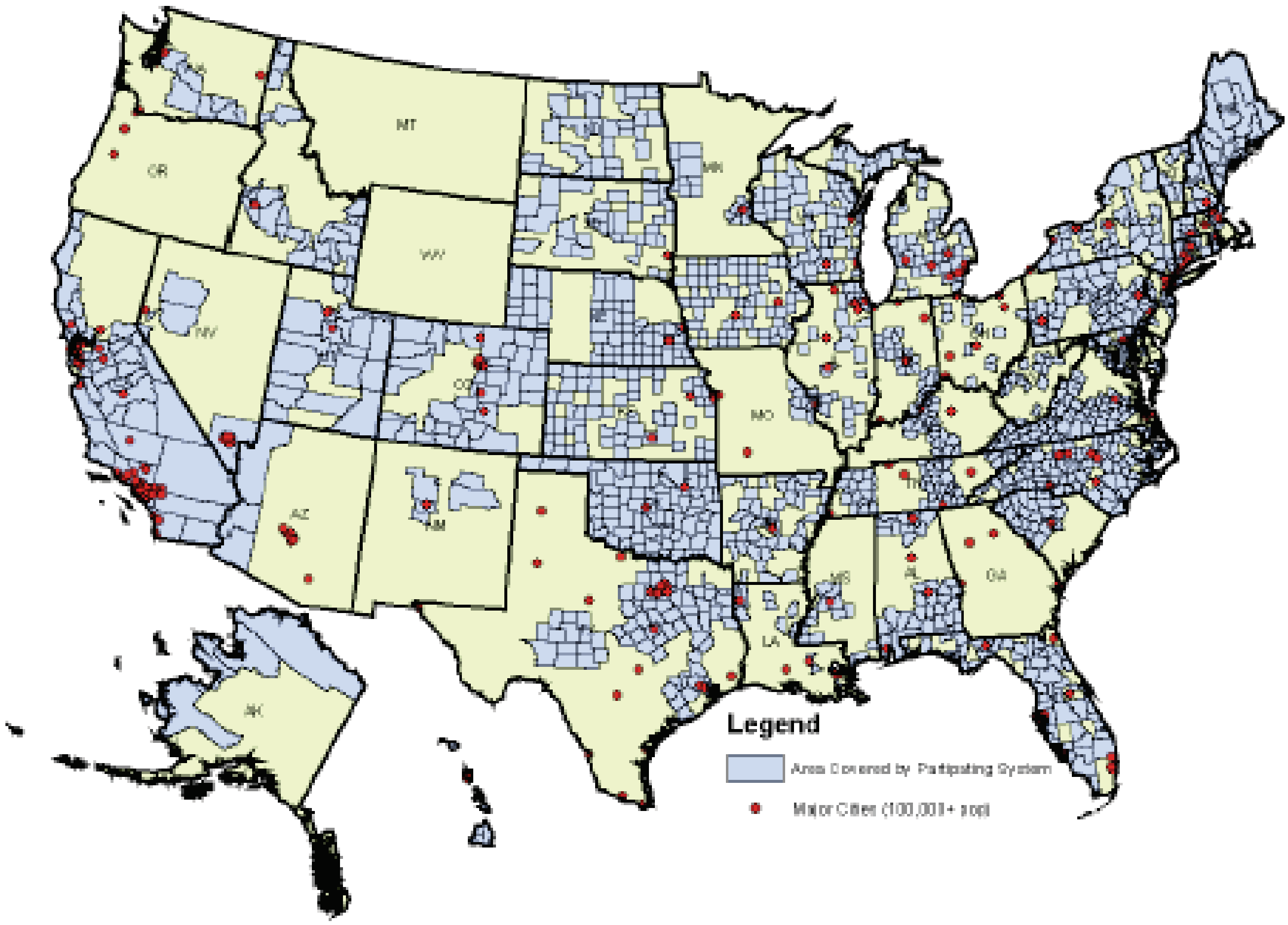

Figure 3: Land area covered by local systems participating in the survey

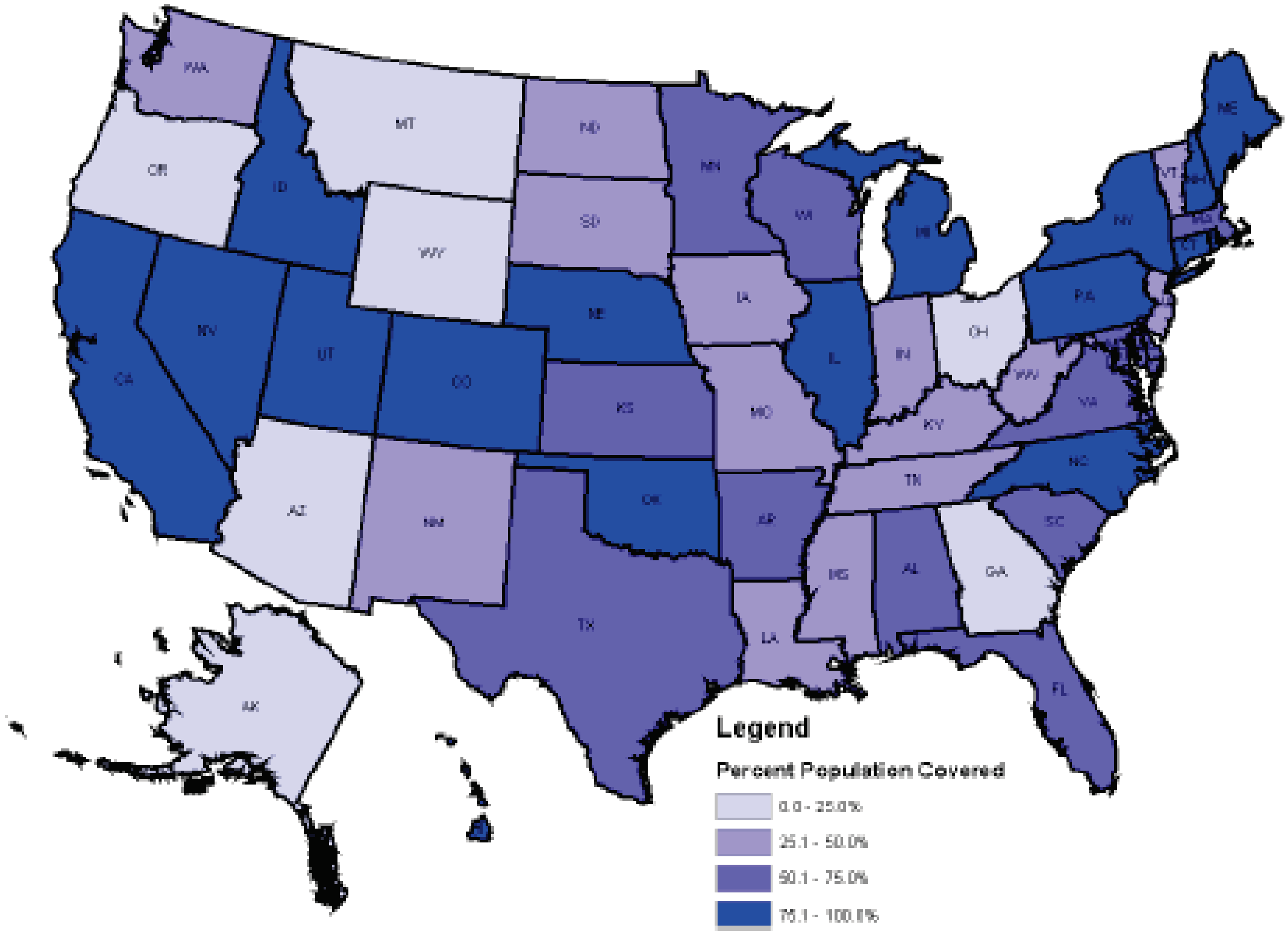

Figure 4: Percentage of the population covered by local systems participating in the survey

C.3 Characteristics of Systems by Rurality, Geographic Region and Size

In Tables C1- C13 we describe the characteristics of the 800 participating systems by *Rurality*, in Tables D1-D13 by Geographic Region and in Tables E1- E13 by Size of the System (as defined by self-reported number of EMS responses per year). In each of these tables, N refers to the total number of participating systems, and the number of systems responding to any specific questions is noted by the (n) in parenthesis. In the summary below, we focus on differences by geographic region and rurality. Due to the high correlation between system size and rurality classification (See Table B3), descriptions of variation by size would be largely redundant of those related to rurality and therefore excluded from the summary below.

Mission and Administration/Ownership of EMS Agencies. Each participating system was provided the opportunity to characterize the first response and transport agencies that comprise the system using an organizational matrix. Along one axis of the matrix was the legal structure of administration or ownership for the system's entities. This axis is divided into 9 items ranging from various governmental arrangements to private business structures (heretofore referred to as "Administration or Ownership"). The second axis of the matrix refers to the primary mission of the system entities, representing the commitment to provide a certain type of service above all others (e.g., a fire department may incorporate EMS care into its role of serving the public, but the organization as a whole is first and foremost organized around fire suppression services). This axis is organized into six different organizational missions (heretofore referred to as "Primary Mission").

Systems classified their EMS agencies according to both axes and could indicate if a particular type of agency handled more than 50% of the overall call volume if more than one type of agency was recorded. For presentation, data were further reduced by collapsing categories on each axis. A primary administrative/ownership type and primary mission type for the system was assigned if either the respondent indicated a single cell of the matrix as the primary agency type or if all the agency types recorded fell only within a particular administrative or mission category. The primary mission and administration/ownership of agencies responsible forfirst response andtransport are summarized in Tables C1-C2, D1-D2 and E1-E2.

First Response. Of the 800 participating systems, 27 (3.3%) did not use first responders. Of those that did use first responders, the primary mission of *agencies providing first response* varied across systems (31.5% fire only; 24.8% EMS only; 8.8% fire and EMS and 29.9% fire and other mission) while the majority of these systems (68.7%) were administered strictly through State or local governments. A chi-square test for differences in first response as a function of rurality was significant ($\chi^2 = 99.33$, $p < .001$). A larger percentage of the more urban systems had a primary mission of fire only, whereas the more rural areas had a larger proportion of systems whose primary mission is EMS Only. The relationship of primary mission by geographic region is less apparent but still statistically significant ($\chi^2 = 29.93$, $p < .05$).

Transport Agencies. A majority of most systems (59.7%) have agencies whose primary mission is EMS, and 62.0% are administered strictly through State or local governments. The percent of transport agencies with the primary mission of EMS only was higher in wilderness areas (74.8%) compared to urban areas (48.7%) and in the Midwest and South (60.3% and 65.7%) compared to the West (56.7%) and Northeast (46.2%) ($\chi^2 = 92.17$, $p < 0.01$). The percentage of transport agencies administered strictly through State/local governments is significantly higher in the South (71.8%) and Midwest (64.3%) compared to the West (50.0%) and Northeast (41.5%) ($\chi^2 = 82.98$, $p < 0.01$). A higher percentage of agencies in the West are for profit (19.6%) and a high percentage of agencies in the northeast are nonprofit (15.1%).

Emergency Call Taking. As shown in Tables C3, D3 and E3, the primary type of agency that receives emergency calls varied across systems. Over one third (34.2%) were public safety (joint police-fire-EMS); 28.2% were law enforcement agencies; and 23.0% were local EMS service providers). This distribution varied significantly by rurality ($\chi^2 = 90.82$, $p < .001$) with a higher percentage of urban systems handling emergency call taking through public safety agencies (43.0% of urban systems compared to 32.3%; 34.4% and 15.5% of suburban, rural and wilderness systems, respectively). Administration of emergency call taking by local EMS services is more prevalent in the rural and wilderness systems (24.6% and 41.2% respectively) compared to urban and suburban systems (14.9% and 19.4% respectively).

Emergency Medical Dispatching. Agencies responsible for emergency medical dispatching varied in a manner similar to emergency call taking (see Tables C4, D4, E4). Over all systems, 39.8% listed their primary agency type as public safety (joint police-fire-EMS) and 37.2% were law enforcement agencies. The chi-square that tested for differences in type of dispatching agency as a function of rurality was significant (χ^2 = 90.42, $p < .001$) Far fewer wilderness systems indicated that the primary type of dispatching agency was public safety (23.4%) whereas in urban areas a larger percent of dispatching agencies were public safety (45.6%). Differences in agency type as a function of geographic region was also significant (χ^2 =49.61, $p < .001$). Systems in the Northeast stood out as having more dispatch agencies administered through public safety (55.9%) and a smaller percentage administered through law enforcement (18.6%).

Level of Providers. Nearly two-thirds (63.4%) of the systems indicated that advanced life support (ALS) was the most common level of care provided by transport agencies (as defined by the maximum capacity of responding unit/vehicles as opposed the actual level of care rendered); intermediate life support (ILS) was the most common levels of care for 12.1% and basic life support (BLS) for 24.5% of the systems. Only 36.2% of systems indicated that ALS was the most common level of care provided by first response agencies (see Tables C5, D5, E5).

The most common level of care for transports varied significantly by rurality (χ^2 = 52.21, $p < 0.001$) , with a larger proportion of urban systems indicating ALS was the most common level of care (72.7%) compared to wilderness areas (40.0%). The level of care for transports also varied significantly by geographic region ($\chi 2$ = 87.46, $p < 0.001$); a high percentage of agencies in the South (78.8%) indicated ALS was the most common level of transport care (compared to 51%-57% for all other regions).

Policies and Practices for First Response and Transport. A little over one-half (54.9%) of participating systems had a policy that sent first responders to all 911 calls (see Tables C6, D6 and E6). The chi-square statistics that tested for differences in having a policy as a function of both rurality and geographic region were significant (χ^2 = 49.96, $p < 0.001$ as a function of rurality and χ^2 = 97.67, $p < 0.001$ as a function of geographic region). The percentage of participating systems that had a policy that sent first responders to all 911 calls ranged from a low of 48.4% for urban systems to a high of 66.7% for rural systems and from 35.5% in the South to 71.2% in the West. In the vast majority of systems (85.8%), the most common practice was simultaneous first response and transport ambulance. This percentage did not vary significantly by rurality or geographic region (χ^2 = 19.43, p=0.20, and χ^2 = 23.55, p=0.07, respectively).

As shown in Tables C7, D7, and E7, a large percentage of systems indicated that vehicles could *respond* to calls and *transport patients* without the use of lights and sirens (78.9%

and 93.4% for response and transport respectively), with little variation in these percentages by rurality ($\chi^2 = 1.15$, p=0.76, and $\chi^2 = 1.13$, p=0.77, respectively) or by geographic region ($\chi^2 = 4.35$, p=0.23, and $\chi^2 = 1.46$, p=0.69, for response and transport respectively).

A far lower percentage (28.1%) of systems indicated they allow providers to transport patients from the scene to non-hospital destinations, although this percentage was higher in rural and wilderness areas (32.4% and 36.4% respectively) than in urban and suburban areas (22.4% and 27.6% respectively) ($\chi^2 = 12.69$, $p<0.01$). Similarly, the percentage of systems allowing dispatch of units to perform non-emergency assessment was low (37.4%) and this practice was more common in the West (44.6%) and South (45.6%) compared to the Northeast (23.8%) and the Midwest (33.4%) ($\chi^2 = 19.89$, $p<0.01$). The differences in the percentage of systems allowing dispatch of units to perform non-emergency assessment were not statistically significant ($\chi2 = 2.15$, p=0.54).

As shown in Tables C7, D7, E7, 51.3% of all systems indicated that all of their dispatch agencies offer pre-arrival instructions; 29.0% indicated that some do and 19.7% indicated that none of their dispatch agencies offer pre-arrival instructions. The percentage of systems that indicated that all of their dispatch agencies offer pre-arrival instructions varied significantly by rurality ($\chi^2 = 73.73$, $p<0.001$); this percentage was 61.3% for urban areas, 59.2% for suburban, 43.2% for rural systems and 33.1% for wilderness systems. These percentages also varied significantly by geographic region ($\chi^2 = 43.20$, $p<0.001$). A higher percentage of systems in the Northeast (72.4%) indicated that all of their dispatch agencies offer pre-arrival instructions compared to the rest of the country (43.22%, 51.9% and 54.3% for the Midwest, South and West, respectively).

When asked how often the first response and transport agencies within the system responded to calls beyond the boundaries of their primary service areas, 40.0% of the systems said their first response agencies responded sometimes or often to these calls; 66.8% of the systems said their transport agencies responded sometimes or often (See Tables C8, D8 and E8). The frequency with which response and transport agencies within the system responded to calls beyond the boundaries of their primary service areas varied by rurality ($\chi^2 = 19.09$, $p < 0.05$ for response agencies and $\chi^2 = 37.49$, $p < 0.001$ for transport agencies), with the major difference being that Wilderness areas indicated that their agencies responded to calls outside their jurisdictions less frequently (26.8% and 52.5% of first response and transport agencies respectively responding sometimes or often). The frequency with which response and transport agencies within the system responded to calls beyond the boundaries of their primary service areas also varied by geographic region ($\chi^2 = 19.66$, $p < 0.05$ for response agencies and $\chi^2 = 50.72$, $p < 0.001$ for transport agencies). In the Northeast, a larger percentage of systems indicate their transport agencies responded to calls beyond their jurisdiction sometimes or often (84.6% versus 64.0% for all other systems.

Only one-third (33.7%) of the systems indicated that *other* EMS systems responded to calls within their own jurisdictions sometimes or often. The frequency with which other EMS systems responded to calls within their own jurisdictions varied significantly by geographic region ($\chi^2 = 34.77$, $p < 0.001$) but not by rurality ($\chi^2 = 13.78$, $p = 0.13$). A larger percentage of agencies in the Northeast indicated that units outside their jurisdiction respond to calls within their system sometimes or often (52.4% versus 30.8% for all other systems).

