

**Relationships Between Emergency Medical Services and Marginalized Communities:  
Disparities Across High- and Low-Income Areas in the United States**

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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## STS Research Paper

### Introduction to Disparities Between High- and Low-Income Communities

In emergency medical situations, the amount of time it takes emergency medical services (EMS) to respond to a distress call can mean the difference between life and death. In cases where the patients do survive, EMS response time (ERT) significantly impacts the severity of health complications the patients experience and the level of hospital care they require (Wilde, 2013). Based on that information, EMS should aim to provide the highest level of medical care in response to every distress call, yet studies have shown that ERTs in the United States vary greatly between high-income and low-income communities, with ERTs being up to 10% longer in the lower-income areas (Hsia et al., 2018). It is important to note that, the 2016 national “median household income for rural households was about 4% lower than the median for urban households” (Bureau, 2016), meaning that more rural areas across the United States were classified as low-income than urban areas. However, the previously noted 10% increase in ERT to lower-income communities does not refer to urban versus rural distress calls. This statistic refers to ERTs between high- and low-income neighborhoods within the same urban communities (Hsia et al., 2018).

It is reasonable that, on average, ERTs are longer to rural areas than to urban areas because they are typically located farther from EMS dispatch centers. However, it is unreasonable that there is a distinct difference in ERTs between high- and low-income neighborhoods within the same urban community, where the dispatch centers are not necessarily located significantly farther from one neighborhood than another (Kironji et al., 2018). The following STS research paper investigates this continued disparity in low-income communities through the lens of actor-network theory in order to answer the overarching research question: what is the sociotechnical

relationship between marginalized communities and emergency medical services in the United States?

### **Research Methods and Outline**

The research question is evaluated using three different methods: documentary research, discourse analysis, and network analysis. First, documentary research includes searching key words (e.g., EMS, response time, low-income, and mortality rate) to locate primary sources. These sources provide data on the relationships between different actors within the network that contribute to slow response times, impact the costs of medical care, and influence community health. Second, discourse analysis gauges community emotions surrounding interactions with EMS, primarily by evaluating threads provided by Twitter and Reddit users in order to locate discussions about the costs of EMS. These threads are located through searches using the key words “ambulance” and “cost.” Third, network analysis is included on the relationship network determined through the use of the STS framework actor-network theory (ANT). The combination of these three research methods provides an overview of the complex relationships between EMS and marginalized communities. The research paper is organized to first provide background on ERTs, the costs of healthcare, and actor-network theory. The results of the research paper then consider the connections between money and the EMS system, which is followed by a discourse analysis about the costs of medical care and a discussion of the effects of emergency response times. Those sections lead into the application of actor-network theory, which ultimately allows for the overarching research question to be fully addressed.

### **Emergency Response Time and the Cost of Healthcare**

When a distress call is placed, there is an expectation that EMS will provide the highest possible level of care, which includes a rapid response time. However, circumstances

surrounding each distress call often influence the ERT, making it difficult for EMS to ensure that all distress calls consistently receive the same level of care. For example, because rural communities are typically located farther from dispatch centers, there are different requirements in place for the amount of time it takes an ambulance to reach a rural versus urban location. While there is no single overhead agency that regulates EMS, there is generally an agreement amongst ambulance companies in regards to acceptable ERTs (Cordi & Goldstein, 2021). The expectations set by National EMS, a for-profit ambulance company, is that an ambulance should arrive to urban areas in less than 9 minutes, whereas an ambulance “should arrive in 13 minutes to rural areas” (Dowd, 2021). These standards show that EMS is able to recognize and accommodate the discrepancies in ERT based on location of the distress call when it is clear that distance to the scene contributes to prioritization of the patient. However, while the roughly 30% increase in ERT to rural locations is accepted by most EMS organizations (Cordi & Goldstein, 2021), the consistent 10% increase in ERT to low-income communities when compared to the ERTs experienced by high-income communities is a statistic that remains largely unaddressed (Hsia et al., 2018).

Additionally, the cost of healthcare is a common theme that disproportionately affects low-income communities, especially those who do not possess any form of health insurance. “In 2009, almost half of those who used a hospital [in the United States] said they went [to the hospital] because they had no other place to go for healthcare” (Amadeo, 2022), meaning that not only do low-income communities have limited access to primary care physicians to maintain good health, but that they also rely heavily on EMS. Therefore, the cycle of poor health contributing to a greater need for EMS in low-income communities is what drives this analysis involving both the costs of emergency healthcare and the factors influencing the overall ERT.

