Rural Communication Study

Focus on Dooly County, Georgia

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A Research Paper Submitted to the School of Education and Behavioral Sciences

Middle Georgia State University

In partial fulfillment of the requirements for the degree of

DOCTOR OF SCIENCE IN PUBLIC SAFETY

Macon, Georgia

December 2025

Abstract:

Bridging the Communication Divide: Rural Emergency Infrastructure in Dooly County, Georgia

The initial minutes of an emergency are often the most critical for ensuring survival, reducing the severity of injuries, and minimizing long-term structural and economic damage. Whether dealing with natural disasters, public health crises, or individual medical emergencies, one constant remains: the need for reliable, time-sensitive communication. Timely coordination among emergency responders—including emergency medical services (EMS), fire departments, law enforcement, and auxiliary personnel—is essential for efficient intervention. However, in rural and geographically isolated regions like Dooly County, Georgia, systemic communication failures significantly delay emergency response efforts. Even a few minutes of delay caused by poor communication infrastructure can result in preventable fatalities—particularly in cases involving cardiac arrest, stroke, trauma, or other medical crises where rapid treatment is essential (Horney et al., 2016).

Modern emergency response systems depend heavily on advanced technologies and stable communication networks to coordinate operations effectively. Unfortunately, the communication infrastructure in rural areas is often outdated or insufficient. Unlike urban centers that have benefitted from years of consistent investment in broadband and cellular networks, rural communities have frequently been overlooked in both public and private infrastructure planning. This digital divide exacerbates vulnerabilities in times of crisis, leaving millions without reliable access to emergency services when they need them most (Federal Communications Commission [FCC], 2023). In counties like Dooly, where access to modern

digital tools is limited, response teams face significant barriers in dispatching services, coordinating personnel, and triaging patients during emergencies.

The limitations faced by rural responders go beyond individual technical issues. They reflect broader systemic inequalities in infrastructure development and emergency preparedness. The case study of Dooly County, located in Georgia—a state where approximately 75% of counties are classified as rural (Sizemore, 2024)—highlights the compounding factors that contribute to this disparity. These include underinvestment in high-speed internet infrastructure, inadequate mobile network coverage, and a chronic shortage of emergency service resources. As populations grow and environmental threats intensify, these shortcomings become increasingly unsustainable.

To illustrate these communication barriers, this study incorporates Geographic Information System (GIS) mapping as a core analytical tool. GIS mapping allows for the identification of "dead zones"—areas with little or no cellular signal—making it a valuable resource for understanding where coverage gaps coincide with high-risk zones. In Dooly County, GIS-based analysis reveals that several regions have virtually no mobile connectivity, leaving them functionally invisible to emergency dispatch systems. According to Kaplan et al. (2018), these dead zones dramatically increase emergency response times and decrease the likelihood of positive outcomes. More than just data points, these delays reflect lives at risk and communities unsupported during critical moments.

Further compounding the issue is the lack of interoperability between emergency response departments. In many rural settings, separate communication systems are used by police, EMS, fire departments, and public health officials, creating silos that hinder effective collaboration. An integrated, interoperable system that enables real-time information sharing

across departments would significantly improve the efficiency and coordination of emergency response efforts. Altevogt et al. (2011) argue that such integrated systems are no longer optional but essential for building resilient emergency infrastructures, particularly in underserved areas.

The case of Dooly County illustrates the urgent need for investment in next-generation communication infrastructure, including 5G connectivity, satellite-based internet services, and Next Generation 911 (NG911) systems. These technologies have the potential to transform rural emergency response capabilities by improving the speed, accuracy, and reliability of communication under pressure (National Emergency Number Association [NENA], 2022). Furthermore, integrating these technologies into local emergency protocols requires collaboration between government agencies, telecommunications providers, and community organizations.

Public-private partnerships can be especially valuable in overcoming the financial and logistical hurdles associated with rural infrastructure expansion. By combining public funding with private sector innovation and technical expertise, joint ventures can extend high-speed internet and cellular service into areas that have traditionally been considered too remote or economically unviable. According to Morrow et al. (2017), such partnerships have already shown success in parts of rural America, with measurable improvements in emergency service delivery and overall community safety.

It is also critical to address the allocation of state and federal resources. Often, funding mechanisms are population-based, which inherently disadvantages sparsely populated rural areas. Instead, resource allocation should consider geographic vulnerability, existing infrastructure conditions, and response time disparities. Targeted public investments—specifically those aimed at modernizing rural communication infrastructure—are needed to level

the playing field. This includes the construction of cellular towers, the expansion of broadband fiber networks, and the upgrading of emergency dispatch systems to support digital communication platforms.