Volunteer Versus Career Providers. In over one-half (53.8%) of the systems, the primary type of provider (as defined by the provider type that represents 50% or more of all EMS personnel) was full-time career (see Tables C9, D9, E9). This percentage varied by rurality ($\chi^2 = 109.20$, $p < 0.001$) and geographic region $\chi^2 = 185.75$, $p < 0.001$). In only 29.6% of the systems in wilderness areas, was the primary type of provider full-time career compared to 68.7% in urban areas. In the South, 80.0% of the systems reported full-time career providers as the primary type of provider, compared to only 35.5% in the Midwest. Across all systems, the average percentage of all calls that are handled by volunteers was 38.0%; this percentage ranged from 25.8% in urban systems to 35.6% in suburban systems, 43.8% in rural system and 60.3% in wilderness systems. A one-way ANOVA that tested for differences in percentage of calls handled as a function of rurality was significant: $F(3,745) = 32.95$, $p < 0.01$. Additionally, Duncan's multiple range test showed that these values differed significantly. Only a small percentage (14.4%) of volunteers typically responds to calls from fire or EMS station houses.

911 System Access and Timely Response to Incoming Calls. In nearly two-thirds (65.2%) of the systems, the highest level of 911 access was reported as wireless E911 (Tables C10, D10, and E10). Access via wireless E911 varied by rurality, ranging from 72.3% and 75.5% in urban and suburban systems respectively to 57.3% and 51.7% in rural and wilderness systems respectively ($\chi^2 = 29.48$, $p < 0.01$). In wilderness areas, the highest level of 911 access was wireless 911 in 15.3% of systems, E911 in 22.8% and Basic 911 in 10.1%. In only 57.4% of systems in the West had Wireless E911, compared to 66.8%-69.5% in other geographic regions of the country although these differences were not statistically significant ($\chi^2 = 3.66$, $p =0.30$).

More than half (55.8%) of the systems indicated that there were locations within their service areas that made timely responses problematic (see tables C11, D11, and E11). There was no significant variation in responses to this item by rurality ($\chi^2 = 6.64$, $p = 0.16$) although a significantly lower percentage of systems in the Midwest indicated timely response is a problem (44.4%) compared to all other regions (64.1%) ($\chi^2 = 30.95$, $p < 0.001$). The primary factors associated with the lack of timely response were remote or distant geographic areas (56.4% systems listed this as the primary reason) and inadequate daytime staffing (26.2%). Responses varied by rurality and geographic region. Only 19.0% of regions in the Northeast listed remote areas as the primary reason compared to 44.5% of Midwest regions, 74.5% of regions in the South and 77.6% regions in the West. In the Northeast a larger percentage of systems listed daytime staffing as the primary reason (compared to 37.5% in the Midwest, 13.4% in the South and 8.2% in the West).

Medical Direction. As shown in Tables C12, D12 and E12, almost all systems (95.9%) had some physician medical direction in place, although 25.6% of all systems had no one person with the primary responsibility of overseeing medical direction. A higher percentage of rural and wilderness systems (37.1% and 32.9%) had no medical direction in place or medical direction with no one person with the primary responsibility) compared to urban or suburban systems (26.8% and 20.4%) ($\chi^2 = 10.86$, $p < 0.02$). A higher percentage of systems in the Northeast and Midwest (43.8% and 34.7%) had no medical direction in place or medical direction with no one person with the primary responsibility) compared to systems in the South and West (21.0% and 20.2%) ($\chi^2 = 27.05$, $p < 0.01$).

Of those with one person with the primary responsibility of overseeing medical direction, 44.9% of the systems indicated this person was responsible to the system agency, 34.8% to the county or EMS regional program and only 10.3% to the State lead agency.

System Financing. We asked participants to think of their systems as a whole and indicate how EMS was financed. They were asked to indicate which funding sources were present at all and to indicate the primary source of funding. All systems tapped into a wide variety of funding sources as shown in tables C13, D13 and E13. Most systems indicated that fees for services and tax subsidies (at the State, county or local level) were the *primary* types of funding for EMS (53.4% and 41.1% of systems respectively). These percentages did not vary significantly geographic region ($\chi^2 = 7.15$, $p = 0.07$). However, rural and wilderness areas had a slightly higher percentage of systems indicating fees for services as their primary source of funding (61.8% and 57.4% respectively) compared to urban and suburban systems (48.0% and 50.6% systems respectively) ($\chi^2 = 9.10$, $p < 0.05$).

C.4 System Outlook by Characteristics of Systems

As described in the Methods above, we asked participants to indicate the extent to which they agreed or disagreed with 16 statements designed to illicit their judgment as to the level of resources present in their system, the extent of public participation, the degree to which there is support of the system among physicians, hospitals and non-EMS organizations, the extent to which turf wars and politics are a problem for the system and the extent to which they feel the system adapts well to change. The responses to these items are summarized in Tables F1 (by rurality), F2 (by geographic region) and F3 (by size of the system).

We performed a principal components analysis (PCA) to explore the extent to which the 13 of the 16 opinion statements clustered together to define independent factors (note: we excluded 3 items from the PCA: Item 23m: *EMS providers enjoy working within our EMS system*; Item 23n: *Our system looks much the same as 10 years ago* and Item 23o*: Our system will look much the same 10 years from now*).

The initial principal components analysis identified four independent factors with Eigen values greater than 1.0 (See Table F4). Together these four factors explained 58% of the variance. An orthogonal transformation yielded four simple factors that were easily interpretable and appeared to measure different constructs (see Table F5). These four factors were used to derive four factor-based summary scores (by adding the responses to the items in each factor (values range from 0 to 4), dividing by the number of items in that factor and standardizing to a 0 to 100 scale.

The items included in each of the four factors are as follows.

Factor 1 (System Support):
23g: Our system has a high level of physician involvement
23h: Hospitals in our systems are supportive of our EMS agencies/providers
23i: Patient handoffs between agencies and hospitals are generally smooth
23j: Our EMS system /participating agencies collaborate well with non-EMS organizations
Factor 2 (System Resources):
23a: Our system is adequately staffed to meet demand
23b: Our system has enough resources (vehicles, equipment) to meet demand
23c: The population served by our system has a high level of EMS awareness, participation or support
Factor 3 (System Politics) - both items were reversed scored:
23k: "Turf Wars" are a problem for our EMS providers
23l: Politics area problem within our EMS system
Factor 4 (Bystander Action)
23d: Defibrillators, available for public access, can be found in many public places without our system
23e: Bystanders often provide CPR prior to EMS arrival at cardiac arrest calls

Two additional items dropped out of the four-factor model as they were correlated with more than one factor; these items were analyzed as separate (binary) items:

23f: Public Satisfaction, The public is satisfied with our EMS system
23p: Adapts to change, Our system adapts well to change

Mean item scores are summarized by rurality, geographic region and size of the systems in Table F6.

Summary of Subjective Assessments: Overall and by Rurality, Geographic Region and Size of the System. Results are summarized here for each of the four main factors identified by the principal components analysis.

System Support: Most respondents (78.8%) agreed or strongly agreed that hospitals in the system are supportive of the EMS personnel and agencies (See Table F1). A lower percentage of systems were satisfied with the level of physician involvement; only 57.0% of respondents agreed or strongly agreed that their system had a high level of physician involvement. Most respondents were positive with regard to collaboration with non-EMS organizations (77.4% agreed or strongly agreed that the EMS system collaborates with non-EMS organizations). Over three-quarters of the respondents (89.2%) agreed that the flow of patients through the system is generally smooth. The overall summary scores for System Support (71.5 on a scale from 0 to 100) did not vary significantly by rurality ($F(3,771) = 1.48$, $p = 0.22$) or by geographic region ($F(3,771) = 0.76$, $p = 0.52$) but did vary by system size ($F(3,696) = 2.66$, $p = 0.05$. Duncan's multiple range test revealed there was a tendency for support to be higher for larger systems (5,000 – 9,999 calls and more than 10,000 calls) versus smaller systems (less than 1,000 and 1,000 – 4,999 calls).

System Politics: "Turf wars" were noted as a problem for less than one-fifth of the systems (19.8%). Politics were noted as a problem for 36.1% of the systems (See Table F1).The overall summary score for System Politics (58.9 on a scale from 0 to 100) varied significantly with rurality ($F(3,788) = 13.37$, $p < 0.001$), geographic region ($F(3,788) = 8.35$, $p < 0.001$) and size of the system ($F(3,712) = 10.30$, $p < 0.001$). Duncan's multiple range test indicated that the larger systems (10,000 or more calls) were significantly more likely to report politics as a problem when compared to two of the other size groups (less than 1,000 calls and 5,000 – 9,999 calls). Similar testing revealed that systems in urban and suburban areas as well as systems in the Northeast were significantly more likely to indicate that systems politics were a problem than all other groups.

Resource Levels: Only 42.3% of respondents across all systems agreed or strongly agreed that their systems had adequate staff to meet demand; 62.2% agreed or strongly agreed they had adequate resources (vehicles, equipment) to meet demands. (See Table F1) Although 78.7% of the respondents agreed that the public is satisfied with EMS services, most felt the public did not have a high level of awareness of the system (i.e., only 39.3% agreed or strongly agreed that the population served had a high level of EMS awareness, participation or support).

The overall summary score for System Resources (54.6 on a scale from 0 to 100) varied significantly by geographic region ($F(3,781) = 5.37$, $p < 0.01$); systems located in the South scored significantly lower (fewer resources) on the summary score for System Resources according to Duncan's multiple range test. There were no significant differences in opinions regarding system resources by rurality ($F(3,781) = 0.75$, $p = 0.52$) or by size of the system ($F(3,706) = 0.55$, $p = 0.65$).

Bystander Involvement: Defibrillators could be found in many public places in 55.2% of the systems. The percentage of systems in which bystanders often provided CPR prior to EMS arrival was low (36.3%).The overall summary score for Bystander Action (54.2 on a scale from 0 to 100) varied significantly with rurality ($F(3,784) = 7.41$, $p < 0.001$), geographic region ($F(3,784) = 9.80$, $p < 0.001$) and size of the system ($F(3,710) = 7.04$, $p < 0.001$). Duncan's multiple range test showed that scores were significantly lower (lower bystander action) in wilderness areas when compared to all other rurality categories. Similarly, systems in the West were more likely than those in the Northeast and Midwest regions to have lower scores and smaller systems (less than 1,000 calls and 5,000 – 9,999 calls) collectively had significantly lower scores than larger systems.

Few respondents (23.5%) agreed that their systems looked much the same as 10 years ago and even fewer (15.2%) agreed that their systems will look much the same 10 years into the future. In contrast, a majority of respondents (58.4%) agreed or strongly indicated that their systems adapt well to change.

Regression Analysis: Multiple linear regressions were used to model the factor-based Summary Opinion Scores by: rurality, geographic region, primary mission of the transport agency, primary administration/ownership of transport agency, primary funding source for the system, presence of medical direction with a single person responsible, and the average percentage of providers in the system that are volunteer. Regression coefficients are reported in Table F7. The two dichotomous opinions regarding "public satisfaction" and "system adapts well to change" were modeled using logistic regressions and adjusted odds ratios reported (Table F7). All independent variables were included in the models as categorical variables and the value of each variable used as the reference category denoted by REF in Table F7.

The regression analyses confirmed most of the patterns noted above (regarding rurality and geographic region) and identified other factors that were associated with the subjective assessments of the respondents.

It is worth noting that the only factor that was significant in predicting positive perceived system support was the presence of a single person with the primary responsibility of overseeing medical direction (*b*-coefficient = 4.39, $p < 0.01$); having a single person responsible for medical direction was strongly and positively related to system support. No other variables in the regression were significantly related to the summary opinions regarding system support.

Rurality was a significant predictor of several opinion measures. Compared to being from an urban system, being from a wilderness system was significantly associated with lower perceived adequacy of resources (*b*-coefficient = -5.29, $p < 0.05$), lower bystander action (*b*-coefficient = -10.70, $p < 0.01$) and lack of systems politics (b-coefficient = 11.50, $p < 0.01$). Being from a rural system (compared to an urban system) was also predictive of the lack of system politics (*b*-coefficient = 6.33, $p < 0.05$).

Geographic region was a significant predictor of all the opinion measures. Compared to systems in the Northeast, systems in the Midwest scored higher on lack of system politics (*b*-coefficient = 7.14, $p < 0.05$) and lower on bystander action (*b*-coefficient = -5.46, $p < 0.05$). Systems in the South scored significantly lower on both adequacy of system resources (*b*-coefficient = -6.27, $p < 0.05$) and bystander action (*b*-coefficient = -13.60, $p < 0.01$). Systems in the Northeast scored significantly higher on Bystander Action than all other systems (all coefficients are negative and significant at $p < 0.01$)

The odds that respondents rated pubic satisfaction as high was 2.70 ($p < 0.01$) and 2.50 ($p < 0.05$) times greater for systems in the Midwest and West compared to systems in the Northeast. Systems in the Northeast were less likely to report they adapt well to change; compared to systems in the Northeast, the odds of systems reporting they adapt well to change was 2.59 ($p < 0.01$) for systems in the Midwest and South and 2.70 for systems in the West ($p < 0.01$).

Primary Mission of the Transport Agencies in the system was predictive of only the public's satisfaction with EMS, with the odds of reporting high satisfaction 0.43 less for systems that were labeled as "other" compared to those that were "EMS Only." The types of agencies falling into the "other category" included hospitals based services, law enforcement and public safety agencies, as well as systems with agencies operating under a variety of organization missions (i.e. no primary mission). The Administration of the Transport Agency was also associated with Public Satisfaction ($p < 0.05$), with the odds of reporting high satisfaction 0.58 less for systems that were" "for profit or other" compared to those that were administered through State or local government. Systems whose primary transport agencies were" "for profit or other" also scored lower on the Lack of System Politics, i.e., they were more likely to indicate system politics were a problem, when compared to systems administered through State or local government (b-coefficient = -5.48, $p < 0.05$).

The percentage of providers who are volunteers was highly predictive of the adequacy of system resources (b-coefficient = 5.12, $p < 0.01$); level of bystander action (b-coefficient = 2.96, $p < 0.05$); public satisfaction with EMS (adjusted odds ratio =2.38, $p<0.01$); and ability to adapt to change (adjusted odds ratio=1.96, $p < 0.01$). In each case, systems with fewer volunteers (50% or less of system staff) indicated positive summary ratings for these four system outlook factors. Perceived system support and system politics were not associated with level of volunteer staffing (b-coefficient = 5.12, $p > 0.10$ for system support and b-coefficient = 1.49, $p > 0.10$ for lack of system politics)

D. Summary and Discussion

D.1 Summary and Interpretation of the Results

EMS systems are configured differently depending on several factors, including the size, organization, demographics and geography of the local communities they serve. Although some information exists about the organization, financing and delivery of EMS in 200 of the nation's largest cities (16), this information is incomplete and does not provide any information on how services are organized outside large urban areas in which 75% of the nation's population resides. Even less is known about how different EMS configurations impact the effectiveness and efficiency of service delivery.

Without the capability of determining what characteristics of EMS systems are most effective and efficient, NHTSA is unable to establish guidelines for EMS best practices that EMS providers may use to assess and ultimately improve their performance. Furthermore, efforts at health care reform have underscored the importance of demonstrating how critical differences in the inputs and processes of health care delivery impact system performance and patient outcomes. Every sector of health care, including EMS, is being challenged to demonstrate the value of services provided and to make head to head comparisons of alternative services and systems of care. Figure 6 presents a model that summarizes how these inputs and processes of EMS care may affect system outputs and patient outcomes.

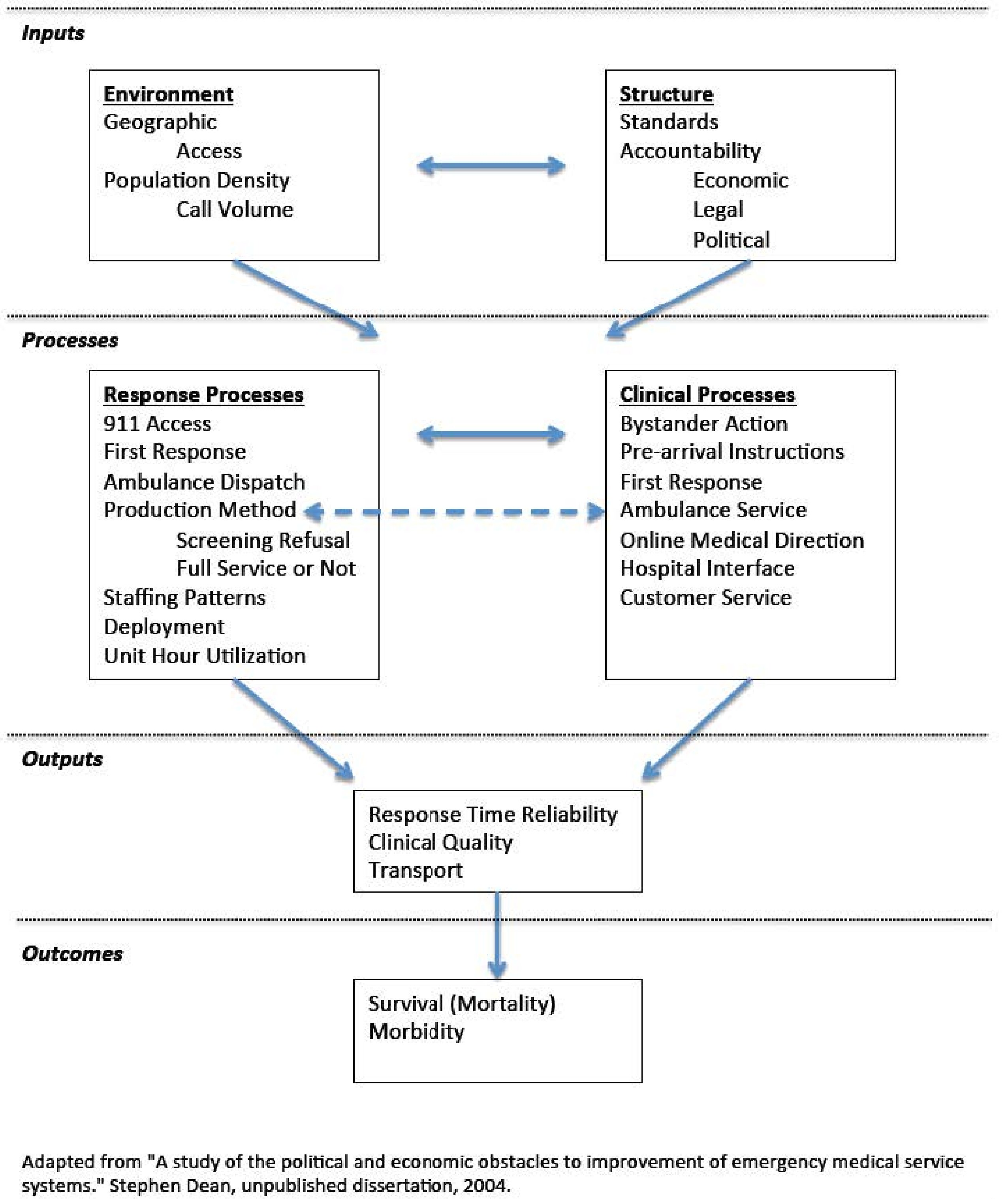

Figure 5: A conceptual model of EMS quality

An important first step in making head-to-head comparisons and understanding what components of EMS systems work well, is the development of a characterization of system structure (inputs) and processes so that systems can be evaluated on a common basis. This study was designed to develop such a characterization of EMS systems around the country. The development of the characterization may also assist in establishing a common EMS language and provide the basis for tracking progress in the development of EMS systems into the future. The need for these data has never been more critical. In its efforts to better prepare for mass casualties and disasters, the nation must have a better understanding as to how EMS systems are organized and delivered at the local level so that these services are appropriately integrated in to an overall systems response capability.

