

## POPULATION SCIENCE

**Characteristics of rural users of emergency medical services in Georgia: A population-based study**

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**ABSTRACT**

**Background:** Emergency medical services (EMS) are an essential part of health care. Appropriate information about EMS usage in rural areas will allow effective utilization of EMS resources for their intended purpose, and at the state level, drive the adoption of better EMS policies to ensure and maintain equitable access to these health services in rural areas.

**Methods:** The present study, performed by analyzing data from the Georgia Emergency Medical Services Information System (GEMSIS), describes the population using EMS in rural Georgia. Distributions of rural EMS transports are reported, along with usage for selected population groups based on race, gender, age groups, and primary impressions recorded by emergency medical personnel (EMP).

**Results:** The groups with the highest rates of EMS use were African Americans, females, and the elderly. In 2014, about twice as many African Americans used EMS as compared to Whites. Rural use of EMS increased with age, with the elderly having the highest percentage of users. About 31% of all transports were for emergency conditions; the remaining 69% were for non-emergencies. The most frequent health complaints were those for altered physical conditions and traumatic injuries.

**Conclusions:** The findings of this study can guide decision in planning future services and ensuring appropriate access to EMS in rural Georgia.

**Keywords:** emergency medical services, rural EMS users, population-based

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**INTRODUCTION**

In the United States, emergency medical services (EMS) are an essential component of health care. EMS, the first line of response to random occurrences of medical emergencies, such as accidents, acute illnesses, or injuries, provide care that is sometimes necessary for survival of patients, before they reach hospitals.

According to data from the 2010 National Emergency Medical Service Information System (NEMSIS) project, there are, in the United States, an estimated 17.4 million emergency responses annually, that is, an incidence of 56 EMS responses per 1,000 and per year (Wang et al., 2012). Overall, one-third of EMS patients are 65 years or older; 75.7% of the EMS responses occur in urban settings, 11.7% in rural areas, 9.7% in suburban areas, and 2.0% in wilderness settings (Wang et al., 2012).

Understanding the pattern of EMS utilization can assist planning, budgeting, and personnel training; guide decision makers; and drive the adoption of better EMS policies, in order to ensure and maintain equitable access to these health services. This understanding may support reshaping, at the

state level, the means by which health services are delivered, especially in rural areas, to allow effective utilization of EMS resources for their intended purpose. The present goal is not to provide recommendations to decision makers about how to address specific policy issues, but rather to establish a reference point for rural EMS use to support decision-making and policy development.

Only a few population-based studies have addressed the characteristics of EMS user populations at the state level; these were focused either on a certain age group (Wofford et al., 1995) or on a limited area for which population-based reporting was available (Svenson, 2000). Our review of the literature could not find any population-based study of the rural utilization of EMS. The purpose of the present study was to provide information about the characteristics of the EMS user population in rural Georgia, by use of EMS data from Georgia Emergency Medical Services Information System (GEMSIS). The following questions are addressed: What are the patterns of EMS transport distribution in terms of race, gender, age, and primary health complaints in rural Georgia? What is the utilization of EMS in rural area for each selected population group?

**METHODS**

**Data**

We used secondary data from the US Census Bureau and GEMSIS. The US Census Bureau estimated that in 2014, Georgia had a population of 10,097,343, of which 18.1% represented the rural population. Selected characteristics of the rural population of Georgia are presented in Figure 1. The EMS dataset obtained from GEMSIS contained de-identified information about rural patients transported by EMS vehicles to hospitals. The data included patients' age, gender, and race, along with the primary impressions of the emergency medical personnel (EMP) about the medical condition/symptom of the patients.