Beyond technological improvements, community resilience also depends on preparedness training, public education, and the integration of local knowledge into emergency planning. In many rural areas, first responders are volunteers who may not have consistent access to the same training or equipment as their urban counterparts. Strengthening training programs and ensuring interoperability between jurisdictions can empower rural responders and reduce the response gap. Bissell et al. (2017) note that community-based preparedness efforts play a vital role in disaster response outcomes, especially when formal infrastructure is lacking.

As an example, the communication challenges in Dooly County are emblematic of a broader national issue—one in which rural communities are consistently underserved in emergency response infrastructure. This study emphasizes four primary areas of concern that need to be addressed:

Cellular “dead zones” that impede communication during emergencies, identified through GIS analysis.

Rural resource allocation that fails to prioritize underserved areas for communication infrastructure upgrades.

Integration of real-time data and interoperable systems to enhance coordination and situational awareness.

Public-private collaboration to implement innovative technologies such as 5G, NG911, and satellite internet.

Bridging the communication gap in rural areas is not just a technological imperative—it is a moral and public health necessity. The disparities between rural and urban emergency capabilities highlight the consequences of long-standing neglect and the importance of targeted, inclusive planning. The case of Dooly County shows that with the right data, community engagement, and strategic investment, meaningful progress is not only possible—it is urgent. Ensuring that every American, regardless of zip code, has timely access to emergency services must be a central goal of infrastructure policy moving forward.

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Chapter 1: Introduction:

Dooly County, located in south-central Georgia, exemplifies the communication and infrastructure challenges faced by rural communities across the United States. With a population of just under 11,000 spread across 392.6 square miles, it ranks as the 59th largest county in Georgia, yet remains sparsely populated. Like much of rural Georgia—where approximately 75% of counties are classified as rural (Sizemore, 2024)—Dooly County contends with persistent barriers to effective communication, especially during emergency situations. These barriers are not simply inconvenient; they present critical risks to public health, safety, and overall emergency preparedness.

Rural areas like Dooly County often struggle with aging infrastructure, geographic isolation, and limited access to advanced communication technologies (Anderson & Gao, 2022). These systemic issues impair the effectiveness of emergency response systems, which depend on reliable, interoperable communication networks. For example, first responders frequently encounter delays or lapses in communication when coordinating across county lines with neighboring jurisdictions such as Houston, Pulaski, Wilcox, Crisp, Sumter, and Macon counties—each facing similar rural infrastructure limitations (Kaplan et al., 2018). The lack of integration across systems undermines collaborative disaster response, and without significant upgrades, these vulnerabilities will likely persist.

The Dooly County EMA communication system reflects a multi-layered, redundant strategy designed to ensure wide dissemination of emergency information to both the public and internal response partners. At its core, the system incorporates mass-notification (public alert)

services, primary emergency-call dispatch (911), integration with state and federal networks, field radio communications, and social-media channels for public messaging.

Public Alert / Mass-Notification Service (CodeRED)

One key element is the use of the automated citizen-notification platform CodeRED. Dooly County encourages residents to register their phone numbers, e-mail addresses, or text-notification preferences via the county website (Dailey,1985) CodeRed is a high-speed emergency notification system used by local governments to quickly alert residents of time-sensitive information. In a rural context, this system is especially useful for delivering alerts about emergencies like wildfires, floods, or missing persons, which may affect more remote areas and require immediate action. Citizens must typically register their contact information for the service, but some systems may allow them to text a keyword to a specific number to sign up. By allowing citizens to proactively enroll, the agency facilitates a direct line of communication that complements passive alert mechanisms (e.g., sirens or broadcast). In effect, CodeRED serves to broadcast condition-specific warnings (such as severe weather, evacuation orders, or shelter-in-place instructions) to those registered, thereby expanding the reach of emergency messaging beyond immediate broadcast media.

911 Dispatch Integration

Another essential component of the system is the connection to the regional 911 dispatch infrastructure. The Middle Flint Regional 911 Authority covers Dooly County as the 911 center, which operates under an agreement between local governments and regional communication agencies to cover the following eight counties: Macon, Marion, Schley, Sumter, Talbot, Taylor,

and Webster. The 911 center coordinates responses among sheriff's offices, fire-rescue services, and other first-responders. Integrating this dispatch network into the EMA communication system ensures that the agency can monitor real-time incident activity, feed forward relevant situational information, and trigger public alerting as appropriate.