## **Introduction to Actor-Network Theory**

A wide variety of different components come together to influence the working EMS system, including ambulance staff, hospital availability, and patient location and condition. Therefore, actor-network theory (ANT) is an effective method for evaluation of the overall system. ANT is a framework that draws connections between different aspects of social and technological worlds, such as “governments, technologies, money, and people” (Cressman, 2009). The actors within a given network determined by ANT are simply different elements that interact with each other, meaning that the overall network is a series of interconnected actors. Bruno Latour, Michel Callon, and John Law worked together to form Latour’s Actor-Network Theory, which specifically refers to “every situation that occurs as a network composed of [actors]” (Quist, n.d.).

ANT provides an approach that advocates for “human and non-human entities [to be] treated equally for the purposes of analysis” (Rodger et al., 2009). One particular instance in which this has proven useful was during the establishment of a program focusing on researching the wildlife tourism industry. “The critical actors and descriptions of their actions” within wildlife tourism were identified in order to determine the direction of the wildlife tourism research program and if any particular negative impacts of the industry should be the focus of the research (Rodger et al., 2009). Some of the specific actors identified within the wildlife tourism network include tourists, tour guides and companies, modes of transportation, litter, the animals, and their environments (Rodger et al., 2009). Placing equal importance upon all of these actors allowed for an unbiased formation of the research program. ANT can be used similarly to inform the direction of research involving the EMS system.

While ANT is a theory that is applicable to many different sociotechnical questions, it has received some criticism for its lack of distinction between human and non-human actors (Sheldon, 2009). This indifference towards human actors versus all other actors in the network has been said to dismiss social factors, such as race, economic class, and gender (Pages, 2011). However, the main criticism of ANT is that the analysis is largely subjective (Sheldon, 2009), which contributes to how the human actors and any corresponding social factors within the network are interpreted and regarded. These criticisms are circumvented for a given network by including actors that specifically take social factors into account, such as income, neighborhood, age, and gender.

Therefore, ANT is effectively employed to evaluate the relationships between EMS and marginalized communities while considering components that influence social biases as non-human actors. The actors within the EMS network of interest are elements that directly influence ERT (e.g., distance to the patient, budgetary constraints, and first responder availability) and elements that affect the relationships between first responders and community members (e.g., median household income and race) (Dowd, 2021; Johnson, 2018). The analysis of these actors and how they interact with each other allows for the assessment of the relationships between EMS and marginalized communities.

## **How Do Different Components Affect the Sociotechnical Relationship?**

### *Summary and Outline of Results*

The sociotechnical relationship between EMS and marginalized communities requires improvement. This research identifies problems in ambulance billing practices, emergency response time inequality, and social biases surrounding low-income neighborhoods that disadvantage these communities when it comes to receiving affordable and timely emergency

medical care. In the following sections, data from Twitter and Reddit reinforces the idea that the public has negative views about the emergency services they have are provided, regardless of whether or not their individual interactions with EMS employees are positive. Actor-network theory connects the different factors that contribute to the strained sociotechnical relationship, indicating that the relationship is complex and there is no simple solution for improvement.

### *The Influence of Money on the EMS System*

Like many organizations within the United States, money plays a role in determining the quality of care provided by emergency medical services (EMS). This role is displayed in several different ways, including the budgeting for local hospitals, the existence of private ambulance companies, and the property taxes of local residents. Funding for hospitals not only affects the quality of care at the facilities, but it also determines which communities are granted easy access to healthcare. Specifically, hospital closures due to lack of funding have adverse effects on the surrounding communities and place a strain on EMS. While the closures do not necessarily have an impact on emergency response times (ERTs), they do result in an overall longer travel time from the location of the distress call to the nearest hospital (Miller et al., 2020). In rural areas that face hospital closures, patients experience the longer transport times in addition to the already elevated ERTs (Miller et al., 2020), making it more difficult to receive timely emergency medical care.