The state has 159 counties, of which 107 have fewer than 35,000 people, thus being considered rural according to the definition adopted by the Georgia General Assembly in 1999. EMS data were obtained from the Georgia Department of Public Health in which the Office of Emergency Medical Services and Trauma operates under the division of Health Protection. In 2006, the EMS office implemented a web-based, statewide system to standardize data collection: the Georgia Emergency Medical Services

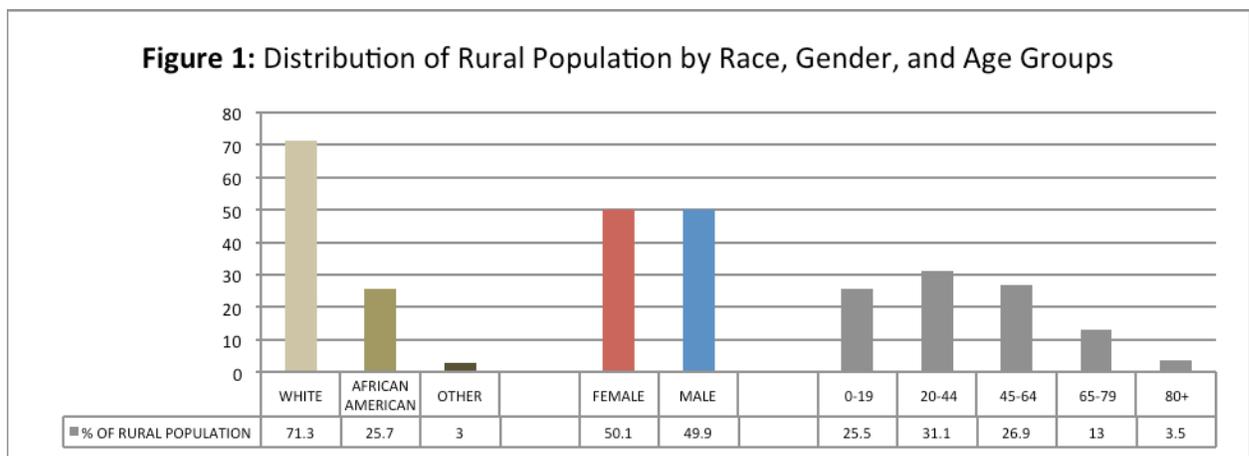
Information System (GEMSIS). All licensed EMS providers in Georgia are required to report their data to GEMSIS. For the study, the Georgia Department of Public Health provided EMS data for all rural patients who were transported by EMS in 2014.

**Analysis**

Data analysis was performed using IBM SPSS Statistics version 21. Scheduled inter-facility transports or transfers were excluded. Data were stratified by race, gender, selected age groups, and primary impression. The distributions of EMS transports by selected characteristics were analyzed, along with EMS usage as percentages of people in each selected group who used rural EMS transport in 2014.