State and Federal Alert Network Integration

Dooly County's EMA communications also link into broader state and federal alert networks. At the state level, the Georgia Emergency Management and Homeland Security Agency (GEMA/HS) outlines the interplay of the Emergency Alert System (EAS) and the Wireless Emergency Alerts (WEA). The EAS is the broadcast- and cable-television–based framework through which state authorities can deliver emergency instructions to the public via TV and radio networks. GEMA/HS describes EAS as a formal mechanism for the broadcast industry to plan for and disseminate messages during emergencies (GEMA/HS, 2025). Likewise, WEA allows government alerting authorities to send geographically limited emergency messages directly to mobile carriers, delivering alerts to mobile phones without the need to download an app or subscribe to a service (GEMA/HS, 2025). Additionally, the National Oceanic and Atmospheric Administration (NOAA) Weather Radio All Hazards provides continuous hazard and weather-warning broadcasts that local EMAs often monitor and incorporate into their alerting strategies (GEMA/HS, n.d.). By tapping into these networks, Dooly County's EMA benefits from upstream feeds of hazard information, alert templates, and nationwide alerting capability—thus ensuring compatibility with standard protocols and wider reach in a large-scale event.

Public Safety Radio/Field Communications

Within the agency's own operational infrastructure, the EMA relies on public safety radio systems used by local law-enforcement, fire, and emergency-medical services. These systems enable real-time coordination in the field, dissemination of tactical updates, and forwarding of incident information back to the EMA and dispatch centers. While specific models and frequencies for Dooly County were not identified in publicly available sources, the use of structured radio communications is consistent with standard county-level emergency management practices (Pre-Disaster Mitigation Plan, Dooly County, 2023).

Social Media and Additional Communication Platforms

Finally, the EMA recognizes the role of social media and digital platforms (e.g., a county Facebook page) as supplementary channels for public messaging. For example, during a fire incident, Dooly County EMA posted updates and acknowledgments on social media to inform residents and express community gratitude (WMGT-DT, 2025). While social media is not a primary alerting mechanism (given its reliance on citizen engagement and internet access), it provides an effective means for situational updates, community engagement, transparency, and follow-up information (e.g., shelter locations, recovery resources).

Holistic System Benefits and Considerations

The integration of these components yields several benefits. First, redundancy: by using multiple platforms (phone/text via CodeRED; TV/radio via EAS; mobile via WEA; NOAA Weather Radio; field radios; social media), the EMA increases the likelihood that citizens and responders receive the message through at least one channel. Second, scalability: the system can

address small localized incidents (e.g., a fire or structure collapse) as well as large-scale regional hazards (e.g., severe storms) by leveraging state/federal networks. Third, coordination: linking the EMA with dispatch, radio systems, and state networks improves situational awareness and reduces delays between detection, decision, and communication.

However, certain considerations remain. Citizen enrollment in the notification system (e.g., CodeRED) requires proactive registration; coverage gaps may exist for unregistered residents. Field radio systems and public alerting may face limitations due to geography or equipment failures (particularly in rural counties). Also, social media communications depend on citizen access to internet-enabled devices and platforms. Finally, the EMA must continually test, train, and update its communications infrastructure, ensuring compatibility with evolving standards (such as newer alert technologies) and maintaining public trust in the system.

In sum, Dooly County's EMA communication system exemplifies a best-practice approach to emergency communications at the county level: blending citizen notification systems, integration with 911 dispatch, leveraging state/federal alert networks, supporting first-responder coordination via radio, and engaging the public through digital channels. This comprehensive architecture positions the agency to inform residents effectively and coordinate with state and local partners during emergencies.

First responders in Dooly County, Georgia, consistently voice concerns about the severe communication limitations affecting emergency preparedness and response. Located in a predominantly rural region, Dooly County lacks the digital and telecommunications infrastructure necessary to support efficient and timely emergency communication. As a result,

local emergency personnel face frequent delays in relaying critical information, coordinating with other agencies, and accessing reliable dispatch support (Perrin & Tierney, 2019).

Additionally, responders have expressed concern over the county's inability to implement Next Generation 911 (NG911) systems. These systems enable the transmission of texts, videos, and images during emergencies—critical capabilities in areas where voice calls are unreliable or impossible. Without NG911, dispatchers are limited in the information they can receive, forcing responders to arrive on scene without full awareness of the situation (National 911 Program, 2020).