Much of the existing information about local EMS system design across the nation is anecdotal, incomplete, or drawn together from national or State level resources. However, a few key previous efforts provided a knowledge base that helped shape and allow comparisons with the current project. These efforts include the following:

- For more than two decades, the *200-City Survey* (16), published annually by the *Journal of Emergency Medical Services,* characterizes individual EMS agencies (specifically agencies responsible for first response and/or transport) in Nation's 200 most populous cities. The *200-City Survey* has varied its focus on specific topics over the years, but issues related to system design, including first responder and transport provider types and response configurations, have been part of this annual effort. While the survey continues to be a valuable resource for evaluating the urban EMS landscape, it does not provide insight into rural areas of the country and has limitations in both its scope and response rate. In the most recent survey, 455 leaders of first responder and transport agencies were asked to participate in an online survey consisting of 118 questions; only 97 (21.3%) of those surveyed completed the survey. Although this represents 97 (48.5%) of the 200 largest cities in the United States, the response rate remains low, making it difficult to generalize beyond the sampling frame.

- In an effort to assess the complex EMS landscape and identify priority areas for improvement, Mears (17) gathered extensive information about State and local EMS structures and functions in a survey of State EMS offices. The survey had a 100% response rate (although not every respondent answered every question) and provided an accounting of local systems, personnel, resources, and procedures. The results indicated wide variation across the country as a whole, and the author acknowledged the challenges in system comparison stemming from the differences in definitions used by States. The data collected by Mears originated at the State level and provided valuable information, although not directly from a local perspective. Additionally, this effort calculated the number of EMS systems using a definition most commonly resembling individual provider agencies.

- The Federal Interagency Committee on EMS (FICEMS) recently sponsored *The National EMS Assessment* (18), which is a comprehensive effort to describe EMS throughout the United States using existing data sources. Using data primarily from the NASEMSO 2011 Industry Snapshot and National EMS Information System (NEMSIS) (www.nemsis.org), along with feedback from expert panels, the report provided an accurate portrayal of EMS in the United States and identified areas for improvement in data systems (19). Key recommendations from the *Assessment* included the creation of data systems that adequately differentiate rural and urban areas and uniform definitions associated with EMS agencies and volunteers to promote data aggregation and analysis at the national level. The *Assessment* tallied the number of EMS agencies nationally and showed variation in the size of the smallest geographic service areas recognized by States for licensure of EMS agencies. Regarding regionalization of EMS services, only 20% of States credential systems comprising multiple EMS agencies functioning together in a given area.

- In 2006 and 2007, with funding from the Federal Office of Rural Health Policy, the North Carolina Health Research and Policy Analysis Center conducted a survey of 2,500 local EMS directors. The survey was distributed by mail to a stratified (based on rurality) random sample of local community-based EMS agency directors derived from a list of licensed EMS agencies maintained by the National Association of EMS Officials. Surveys were received from 1,425 (57.2%) EMS directors across 47 States. The survey identified interesting findings between metropolitan and non-metropolitan entities with regard to general characteristics (20) and medical direction (21). However, the final number of respondents represented less than 10% of the list from which it was originally drawn, so generalization is again problematic.

Comparison with Other Studies. Findings of the current study align with several key conclusions of the previous efforts. The *National EMS Assessment* (18) indicated, "There is a wide variation in how EMS Agencies are defined" and "there does not appear to be a common political boundary used for EMS system credentialing." Results from the present study support these conclusions. The *National EMS Assessment* also revealed that only 10 States credential EMS systems composed of multiple EMS agencies, and the authors questioned if regionalization of pre-hospital care may take another form in States that do not credential or license EMS systems. One might argue that the operational definition used as part of the present study represents such a form of regionalization as a matter of practice, if not exclusively, based on licensing or credentialing processes.

Due to differences in definitions and study design, it was not possible to make a direct comparison between our study and the *National EMS Assessment* with regard to organizational types. However, our study of EMS systems reflected roughly similar ratios regarding the organizational types reported for agencies in the *National EMS Assessment*. Overall, 31.2% of the transport agencies in our study had a single or dual organizational mission associated with the fire service, compared to 40% in the *National EMS Assessment*. Comparing our study to the *National EMS Assessment*, similar percentages were found for hospital-based agencies (5.2% versus 6%) and EMS Only (non-hospital, non-fire) agencies (59.7% versus 46%). The *National EMS*

Assessment indicated that half (51%) of licensed agencies function at the EMT-Basic level and 38% function at the EMT-Paramedic level. This is consistent with our findings for first response systems (ALS 36.2%, BLS 55.0%) but not for level of response for transport (ALS 63.4%, BLS 24.3%). This difference was surprising since we expect first responders to be largely basic life support, saving more limited ALS resources for transport. However, this contrast could be the result of evaluating first response and transport separately or other measurement differences between the two studies.

Freeman et al. (20) noted that a higher percentage of urban EMS organizations were part of the fire department. In contrast, the authors note that free standing and hospital based organizations tended to be from rural areas. These findings align quite well with our data. Additionally, Freeman and colleagues noted that metropolitan entities reported higher levels of use of ALS and ILS providers as opposed to their non-metropolitan counterparts. This finding is consistent with our study as well; increased levels of urbanicity were associated with increased use of ALS in response for transport.

The annual JEMS *200-City Survey* is still the most comprehensive and well-known assessment of urban EMS issues to date, although it has limited generalizability to the nation, particularly with regard to rural and wilderness areas. The following is a list of comparisons between our data and the last several years of this JEMS effort (16, 22-25).

- The last five iterations (2007-2011) of the JEMS survey consistently showed that private companies and the fire service were the top two providers of transportation services, and often close in percentage of respondents. Our data support the finding that both fire and private organizations play a significant role in providing transportation services. However, our data indicate a slightly larger role for the non-fire, governmental (third service) organizational type in the urban setting. This may be, in part, due the operational definition of a local EMS system used for our study (i.e. our systems often extend beyond the borders of a single city).
- The 2008 and 2009 releases of the survey stated that fire departments were the primary organizations for providing emergency medical dispatch with public safety organizations ranking second. Our data suggest that although the fire department is providing such services in nearly 40% of urban systems, its role as the primary dispatch organization type lags far behind public safety and law enforcement organizations. This difference in finding may also be due to the use of a local system definition that often extends beyond the borders of a single city.
- There was a high degree of correspondence between the current results and the JEMS data with regard to first response services. The fire department is the provider of the majority of first response services in our survey (84.2%) and the 2008 JEMS survey (94.6%). The 2008 and 2010 JEMS surveys noted that nearly half of responding cities (46.4% and 47.4% respectively) still send first responders to all 911 calls. This practice was observed in 48.4% of urban systems participating in our study. Sending first response and transport vehicles simultaneously was reported by 78.9% of cities in the JEMS 2007 survey while this percentage is 86.1% in our study.

- The 2007 JEMS report noted that 50.4% of cities respond to calls with ALS first response and ALS transport, and 42.7% respond with BLS first response and ALS transport. Our data indicate that BLS is the most common level of first response (reported by 54.6% of responding urban systems).
- The JEMS 2008 annual survey reported that 56.4% of cities respond to calls with lights and sirens *only in instances where the patient is believed to be at risk of death* (with 35.5% of cities responding to every call with lights and sirens). Our data show that a higher percentage of EMS systems have the *ability* to respond to calls without lights and sirens (79.8% of urban systems) and transport without lights and sirens (94.3% of urban systems). These numbers were universally high in our study group, regardless of rurality. These high percentages, however, may reflect the policy as opposed to what actually happens in practice.

An overwhelming majority (91.5%) of respondents to the 2011 JEMS survey agreed or strongly agreed that their local EMS systems were integrated into the greater healthcare system. This was up from 65.0% of respondents in the 2008 survey, when half of the respondents indicated formal partnerships with public health or social services organizations. Our study shows that systems (across levels of rurality) generally agree that there are high levels of physician involvement, hospital support, smoothness of patient handoffs and collaboration with non-EMS organizations.

Variations Within and Across States. A formal analysis of differences across States was not possible in this study, primarily due to variations in response rates. However given our knowledge about responding systems and States as a whole, it is reasonable to infer that many potential variations exist. The *National EMS Assessment* (18) noted that the number of EMS agencies per State ranges from 7 to 1,555 and that a majority of States credential multiple categories of agencies (by level of service, organizational type), vehicles, and personnel. Additionally, variations within a State would be expected to result from geographic, demographic and political differences. Our data indicate that variations within States exist more broadly, but more importantly are exhibited across groups such as rurality and even at the individual system level (i.e., many respondents checked multiple categories for questions where prompted to "check all that apply").

Variation across States is a ubiquitous theme in EMS and is well supported by documents such as the *National EMS Assessment*. States have evolved quite differently in how they handle the oversight of EMS. With such contrasting approaches in State regulation and policy, along with differences in overall size, demographics and geography, it is not surprising that we see variability in our data across these States. As part of this study, representatives from State EMS offices were interviewed, providing information on how States were organized and where responsibility for various EMS system functions was held. Figure 1 shows that functions are often addressed at multiple system levels and the percentage of States indicating responsibility for a particular function at any given level varies widely. In the broadest terms, the most obvious difference noted is how each State related to our operational definition of a local EMS system to itself. Table B1 establishes that States choose to organize local emergency medical services coordination in a variety of ways from hospital-centered models to county based systems to larger regional entities. We did find sizeable differences by rurality, system size and census region, all of which are related in many ways to how States are organized. Below we discuss our results in the context of rurality.

Variations by Rurality. EMS has developed very differently throughout the country based on varied histories, economics, policies, and local needs. Perhaps the most pronounced demarcation of such differences is with respect to the rurality of a system's service area. Urban, suburban, rural and wilderness area vary greatly with regard to population demographics, industry, and economics. Such diversity has led to equally varied expectations of an EMS system within those areas.

A report by National Conference of State Legislatures (26) noted four sweeping dynamics from the Federal Office of Rural Health Policy (OHRP) that have wide impact on rural EMS issues. These include: 1. low population density and large geographic areas that raise the cost of providing EMS; 2. State and local governments have lower capacity for funding through a tax base; 3. difficult economies in these areas have challenges in maintaining public services and managing change; and 4. rural areas have less volume and profit potential to lure private EMS services to their region. Priorities for rural and wilderness EMS systems continue to center around recruitment and retention (including the role of volunteers), reimbursement and subsidization and medical oversight (27).

In urban areas, systems are likely to have higher call volumes, use volunteers less frequently, support greater use of a tiered response structure and non-response vehicles, rely more on increased non-emergent use, and have a more developed administrative structure (28). Additionally, we expect that urban EMS systems would have a high representation from fire-based organizations as opposed to freestanding or hospital-based in other settings (16, 20). Rural jurisdictions often must rely on volunteer personnel, have longer response times, face high personnel turnover and service coverage issues, lack quality medical direction, and may lack access to advanced prehospital care. Further, these areas often encounter greater financial constraints and sometimes even lack the infrastructure needed to ensure complete public access to the emergency care system (4, 27, and 29). This is particularly important for medical oversight where recruitment of a dedicated medical director can be particularly difficult (21). Additionally, in urban and suburban areas where multiple agency types are used, the need for improved coordination and integration among disparate agencies increases (30).

When evaluated by level of rurality, our data support many of the differences noted above. The mean number of EMS responses was significantly higher for more urban systems and the use of volunteers was higher for systems that were more rural. It was not surprising to find that the primary organizational missions for first response and transportation agencies were mostly fire-based in urban systems while an "EMS only" mission was more prevalent in more rural areas. When it comes to both call taking and dispatching agencies, combined public safety agencies (police, fire and EMS) have a larger role in urban settings as opposed to more rural systems. Our findings seem reasonable when considering first response, transport, call taking and dispatch entities. Specifically, urban systems are often larger, have a greater tax base to draw from and have robust and well sized agencies from which to draw economies of scale. It is also not surprising that urban systems report a higher prevalence of response configurations that involve advanced life support units for the same reasons.

In rural and wilderness systems, sending first responders to all calls is a more prevalent practice, likely due to lower volumes overall (less possibility of taking away a resource from a higher priority) as well as the need to deliver resources for the most emergent cases over greater distances more quickly. We expected to find greater differences in the prevalence of responses and patient transports without the use of lights and sirens, but the results indicate the distribution of each was relatively flat (and present in a sizable percentage of systems) when examining variations by rurality. However, a higher percentage of more rural systems reported having a policy that allowed for non-hospital destinations for transport (not related to interfacility services). This finding was expected and particularly important when considering that more rural areas often have less access to acute care facilities. Given this fact, it was intriguing that the ability to dispatch units to conduct non-emergency assessments did not vary significantly by rurality. More urban systems reported higher rates of having all of its dispatch agencies providing pre-arrival instructions, which may be due to having a greater number of NAEMD accredited or technically sophisticated dispatch agencies.

When considering career versus volunteer EMS personnel, urban and suburban systems predictably had higher levels of full time career providers when compared to rural and wilderness systems. Similarly, the percentage of personnel operating in some capacity as a volunteer, as well as the percentage of calls handled by volunteers, was substantially higher in the more rural systems. Such findings were not only in line with expectations but also convincingly demonstrated how crucial volunteer participation is to sustaining EMS operations in more remote areas.

The technological sophistication of public access to the EMS system differed significantly by rurality. This is an important issue for more rural areas and our data indicate this difference to be largely dependent on the availability of wireless E911 access. It is notable that despite this variation, nearly 90% of wilderness systems and over 95% of rural systems still provided access through at least enhanced 911 technologies.

There are nominal differences by rurality when evaluating consistent response problems. Remote and geographically distant areas as well as daytime staffing were consistently the top two difficulties cited by systems among all rurality levels, although remote areas are far and away the most prevalent concern in wilderness areas.

One of the most pressing issues for rural and wilderness EMS is medical direction. Our data indicate that a higher percentage of rural and wilderness systems either did not have a dedicated medical director in place or did not have a single person responsible for fulfilling that role. Furthermore, rural and wilderness areas report a lower level of physician involvement (as measured by respondent opinion). These are in line with the findings of Slifkin et al. (21) and likely caused by the difficulties in recruiting a medical director, including a lower availability of physicians, the lack of desire for providers to take on such a role as well as less available funds to pay for these services. While more urban systems are often larger and use ALS to a greater extent, the need for rural medical direction remains vitally important to system leadership and operations.

There were few differences by rurality when considering the primary mechanism for system finance. Rural and wilderness systems rely more heavily on fees and billing for service than suburban and urban systems. This finding is not surprising given such areas often have less of a tax base from which to draw. System resources, particularly staffing, were reported to be adequate more frequently in less rural systems based on respondent opinions. EMS agencies often feel significant financial pressures, regardless of location, although these challenges are particularly pronounced in rural and wilderness areas. Call volumes are low and amount of geography to cover is high, making the cost of providing emergency medical services an expensive proposition. The financing of EMS, which is largely related to the cost associated with standby capabilities, does not translate well to a bill for service model in rural areas, which typically pays only for transported patients and often at a lower rate than in urban settings. These circumstances further compound the difficulties of attracting private services to a given area and intensify the need to rely on volunteer personnel.

Perception of bystander action (i.e. availability of defibrillators and bystander provision of CPR) is lower in more rural areas, likely due to lower population densities and less feasibility in implementing public access defibrillation programs. Systems in rural and wilderness areas are less likely to report that system politics and turf wars are a problem. And while two-thirds of all respondents (regardless of rurality) indicated they feel they had enough resources (as measured in terms of vehicles and equipment) to meet demands, a significantly lower percentage of rural and wilderness systems agreed that their systems were adequately staffed to meet demands. A high percentage of systems (regardless of rurality) agreed that the public is satisfied with EMS services.

D2. Implications of the Study Results and Future Application to NEMSIS

Following a surge of activity in the 1960s and 1970s, Federal support of EMS systems has steadily declined, leaving State and local governments to take the lead in program development and system design. This shift created a fragmented system of care nationwide and continues to promote regional and local approaches to system design (4, 33).