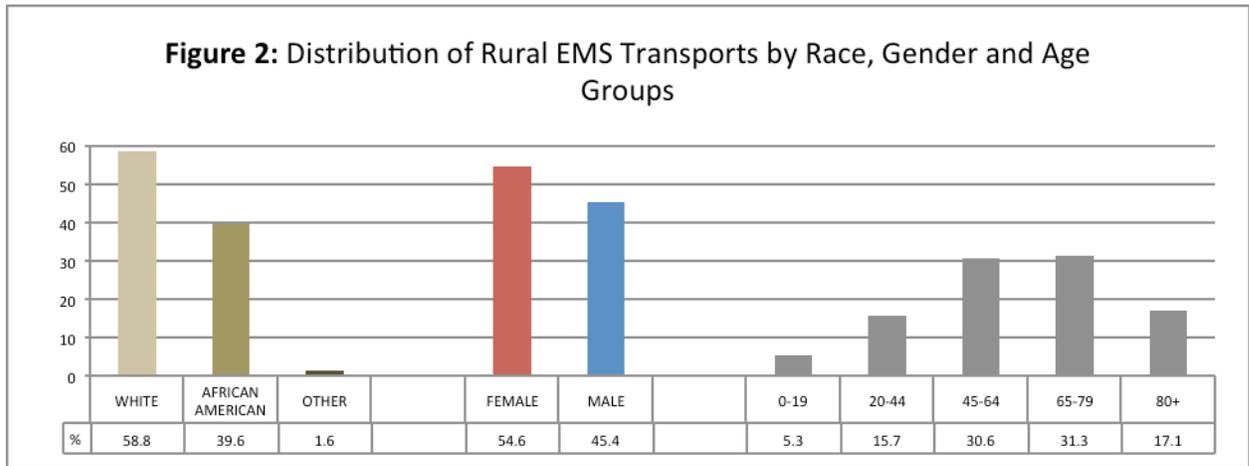
**RESULTS**

The rural population distribution, based on US Census population estimates for 2014, is presented in Figure 1. The White population was 73.1% of the total rural population, three times that of African Americans. There were equal proportions of males and females and a normal population distribution by age.



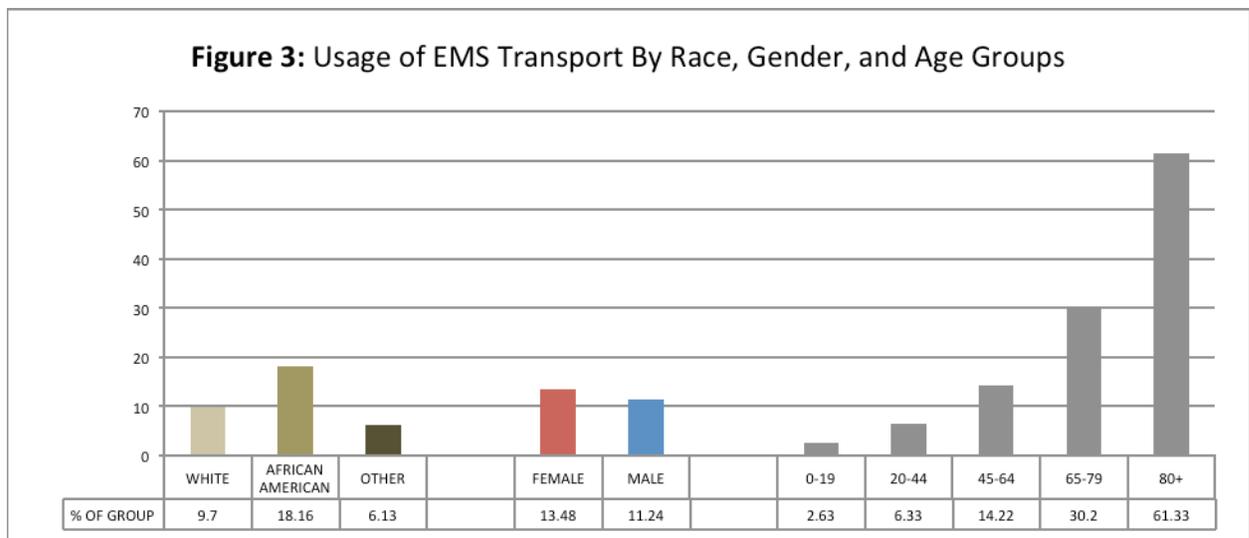
From January 1<sup>st</sup> to December 31<sup>st</sup> of 2014, GEMSIS recorded 1,358,240 valid transport cases in the state of Georgia, of which 229,571 (16.9%) were rural transports. Their distributions by selected characteristics are presented in Figure 2. Most of the rural EMS users (58.8%) were White. By gender, about 9% more females than males used

EMS transports in 2014. EMS transports approached a normal distribution by age groups, with the people of working age (young and mature adults, 20-64 years old) representing 46.3% and the elderly (65 years of age and older) comprising 48.4% of all users.