Another concern relates to training and preparedness. Many responders in Dooly County are part-time or volunteer workers who receive minimal training in modern communication tools. As advanced systems are introduced, the lack of consistent education and drills leaves first responders underprepared to use these technologies effectively (Smith & Thompson, 2019). Qualitative interviews with rural EMS and fire personnel highlight a widespread feeling of being left behind in the state's broader push toward technological modernization.

Overall, first responders in Dooly County emphasize the urgent need for infrastructure upgrades, interoperability planning, and recurring training to close the communication gap. These issues must be addressed through localized policies and funding that recognize the unique challenges rural communities face in public safety communication.

In many rural communities, fire departments rely heavily on local residents for funding and support, while those residents in turn depend on the department to provide quality fire protection. This inter-dependent relationship is framed by the rating system of the Insurance

Services Office (ISO). The ISO assigns a Public Protection Classification (PPC) score from 1 to 10 to a community's fire-suppression capabilities—taking into account dispatch/communications, the fire department itself (equipment, staffing, training) and the water supply infrastructure (ISO, 2025). According to ISO, "Class 1 generally represents superior property fire protection, and Class 10 indicates that the area's fire-suppression program does not meet our minimum criteria." (ISO, n.d., "PPC Program" section).

A lower PPC score (for example Class 1) signifies a higher level of fire protection and frequently is linked to lower insurance costs for homeowners or businesses (Johnson and Wang,2021). Thus, for rural fire departments, the circle of support is: residents provide funding → department provides protection → ISO rating reflects that protection → which influences insurance premiums for the residents. When the department's capabilities are strong, the community benefits; when they are weak, everyone is at risk.

Within the PPC evaluation, one of the critical elements is the communications system of the fire department and its interaction with dispatch/telecommunicators. The PPC evaluation weights communications (emergency reporting, telecommunicators, dispatch circuits) at 10% of the total classification, with the fire department capabilities at 50%, and water supply at 40% (Storey Fire, 2025.; Fire Engineering, 2017). Communications are vital because without reliable alerting, dispatching, and linking with responding units, even well-equipped departments may struggle to provide effective protection.

In rural settings, communications can pose particular challenges. Many departments use either Very High Frequency (VHF) or Ultra High Frequency (UHF) radio systems. UHF systems are better at penetrating obstacles such as walls and concrete due to their higher frequency; VHF

signals, having lower frequency, generally travel farther in open outdoor environments. In a multi-county rural region, if one county's fire department or emergency dispatch operates on VHF and a neighboring county uses UHF, interoperability becomes difficult. Radios from different vendors (e.g., LT Harris, Motorola, Kenwood) may not communicate directly with one another, so fire agencies may be unable to talk across county lines or with other agencies (police, public works) within their own region. This lack of interoperability undermines the department's ability to respond effectively, especially when mutual aid or multi-agency coordination is required.

In addition to cross-agency communication mismatches, many rural agencies lack effective backup systems. If a community's primary radio antenna (whether VHF or UHF) fails, responders may be forced to rely on mobile phones—assuming there is cellular service in the incident area. This dependency is precarious because in remote settings cell coverage may be absent or unreliable. Such failures in communication capability can degrade response times, reduce coordination, and ultimately impact the fire department's ability to respond—and thus negatively affect the PPC rating under the communications category.

Given this context, rural fire departments face a significant operational challenge: they must maintain or improve their ISO PPC rating in order to keep insurance premiums reasonable for their residents, support funding from the community, and sustain trust. However, communications gaps (radio channel mismatches, vendor incompatibility, lack of backup systems) present a recurrent weak point. Because the ISO rating is in part determined by the effectiveness of the communications/reporting/dispatch systems, rural departments unable to

demonstrate reliable interoperability may be penalized (Storey Fire, 2025.). Consequently, the circle of support between residents and the department may be threatened.

In conclusion, rural fire departments are in the unique position of being funded by their communities and providing an essential public service that also impacts those same communities' insurance costs. The ISO PPC rating system codifies this relationship through a measurable evaluation of fire protection capabilities, including communications, equipment, training and water supply. In rural regions, communications mismatches between VHF and UHF systems, vendor incompatibility, and lack of redundancy undermine response capability and thus threaten the PPC rating and by extension the affordability of insurance for residents. Addressing these communications and interoperability issues is therefore not just a technical matter—but a financial and community-trust matter as well.