In urban locations, hospital closures disproportionately affect minorities, such as the African American community (Williams, 2019). In 2019, the Hahnemann University Hospital in Philadelphia, which had a mandate to “treat everyone who walks through its doors, the indigent as well as the insured,” was closed due to consistent monthly losses of over \$3 million (Williams, 2019). This closure led to many deaths that had been previously preventable as other

nearby hospitals attempted to absorb the misplaced patients but did not have the necessary capacity (Williams, 2019). Closures such as this more commonly occur in lower-income communities, as healthcare facilities in higher-income areas receive more adequate funding (Rau & Spolar, 2021). Similar to the effects seen with rural hospital closures, not only do the affected minority community patients require care from an entirely new facility and set of physicians, but they also experience longer transport times to the hospital. Therefore, communities that are already experiencing slower ERTs are also suffering longer trips before they can receive the comprehensive emergency treatment they require.

Several factors in addition to hospital closures, such as the use of private ambulance companies and the cost of property taxes, have been used to justify the current ERT disparities. Higher-income communities are willing and able to pay higher property taxes, so their households are, therefore, often matched with a “public good package” that includes EMS prioritization (Friedson, 2018). Additionally, private ambulance companies are more drawn to communities that can reliably pay for their services (Friedson, 2018), and these private equity-owned companies are “driving the cost curve” of ambulance fare (Webb, 2019). “Unlike many medical services, the patient is often exposed to the entire cost” of the treatment provided by an ambulance, regardless of whether it is privately or publicly owned (Webb, 2019). Data from the Centers for Medicare and Medicaid Services shows that ambulance costs remained around \$1,200 between 2010 and 2019 (Hurst, 2021). The reasons for such high costs of service are not openly disclosed to the patient, so while it is not easy to prove, patients are likely being overcharged (Webb, 2019). Patients with insurance typically pay \$40-\$100 of the total bill, while uninsured patients are largely tasked with paying the prices in full (CostHelper, 2021). Insurance requirements benefit patients who can afford health insurance, especially high-quality insurance,



and these patients typically belong to higher-income communities. At the same time, patients belonging to lower-income communities are either unable to pay the ambulance and other medical bills, or they go into debt doing so.

*Discourse Analysis: Evaluating EMS Discussions on Twitter and Reddit*

A discourse analysis using Twitter and Reddit locates discussions about the public opinion on ambulance prices and EMS. First, the key words “ambulance,” “cost,” and “don’t” are used in an advanced search on Twitter, which reveals a multitude of tweets from users stating that if they are in need of emergency medical care, they do not want an ambulance called for them. Rather, someone should call them a Lyft or an Uber. Other tweets state that the users are not able to afford both the cost of the ambulance and the medical bills that they would accrue at the hospital. One tweet, in particular, stands out: user @AndreaRovenski says, “My mom’s last words to me were ‘don’t call an ambulance, we can’t afford it’” (Twitter, 2020). People belonging to low-income communities are losing their lives over bills that they cannot afford to pay, and they would rather use a third-party transportation service than face EMS during an emergency that requires immediate treatment. Another search on Reddit using the key words “ambulance” and “cost” yields a subreddit started in December 2021 by a non-American user, @kirabera, who was confused about ambulance prices in the United States and how patients are able to get to the hospital if they cannot pay the cost. The initial question received over twenty comments detailing how patients are not tasked with paying the cost upfront, so they are forced to pay the bill at a later date. Several of the comments also mimic the discussion found on Twitter: Lyft and Uber are cheaper, more reliable options (Reddit, 2021).

The results of the discourse analysis reinforce the notion that lower-income communities are suffering when it comes to the costs of emergency medical care, and this is important because

the way people discuss their experiences on social media impacts their relationships. In this case, the public perception of their interactions with EMS affects the interpretation of their overall relationship with EMS by highlighting clear problems that are not openly being addressed.

### *Effects of Emergency Response Times*

As previously stated, there are clear differences in treatment of high-income and low-income communities that do not directly involve money, like emergency response times (ERTs). While it is understandable, and relatively expected, for rural communities to be subjected to longer ERTs, there are disparities seen in urban areas that need to be addressed. There is a 10% increase in the time it takes for EMS to respond to a distress call when it is placed from a low-income community versus a high-income community within the same urban area (Hsia et al., 2018). This ERT disparity is a problem that does not have one clear cause, but it does have many effects, one of them being the perpetuation of poor health in low-income communities. ERT contributes to the rates of health complications and mortality within any given community, especially in low-income communities where health issues are more prevalent (Hsia et al., 2018). In the case of out-of-hospital cardiac arrests, which are among the most common and most severe calls to EMS (Jordan, 2021), ERT has an influence over survival as well as the rate of hospital discharge in affected patients. Faster response times allow for quicker resuscitation and transportation of the patient, leading to a higher rate of patient discharge from the hospital with good outcomes (Bürger et al., 2018).