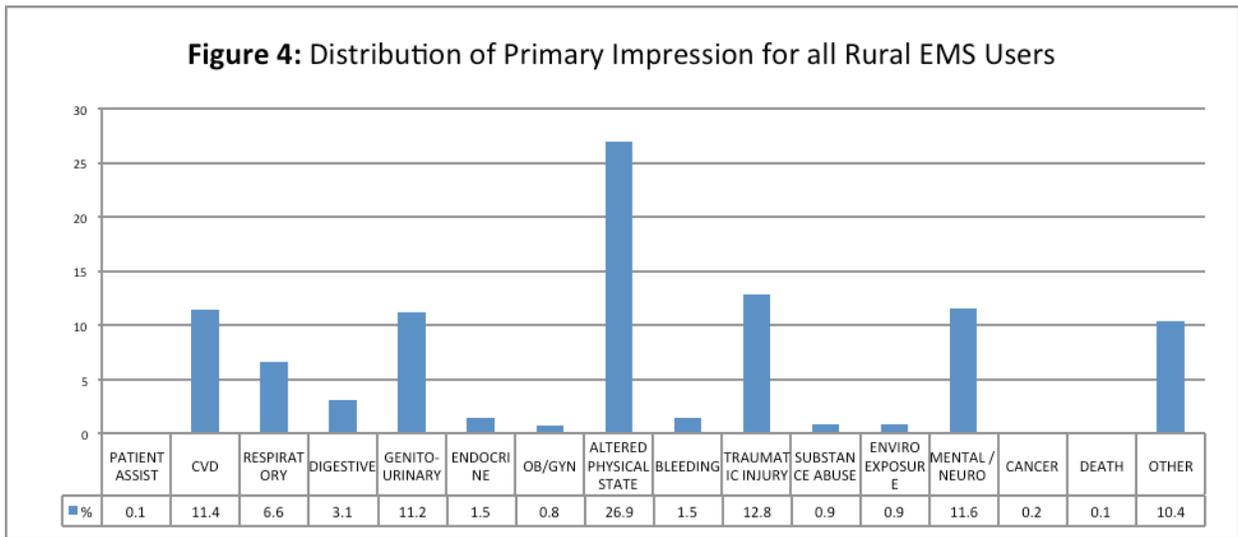
Relative to the size of rural population, the EMS usage was 12.5% overall, meaning that this percentage of all rural residents used EMS services in 2014. EMS usage by each

selected group is presented in Figure 3. African Americans had the highest usage of all races (18.2%). Usage by rural females was higher by 2.2% than that of males.



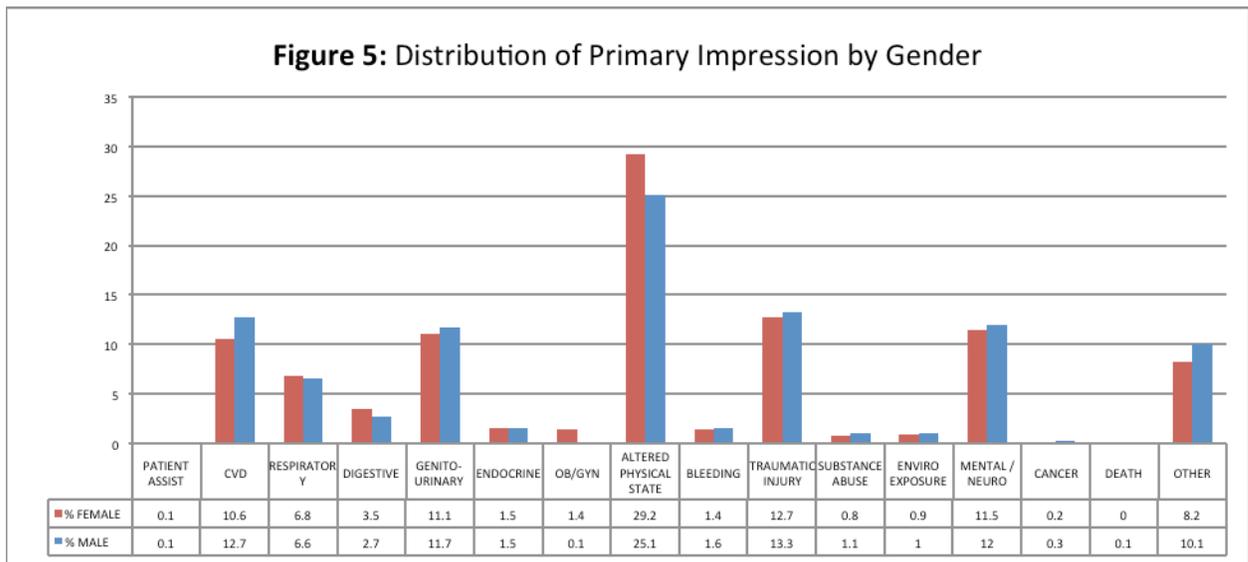
The EMS usage by selected age groups had a left skewed distribution, with the usage percentage more than doubling with age increase from one age group to the next. The highest usage was for the 80 years of age and older group (61.3%).