The increasing frequency and intensity of climate-related disasters, including hurricanes, wildfires, and flooding, further strain rural emergency response systems. As climate change accelerates and urban populations expand into peri-urban and rural areas, the need for robust and adaptable communication infrastructure becomes more urgent (Chan et al., 2021). Natural disasters often reveal the weakest links in emergency communication, leading to loss of life, delayed evacuations, and overwhelmed medical systems (Bissell et al., 2017). In such scenarios, inadequate systems in counties like Dooly leave residents particularly vulnerable.

Another compounding issue is the digital divide that continues to limit broadband access and cellular coverage in rural areas. Without reliable high-speed internet or mobile networks, rural residents may not receive timely emergency alerts, while emergency responders may face difficulty coordinating across platforms (Anderson & Gao, 2022). These issues are further

exacerbated by a lack of public trust in communication systems, especially when communities feel excluded from the planning process (Kaufmann et al., 2021). When public communication strategies fail, individuals are more likely to turn to informal or inaccurate information sources, which can compromise safety during emergencies.

Training and preparedness are also critical concerns in rural counties. Emergency response personnel in rural areas often have fewer resources and less access to continuing education or specialized training compared to their urban counterparts (Henry et al., 2022). This disparity contributes to a slower and less coordinated response to disasters. Additionally, the challenge of retaining skilled professionals in rural health and emergency services further weakens infrastructure and response capacity (Horney et al., 2016).

Efforts to address these challenges must be multifaceted, involving both technological innovation and community engagement. For instance, GIS mapping and network analysis tools can support better planning for emergency communication in geographically dispersed areas (Kaplan et al., 2018). Similarly, local disaster risk reduction initiatives—such as volunteer responder training and community-based planning—can foster resilience and trust at the community level (Chan et al., 2021). However, for these efforts to be effective, they must be supported by state and federal investments that prioritize the unique needs of rural counties.

Ultimately, improving emergency communication in Dooly County and similar rural communities requires a systems-thinking approach—one that acknowledges the interplay between infrastructure, social trust, public health, and environmental risk (Kaufmann et al., 2021). Without such an approach, the vulnerabilities that currently exist will only deepen in the face of growing environmental and demographic pressures.

Despite ongoing advancements in emergency communication technologies, rural regions in Georgia remain burdened by outdated or incomplete infrastructure. The challenges in Dooly County, such as unreliable broadband access, limited cellular coverage, and minimal digital emergency coordination, are emblematic of broader statewide and national issues. These deficiencies continue to hamper effective emergency responses and delay critical aid during disasters. This paper argues that targeted investments in broadband and cellular expansion, coupled with the deployment of interoperable emergency systems, are essential to improving emergency response outcomes and ensuring public safety equity across rural and urban areas in Dooly County.

Historically, rural Georgia's emergency communications infrastructure has consistently lagged behind urban centers. In the early 20th century, local emergency services in counties like Dooly were often volunteer-based, lacking basic radio equipment and formal coordination protocols (Bissell et al., 2017). The introduction of 911 systems in the latter half of the century improved emergency accessibility, but rural implementation was slow due to infrastructure costs and inadequate funding mechanisms. While urban areas quickly adopted cellular and digital communication technologies in the 1980s and 1990s, rural deployment was hindered by the high cost of development and sparse population density, which disincentivized private-sector investment (Kaplan et al., 2018).

Today, the digital divide continues to manifest in tangible consequences. Many residents in Dooly County and surrounding rural communities still face significant challenges in accessing high-speed internet or reliable mobile networks (Morrow et al., 2017). These gaps are particularly perilous during natural disasters—floods, hurricanes, wildfires—that have become

more frequent and destructive due to climate change. Without stable communication networks, emergency services are slowed, critical updates fail to reach vulnerable populations, and coordination among responders breaks down (Fourati et al., 2022; Chan et al., 2021).

Moreover, rural healthcare systems remain underfunded and technologically under-equipped, limiting their ability to manage surge events or mass casualty incidents (Smith & Thompson, 2019; Lloyd, 2023). For example, rural emergency departments may be unable to communicate with EMS units in real time or access patient data during transport, complicating triage and treatment. While mobile telemedicine systems such as PAVES have begun to bridge this gap in rural Georgia, they rely heavily on consistent connectivity, which is still lacking in many areas (Kobus, 2025).