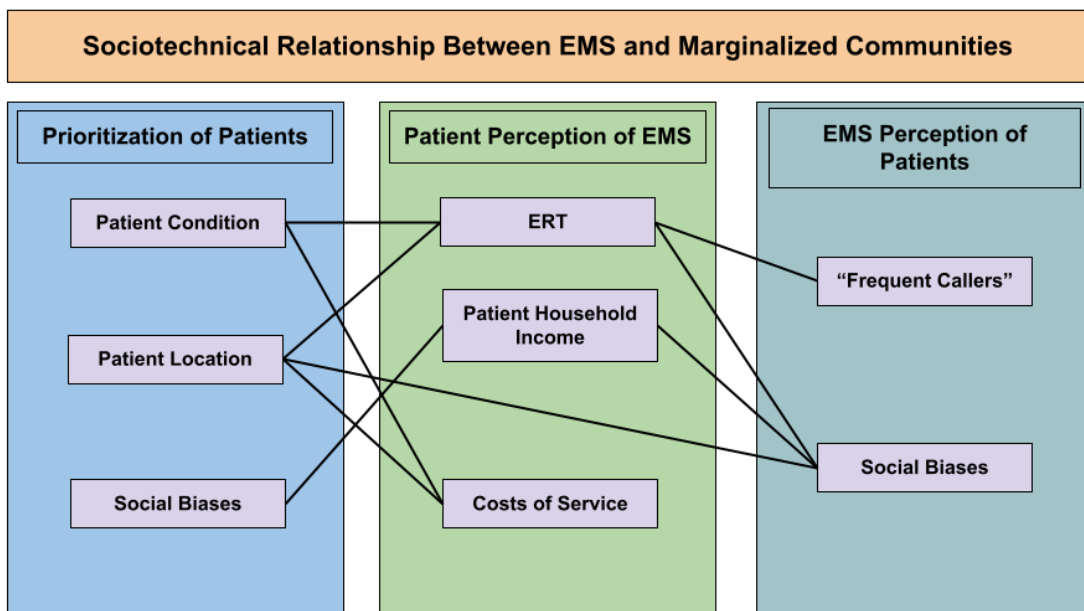
The variation in ERTs is often the direct result of the process by which EMS prioritizes the need of each distress call. The need is determined by factors surrounding the patient's condition as well as the first responders available within the area. With an industry-wide shortage of emergency medical technicians and paramedics, EMS availability is often limited,

which increases ERT (Wright, 2021). Other system-level factors that influence ERT include distance to the scene, time of day, previous workload, the skill set of responders present in the ambulance, hospital closures and delay times, etc. (Nehme et al., 2016). Using only these factors, ERTs should be relatively constant across all communities from the same region. However, the blatant disparity in ERTs between high- and low-income communities remains largely misunderstood and implies that there is a bias surrounding low-income communities present within the EMS system.

### *Analysis of the Sociotechnical Relationship Using Actor-Network Theory*

In addition to the previously outlined factors affecting the relationship between EMS and marginalized communities, there are less-concrete components that are not as commonly addressed but likely contributors to the relationship. These components are biases toward patient characteristics, such as race. In many of the disparities involving low-income communities, race is at the forefront of the conversation, yet it is difficult to label it as a definitive cause for the disparities. Rather, inferences have to be made about the racial biases within EMS and the subsequent patient treatment. These inferences are based on how EMS reacts to and treats incidents involving patients with diverse backgrounds, and they are made using references such as ERTs in low-income neighborhoods, costs of emergency medical care, and the Hahnemann University Hospital closure. In New York City, specifically, poor access to timely and affordable medical care perpetually contributes to poor health in low-income neighborhoods that are primarily composed of minority groups. The need for accessible medical care in these communities is so dire that “eliminating [the] health disparities in New York City would save thousands of lives each year” (Frieden & Karpati, n.d.).