Given this fragmentation, local EMS systems are complex entities and difficult to describe in a uniform manner. Some systems are small and others large, encompassing disparate geographic areas and populations. Some systems are rigidly tied to well-defined political boundaries and others are defined by a vaguely defined catchment area for a particular hospital. At opposite ends of the spectrum are North Carolina, which defines (through regulation) the minimum service area of an EMS system to be one county, and States such as Idaho where some areas are organized at the county level while others have active EMS agencies with less than county-wide coverage and/or no centralized authority. Very large land areas, such as the region-based systems in Texas, are difficult to classify with regard to demography and geography, irrespective of the

EMS being provided. As Mears (17) convincingly stated, “The definition of an EMS system varies from State to State, which makes any analysis of EMS systems impossible.” This study attempted to standardize the definition of an EMS system to promote more fluid analyses, but in doing so, we may have created artificial boundaries for any given system.

Notwithstanding this limitation, it is abundantly clear that within a local system as we have defined it, there is significant variation in how services are organized and delivered. Even within a single countywide system, fire departments, private agencies, government and volunteer organizations may all be providing services, at a variety of levels in a multitude of ways. EMS can vary from town to town, even within a highly organized system.

This variation is not inherently inappropriate, although it raises important questions about the effectiveness and efficiency of alternative approaches. These questions cannot be addressed in this study. Opportunities do exist, however, to link the descriptive characterization of systems (and the counties they represent) to data being collected as part of the National EMS Information System (NEMSIS) (www.nemsis.org). Such a linkage will allow for evaluations of different system designs and system performance measures as being defined and standardized within the context of the Performance Measures Project (www.nasemso.org/Projects/PerformanceMeasures/).

NEMSIS was designed for the purpose of creating a uniform national EMS dataset with standard terms, definitions, and values as well as a database of data aggregated from across the country. There are many benefits expected to stem from this effort, including the facilitation of national benchmarking, comparison of local system performance, exploration of variations across a number of constructs (including rurality) and better description of the nation’s EMS system as a whole (32). As of May 4, 2012, 35 States were contributing data to NEMSIS with several more actively working with the NEMSIS Technical Assistance Center to contribute data in the near future (33). NEMSIS contains many useful data elements, including an array of EMS agency characteristics such as geography, population served, call volume, level and type of service, and organizational characteristics (34).

NEMSIS is an increasingly powerful data resource that can be used to help verify and validate some of our findings. Incident-level data as well as EMS agency characteristics from NEMSIS can be linked using geographic identifiers to the data collected as part of this project. This can help better distill system characteristics to evaluate the uniformity of various systems and system types. The most obvious potential benefit in connecting these data would be to evaluate performance on a local EMS system level. Such an undertaking would help generate an evidence-based approach to local, State, and national EMS policy and planning efforts.

In addition to documenting overall variation in the organization and delivery of EMS across systems, this study clearly underscored the challenges faced by systems providing services in rural and wilderness areas of the country. Most apparent (and of potential concern) are low percentages in rural and wilderness areas of full-time versus part-time and career versus volunteer EMS providers, ALS versus BLS providers involved in transport, and dispatch agencies providing pre-arrival instructions. In addition, a higher percentage of systems in more rural/wilderness versus urban/suburban areas had no medical direction in place and or had some organized medical direction but with no one person with primary responsibility. System financing was clearly a challenge for all systems, but a slightly higher percentage of systems in rural and wilderness areas rely on fee for service as their primary source of funding.

D3. Limitations of the Study

This study has a number of limitations, which can be grouped into three types: 1. potential response bias; 2. instrument design; and 3. respondent and system comparability.

Potential Response Bias. The overall rate of participation in the study was modest (63.6%) and lower than that achieved in the pilot study (86%). Despite the less than ideal response rate participation did not differ significantly by geographic region of the country or by rurality. Overall, the participating systems covered only 44.0% of the land in the United States, but represented 63.6% of the U. S. population. While a survey that covers practices serving nearly two-thirds of the U. S. population is informative, caution is needed in interpreting the data as the potential for response bias exists. The variation in response rates by State made a State-by-State comparison difficult.

Limitations Related to Instrument Design. The survey instrument contained 24 questions, some of which were fairly complex to answer or relied on estimation on the part of the respondent. The desire to keep the survey short and straightforward as possible led to using fewer and broader questions about a particular concept. Quantitative data (e.g., call volume) were self-reported and opinion questions may present a greater bias depending on the person serving as the system's proxy respondent. Non-standard definitions also could potentially be reflected in the self-reported data based on the local system variations (e.g., how to count call volume).

The widespread use of different terminology in the EMS field may have presented some challenges for some respondents on certain questions. For example, a straightforward question regarding the number of EMS "providers" was interpreted by the majority of respondents to be equivalent to "personnel" (based on the surrounding question language) but we determined (by way of a data quality assurance follow up phone call) that at least one large regional system to have answered as if this was the number of EMS agencies. Finally, we determined the questions regarding the administrative structure and organizational mission of first responder and transport agencies were challenging for some respondents. The difficulties became apparent through follow up calls to several respondents as well as based on the handwritten mark up of returned hard copy surveys.

Finally, while the survey was designed to be broad and generic in nature to ensure brevity and answerability, it is by no means complete in terms of what should be asked of an EMS system. The questions address many of the key facets of system structure and environment, but some specific areas require further inquiry and there is a need to examine yet another class of quantitative and performance variables to assess the relative value of any given configuration. While the system as an entity works to improve the operations it governs, the effective administration of an EMS system requires a different perspective and knowledge base than is found in field operations.

Respondent and System Comparability. Perhaps the most challenging aspect of this study is the variability in the size and geography of the systems we surveyed. Despite our efforts to apply a uniform definition of "system", there are still differences to be expected when considering each system as a unit. This is true for the individual completing the survey as well. As reported above, most States had types of organizations that met our definition within their own borders but the type and level of these organizations did vary across States. For example, some States provided contacts at the county or municipality level while others were regional or hospital-based. The State EMS offices themselves completed local system surveys for both Hawaii and Rhode Island. It is possible that there may be differences present in the data based on the formal organizational roles, level of system engagement and experience of each respondent, particularly for opinion-based questions.

Airport, tribal, or military EMS systems also present challenges. Atypical systems, while important to their respective State EMS structures and likely fairly homogeneous as individual units, may prove difficult to compare with the majority of jurisdictional systems.

There are many ways to classify rurality, each with strengths and weaknesses based on their definitions, data availability, and the purposes for which they are needed. Further, there is no universally accepted approach that meets the needs of every analytical effort (35). Large "multiple rurality" systems can be extremely diverse in their makeup, but this alone does not illuminate all the potential inconsistencies when considering rurality. Based on the geographic units of measurement and design, rurality taxonomies can mask the heterogeneity of a particular area (e.g., a single county) in many ways (36) and the county-based urban influence codes used to classify systems in this study are no exception.

Due to the variable size and geography of the systems we surveyed, we were often challenged in defining the "rurality" of the system. There were several participating systems that encompassed within their boundaries multiple urban influence codes, and 63 (7.9%) that even spanned across our four-category scheme. For example, the Southwest Texas Regional Advisory Council is charged with the development and implementation of the regional trauma and emergency healthcare system for a 22-county region of over 26,000 square miles. It contains both Bexar County (19th most populous county in the nation; population density of 1,375/sq. mi.; home to San Antonio, the nation's 7th largest city) as well as Real County (700 square mile frontier area with population 3,309 and a population density of less than 5/sq. mi.). The size and complexity of our participating systems limited the options for classifying rurality in a different manner, although our categorization was still similar to that used in NEMSIS.

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Table A1: Characteristics of States – Demography

State	Total Land Area (sq mi)	Population (2007 Estimate)	Population Density (pop/sq mi)	Total Number of Counties	Number (%) of Counties in Persistent Poverty[1]	Number (%) of Counties by Rurality: Urban	Suburban	Rural	Wilderness
AK	571,951	683,478	1.2	27	4 (5.2%)	3 (67.3%)	0	3 (8.3%)	21 (24.4%)
AL	50,744	4,627,851	91.2	67	22 (11.9%)	28 (71.3%)	11 (15.1%)	18 (10.0%)	10 (3.6%)
AR	52,068	2,834,797	54.4	75	17 (13.2%)	20 (59.5%)	6 (8.2%)	36 (25.7%)	13 (6.6%)
AZ	113,635	6,338,755	55.8	15	2 (2.9%)	6 (89.6%)	4 (6.6%)	5 (3.8%)	0
CA	155,959	36,553,215	234.4	58	0 (0.0%)	37 (97.7%)	5 (1.0%)	12 (1.0%)	4 (0.2%)
CO	103,717	4,861,515	46.9	64	4 (0.7%)	17 (86.2%)	3 (2.6%)	13 (6.5%)	31 (4.8%)
CT	4,845	3,502,309	722.9	8	0 (0.0%)	6 (91.3%)	2 (8.7%)	0	0
DC	61	588,292	9,581.3	1	0 (0.0%)	1 (100.0%)	0	0	0
DE	1,954	864,764	442.7	3	0 (0.0%)	2 (78.7%)	1 (21.3%)	0	0
FL	53,927	18,251,243	338.4	67	4 (1.7%)	38 (93.7%)	11 (4.2%)	10 (1.5%)	8 (0.7%)
GA	57,906	9,544,750	164.8	159	50 (9.5%)	70 (81.3%)	20 (7.9%)	46 (8.3%)	23 (2.5%)
HI	6,423	1,283,388	199.8	5	1 (0.0%)	1 (70.6%)	0	4 (29.4%)	0
IA	55,869	2,988,046	53.5	99	0 (0.0%)	20	6 (6.9%)	53	20 (7.1%)
ID	82,747	1,499,402	18.1	44	0 (0.0%)	12 (65.4%)	6 (12.0%)	12 (16.4%)	14 (6.2%)
IL	55,584	12,852,548	231.2	102	3 (0.6%)	36	14 (4.8%)	44 (7.7%)	8 (0.5%)
IN	35,867	6,345,289	176.9	92	0 (0.0%)	46 (78.1%)	21 (13.1%)	23 (8.4%)	2 (0.5%)
KS	81,815	2,775,997	33.9	105	0 (0.0%)	17 (63.7%)	7 (7.4%)	34 (22.2%)	47 (6.8%)
KY	39,728	4,241,474	106.8	120	43 (18.4%)	35 (57.3%)	10 (8.0%)	45 (23.3%)	30 (11.5%)
LA	43,562	4,293,204	98.6	64	32 (28.9%)	29 (73.6%)	16 (18.6%)	13 (6.3%)	6 (1.6%)
MA	7,840	6,449,755	822.7	14	0 (0.0%)	12 (99.6%)	0	0	2 (0.4%)
MD	9,774	5,618,344	574.8	24	0 (0.0%)	17 (94.7%)	4 (3.9%)	2 (0.9%)	1 (0.5%)
ME	30,862	1,317,207	42.7	16	0 (0.0%)	5 (58.4%)	1 (9.2%)	7 (21.9%)	3 (10.6%)
MI	56,804	10,071,822	177.3	83	0 (0.0%)	26 (81.6%)	8 (5.6%)	27 (8.5%)	22 (4.3%)
MN	79,610	5,197,621	65.3	87	0 (0.0%)	21 (72.9%)	8 (6.5%)	40 (17.9%)	18 (2.7%)
MO	68,886	5,878,415	85.3	115	16 (10.0%)	34 (73.4%)	10 (6.2%)	46 (16.8%)	25 (3.6%)
MS	46,907	2,918,785	62.2	82	51 (42.1%)	17 (43.8%)	7 (10.0%)	42	16 (6.0%)

[1] Persistent poverty defined as 20 percent or more of residents measured as poor in each of the 1970, 1980, 1990 and 2000 censuses

Table A1 cont.: Characteristics of States – Demography

State	Total Land Area (sq mi)	Population (2007 Estimate)	Population Density (pop/sq mi)	Total Number of Counties	Number (%) of Counties in Persistent Poverty[1]	Number (%) of Counties by Rurality: Urban	Suburban	Rural	Wilderness
MT	145,552	957,861	6.6	56	3 (3.4%)	4 (35.2%)	0	13 (44.6%)	39
NC	48,711	9,061,032	186.0	100	10 (5.5%)	40 (70.1%)	25 (19.6%)	18 (7.1%)	17 (3.2%)
ND	68,976	639,715	9.3	53	5 (4.5%)	4 (48.1%)	1 (2.6%)	10 (24.5%)	38
NE	76,872	1,774,571	23.1	93	1 (0.4%)	9 (58.0%)	2 (3.3%)	30 (25.7%)	52 (13.0%)
NH	8,968	1,315,828	146.7	10	0	3 (62.4%)	3 (21.8%)	4 (15.8%)	0
NJ	7,417	8,685,920	1,171.0	21	0	21 (100.0%)	0	0	0
NM	121,356	1,969,915	16.2	33	12 (30.1%)	7 (66.0%)	7 (14.0%)	13 (18.6%)	6 (1.4%)
NV	109,826	2,565,382	23.4	17	0	4 (89.7%)	3 (4.5%)	7 (4.9%)	3 (1.0%)
NY	47,214	19,297,729	408.7	62	0	36	12 (4.5%)	12 (3.3%)	2 (0.1%)
OH	40,948	11,466,917	280.0	88	0	40	28 (14.6%)	17 (4.4%)	3 (0.4%)
OK	68,667	3,617,316	52.7	77	14 (6.4%)	17 (63.7%)	8 (11.9%)	35	17 (4.4%)
OR	95,997	3,747,455	39.0	36	0	11 (77.7%)	9 (11.9%)	9 (9.5%)	7 (0.9%)
PA	44,817	12,432,792	277.4	67	0	32 (84.1%)	19 (11.9%)	11 (3.2%)	5 (0.7%)
RI	1,045	1,057,832	1,012.4	5	0	5 (100.0%)	0	0	0
SC	30,109	4,407,709	146.4	46	12 (8.6%)	21 (76.1%)	13 (14.4%)	11 (9.3%)	1 (0.2%)
SD	75,885	796,214	10.5	66	13 (9.1%)	7 (45.4%)	3 (5.1%)	15 (27.8%)	41 (21.8%)
TN	41,217	6,156,719	149.4	95	9 (3.1%)	38 (73.2%)	15 (11.8%)	31 (12.9%)	11 (2.0%)
TX	261,797	23,904,38	91.3	254	46 (12.1%)	77 (87.5%)	29 (4.3%)	94 (7.0%)	54 (1.1%)
UT	82,144	2,645,330	32.2	29	1 (0.5%)	10 (89.0%)	2 (3.5%)	6 (4.4%)	11 (3.1%)
VA	39,591	7,712,091	194.8	134	2 (0.5%)	80	5 (2.4%)	28 (7.7%)	21 (4.2%)
VT	9,250	621,254	67.2	14	0	3 (33.4%)	2 (15.4%)	7 (42.9%)	2 (8.4%)
WA	66,544	6,468,424	97.2	39	0	17 (87.7%)	8 (7.8%)	8 (3.8%)	6 (0.8%)
WI	54,310	5,601,640	103.1	72	0	25 (72.8%)	12 (13.4%)	22 (10.4%)	13 (3.4%)
WV	24,078	1,812,035	75.3	55	9 (7.4%)	21 (55.4%)	5 (12.4%)	14 (20.5%)	15 (11.7%)
WY	97,100	522,830	5.4	23	0	2 (30.2%)	1 (6.2%)	13 (50.0%)	7 (13.6%)
U. S.	3,537,435	301,621,157	85.3	3141	386	1090	393	963 (7.6%)	695 (2.1%)

Table A2: Characteristics of States – Mortality Rates

State	Rates for All Injury Causes	Rates for Cerebrovascular Disease	Rates for Heart Disease	Rates for All Causes
Alabama	77.41	55.42	233.10	930.23
Alaska	88.94	42.89	145.39	742.02
Arizona	69.18	30.06	145.65	653.70
Arkansas	77.97	51.97	226.22	899.64
California	46.89	39.72	170.19	660.30
Colorado	68.34	36.91	140.96	708.99
Connecticut	49.61	33.06	170.89	691.36
Delaware	60.87	36.75	179.45	780.75
District of Columbia	62.92	36.01	229.17	850.01
Florida	67.27	31.96	156.95	679.13
Georgia	59.73	47.16	190.53	831.87
Hawaii	44.83	38.40	140.99	590.63
Idaho	64.13	40.42	153.04	723.04
Illinois	49.39	42.58	191.88	770.94
Indiana	61.39	45.21	198.45	835.27
Iowa	54.90	42.79	182.22	744.18
Kansas	57.01	47.64	172.36	784.86
Kentucky	76.67	45.90	217.84	902.36
Louisiana	80.46	46.65	230.42	922.13
Maine	59.96	40.62	165.27	764.81
Maryland	55.58	41.43	195.52	771.72
Massachusetts	39.80	35.05	163.81	705.94
Michigan	56.44	43.35	220.27	811.94
Minnesota	51.52	37.68	126.56	675.40
Mississippi	85.47	51.90	260.19	950.09
Missouri	70.78	47.71	214.43	847.15
Montana	86.38	39.80	169.80	786.93

Table A2 cont.: Characteristics of States – Mortality Rates

State	Rates for All Injury Causes	Rates for Cerebrovascular Disease	Rates for Heart Disease	Rates for All Causes
Nebraska	52.53	40.13	159.49	741.42
Nevada	72.29	39.19	195.73	808.63
New Hampshire	50.62	33.63	164.84	712.47
New Jersey	38.69	32.97	190.61	717.20
New Mexico	100.86	35.62	151.86	758.64
New York	37.32	27.41	218.91	675.96
North Carolina	66.80	50.19	184.89	825.64
North Dakota	63.22	36.62	158.76	713.17
Ohio	60.48	45.07	206.34	844.10
Oklahoma	80.73	51.49	242.21	931.03
Oregon	60.96	43.79	149.55	748.59
Pennsylvania	60.79	41.53	199.95	796.53
Rhode Island	54.10	34.40	195.20	749.41
South Carolina	71.18	50.00	186.00	839.53
South Dakota	62.63	37.55	160.82	708.76
Tennessee	76.37	51.02	220.11	888.82
Texas	57.56	46.72	183.29	776.05
Utah	63.13	36.77	138.04	659.08
Vermont	62.70	38.27	165.93	721.92
Virginia	53.76	43.30	176.56	762.74
Washington	58.68	41.45	161.01	723.66
West Virginia	86.95	47.21	228.13	958.49
Wisconsin	57.65	39.97	171.79	729.94
Wyoming	92.32	43.29	169.39	773.36

Table B2: Participation Rates by Rurality and Geographic Region

	Participation Rates				
	Number of Systems	Number of Systems Participating In Study	Percent of Systems Participating	Percent of Land Covered by Participating Systems	Percent of Population Covered by Participating Systems
ALL REGIONS	1268	800	63.1	44.0	63.6
RURALITY [1]					
Urban	581	355	61.1	48.7	64.1
Suburban	150	98	65.3	39.1	47.9
Rural	298	193	64.8	31.6	39.3
Wilderness	239	154	64.4	38.0	42.6
GEOGRAPHIC					
Northeast	182	106	58.2	72.9	76.6
Midwest	531	336	63.3	42.8	52.2
South west	409	263	64.3	42.5	54.1
West	146	95	65.1	32.7	66.0

[1] Rurality defined using Urban Influence Codes (UIC); systems that span two or more UIC (N=140) were categorized according to most urban UIC code in system.