In response to these ongoing disparities, both federal and state agencies have launched initiatives to enhance rural connectivity. Programs like the Rural Digital Opportunity Fund (RDOF) and the Emergency Connectivity Fund aim to extend broadband infrastructure and digital tools to underserved communities (Morrow et al., 2017). In Georgia specifically, the Broadband Infrastructure Program and the statewide rollout of Next-Generation 911 (NG911) represent major steps toward more integrated emergency communications. NG911 systems enable the transmission of multimedia—such as images, text, and video—during emergency calls, vastly improving situational awareness for dispatchers and first responders (Kaplan et al., 2018; Buchanan et al., 2023).

However, implementation of these systems remains uneven. Counties like Dooly often lack the technical expertise and financial capacity to upgrade outdated systems, apply for grants, or maintain new technologies. Workforce shortages in public safety communications further

impede progress (Bissell et al., 2017; Henry et al., 2022). Moreover, rural counties frequently depend on short-term funding cycles, which hinder long-term planning and sustainability (Powell & Sanyal, 2022).

Positive developments have emerged in the form of public–private partnerships (PPPs), which bring together local governments, telecommunications providers, and emergency management agencies to pool resources and expertise (Powell & Sanyal, 2022). These partnerships have been effective in piloting rural broadband projects and expanding GIS-based tools for emergency response planning (Gunes & Kovel, 2000; Kostelnicka et al., 2024). GIS and remote sensing technologies help identify infrastructure vulnerabilities, improve disaster preparedness, and optimize emergency response routes—particularly important in geographically large and dispersed counties like Dooly (Siebeneck et al., 2019; Park et al., 2024).

At the national level, recent Supreme Court cases may reshape the future of rural telecommunications funding. In 2024, the U.S. Supreme Court heard arguments in two cases—FCC et al. v. Consumers' Research and Schools, Health & Libraries Broadband Coalition et al. v. Consumers' Research—that question the constitutionality of the Universal Service Fund (USF), an $8 billion program used to support communications in underserved areas (Supreme Court Docket Nos. 24-354 & 24-422). The outcomes of these cases could either safeguard or dismantle a critical funding stream for rural broadband and emergency communication infrastructure, with significant implications for counties like Dooly.

In sum, while technological innovation and policy support are beginning to address the rural–urban communication gap, much work remains. Communities like Dooly County face an urgent need for strategic investment in communication networks that ensure their residents

receive the same level of emergency protection as urban populations. Expanding broadband and cellular infrastructure, deploying interoperable NG911 systems, and strengthening public–private partnerships are essential next steps. Without sustained attention and resources, the communication gap will persist—perpetuating inequalities in emergency response capabilities and endangering the lives of rural residents.

Chapter 2: Literature Review:

Effective resilient infrastructure with reliable, constant emergency communication is critical to routine and disaster preparedness response, particularly in rural areas that face technological limitations and systemic underinvestment. With geographic isolation, residents in rural communities face emergency preparedness challenges due to technological limitations, infrastructural. A multidisciplinary body of literature has examined these challenges from a wide perspective encompassing healthcare, communication vulnerabilities with the digital divide, emergency management, funding, and Global Information Systems-based modeling. The growing body of research highlights the critical influence of rural response and the role emergency planning plays in these communities. This review synthesizes aspects of key findings used towards highlighting the opportunities elaborated on for improving rural emergency readiness through technological integration and potential communication reforms within Dooly County, Georgia.

Healthcare

Lloyd (2023) integrates the relationship of the need for rural healthcare communication through the analysis of how collaborative systems in rural hospitals intermix before, during, and

after disasters. His dissertation highlights the case between urban and rural systems in inter-agency coordination, their service training, infrastructure, and their relation to reliable communication systems. The identified deficiencies uniformly resulted in the delay in response times, the lack of ability to conduct data sharing from field to hospital and diminished the overall patient's healthcare outlooks. Lloyd divergences of information elaborate on the ramifications of the outcome of patient care without community investment for integrated technologies for mutual aid with standardized protocols allowing for emergency planning within any area's emergency management systems.

The substandard services within rural health systems compound the vulnerabilities faced in rural communities. The public health emergency preparedness is considered for rural communities through the study of assets found in Horney, MacDonald, and Parrish (2016). They bring to light how understaffed and struggling rural health systems respond as underfunded entities within public health crises. A correlated work is seen through advocacy for evidence-based emergency planning within the similar work of Bissell et al. (2017), data mining. Their work demonstrates the ramifications of the lack of allocation within rural communities. Within their work, the suggestion is made for the action implementation within the rural communities to ensure planning is tailored for community safety through more efficient emergency response delivered with a faster lead time.