Primary impressions recorded by EMP were classified by anatomic systems (e.g., cardiovascular or digestive) or type of injury (e.g., trauma, bleeding, or environmental exposure), and by emergency/non-emergency conditions (Figure 4).



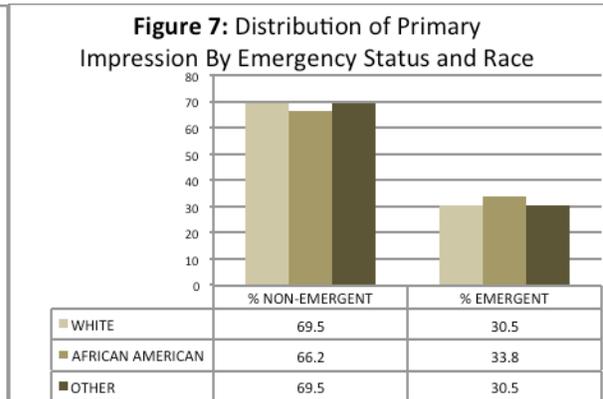
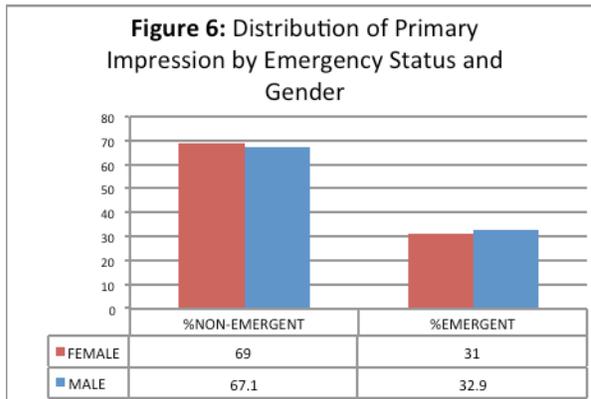
The largest percentage of EMS assistance occurred for some type of altered physical state (26.9%) such as pain (e.g., abdominal, back, or neck), fever, headache/migraines, general malaise, or physical weakness. The next most frequent primary impression was traumatic injuries (12.8%), such as amputations, fractures, or electrocution. Fairly equal shares of EMS transports were recorded for cardiovascular disease (CVD), genitourinary, mental health, and other non-specified health conditions.

A comparison of genders revealed slight differences: 4.1% more females than males used EMS due to altered physical state, and 2.1% more males reported CVD. More males (10.1%) than females (8.2%) reported non-specific issues included in the 'other' category of primary impression (Figure 5).