Table B3: Percent Distribution of Number of EMS Providers, Annual Number of 911 Calls and Annual Number of EMS Responses, by Rurality[1]

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems	Urban N=355	Suburban N=98	Rural N=193	Wilderness N=154
Number of EMS Care Providers, incl. volunteers, at all levels	Percent Dist'n (n=753)	Percent Dist'n (n=337)	Percent Dist'n (n=97)	Percent Dist'n (n=179)	Percent Dist'n (n=137)
<50	32.	14.6	29.2	36.4	74.2
50 – 99	14.	8.0	15.7	27.8	12.9
100 – 499	30.	34.4	47.2	31.2	12.9
500 +	23.	43.1	7.9	4.6	0.0
Annual Number of 911 Calls for EMS	Percent Dist'n (n=724)	Percent Dist'n (n=320)	Percent Dist'n (n=93)	Percent Dist'n (n=177)	Percent Dist'n (n=148)
<1000	25.	7.8	10.6	29.2	70.9
1000 – 4999	29.	17.0	38.8	54.4	25.0
5000 – 9999	12.	13.6	25.9	12.3	2.0
10,000 +	32.	61.6	24.7	4.1	2.1
Annual Number of EMS Responses	Percent Dist'n (n=720)	Percent Dist'n (n=309)	Percent Dist'n (n=88)	Percent Dist'n (n=178)	Percent Dist'n (n=145)
<1000	24.	6.8	9.1	26.4	68.9
1000 – 4999	31.	15.9	37.5	57.3	26.9
5000 – 9999	12.	12.9	26.1	12.9	2.8
10,000 +	32.	64.4	27.3	3.4	1.4

[1] Rurality defined using Urban Influence Codes (UIC); systems that span two or more UIC (N=140) were categorized according to most urban UIC code in system.

Table B4: Percent Distribution of Number of EMS Providers, Annual Number of 911 Calls and Annual Number of EMS Responses, by Geographic Region

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=80	Northeast N=106	Midwest N=336	West N=263	South N=95
Number of EMS Care Providers, incl. volunteers, at all levels	Percent Dist'n (n=753)	Percent Dist'n (n=101)	Percent Dist'n (n=317)	Percent Dist'n (n=260)	Percent Dist'n (n=73)
<50	32.1	5.0	46.7	25.0	27.0
50 – 99	14.5	5.0	17.7	16.3	13.3
100 – 499	30.2	37.6	23.3	28.3	36.9
500 +	23.2	52.5	12.3	30.4	22.8
Annual Number of 911 Calls for EMS	Percent Dist'n (n=724)	Percent Dist'n (n=89)	Percent Dist'n (n=306)	Percent Dist'n (n=252)	Percent Dist'n (n=70)
<1000	25.8	2.3	36.0	26.2	8.0
1000 – 4999	29.3	19.1	31.0	25.0	32.4
5000 – 9999	12.0	16.9	9.6	8.3	14.7
10,000 +	32.9	61.8	13.4	40.5	45.0
Annual Number of EMS Responses	Percent Dist'n (n=720)	Percent Dist'n (n=89)	Percent Dist'n (n=305)	Percent Dist'n (n=238)	Percent Dist'n (n=88)
<1000	24.4	2.2	43.6	8.0	25.0
1000 – 4999	31.0	22.5	35.7	30.7	23.9
5000 – 9999	12.5	16.9	8.9	16.8	9.1
10,000 +	32.1	58.4	11.8	44.5	42.0

Table C1: Primary Mission[1] of First Response and Transport Agencies, by Rurality

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=800		Urban N=355		Suburban N=98		Rural N=193		Wilderness N=154	
Primary Mission Any Checked	Percent Dist'n of First Response[2] (n=731)	Percent Dist'n of Transport (n=782)	Percent Dist'n of First Response (n=342)	Percent Dist'n of Transport (n=345)	Percent Dist'n of First Response (n=92)	Percent Dist'n of Transport (n=96)	Percent Dist'n of First Respon se (	Percent Dist'n of Transport (n=190)	Percent Dist'n of First Response (n=124)	Percent Dist'n of Transport (n=151)
Fire Only	31.5	12.0	43.6	20.0	31.5	12.5	19.1	5.3	15.3	2.0
EMS Only	24.8	59.7	12.0	48.7	34.8	64.6	33.0	65.3	41.1	74.8
Hospital	1.5	5.2	0.6	2.3	2.2	3.1	3.	11.6	0.8	5.3
Fire and EMS	8.8	9.2	9.9	12.8	6.5	9.4	12.1	7.9	2.4	2.6
Fire and Other	29.9	9.9	30.7	12.2	21.7	5.2	28.3	6.8	36.3	11.3
All Other	3.5	4.0	3.2	4.1	3.3	5.2	4.	3.2	4.0	4.0

[1] Primary mission assigned if respondent indicated a single agency type handles majority of call volume or if all the agency types recorded fell only within a particular group.

[2] Twenty-seven of the 800 responding systems do not use first responders; of the 773 systems that do, data on primary mission of first response agencies was missing for 42 systems (5.4% of all systems with first response).

Table C2: Primary Administration or Ownership[1] of First Response and Transport Agencies, by Rurality

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=80		Urban N=355		Suburban N=98		Rural N=193		Wilderness N=154	
Agency Type	Percent Dist'n of First Response[2] (n=731)	Percent Dist'n of Transport (n=782)	Percent Dist'n of First Response (n=342)	Percent Dist'n of Transport (n=345)	Percent Dist'n of First Response (n=92)	Percent Dist'n of Transport (n=96)	Percent Dist'n of First Response (n=173)	Percent Dist'n of Transport (n=190)	Percent Dist'n of First Response (n=124)	Percent Dist'n of Transport (n=151)
State/Local Gov't	68.7	62.0	67.2	56.2	66.3	67.7	69.9	65.3	72.6	67.6
For Profit (FP)	2.7	8.1	2.0	9.9	7.6	7.3	2.9	8.9	0.8	3.3
Not for Profit (NFP)	5.6	10.7	4.1	9.6	7.6	10.4	5.8	10.0	8.1	14.6
Gov't & NFP	7.1	6.1	6.1	6.1	7.6	4.2	7.5	5.8	8.9	7.9
Gov't & FP	6.6	4.5	7.3	5.5	4.4	3.1	8.7	4.7	3.2	2.6
All Other	9.3	8.6	13.2	12.7	6.5	7.3	5.2	5.3	6.4	4.0

[1] Primary administration or ownership assigned if respondent indicated a single agency type handles majority of call volume or if all the agency types recorded fell only within a particular group.

[2] Twenty-seven of the 800 responding systems do not use first responders; of the 773 systems that do, data on primary mission of first response agencies was missing for 42 systems (5.4% of all systems with first response).

Table C3: Emergency Medical Call Taking: Organizational Type of Agency, by Rurality

(N=number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=800		Urban N=355		Suburban N=98		Rural N=193		Wilderness N=154	
Agency Type	Percent Present within the System	Percent Dist'n of Primary Type[2] (n=752)	Percent Present within the System	Percent Dist'n of Primary Type (n=328)	Percent Present within the System	Percent Dist'n of Primary Type (n=93)	Percent Present within the System	Percent Dist'n of Primary Type (n=183)	Percent Present within the System	Percent Dist'n of Primary Type (n=148)
Public Safety/Joint Police-Fire-EMS	46.6	34.2	59.9	43.0	42.4	32.3	43.1	34.4	21.8	15.5
Fire	30.4	6.4	38.2	11.2	23.5	2.2	26.9	3.8	20.3	1.4
Law Enforcement	46.2	28.2	48.0	21.0	48.2	37.6	40.1	30.0	48.1	35.8
Local EMS Service	43.0	23.0	38.9	14.9	40.0	19.4	45.5	24.6	51.9	41.2
Other	10.1	8.2	13.5	9.9	12.1	8.5	7.8	7.2	4.5	6.1

[1] Systems can have multiple types (>1) of agencies within the same system allowing column values to add to more than 100%.

[2] Primary Type was self-reported and denotes the agency that handles the majority (50% or more) of the call volume for the system.

Table C4: Emergency Medical Dispatching: Organizational Type of Agency, by Rurality

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=80		Urban N=355		Suburban N=98		Rural N=193		Wilderness N=154	
Agency Type	Percent Present within the System	Percent Dist'n of Primary Type[1] (n=741)	Percent Present within the System	Percent Dist'n of Primary Type (n=333)	Percent Present within the System	Percent Dist'n of Primary Type (n=91)	Percent Present within the System	Percent Dist'n of Primary Type (n=176)	Percent Present within the System	Percent Dist'n of Primary Type (n=141)
Public Safety/Joint Police-Fire-EMS	49.8	39.8	58.6	45.6	41.1	37.4	51.7	43.2	30.6	23.4
Fire	21.4	5.0	32.2	9.9	12.3	1.1	11.6	1.1	11.6	0.7
Law Enforcement	49.3	37.2	41.4	22.8	54.8	50.6	51.7	42.6	62.8	56.0
Local EMS Service	3.1	1.2	3.9	2.1	1.4	0.0	2.0	0.0	3.3	1.4
Other	19.4	16.8	22.7	19.6	13.1	10.9	15.6	13.1	19.0	18.5

[1] Primary Type was self-reported and denotes the agency that handles the majority (50% or more) of the call volume for the system.

Table C5: Most Common Level of First Response and Transport,[1] by Rurality

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=80		Urban N=355		Suburban N=98		Rural N=193		Wilderness N=154	
Level of Care	Percent Dist'n of First Response[2] (n=735)	Percent Dist'n of Transport (n=786)	Percent Dist'n of First Response (n=335)	Percent Dist'n of Transport (n=348)	Percent Dist'n of First Response (n=88)	Percent Dist'n of Transport (n=97)	Percent Dist'n of First Response (n=172)	Percent Dist'n of Transport (n=191)	Percent Dist'n of First Response (n=140)	Percent Dist'n of Transport (n=150)
ALS	36.2	63.4	40.9	72.7	30.7	64.9	37.8	63.9	26.4	40.0
ILS	8.8	12.1	4.5	7.5	9.1	15.5	12.2	13.6	15.0	18.7
BLS	55.0	24.5	54.6	19.8	60.2	19.6	50.0	22.5	58.6	41.3

[1] Level of response represents the maximum capacity of the responding unit/vehicle to call and not the level of care rendered; most common level is self-reported.

[2] Twenty-seven of the 800 responding systems do not use first responders; of the 773 systems that do, data on level of first response was missing for 38 systems (4.9% of all systems with first response).

Table C6: First Responder Policies and Practices, by Rurality (for areas of systems that use first responders)

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=80	Urban N=355	Suburban N=98	Rural N=193	Wilderness N=154
	Percent with Policy/Practice (n=643)[1]	Percent with Policy/Practice	Percent with Policy/Practice	Percent with Policy/Practice	Percent with Policy/Practice
Policy Used to Send First Responders					
First Responders Sent to all 911 Calls	54.9	48.4	53.0	66.7	58.2
First Responders Sent only to calls based on priority dispatch or other call taking	35.5	45.1	38.6	21.8	24.5
Other	9.6	6.5	8.4	11.5	17.3
Most Common Practice (based on percentage of total calls)	Percent with Policy/Practice (n=643)[1]	Percent with Policy/Practice	Percent with Policy/Practice	Percent with Policy/Practice	Percent with Policy/Practice
First Response followed by transport ambulance as	3.1	2.3	2.4	3.9	5.1
Simultaneous First Response and transport ambulance	85.8	86.1	85.7	86.3	83.7
It varies, based on protocol	8.2	9.7	5.9	6.5	8.2
Other	2.9	1.9	6.0	3.3	3.0

[1] Twenty-seven of the 800 responding systems do not use first responders; of the 773 systems that do, data on policies and practices were missing for 130 systems.

Table C7: Operating Procedures Regarding Dispatch and Transport by Rurality

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=800	Urban N=355	Suburban N=98	Rural N=193	Wilderness N=154
Percent of systems that . . .					
Allow vehicles to respond to calls *without* use of lights and sirens	78.9 (n=782)	79.8 (n=347)	79.4 (n=97)	79.5 (n=190)	75.7 (n=148)
Allow vehicles to transport non-emergent patients *without* use of lights and sirens	93.4 (n=788)	94.3 (n=350)	93.9 (n=98)	92.6 (n=191)	92.0 (n=151)
Allow providers to transport patients from the scene to non-hospital destinations	28.1 (n=789)	22.4 (n=349)	27.6 (n=98)	32.5 (n=191)	36.4 (n=151)
Have units that can be dispatched to perform non-emergency assessments	37.4 (n=788)	36.9 (n=352)	42.3 (n=97)	38.9 (n=190)	33.6 (n=149)
How many dispatch agencies offer pre-arrival instructions to callers for certain types of calls?	(n= 783)	(n=349)	(n=98)	(n=185)	(n=151)
All	51.3	61.3	59.2	43.2	33.1
Some	29.0	30.4	23.5	24.9	34.4
None	19.7	8.3	17.3	31.9	32.5

Table C8: Frequency of Out of Area Response to Calls by Rurality

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=80	Urban N=355	Suburban N=98	Rural N=193	Wilderness N=154
How often do your *first response agencies* respond to calls beyond the boundaries of their primary service areas	(n=677)	(n=322)	(n=85)	(n=158)	(n=112)
Never	15.8	15.5	14.1	15.2	18.7
Seldom	44.2	42.9	40.0	41.8	54.5
Sometimes	33.2	33.5	32.9	39.2	24.1
Often	6.8	8.1	12.9	3.8	2.7
How often do your *transport agencies* respond to calls beyond the boundaries of their primary service areas	(n=770)	(n=344)	(n=98)	(n=185)	(n=143)
Never	2.9	2.3	1.0	1.6	7.0
Seldom	30.4	24.4	35.7	30.8	40.5
Sometimes	49.4	50.9	42.9	53.5	44.8
Often	17.4	22.4	20.4	14.1	7.7
How often do units from other EMS systems respond to calls within your own jurisdiction?	(n=792)	(n=352)	(n=98)	(n=191)	(n=151)
Never	6.8	5.1	7.1	6.3	11.3
Seldom	59.5	57.4	61.2	60.7	61.6
Sometimes	28.7	30.7	25.5	29.8	24.5
Often	5.0	6.8	6.1	3.1	2.6

Table C9: EMS Provider Type by Rurality

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=800		Urban N=355		Suburban N=98		Rural N=193		Wilderness N=154	
Type of Provider	Percent Present within the System	Percent Dist'n of Primary Type [1] (n=747)	Percent Present within the System	Percent Dist'n of Primary Type (n=332)	Percent Present within the System	Percent Dist'n of Primary Type (n=92)	Percent Present within the System	Percent Dist'n of Primary Type (n=181)	Percent Present within the System	Percent Dist'n of Primary Type (n=142)
Volunteer										
Compensated	56.5	22.2	51.5	8.7	54.7	16.3	60.8	30.4	64.1	47.2
Non-compensated	61.1	19.3	69.2	19.0	64.2	21.7	62.4	19.9	38.0	17.6
Career										
Part time	61.2	4.7	69.2	3.6	64.2	3.3	61.8	6.6	39.4	5.6
Full time	84.5	53.8	94.4	68.7	91.6	58.7	80.1	43.1	62.0	29.6
Average % of providers who serve as volunteers (compensated or not)	47.4 (N=768)		36.5 (N=338)		46.7 (N=94)		55.3 (N=186)		62.5 (N=150)	
Average % of total calls that are handled by volunteers (compensated or not)	38.0 (N=749)		25.8 (N=329)		35.6 (N=94)		43.8 (N=183)		60.3 (N=143)	
Average % of Volunteers who typically respond to calls from Fire or EMS station houses	14.4 (N=751)		23.0 (N=335)		7.8 (N=90)		9.9 (N=182)		4.2 (N=144)	

[1]Primary Type is self-reported and denotes the provider type that represent the majority (50% or more) of EMS personnel in the system.