Communication Vulnerabilities and the Digital Divide

A key hinge point within rural emergency preparedness correlates with the chasm of a digital divide that binds the capabilities of responders' communication throughout normal and disaster response in urban areas. Anderson and Gao (2022) present that within rural

communities, there is diminished access to infrastructure, providing inadequate internet connectivity. The need to address communication vulnerabilities in rural environments was emphasized throughout their study of public health crises and natural disasters. Kaufmann, Schäpke, and Wiek (2021) expand on the major concern for the lack of trust in the communication infrastructure due to the lack of reliable support systems and the evident Swiss cheese of misinformation that leads the disenfranchised to make uninformed decisions resulting in delayed response actions.

The Next Generation 911 (NG911) operation for emergency management in rural areas is hindered by unique communication challenges, which limit the ability of rural community leaders to protect community safety. With its incorporation of methods that include text, image, and video transmission, critical in areas with limited voice connectivity (National 911 Program, 2020) is hampered by cost for rural administrations. The ability for rural communities like Dooly County, Georgia, to obtain the NG911 is also hampered by the combination of technological infrastructure gaps, geographical isolation, and limited resources. The example of innovative services through NG911, such as the possibility of improved emergency management in rural environments, could enhance coordinated response efforts and the greater dissemination of public information.

Community communication with NG911 can only work with the community involvement described in Chan, Lam, and So's (2021) argument for community-based disaster risk reduction (CBDRR), where local resilience is built as a recurring theme across the community. Their stressing of the need for local participation provides a quality analysis for communities to function during and post recovery from disasters. The community resilience is impacted by

stakeholders that are active within the area, rather than the passive requesting aid. Through their bottom-up primary quality approach, there is an immediate rebound for institutional support within rural settings despite their limited capabilities.

Emergency Management

To enhance preparedness and recovery through advanced data analysis and mapping, speedier response capabilities, and improved emergency management in rural communities, geospatial technology augmentations are necessary. “Quantification of Loss of Access to Critical Services during Floods in Greater Jakarta: Integration of Social, Geospatial, and Network Perspectives” presents a focused study on the metropolitan area infrastructure vulnerability following floods, while offering a demonstration of the promising tools for addressing some of these deficiencies. Although their research is urban-focused, Kiparisov and Lagutov (2024) propose a Global Information Management- and network-based framework for evaluating critical infrastructure accessibility and resilience. Their methodology uses graph theory and spatial analysis to simulate service disruption scenarios, identifying weak nodes and proposing interventions. This approach, though designed for cities, can be adapted for rural settings where infrastructure is sparse and vulnerable to natural hazards.

Emergency management is only as effective in a disaster as it is trained at times of normalcy. Henery, Jordan, and Schroeder (2022) performed an analytical review identifying the key hindrances, including funding, the lack of facilities for training, and isolation by rural geographic sites, that contribute to the inability to retain qualified emergency personnel and diminished training in rural areas. The consideration of building a more normative sustainable

workforce within rural communities remains a major hurdle, resulting in the decrease of the emergency workforce within communities.

Global Information Systems-Based Modeling

Similarly, the GEMAR system—a web-based emergency management Global Information System (GIS) tool that provides for emergency management and ambulance routing—demonstrates how technology can enhance response times by integrating real-time geospatial and road network data (Utami, I. Q., & Ramdani, F., 2022). Through the reporting subsystem, helping collect emergency information in urban areas using geocoding and geolocation functions, users are able to improve optimal route management for pick-up operations and selection of the nearest hospital for patient delivery coordination. In rural areas where emergency transport can take significantly longer, such optimization can have life-saving implications. The use of GIS for dynamic route planning aligns with Gunes and Kovel's (2000) Work on the Use of Geospatial Tools in Emergency Management, which serves as a foundational work on GIS as a decision-support system for emergency operations. Their work demonstrates the life cycle potential in emergency management for lifesaving, limiting damage, and reducing the cost for rural managers.

GIS mapping, combined with sensor-based communications, is being employed in urban city centers as an enhanced, innovative technology that comprises wireless ad-hoc networks. Channa and Ahmed (2010) combine their leveraged shared knowledge to entwine the exploration of how emergency communication networks with disaster-prone areas can be supported by real-time coordination through wireless mesh communication systems. They highlight the security vulnerabilities of not implementing these successful systems in potentially vulnerable rural

systems. Their comments are demonstrated through Kaplain, Frischmann, and Simmons' (2018) work, where they demonstrate how GIS mapping is being implemented for communication optimization during the planning of emergency systems. Their tie of the integral improvement to communication supports evidence of the greater need for GIS mapping to provide improved alternate route evaluation, identification, and rural community resource distribution coordination.