Eliminating all health disparities is not something that has one simple fix or can be done quickly. It is a process that takes a lot of time and requires changes to a multitude of policies and practices as well as unlearning implicit and explicit biases toward marginalized communities. This process begins by understanding how all of the factors affecting the overarching relationship between EMS and marginalized communities are connected to one another. Therefore, actor-network theory (ANT) is necessary to visualize how the EMS system interacts with minority groups and vice versa. Figure 1 draws connections between the prioritization of patients, the patient view of the EMS system, and the view that EMS has of the patients placing each call (Luckinbill, 2022). Within the EMS perception category of the figure, there is a component labeled “Frequent Callers,” which addresses patients, mostly stemming from elderly and low-income communities, who frequently place distress calls for minor incidents or incidents that do not require emergency medical care. EMS views these calls to be taking away from more important, high-stakes emergencies (Cannuscio et al., 2016).



**Figure 1. A visualization of the actors within the network that determines the sociotechnical relationship between EMS and marginalized communities.** The network consists of three main categories that influence each other: patient prioritization, patient perception of EMS, and EMS perception of the patients. Each of those categories contain actors that interact with one another and impact not only the level of care a patient receives, but the overarching relationships between the people and the system who are involved with each interaction.

Indicated in Figure 1 (Luckinbill, 2022), the sociotechnical relationship is formed out of complex connections between the wide variety of different actors established in the above sections of this paper. It is important to note that many of the actors within the EMS network are non-human actors, each affecting the level of care a patient receives based on the social biases present in the EMS system and the first responders themselves. As mentioned previously, non-human actors are regarded equally compared to human actors when using ANT. The human actors in the EMS network, namely the first responders, are interacting with the non-human actors (e.g., patient location, patient household income, and patient condition) by exerting their social biases while assessing the situation. There are many opportunities for social biases to be enacted throughout the decision-making processes of an EMS response. Any action, automated or not, can be subjected to bias: the EMS evaluation of patient condition, the decision to tend to one patient over another if there are multiple calls placed at the same time, the urgency with which EMS responds, etc. These non-human actors must be considered with importance when evaluating the relationship between EMS and marginalized communities because they influence each component of the network.

Based on the information and analysis presented, it is determined that the sociotechnical relationship between EMS and marginalized communities is strained. While not all individual interactions between EMS workers and minority patients are negative, there are barriers within the EMS system that continually disadvantage patients from low-income communities while simultaneously providing advantages to high-income communities. This means that there are still underlying systemic biases within the United States EMS system and that the United States is far from providing equitable healthcare to marginalized communities. These healthcare barriers need

to be addressed and improved upon in order to enhance the medical treatment of minority communities and allow them to better rely on EMS.

### *Research Limitations and Next Steps*

There are a few factors that limit the research presented in this paper. For example, there is not much available data relating ERT to prioritization procedures and virtually no data relating ERT to social factors. ERT resulting from prioritization has to be extrapolated based on prioritization criteria, and social factors must be identified through observable EMS trends, such as the longer ERTs to low-income communities and the resulting transportation and medical bills. In order to further this research, data should be collected to draw more concrete connections between EMS and their social biases. Surveys highlighting possible generalizations about marginalized communities and the EMS treatment they are given should be distributed to EMS employees to determine why low-income communities receive different responses than high-income communities. Similar surveys should be distributed to both high- and low-income communities to better gauge the differences in their perspectives on the emergency medical services they receive. Based on the information from the surveys, new additions or adjustments to EMS policies and training programs should be made to address biases and ensure that low-income communities are granted the same emergency medical care opportunities that are afforded to high-income communities.

### **Conclusion: The Sociotechnical Relationship Requires Improvement**

Ultimately, this research and ANT analysis identifies tension in the sociotechnical relationship between EMS and marginalized communities. There are compounding effects of hospital closures, ambulance costs, and social biases that cause low-income neighborhoods to experience lesser emergency medical care than high-income neighborhoods. This research is

important not only because it brings attention to the disparities minority communities face within the greater healthcare industry, but also because it leads to a discussion about relationships that can be improved. While it is a difficult and complicated process, systemic biases in the United States must be evaluated and eliminated, especially as they relate to healthcare. EMS should strive to treat all communities with the same level of respect, and that includes responding to all distress calls with the same urgency regardless of race, household income, or location.

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