Table C10: 911 System Access by Rurality

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=80		Urban N=355		Suburban N=98		Rural N=193		Wilderness N=154	
Type of Provider	Percent Present within the System	Percent Dist'n of Highest Level (n=779)	Percent Present within the System	Percent Dist'n of Highest Level (n=347)	Percent Present within the System	Percent Dist'n of Highest Level (n=98)	Percent Present within the System	Percent Dist'n of Highest Level (n=185)	Percent Present within the System	Percent Dist'n of Highest Level (n=149)
Wireless E 911	65.2	65.2	72.3	72.3	75.5	75.5	57.3	57.3	51.7	51.7
Wireless E 911	39.0	13.7	50.1	16.1	24.5	5.1	32.4	12.4	30.9	15.4
E 911	92.7	16.8	95.1	9.5	98.0	17.4	92.4	25.4	83.9	22.8
Basic 911	30.7	4.1	34.0	1.7	29.6	2.0	24.3	4.9	31.5	10.1
7 or 10 Digit Number	29.5	0.1	35.2	0.3	24.5	0.0	24.9	0.0	25.5	0.0

Table C11: Timely Response to Incoming Calls by Rurality

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems		Urba n		Suburban N=98		Rural N=193		Wilderness N=154	
Percent indicating timely response to incoming calls a consistent problem	55.8 (n=786)		55.3 (n=349)		61.2 (n=98)		59.9 (n=187)		48.7 (n=152)	
Of those with consistent problems, response difficulties due to:	Percent Any Listed	Percent Dist'n of Primary Difficulty[1] (n=786)	Percent Any Listed	Percent Dist'n of Primary Difficulty (n=349)	Percent Any Listed	Percent Dist'n of Primary Difficulty (n=98)	Percent Any Listed	Percent Dist'n of Primary Difficulty (n=187)	Percent Any Listed	Percent Dist'n of Primary Difficulty (n=152)
Daytime Staffing	52.9	26.2	53.8	27.2	57.9	29.1	53.8	31.6	45.1	12.5
Night time staffing	29.6	5.3	33.7	5.0	24.6	5.4	24.0	3.1	31.0	9.4
Remote or distant geographic areas	79.1	56.4	78.3	52.8	80.7	54.6	74.0	56.1	87.3	68.8
Exceptionally high demand	17.1	2.5	26.6	4.4	14.0	3.6	7.7	0.0	8.4	0.0
Provider retention	38.0	4.0	44.6	3.9	35.1	1.8	37.5	5.1	23.9	4.7
Provider recruitment	40.4	3.3	42.9	3.3	43.9	3.6	40.4	3.1	31.0	3.1
Other	5.3	2.3	5.4	3.3	3.5	1.8	3.8	1.0	8.4	1.6

[1] Primary difficulty is self-reported and is the one difficulty identified as the primary difficulty selected from list.

Table C12: Medical Direction by Rurality

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=80	Urban N=355	Suburban N=98	Rural N=193	Wilderness N=154
	Percent with Characteristic (n=786)	Percent with Characteristic (n=350)	Percent with Characteristic (n=98)	Percent with Characteristic (n=186)	Percent with Characteristic (n=152)
System had no physician medical direction in place	4.1	4.0	2.0	3.8	5.9
System has medical direction but with no one person with primary responsibility	25.6	22.8	18.4	33.3	27.0
Of systems with one person with primary responsibility, this person is					
Responsible to system agency	44.9	46.4	48.0	40.0	44.1
Responsible to county or EMS regional program	34.8	35.7	32.5	36.5	32.4
Responsible to State lead EMS agency	10.3	7.9	9.1	13.0	13.7
Other	10.0	10.0	10.4	10.5	9.8

Table C13: System Financing by Rurality

(N= number of systems participating in overall study; n=number of systems responding to a specific survey item)

	All Systems N=800		Urban N=355		Suburban N=98		Rural N=193		Wilderness N=154	
Funding Sources	Percent Present within the System	Percent Dist'n of Primary Type (n=686)[1]	Percent Present within the System	Percent Dist'n of Primary Type (n=308)	Percent Present within the System	Percent Dist'n of Primary Type (n=85)	Percent Present within the System	Percent Dist'n of Primary Type (n=157)	Percent Present within the System	Percent Dist'n of Primary Type (n=136)
Tax Subsidies										
State	18.5	1.6	23.4	2.6	18.4	0.0	15.4	0.6	11.5	1.5
County	59.8	24.9	55.9	23.0	65.3	27.1	56.6	19.8	68.9	33.8
Local	47.4	14.6	60.1	20.1	44.9	16.5	39.6	11.5	29.7	4.4
Fees for Services	90.9	53.4	91.7	48.0	90.8	50.6	91.2	61.8	88.5	57.4
Homeland Security Grants	33.7	0.1	38.2	0.0	26.5	0.0	30.2	0.0	32.4	0.0
Other Grants	47.3	0.9	48.8	0.6	39.8	0.0	52.2	1.9	42.6	0.7
Donations/fundraiser	50.4	2.6	47.3	1.9	51.0	4.7	52.8	3.2	54.0	2.2
Other	47.1	1.9	48.2	3.8	40.8	1.1	50.6	1.2	44.6	0.0

[1] Primary source is self-reported and identified as primary source of funding selected from list.

Table D1: Primary Mission[1] of First Response and Transport Agencies by Geographic Region

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=80		Northeast N=106		Midwest N=336		South N=263		West N=95	
Primary Mission	Percent Dist'n of First Response (n=731)[2]	Percent Dist'n of Transport (n=782)	Percent Dist'n of First Response (n=105)	Percent Dist'n of Transport (n=106)	Percent Dist'n of First Response (n=294)	Percent Dist'n of Transport (n=328)	Percent Dist'n of First Response (n=245)	Percent Dist'n of Transport (n=256)	Percent Dist'n of First Response (n=87)	Percent Dist'n of Transport (n=92)
Fire	31.5	12.0	34.3	17.0	21.1	7.6	37.9	13.3	44.8	18.4
EMS Only	24.8	59.7	18.1	46.2	29.9	60.3	23.3	65.6	19.5	56.5
Hospital	1.5	5.2	3.8	0.9	1.0	8.8	1.2	3.1	1.2	3.3
Fire and EMS	8.8	9.2	12.4	20.8	7.8	9.2	8.2	3.9	9.2	10.9
Fire and Other	29.9	9.9	27.6	13.2	35.4	9.2	26.5	9.4	24.1	9.8
All Other	3.5	4.0	3.8	1.9	4.8	4.9	2.9	4.7	1.2	1.1

[1] Primary mission assigned if respondent indicated a single agency type handles majority of call volume or if all the agency types recorded fell only within a particular group.

[2] Twenty-seven of the 800 responding systems do not use first responders; of the 773 systems that do, data on primary mission of first response agencies was missing for 42 systems (5.4% of all systems with first response).

Table D2: Primary Administration or Ownership[1] of First Response and Transport Agencies by Geographic Region

(N = number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=80		Northeast N=106		Midwest N=336		South N=263		West N=95	
Agency Type	Percent Dist'n of First Response (n=731)[2]	Percent Dist'n of Transport (n=782)	Percent Dist'n of First Response (n=105)	Percent Dist'n of Transport (n=106)	Percent Dist'n of First Response (n=294)	Percent Dist'n of Transport (n=328)	Percent Dist'n of First Response (n=245)	Percent Dist'n of Transport (n=256)	Percent Dist'n of First Response (n=87)	Percent Dist'n of Transport (n=92)
State/Local Gov't	68.7	62.0	49.5	41.5	71.1	64.3	73.9	71.8	69.0	50.0
For Profit (FP)	2.7	8.1	6.7	12.3	1.7	5.2	3.3	5.9	0.0	19.6
Not for Profit (NFP)	5.6	10.7	10.5	15.1	4.4	12.8	6.1	9.4	2.3	2.2
Gov't & NFP	7.1	6.1	12.4	9.4	8.5	7.9	4.9	3.9	2.3	2.2
Gov't & FP	6.6	4.5	5.7	4.7	7.5	3.1	5.7	4.7	6.9	8.7
All Other	9.3	8.6	15.2	17.0	6.8	6.7	6.1	4.3	19.5	17.4

[1] Primary administration or ownership assigned if respondent indicated a single agency type handles majority of call volume or if all the agency types recorded fell only within a particular group.

[2] Twenty-seven of the 800 responding systems do not use first responders; of the 773 systems that do, data on primary mission of first response agencies was missing for 42 systems (5.4% of all systems with first response).

Table D3: Emergency Medical Call Taking: Organizational Type of Agency by Geographic Region

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=800		Northeast N=106		Midwest N=336		South N=263		West N=95	
Agency Type	Percent Present within the System	Percent Dist'n of Primary Type (n=752)[1]	Percent Present within the System	Percent Dist'n of Primary Type (n=104)	Percent Present within the System	Percent Dist'n of Primary Type (n=314)	Percent Present within the System	Percent Dist'n of Primary Type (n=247)	Percent Present within the System	Percent Dist'n of Primary Type (n=87)
Public Safety/Joint Police-Fire-EMS	46.6	34.2	59.6	51.0	41.8	29.6	46.3	34.0	48.8	31.0
Fire	30.4	6.4	42.4	14.4	21.4	3.2	32.8	6.1	41.5	9.2
Law Enforcement	46.2	28.2	41.4	16.4	44.9	30.2	45.0	29.2	59.8	32.2
Local EMS Service	43.0	23.0	43.4	10.6	46.6	29.9	38.9	19.4	41.5	23.0
Other	10.1	8.2	18.2	7.6	7.8	7.1	9.6	11.3	11.0	4.6

[1] Primary Type was self-reported and denotes the agency that handles the majority (50% or more) of the call volume for the system.

Table D4: Emergency Medical Dispatching: Organizational Type of Agency by Geographic Region

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=80		Northeast N=106		Midwest N=336		South N=263		West N=95	
Agency Type	Percent Present within the System	Percent Dist'n Primary Type (n=741)[1]	Percent Present within the System	Percent Dist'n Primary Type (n=102)	Percent Present within the System	Percent Dist'n Primary Type (n=308)	Percent Present within the System	Percent Dist'n Primary Type (n=240)	Percent Present within the System	Percent Dist'n Primary Type (n=91)
Public Safety/Joint Police-Fire-EMS	49.8	39.8	67.4	55.9	42.6	33.4	53.2	42.9	44.0	35.2
Fire	21.4	5.0	33.7	10.8	14.0	1.9	23.9	6.2	25.0	5.5
Law Enforcement	49.3	37.2	33.7	18.6	56.2	46.1	41.8	30.4	63.1	46.2
Local EMS Service	3.1	1.2	3.2	2.0	3.0	1.0	4.5	1.7	0.0	0.0
Other	19.4	16.8	22.1	12.7	20.8	17.6	17.4	18.8	16.7	13.1

[1] Primary Type was self-reported and denotes the agency that handles the majority (50% or more) of the call volume for the system.

Table D5: Most Common Level of First Response and Transport[1] by Geographic Region

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=80		Northeast N=106		Midwest N=336		South N=263		West N=95	
Level of Care	Percent Dist'n of First Response (n=735)[2]	Percent Dist'n of Transport (n=786)	Percent Dist'n of First Response (n=102)	Percent Dist'n of Transport (n=104)	Percent Dist'n of First Response (n=304)	Percent Dist'n of Transport (n=331)	Percent Dist'n of First Response (n=240)	Percent Dist'n of Transport (n=259)	Percent Dist'n of First Response (n=89)	Percent Dist'n of Transport (n= 92)
ALS	36.2	63.4	18.6	51.9	30.9	57.4	47.9	78.8	42.7	54.4
ILS	8.8	12.1	11.8	11.5	8.9	10.6	3.3	6.6	20.2	33.7
BLS	55.0	24.5	69.6	36.6	60.2	32.0	48.8	14.6	37.1	11.9

[1] Level of response represents the maximum capacity of the responding unit/vehicle to call and not the level of care rendered; most common level is self-reported.

[2] Twenty-seven of the 800 responding systems do not use first responders; of the 773 systems that do, data on level of first response was missing for 38 systems (4.9% of all systems with first response).

Table D6: First Responder Policies and Practices by Geographic Region

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=800	Northeast N=106	Midwest N=336	South N=263	West N=95
Policy used to Send First Responders	Percent with Policy/Practice (n=643)[1]	Percent with Policy/Practice (n=94)	Percent with Policy/Practice (n=253)	Percent with Policy/Practice (n=223)	Percent with Policy/Practice (n=73)
First Responders Sent to all 911 Calls	54.9	55.3	67.6	35.0	71.2
First Responders Sent only to calls based on priority dispatch or other call taking	35.5	35.1	21.7	56.0	20.6
Other	9.6	9.6	10.7	9.0	8.2
Most Common Practice (based on percentage of total calls)	Percent with Policy/Practice (n=643)[1]	Percent with Policy/Practice (n=94)	Percent with Policy/Practice (n=253)	Percent with Policy/Practice (n=223)	Percent with Policy/Practice (n=73)
First Response followed by transport ambulance as necessary	3.1	5.3	3.5	2.2	1.4
Simultaneous First Response and transport ambulance	85.8	88.4	88.2	80.3	90.5
It varies, based on protocol	8.2	4.2	5.9	13.0	6.8
Other	2.9	2.1	2.4	4.5	1.3

[1] Twenty-seven of the 800 responding systems do not use first responders; of the 773 systems that do, data on policies and practices were missing for 130 systems (16.8% of all systems with first response).

Table D7: Operating Procedures Regarding Dispatch and Transport by Geographic Region
(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

Percent of systems that . . .	All Systems N=800	Northeast N=106	Midwest N=336	South N=263	West N=95
Allow vehicles to respond to calls *without* use of lights and sirens	78.9 (n=782)	80.8 (n=104)	79.6 (n=328)	75.2 (n=258)	84.8 (n=92)
Allow vehicles to transport non-emergent patients *without* use of lights and sirens	93.4 (n=788)	94.3 (=105)	92.4 (n=331)	93.4 (n=258)	95.7 (n=94)
Allow providers to transport patients from the scene to non-hospital destinations	28.1 (n=789)	17.1 (=105)	29.4 (n=330)	29.6 (n=260)	31.9 (n=94)
Have units that can be dispatched to perform non-emergency assessments	37.4 (n=788)	23.8 (n=105)	33.4 (n=332)	45.6 (n=259)	44.6 (n=92)
How many dispatch agencies offer pre-arrival instructions to callers for certain types of calls?	(n= 783)	(n=105)	(n=326)	(n=258)	(n=94)
All	51.3	72.4	43.2	51.9	54.3
Some	29.0	25.7	34.7	22.9	29.8
None	19.7	1.9	22.1	25.2	15.9

Table D8: Frequency of Out of Area Response to Calls by Geographic Region

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=80	Northeast N=106	Midwest N=336	South N=263	West N=95
How often do your *first response agencies* respond to calls beyond the boundaries of their primary service areas	(n=677)	(n=95)	(n=273)	(n=231)	(n=78)
Never	15.8	26.3	17.2	12.5	7.7
Seldom	44.2	37.9	46.2	44.2	44.9
Sometimes	33.2	26.3	32.2	35.1	39.7
Often	6.8	9.5	4.4	8.2	7.7
How often do your *transport agencies* respond to calls beyond the boundaries of their primary service areas	(n=770)	(n=104)	(n=322)	(n=256)	(n=88)
Never	2.9	0.0	3.7	3.5	1.1
Seldom	30.4	15.4	35.4	31.2	27.3
Sometimes	49.4	46.1	49.7	49.6	51.1
Often	17.4	38.5	11.2	15.6	20.5
How often do units from other EMS systems respond to calls within your own jurisdiction?	(n=792)	(n=105)	(n=333)	(n=260)	(n=94)
Never	6.8	0.9	6.3	10.0	6.4
Seldom	59.5	46.7	67.3	53.4	62.8
Sometimes	28.7	45.7	22.2	30.8	26.6
Often	5.0	6.7	4.2	5.8	4.3

Table D9: Percent Distribution of EMS Provider Type by Geographic Region

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=800		Northeast N=106		Midwest N=336		South N=263		West N=95	
Type of Provider	Percent Present within the System	Percent Dist'n of Primary Type [1] (n=747)	Percent Present within the System	Percent Dist'n of Primary Type (n=97)	Percent Present within the System	Percent Dist'n of Primary Type (n=318)	Percent Present within the System	Percent Dist'n of Primary Type (n=245)	Percent Present within the System	Percent Dist'n of Primary Type (n=87)
Volunteer										
Compensated	56.5	22.2	50.0	5.2	73.5	39.0	32.7	4.5	72.1	29.9
Non-compensated	61.1	19.3	85.6	43.3	49.2	20.1	68.5	11.8	53.5	10.3
Career										
Part time	61.2	4.7	85.6	7.2	49.5	5.4	66.9	3.7	58.1	2.3
Full time	84.5	53.8	96.2	44.3	71.6	35.5	96.8	80.0	81.4	57.5
Average % of providers who serve as volunteers (compensated or not)	47.4 (n=768)		54.8 (n=101)		59.5 (n=322)		31.1 (n=252)		41.3 (n=93)	
Average % of total calls that are handled by volunteers (compensated or not)	38.0 (n=749)		40.9 (n=98)		50.0 (n=319)		21.4 (n=244)		37.2 (n=88)	
Average % of volunteers who typically respond to calls from Fire or EMS station houses	14.4 (n=751)		14.4 (n=104)		7.9 (n=315)		24.6 (n=240)		9.8 (n=92)	

[1] Primary type is self-reported and denotes the provider type that represents the majority (50% or more) of EMS personnel in the system.