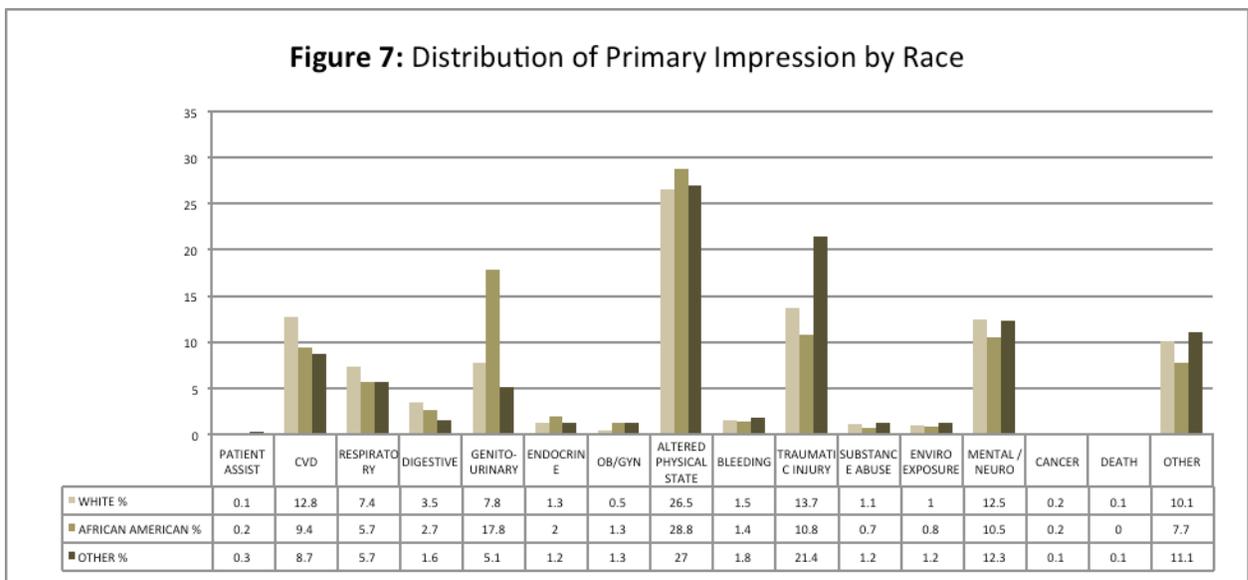
The distribution by emergency/non-emergency conditions indicated that 68.6% of EMS transports took place for non-

emergency conditions. There were slight gender differences between males and females (Figure 6).



Stratification of primary impression by race revealed several differences (Figure 7). As an example, EMPs assisted 3.4% more Whites than African Americans for CVD, and 10% more African Americans than Whites for genitourinary

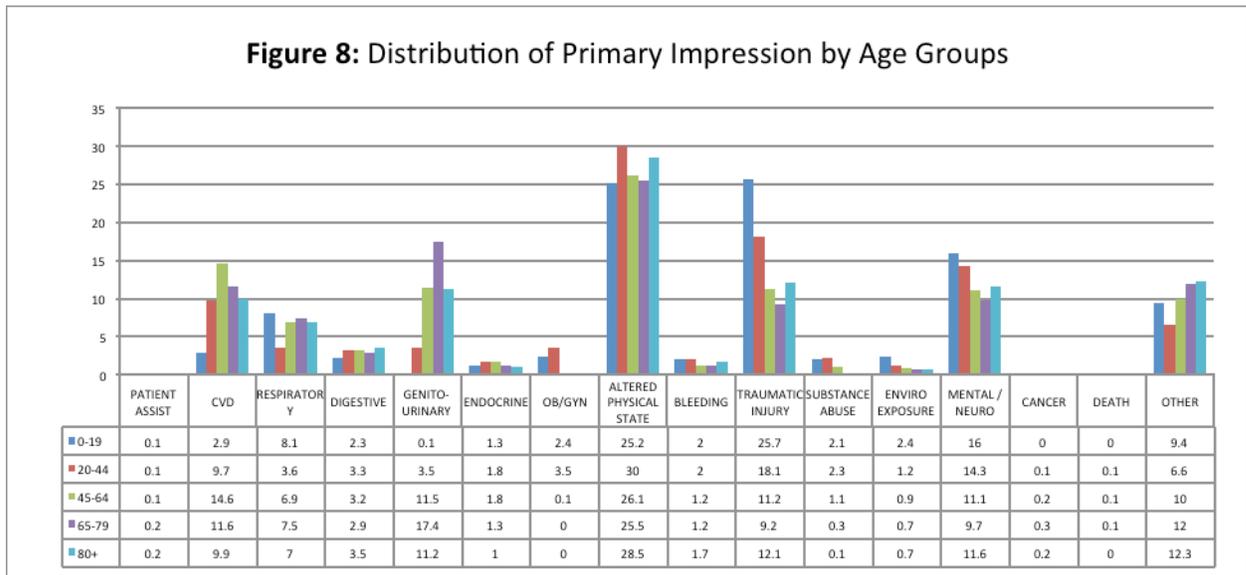
conditions. The highest percent of traumatic injuries (21.4%) was noted for people of 'other' races (all but White and African American).