Table D10: 911 System Access by Geographic Region

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=800		Northeast N=106		Midwest N=336		South N=263		West N=95	
Type of Provider	Percent Present within the System	Percent Dist'n of Highest Level (n=779)	Percent Present within the System	Percent Dist'n of Highest Level (n=105)	Percent Present within the System	Percent Dist'n of Highest Level (n=324)	Percent Present within the System	Percent Dist'n of Highest Level (n=256)	Percent Present within the System	Percent Dist'n of Highest Level (n=94)
Wireless E 911	65.2	65.2	69.5	69.5	64.8	64.8	66.8	66.8	57.4	57.4
Wireless E 911	39.0	13.7	44.8	16.2	36.7	11.1	34.8	12.1	52.1	24.5
E 911	92.7	16.8	96.2	14.3	92.3	18.8	93.4	16.8	88.3	12.8
Basic 911	30.7	4.1	31.4	0.0	29.6	5.2	28.5	4.3	39.4	4.3
7 or 10 Digit Number	29.5	0.1	35.2	0.0	27.2	0.0	29.3	0.0	31.9	1.0

Table D11: Timely Response to Incoming Calls by Geographic Region

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=800		Northeast N=106		Midwest N=336		South N=263		West N=95	
Percent indicating timely response to incoming calls a consistent problem	55.8 (n=786)		64.8 (n=105)		44.4 (n=329)		65.2 (n=259)		60.2 (n=93)	
Of those with consistent problems, response difficulties primarily due to :	Percent Any Listed	Percent Dist'n of Primary Difficulty (n=786)[1]	Percent Any Listed	Percent Dist'n of Primary Difficulty (n=105)	Percent Any Listed	Percent Dist'n of Primary Difficulty (n=329)	Percent Any Listed	Percent Dist'n of Primary Difficulty (n=259)	Percent Any Listed	Percent Dist'n of Primary Difficulty (n=93)
Daytime Staffing	52.9	26.2	79.4	49.2	64.7	37.5	36.2	13.4	38.5	8.2
Night time staffing	29.6	5.3	55.9	9.5	19.8	4.7	26.2	4.5	30.8	4.1
Remote or distant geographic areas	79.1	56.4	57.4	19.0	68.4	44.5	93.8	74.5	90.4	77.6
Exceptionally high demand	17.1	2.5	26.5	3.2	8.8	1.6	20.6	3.8	15.4	0.0
Provider retention	38.0	4.0	69.1	6.4	38.2	3.9	23.1	2.5	42.3	6.1
Provider recruitment	40.4	3.3	67.6	11.1	46.3	3.9	23.1	0.0	42.3	2.0
Other	5.3	2.3	4.4	1.6	7.4	3.9	5.0	1.3	1.9	2.0

[1] Primary difficulty is self-reported and is the one difficulty identified as the primary difficulty selected from list.

Table D12: Medical Direction by Geographic Region

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=800	Northeast N=106	Midwest N=336	South N=263	West N=95
Percent with Characteristic:	Percent with Characteristic (n=786)	Percent with Characteristic (n=105)	Percent with Characteristic (n=329)	Percent with Characteristic (n=258)	Percent with Characteristic (n=94)
System had no physician medical direction in place	4.1	6.7	4.3	4.3	0.0
System has medical direction but with no one person with primary responsibility	25.6	37.1	30.4	16.7	20.2
Of systems with one person with primary responsibility, this person is					
Responsible to system agency	44.9	29.3	44.4	49.0	47.3
Responsible to county or EMS regional program	34.8	39.7	29.9	36.5	40.5
Responsible to State lead EMS agency	10.3	8.6	13.1	9.0	6.8
Other	10.0	22.4	12.6	5.5	5.4

Table D13: Percent Distribution of Funding Sources for System by Geographic Region

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=800		Northeast N=106		Midwest N=336		South N=263		West N=95	
Funding Sources	Percent Present within the System	Percent Dist'n of Primary Source (n=686)[1]	Percent Present within the System	Percent Dist'n of Primary Source (n=93)	Percent Present within the System	Percent Dist'n of Primary Source (n=289)	Percent Present within the System	Percent Dist'n of Primary Source (n=222)	Percent Present within the System	Percent Dist'n of Primary Source (n=82)
Tax Subsidies										
State	18.5	1.6	14.4	1.1	15.9	0.7	19.0	1.8	31.5	4.9
County	59.8	24.9	13.5	2.1	62.3	21.4	74.2	39.6	64.0	23.2
Local	47.4	14.6	85.6	29.0	48.9	14.2	30.6	9.0	44.9	14.6
Fees for Services	90.9	53.4	94.2	59.1	92.2	57.4	90.5	47.3	83.2	48.8
Homeland Security Grants	33.7	0.1	36.5	0.0	31.5	0.0	31.8	0.0	43.8	1.2
Other Grants	47.3	0.9	39.4	1.1	46.1	0.7	47.2	0.4	60.7	2.4
Donations/fundraisers	50.4	2.6	77.9	7.5	59.5	3.5	32.1	0.0	37.1	1.2
Other	47.1	1.9	36.5	0.1	46.4	2.1	46.4	1.9	64.0	3.7

[1] Primary source is self-reported and identified as primary source of funding selected from list.

Table E1: Primary Mission[1] of First Response and Transport Agencies by Size of System[2]

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=720		Small (<1,000) N=176		Medium (1,000-4,999) N=223		Large (5,000-9,999) N=90		Very Large (> = 10,000) N=231	
Primary Mission	Percent Dist'n of First Response (n=657)[3]	Percent Dist'n of Transport (n=708)	Percent Dist'n of First Response (n=142)	Percent Dist'n of Transport (n=172)	Percent Dist'n of First Response (n=204)	Percent Dist'n of Transport (n=220)	Percent Dist'n of First Response (n=87)	Percent Dist'n of Transport (n=90)	Percent Dist'n of First Response (n=224)	Percent Dist'n of Transport (n=226)
Fire	32.6	12.0	9.9	3.5	29.4	8.6	35.6	16.7	48.7	19.9
EMS Only	25.4	60.2	43.0	70.4	31.9	66.8	21.9	54.5	9.8	48.2
Hospital	1.2	4.9	2.8	9.3	1.0	6.4	0.0	3.3	0.9	0.9
Fire and EMS	8.8	9.5	3.5	4.6	6.4	9.5	17.2	13.3	11.2	11.5
Fire and Other	28.9	9.5	36.6	9.3	26.9	4.6	23.0	8.9	28.1	14.6
All Other	3.1	3.9	4.2	2.9	4.4	4.1	2.3	3.3	1.3	4.9

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[1] Primary mission assigned if respondent indicated a single agency type handles majority of call volume or if all the agency types recorded fell only within a particular group.

[2] Size is based on number of annual EMS responses; of the 800 participating systems, 80 did not provide information on the annual number of EMS responses.

[3] Twenty-seven of the 720 systems who provided information on the size of their system do not use first responders. Of the 693 systems that do, data on mission of first response agencies was missing for 36 systems (5.2 % of all systems with first response).

Table E2: Primary Administration or Ownership [1] of First Response and Transport Agencies by Size of System[2]

(N = number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=720		Small (<1,000) N=176		Medium (1,000-4,999) N=223		Large (5,000-9,999) N=90		Very Large (> = 10,000) N=231	
Agency Type	Percent Dist'n of First Response (n=657)[3]	Percent Dist'n of Transport (n=708)	Percent Dist'n of First Response (n=142)	Percent Dist'n of Transport (n=172)	Percent Dist'n of First Response (n=204)	Percent Dist'n of Transport (n=220)	Percent Dist'n of First Response (n=87)	Percent Dist'n of Transport (n=90)	Percent Dist'n of First Response (n=224)	Percent Dist'n of Transport (n=226)
State/Local Gov't	70.5	63.2	74.7	69.8	71.1	67.7	67.8	68.8	68.3	51.8
For Profit (FP)	2.3	7.8	2.1	3.5	2.9	8.2	3.5	7.8	1.3	10.6
Not for Profit (NFP)	5.9	11.0	9.2	14.0	5.9	11.4	6.9	8.9	3.5	9.3
Gov't & NFP	6.7	5.7	5.6	6.4	8.8	5.4	6.9	5.6	5.4	5.3
Gov't & FP	5.6	4.0	3.5	1.7	5.4	2.7	10.3	3.3	5.4	7.1
All Other	9.0	8.3	4.9	4.6	5.9	4.6	4.6	5.6	16.1	15.9

[1] Primary administration or ownership assigned if respondent indicated a single agency type handles majority of call volume or if all the agency types recorded fell only within a particular group.

[2] Size is based on number of annual EMS responses; of the 800 participating systems, 80 did not provide information on the annual number of EMS responses.

[3] Twenty-seven of the 720 systems who provided information on the size of their system do not use first responders. Of the 693 systems that do, data on ownership/administration of first response agencies was missing for 36 systems (5.2 % of all systems with first response).

Table E3: Emergency Medical Call Taking: Organizational Type of Agency by Size of System[1]

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=720		Small (<1000) N=176		Medium (1,000-4,999) N=223		Large (5,000-9,999) N=90		Very Large (> = 10,000) N=231	
Agency Type	Percent Present within the System	Percent Dist'n of Primary Type (n=682)[2]	Percent Present within the System	Percent Dist'n of Primary Type (n=167)	Percent Present within the System	Percent Dist'n of Primary Type (n=218)	Percent Present within the System	Percent Dist'n of Primary Type (n=86)	Percent Present within the System	Percent Dist'n of Primary Type (n=211)
Public Safety/Joint Police-Fire-EMS	46.1	33.6	30.9	21.0	33.3	23.9	47.4	39.5	67.6	51.2
Fire	29.5	6.7	23.0	3.0	28.0	5.5	18.4	4.7	39.4	11.8
Law Enforcement	46.8	29.5	46.7	34.1	50.3	38.3	39.5	26.7	44.9	17.5
Local EMS Service	41.1	22.3	48.7	37.7	42.9	24.3	27.6	14.0	38.9	11.4
Other	10.9	7.9	5.3	4.2	7.9	7.8	7.9	15.1	18.5	8.1

[1] Size is based on number of annual EMS responses; of the 800 participating systems, 80 did not provide information on the annual number of EMS responses.

[2] Primary Type was self-reported and denotes the agency that handles the majority (50% or more) of the call volume for the system.

Table E4: Emergency Medical Dispatching: Organizational Type of Agency by Size of System[1]

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=720		Small (<1000) N=176		Medium (1,000-4,999) N=223		Large (5,000-9,999) N=90		Very Large (> = 10,000) N=231	
Agency Type	Percent Present within the System	Percent Dist'n Primary Type (n=667)[2]	Percent Present within the System	Percent Dist'n Primary Type (n=162)	Percent Present within the System	Percent Dist'n Primary Type (n=204)	Percent Present within the System	Percent Dist'n Primary Type (n=84)	Percent Present within the System	Percent Dist'n Primary Type (n=217)
Public Safety/Joint Police-Fire-EMS	49.2	39.1	34.5	27.2	42.9	35.3	52.1	42.9	63.0	50.3
Fire	20.4	5.3	14.4	2.5	11.8	1.5	14.1	3.6	33.2	11.5
Law Enforcement	49.2	38.7	64.0	57.4	57.1	49.5	40.9	34.5	36.1	16.1
Local EMS Service	2.8	0.9	3.6	1.2	0.0	0.0	4.2	0.0	3.8	1.8
Other	19.0	16.0	12.9	11.7	16.8	13.7	18.3	19.0	25.0	20.3

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[1] Size is based on number of annual EMS responses; of the 800 participating systems, 80 did not provide information on the annual number of EMS responses.

[2] Primary Type was self-reported and denotes the agency that handles the majority (50% or more) of the call volume for the system.

Table E5: Most Common Level of First Response [1] and Transport by Size of System [2]

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=720		Small (<1000) N=176		Medium (1,000-4,999) N=223		Large (5,000-9,999) N=90		Very Large (> = 10,000) N=231	
Level of Care	Percent Dist'n of First Response (n=664)[3]	Percent Dist'n of Transport (n=709)	Percent Dist'n of First Response (n=154)	Percent Dist'n of Transport (n=170)	Percent Dist'n of First Response (n=204)	Percent Dist'n of Transport (n=220)	Percent Dist'n of First Response (n=84)	Percent Dist'n of Transport (n=90)	Percent Dist'n of First Response (n=222)	Percent Dist'n of Transport (n= 229)
ALS	36.5	63.8	18.8	32.3	42.6	69.6	46.4	76.7	39.2	76.4
ILS	8.7	11.8	17.6	21.2	10.8	13.6	4.8	10.0	2.2	3.9
BLS	54.8	24.4	63.6	46.5	46.6	16.8	48.8	13.3	58.6	19.7

[1] Level of response represents the maximum capacity of the responding unit/vehicle to call and not the level of care rendered.

[2] Size is based on number of annual EMS responses; of the 800 participating systems, 80 did not provide information on the annual number of EMS responses.

[3] Twenty-seven of the 720 systems who provided information on the size of their system do not use first responders.

Table E6: First Responder Policies and Practices by Size of System[1]

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=720	Small (<1,000) N=176	Medium (1,000-4,999) N=223	Large (5,000-9,999) N=90	Very Large (> = 10,000) N=231
Policy used to Send First Responders	Percent with Policy/Practice (n=576)[2]	Percent with Policy/Practice (n=112)	Percent with Policy/Practice (n=178)	Percent with Policy/Practice (n=78)	Percent with Policy/Practice (n=208)
First Responders Sent to all 911 Calls	53.6	67.0	62.9	50.0	39.9
First Responders Sent only to calls based on priority dispatch or other call taking system	36.8	17.9	26.4	41.0	54.3
Other	9.6	15.1	10.7	9.0	5.8
Most Common Practice (based on percentage of total calls)	Percent with Policy/Practice (n=576)[1]	Percent with Policy/Practice (n=112)	Percent with Policy/Practice (n=178)	Percent with Policy/Practice (n=78)	Percent with Policy/Practice (n=208)
First Response followed by transport ambulance as necessary	3.3	4.6	3.9	2.5	2.4
Simultaneous First Response and transport ambulance	85.8	86.4	83.6	86.4	87.1
It varies, based on protocol	8.0	4.6	9.0	9.9	8.1
Other	2.9	7.4	3.5	1.2	2.4

[1] Size is based on number of annual EMS responses; of the 800 participating systems, 80 did not provide information on the annual number of EMS responses.

[2] Twenty-seven of the 720 systems who provided information on the size of their system do not use first responders.

Table E7: Operating Procedures Regarding Dispatch and Transport by Size of System[1]

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

Percent of systems that . . .	All Systems N=720	Small (<1,000) N=176	Medium (1,000-4,999) N=223	Large (5,000-9,999) N=90	Very Large (> = 10,000) N=231
Allow vehicles to respond to calls *without* use of lights and sirens	80.2 (n=703)	74.9 (n=169)	78.8 (n=217)	81.1 (n=90)	85.9 (n=227)
Allow vehicles to transport non-emergent patients *without* use of lights and sirens	94.1 (n=710)	89.0 (n=173)	94.9 (n=218)	95.5 (n=89)	96.5 (n=230)
Allow providers to transport patients from the scene to non-hospital destinations	27.6 (n=711)	30.1 (n=173)	31.4 (n=220)	27.8 (n=90)	21.9 (n=228)
Have units that can be dispatched to perform non-emergency assessments	38.2 (n=709)	34.3 (n=169)	43.0 (n=221)	41.1 (n=90)	35.6 (n=229)
How many dispatch agencies offer pre-arrival instructions to callers for certain types of calls?	(n=718)	(n=175)	(n=222)	(n=90)	(n=231)
All	52.1	30.9	46.0	72.2	66.2
Some	27.9	33.1	25.2	15.6	31.2
None	20.0	36.0	28.8	12.2	2.6

[1] Size is based on number of annual EMS responses; of the 800 participating systems, 80 did not provide information on the annual number of EMS responses.

Table E8: Frequency of Out of Area Response to Calls by Size of System[1]

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=720	Small (<1,000) N=176	Medium (1,000-4,999) N=223	Large (5,000-9,999) N=90	Very Large (> = 10,000) N=231
How often do your *first response agencies* respond to calls beyond the boundaries of their primary service areas	(n=605)	(n=120)	(n=192)	(n=77)	(n=216)
Never	16.4	15.0	17.2	13.0	17.6
Seldom	44.0	52.5	41.1	50.6	39.3
Sometimes	33.2	25.8	36.5	33.8	34.3
Often	6.4	6.7	5.2	2.6	8.8
How often do your *transport agencies* respond to calls beyond the boundaries of their primary service areas	(n=695)	(n=163)	(n=216)	(n=89)	(n=227)
Never	2.6	4.3	2.3	1.1	2.2
Seldom	30.6	39.3	33.8	28.1	22.5
Sometimes	49.5	46.6	49.5	56.2	48.9
Often	17.3	9.8	14.4	14.6	26.4
How often do units from other EMS systems respond to calls within your own jurisdiction?	(n=714)	(n=173)	(n=223)	(n=90)	(n=228)
Never	7.1	6.4	8.5	3.3	7.9
Seldom	59.5	61.3	61.0	58.9	57.0
Sometimes	29.0	27.7	28.3	31.1	29.8
Often	4.4	4.6	2.2	6.7	5.3

[1] Size is based on number of annual EMS responses; of the 800 participating systems, 80 did not provide information on the annual number of EMS responses.

Table E9: Percent Distribution of EMS Provider Type by Size of System[1]

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=720		Small (<1,000) N=176		Medium (1,000-4,999) N=223		Large (5,000-9,999) N=90		Very Large (> =10,000) N=231	
Type of Provider	Percent Present within the System	Percent Dist'n of Primary Type [2] (n=673)	Percent Present within the System	Percent Dist'n of Primary Type (n=165)	Percent Present within the System	Percent Dist'n of Primary Type (n=206)	Percent Present within the System	Percent Dist'n of Primary Type (n=85)	Percent Present within the System	Percent Dist'n of Primary Type (n=217)
Volunteer										
Compensated	56.5	23.3	72.0	57.0	54.5	20.4	47.1	9.4	50.9	6.0
Non-compensated	60.0	18.4	3.2.9	18.2	62.6	21.4	69.0	17.6	73.7	16.1
Career										
Part time	60.6	4.5	31.7	4.8	64.9	6.8	69.0	0.0	74.1	3.7
Full time	83.9	53.8	51.6	20.0	89.1	51.4	96.6	72.9	97.3	74.2
Average % of providers who serve as volunteers (compensated or not)	47.6 (n=696)		71.7 (n=172)		46.3 (n=220)		42.8 (n=85)		31.7 (n=219)	
Average % of total calls that are handled by volunteers (compensated or not)	37.6 (n=681)		65.9 (n=167)		35.4 (n=213)		32.9 (n=86)		19.6 (n=215)	
Average % of volunteers who typically respond to calls from Fire or EMS station houses	14.4 (n=675)		5.4 (n=167)		7.7 (n=207)		14.6 (n=82)		27.4 (n=219)	

[1] Size is based on number of annual EMS responses; of the 800 participating systems, 80 did not provide information on the annual number of EMS responses.

[2] Primary type is self-reported and denotes the provider type that represents the majority (50% or more) of EMS personnel in the system.

Table E10: 911 System Access by Size of System[1]

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=720		Small (<1000) N=176		Medium (1,000-4,999) N=223		Large (5,000-9,999) N=90		Very Large (> = 10,000) N=231	
Type of Provider	Percent Present within the System	Percent Dist'n of Highest Level (n= 713)	Percent Present within the System	Percent Dist'n of Highest Level (n= 173)	Percent Present within the System	Percent Dist'n of Highest Level (n= 221)	Percent Present within the System	Percent Dist'n of Highest Level (n= 90)	Percent Present within the System	Percent Dist'n of Highest Level (n=229)
Wireless E 911	65.8	65.8	52.6	52.6	62.0	61.9	72.2	72.2	76.9	76.9
Wireless E 911	39.1	14.2	29.5	13.3	36.6	12.2	31.1	14.5	52.0	16.6
E 911	93.1	16.3	86.7	25.4	92.8	21.8	96.7	12.2	96.9	5.6
Basic 911	29.4	3.6	30.1	8.1	25.3	4.1	21.1	1.1	36.2	0.9
7 or 10 Digit Number	29.3	0.1	27.8	0.6	24.4	0.0	23.3	0.0	37.6	0.0

[1] Size is based on number of annual EMS responses; of the 800 participating systems, 80 did not provide information on the annual number of EMS responses.

Table E11: Timely Response to Incoming Calls by Size of System[1]

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=720		Small (<1000) N=176		Medium (1,000-4,999) N=223		Large (5,000-9,999) N=90		Very Large (> = 10,000) N=231	
Percent indicating timely response to incoming calls a consistent problem	55.8 (n= 717)		42.5 (n=174)		60.1 (n=223)		60.0 (n=90)		60.0 (n=230)	
Of those with consistent problems, response difficulties primarily due to :	Percent Any Listed	Percent Dist'n of Primary Difficulty (n=364)[2]	Percent Any Listed	Percent Dist'n of Primary Difficulty (n=70)	Percent Any Listed	Percent Dist'n of Primary Difficulty (n=112)	Percent Any Listed	Percent Dist'n of Primary Difficulty (n=50)	Percent Any Listed	Percent Dist'n of Primary Difficulty (n=132)
Daytime Staffing	51.8	25.0	57.1	20.0	52.8	30.4	53.2	20.0	47.8	25.0
Night time staffing	28.8	5.8	30.0	8.6	24.0	5.4	29.8	8.0	32.4	3.8
Remote or distant geographic areas	79.1	57.4	77.1	61.4	76.0	59.8	76.6	56.0	83.8	53.8
Exceptionally high demand	18.2	2.7	4. 3	0.0	13.6	0.0	14.9	2.0	30.9	6.8
Provider retention	36.5	3.6	21.4	1.4	36.8	1.8	38.3	12.0	43.4	3.0
Provider recruitment	39.4	3.3	35.7	5.7	39.2	1.8	38.3	2.0	41.9	3.8
Other	5.3	2.2	8.	2.9	2.	0.8	2.1	0.0	7.4	3.8

[1] Size is based on number of annual EMS responses; of the 800 participating systems, 80 did not provide information on the annual number of EMS responses.

[2] Primary difficulty is self-reported and is the one difficulty identified as the primary difficulty selected from list.

Table E12: Medical Direction by Size of System[1]

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=720	Small (<1,000) N=176	Medium (1,000-4,999) N=223	Large (5,000-9,999) N=90	Very Large (> = 10,000) N=231
Percent with Characteristic:	Percent with Characteristic (n= 718)	Percent with Characteristic (n= 175)	Percent with Characteristic (n= 223)	Percent with Characteristic (n= 89)	Percent with Characteristic (n= 231)
System had no physician medical direction in place	3.5	6.9	3.1	0.0	2.6
System has medical direction but with no one person with primary responsibility	24.4	30.8	23.3	21.3	21.6
Of systems with one person with primary responsibility, this person is	(n=511)	(n=109)	(n=161)	(n=69)	(n=172)
Responsible to system agency	45.0	47.7	42.2	44.9	45.9
Responsible to county or EMS regional program	35.4	32.1	36.0	34.8	37.2
Responsible to State lead EMS agency	9.8	12.8	11.2	8.7	7.0
Other	9.8	7.4	10.6	11.6	9.9

[1] Size is based on number of annual EMS responses; of the 800 participating systems, 80 did not provide information on the annual number of EMS responses.

Table E13: Percent Distribution of Funding Sources for System by Size of System[1]
(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=720		Small (<1,000) N=176		Medium (1,000-4,999) N=223		Large (5,000-9,999) N=90		Very Large (> = 10,000) N=231	
Funding Sources	Percent Present within the System	Percent Dist'n of Primary Source (n=632)[2]	Percent Present within the System	Percent Dist'n of Primary Source (n=163)	Percent Present within the System	Percent Dist'n of Primary Source (n=187)	Percent Present within the System	Percent Dist'n of Primary Source (n=82)	Percent Present within the System	Percent Dist'n of Primary Source (n=200)
Tax Subsidies										
State	18.1	1.6	12.4	0.0	14.6	1.6	14.9	1.2	26.8	3.0
County	61.1	25.6	65.9	30.1	60.4	20.9	63.2	28.1	57.6	25.5
Local	45.7	14.1	32.4	8.6	41.5	14.4	52.9	19.5	56.7	16.0
Fees for Services	91.1	53.2	85.9	54.6	93.9	58.3	88.5	46.3	93.5	50.0
Homeland Security Grants	33.6	0.0	32.9	0.0	27.4	0.0	25.3	0.0	42.9	0.0
Other Grants	48.1	0.9	51.2	1.2	45.3	1.1	41.4	1.2	51.1	0.5
Donations/fundraisers	49.9	2.8	60.0	3.7	48.1	2.7	42.5	2.4	46.8	2.5
Other	47.9	1.8	52.4	1.8	44.3	1.0	41.4	1.3	50.2	2.5

[1] Size is based on number of annual EMS responses; of the 800 participating systems, 80 did not provide information on the annual number of EMS responses.

[2] Primary source is self-reported and identified as primary source of funding selected from list.

Table F1: Responses to Opinion Questions by Rurality

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=800	Urban N=355	Suburban N=98	Rural N=193	Wilderness N=154
Opinion	Percent Agree or Strongly Agree (n=787-795)	Percent Agree or Strongly Agree (n=349-352)	Percent Agree or Strongly Agree (n=96-98)	Percent Agree or Strongly Agree (n=188-193)	Percent Agree or Strongly Agree (n=153-154)
Resource Levels					
System is adequately staffed to meet demand	42.3	48.3	45.4	37.0	33.1
System has enough resources (vehicles, Equipment) to meet demand	62.2	62.4	62.9	61.7	61.7
Public Participation					
Pop'n has high level of EMS awareness, participation, support	39.6	34.1	38.5	46.4	44.4
AEDs can be found in many public places	55.2	61.4	52.6	55.7	42.1
Bystanders often provide CPR prior to EMS arrival	36.3	36.1	35.0	41.6	31.2
The public is satisfied with EMS services	78.7	79.2	72.2	78.0	82.4
System Support					
System has high level of physician involvement	57.0	64.8	64.9	46.6	47.1
Hospitals are supportive of EMS agencies/providers	78.8	79.6	79.4	75.5	80.9
Patient Handoffs between agencies and hospitals are generally smooth	82.9	80.8	86.5	83.3	84.0
EMS system/ agencies collaborate with Non-EMS organizations.	77.4	75.4	76.3	80.5	78.8

	All Systems (n=800)	Urban (N=355)	Suburban (N=98)	Rural (N=193)	Wilderness (N=154)
Opinion	Percent Agree or Strongly Agree (n=787-795)	Percent Agree or Strongly Agree (n=349-352)	Percent Agree or Strongly Agree (n=96-98)	Percent Agree or Strongly Agree (n=188-193)	Percent Agree or Strongly Agree (n=153-154)
"Turf wars" are a problem	19.8	23.9	28.9	16.3	9.1
Politics are a problem	36.1	44.3	39.2	29.7	23.4
EMS providers enjoy working in system	81.3	81.7	81.2	83.1	78.4
System Change					
System looks much the same as 10 years ago	23.5	21.0	26.0	24.5	26.1
System will look much the same 10 years from now	15.2	13.6	14.4	15.3	19.0
Our system adapts well to change	58.4	59.4	48.4	57.6	63.4

Table F2: Responses to Opinion Questions by Geographic Region

(N= number of systems participating in overall study; n=number of systems responding to specific survey item)

	All Systems N=800	Northeast N=106	Midwest N=336	South N=263	West N=95
Opinion	Percent Agree or Strongly Agree (n=787-795)	Percent Agree or Strongly Agree (n=104-105)	Percent Agree or Strongly Agree (n=329-333)	Percent Agree or Strongly Agree (n=259-262)	Percent Agree or Strongly Agree (n=93-95)
Resource Levels					
System is adequately staffed to meet demand	42.3	38.1	41.1	40.1	55.8
System has enough resources (vehicles, Equipment) to meet demand	62.2	73.8	67.5	50.4	63.2
Public Participation					
Pop'n has high level of EMS awareness, participation, support	39.6	24.8	48.6	34.2	39.4
AEDs can be found in many public places	55.2	80.0	59.3	45.5	41.5
Bystanders often provide CPR prior to EMS arrival	36.3	37.5	37.6	33.5	38.3
The public is satisfied with EMS services	78.7	67.6	85.5	72.0	85.3
System Support					
System has high level of physician involvement	57.0	48.1	54.6	60.5	65.3
Hospitals are supportive of EMS agencies/providers	78.8	83.8	80.1	76.2	75.8
Patient Handoffs between agencies and hospitals are generally smooth	82.9	81.7	87.8	76.7	84.2
EMS system/ agencies collaborate with Non-EMS organizations.	77.4	67.2	82.1	75.3	77.7

	All Systems N=800	Northeast N=106	Midwest N=336	South N=263	West N=95
Opinion	Percent Agree or Strongly Agree (n=787-795)	Percent Agree or Strongly Agree (n=104-105)	Percent Agree or Strongly Agree (n=329-333)	Percent Agree or Strongly Agree (n=259-262)	Percent Agree or Strongly Agree (n=93-95)
"Turf wars" are a problem	19.8	30.5	17.2	17.7	23.2
Politics are a problem	36.1	53.3	30.6	36.3	35.8
EMS providers enjoy working in system	81.3	65.4	83.9	83.1	84.9
System Change					
System looks much the same as 10 years ago	23.5	26.7	25.2	18.8	25.3
System will look much the same 10 years from now	15.2	9.5	16.3	14.6	18.9
Out system adapts well to change	58.4	36.2	59.9	63.4	63.8

Table F3: Responses to Opinion Questions by Size of System[1]

(N = number of systems participating in overall study; n = number of systems responding to specific survey item)

	All Systems N=720	Small (<1000) N=176	Medium (1,000-4,999) N=223	Large (5,000-9,999) N=90	Very Large (> = 10,000) N=231
Opinion	Percent Agree or Strongly Agree (n=711-719)	Percent Agree or Strongly Agree (n=173-176)	Percent Agree or Strongly Agree (n=220-223)	Percent Agree or Strongly Agree (n=89-90)	Percent Agree or Strongly Agree (n=-227-230)
Resource Levels					
System is adequately staffed to meet Demand	42.1	31.8	39.9	43.3	51.7
System has enough resources (vehicles, Equipment) to meet demand	62.9	64.8	60.0	62.2	64.6
Public Participation					
Pop'n has high level of EMS awareness, participation, support	40.9	48.6	39.5	44.9	34.8
AEDs can be found in many public places	54.7	46.6	48.2	57.8	66.1
Bystanders often provide CPR prior to EMS arrival	37.3	35.8	35.3	47.2	36.7
The public is satisfied with EMS services	80.2	83.3	78.0	83.2	78.7
System Support					
System has high level of physician involvement	57.8	45.1	52.2	65.6	69.7
Hospitals are supportive of EMS agencies/providers	79.5	78.9	74.0	86.5	82.6

Patient Handoffs between agencies and hospitals are generally smooth	83.5	86.2	83.0	83.3	81.9

[1] Size is based on number of annual EMS responses; of the 800 participating systems, 80 did not provide information on the annual number of EMS responses.

	All Systems N=720	Small (<1,000) N=176	Medium (1,000-4,999) N=223	Large (5,000-9,999) N=90	Very Large (> = 10,000) N=231
Opinion	Percent Agree or Strongly Agree (n=711-719)	Percent Agree or Strongly Agree (n=173-176)	Percent Agree or Strongly Agree (n=220-223)	Percent Agree or Strongly Agree (n=89-90)	Percent Agree or Strongly Agree (n=-227-230)
EMS system/agencies collaborate with Non-EMS organizations	79.0	79.8	78.7	83.3	77.1
"Turf wars" are a problem	19.8	15.3	19.3	15.9	25.3
Politics are a problem	36.0	23.9	35.0	31.1	48.3
EMS providers enjoy working in system	82.4	80.5	83.6	82.0	82.9
System Change					
System looks much the same as 10 years ago	23.0	29.7	20.2	19.1	22.2
System will look much the same 10 years from now	14.9	19.5	14.4	13.3	12.6
System adapts well to change	59.3	61.5	56.0	63.3	59.1

Table F4: Mean Scores on Summary Measures by Rurality, Geographic Region and Size of the System[1,2]

	Mean Score (0-100)				Percent Satisfied	
	System Support	Lack of System Politics	System Resources	Bystander Action	Public Satisfaction	Adapts Well to Change
All Systems	71.5	58.9	54.6	54.2	78.7	58.4
Rurality						
Urban	72.8	54.3	55.3	56.9	79.2	59.4
Suburban	74.1	53.8	57.1	54.3	72.2	48.4
Rural	70.7	62.9	55.8	56.2	78.8	57.6
Wilderness	70.8	67.9 **	52.2	47.4**	82.4	63.4*
Geographic Region						
Northeast	70.9	48.5	54.9	64.2	67.6	36.2
Midwest	72.6	62.7	57.1	55.6	85.5	59.9
South	71.3	59.8	51.4	51.3	72.0	63.4
West	73.2	55.7**	57.6**	49.6**	85.3**	63.8**
Size of System						
<1,000	70.3	67.3	54.5	50.4	83.3	61.5
1,000-4,999	70.9	58.1	53.9	51.6	78.0	56.0
5,000-9,999	74.9	60.2	56.7	58.7	83.2	63.3
>=10,000	73.2*	53.3**	55.8	58.8**	78.7	59.1*

[1] Size is based on number of annual EMS responses; of the 800 participating systems, 80 did not provide information on the annual number of EMS responses.

[2] + p <0.10; * p< 0.05; ** p< 0.01

Table F5: Regressions Results: Modeling Opinion Summary Measures by Selected System Characteristics

		Regression Coefficients from Multiple Linear				Odds Ratios from Multiple	
		Positive System Support	Lack of System Politics	Adequate System Resources	Bystander Action	Public Satisfaction	Adapts Well to Change
Rurality							
Urban		REF	REF	REF	REF	REF	REF
Suburban		-0.52	-1.98	0.94	-3.54	0.63	0.58 *
Rural		-2.26	6.33 *	-0.63	-0.89	0.83	0.86
Wilderness		-2.48	11.50 **	-5.29 *	-10.7 **	0.84	1.10
Geographic Region							
Northeast		REF	REF	REF	REF	REF	REF
Midwest		3.22 +	7.14 *	3.24	-5.46 *	2.70 **	2.59 **
South		0.18	5.64 +	-6.27 *	-13.60 **	0.73	2.59 **
West		2.31	4.36	2.80	-12.10 **	2.50 *	2.70 **
Mission of Transport Agency							
EMS Only		REF	REF	REF	REF	REF	REF
Fire, Fire & EMS, Fire & Another		-1.04	-3.40	-3.39 +	-1.59	0.79	0.98
All other		2.98	-0.62	-5.24 +	-0.66	0.43 **	0.83
Admin/ Ownership of Transport Agency							
State or Local Government		REF	REF	REF	REF	REF	REF
Not For Profit		-2.23	0.58	-1.30	-0.12	0.93	0.87
For Profit and All others		0.75	-5.48 *	-1.97	-2.77	0.58 *	1.16
Primary Funding Source							
All Other		REF	REF	REF	REF	REF	REF
Tax Subsidies (State or local)		-2.15 +	2.70	-2.73	-2.49	1.07	0.80
Medical Direction							
All Other (including none)		REF	REF	REF	REF	REF	REF
Single Person Responsible		4.39 **	0.43	2.75	0.69	1.47 +	1.19
% of Providers that are Volunteer							
> 50%		REF	REF	REF	REF	REF	REF
<=50%		0.92	1.49	5.12 **	2.96 *	2.38 **	1.96 **

+ p <0.10; * p< 0.05; ** p< 0.01

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