For all age groups, altered physical state had the highest percentage of EMS transports. The next highest usage was different for each age group. Children and teenagers (0-19 years old) had the highest percentage of EMS transports for traumatic injury (25.7%), and mental health/neurological

problems (16%); mature adults (45-64 years old) for CVD (14.6%); retirees (65-79 years old) for genitourinary problems (17.4%); and the elderly (80+ years old) for 'other' health conditions (12.3%). Figure 8 presents these differences.

**Figure 8: Distribution of Primary Impression by Age Groups**



**DISCUSSION**

The present results show demographic characteristics of EMS users in rural Georgia, based on population data. Of all race categories, African Americans had the highest percentage of rural EMS usage in 2014. The finding is consistent with previous research (Wofford et al., 1995). African Americans represent about 25% of the rural population but comprise almost 40% of rural EMS users. Almost twice as many African Americans used EMS as compared to Whites. This discrepancy suggests an underlying health disparity of this group. This should not be construed as a higher prevalence of disease among African Americans, but rather it invites further research to clarify this link between EMS use and health.

There were slight gender differences in rural use of EMS transport, with about 2% more females than males using EMS transports. Although the rural EMS transports were normally distributed by age, the percentage of people from each age group who used EMS transport in 2014 increased with increase in age. People 65 and older used 48.8% of all EMS transports. This finding is consistent with previous research indicating that the elderly comprise the largest population group using EMS transport (Stripe & Susman, 1991; Svenson, 2000); this, however, is for the general, not the rural population. The elderly group also had the largest rural EMS usage in 2014; 61.3% of all rural people 80 years of age and older comprised 17.1% of all EMS users. In the future, this trend can be expected to continue or possibly intensify as the ‘baby-boom’ generation ages. For the general population, age-associated increase in EMS use is related to medical conditions rather than trauma (McConnel & Wilson, 1998). The present results show that, in rural Georgia, medical conditions account for about one third (32.6%) of EMS use by the elderly, 28.5% were for some type of altered state, and the remaining 36% were for mental health/neurological issues, traumatic injury, and ‘other’ health conditions. Strategic planning for rural EMS services may require services designed to address the needs of an aging population and differentiation of services in

rural locations. In that respect, we hope that this study provides a useful reference point for decision makers to consider.

About 27% of all EMS transports involved altered physical state, such as weakness, headaches, migraines, or fever. This finding may point to a lack of access to preventive health care services, insurance coverage, and/or availability of health care services within reasonable travelling distances. Postponing routine check-ups and maintenance of chronic conditions may lead to calls for care of non-emergency conditions. In rural Georgia, a clear pattern of systemic health conditions were evident, representing about 54% of all documented primary impressions, especially CVD, genitourinary, respiratory, digestive, and mental or neurological. In the future, alternative ways for serving the healthcare needs of rural patients may be necessary. To enhance the quality of rural EMS services, an emphasis is needed on chronic disease maintenance through collaboration with primary care physicians (to ensure regular medical check-ups), and electronic health data exchange.

Children and teenagers had the largest share of traumatic injuries (25.7%), almost double the rate of most other age groups and higher than that reported in previous research (Patterson et al., 2006). In fact, for this age group, traumatic injuries and altered physical conditions represented almost 51% of all rural EMS transports. Future studies should evaluate data from emergency rooms matching EMS transports to determine if these conditions are related to preventable causes and whether public health interventions would be appropriate.

The dataset was limited to demographic characteristics and primary impressions recorded by EMP of rural EMS patients transported to the hospital. This limitation constrained our capability for conducting in-depth analyses to explain the findings.

## CONCLUSIONS

Additional information about the underlying causes of the characteristics of the rural EMS usage is needed.

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### Acknowledgements

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