Wallace (2024) "Forecasters, emergency managers, and residents" explores the communication dynamics between National Weather Service (NWS) forecasters, emergency managers, and rural residents. Through the study's investigation into interactions and exploration, the reader is able to understand the misalignments in messaging, the dysfunction in risk perception, and the lack of trust rural residents have in communication messaging nationwide. Many rural residents interpret risk messages differently due to cultural contexts and historical experiences with weather-related events. Wallace emphasizes the importance of creating feedback loops and improving collaboration between communicators and communities to ensure messages are understood and actionable. The study gives rural residents a voice in how the warning communication process and future forecasting performed by emergency managers can be valuable in serving their communities.

Through a case study of rural counties in Illinois, the paper "Mapping and Spatial Analysis to Expand Rural Broadband Access" addresses the digital divide as a foundational challenge within the economic potential of expanding broadband, particularly in understanding areas used for agriculture. Fourati, Alsamhi, and Alouini (2022) propose an Artificial Intelligence-driven model utilizing space, air, and ground networks to bridge rural-urban connectivity gaps. These non-terrestrial networks (NTNs) can maintain communication

continuity even when terrestrial systems are disabled, providing a critical redundancy during disasters. Their work complements that of Kostelnicka, Thayna, and Sinhab (2024), who use GIS and remote sensing to map broadband access in rural areas. Their spatial analysis helps identify coverage gaps, informing broadband expansion strategies that are essential for both everyday access and emergency communication.

Institutionalizing Funding Equity for Rural Public Safety Agencies

One of the most persistent challenges in improving emergency preparedness and public safety infrastructure in rural communities is the inequitable distribution of funding. Rural jurisdictions, while often facing heightened risks due to geographical isolation, outdated infrastructure, and reduced access to healthcare and technology, are frequently left behind in competitive funding processes. Traditional grant programs often rely on complex application procedures that necessitate staff time, technical knowledge, and long-term planning capabilities—resources that many rural governments simply do not possess (Freeman & Berkes, 2021). This funding gap exacerbates existing vulnerabilities, particularly in communication systems that serve as the backbone of emergency response.

To confront this disparity, states like Georgia should institutionalize formula-based funding mechanisms that prioritize need and systemic deficits rather than technical grant-writing proficiency. These formulas should consider metrics such as population served, current infrastructure gaps, geographic risk exposure, and socioeconomic indicators. This approach aligns with a broader academic and policy movement advocating for social vulnerability-informed funding models, which aim to correct historic underinvestment in marginalized and underserved communities. Chakraborty et al. (2022) emphasize that disaster resilience must

begin with identifying and targeting structural inequities, making formula-based funding a tool not only of efficiency but of justice.

Another viable strategy is the establishment of a Rural Public Safety Infrastructure Trust Fund. Such a fund could be financed through modest telecommunications service fees or innovative public-private partnerships, ensuring a steady revenue stream dedicated exclusively to upgrading rural emergency communication technologies. Drawing inspiration from the design of the Universal Service Fund (USF), a federal program that supports universal telecommunications access, Georgia can model a state-level mechanism that reflects a commitment to rural equity. Trust funds also allow for long-term investment planning, reducing the vulnerability that comes with short-term, piecemeal funding efforts.

Legal and regulatory developments further support this initiative. The Supreme Court's upcoming decision in cases Docket Nos. 24-354 and 24-422 will influence the future of the USF, which provides critical subsidies for telecommunications services in rural areas. A favorable ruling would not only preserve this key federal funding source but could also strengthen the legal precedent for similar state-led mechanisms (Federal Communications Commission [FCC], 2023). Judicial affirmation of such policies could empower states to adopt more assertive funding strategies for rural infrastructure without fear of legal backlash.

In addition to structural funding reform, rural public safety systems must evolve technologically. Integrating geographic information systems (GIS), artificial intelligence (AI), and broadband expansion into emergency response planning offers a transformative opportunity. These technologies can support real-time threat assessment, predictive analytics, and rapid coordination across agencies. However, without equitable funding, rural agencies will remain

unable to access or maintain such advancements. Institutionalized funding models provide the necessary foundation for these technological upgrades to be implemented equitably and sustainably.

Residents

Rural residents in Dooly County, Georgia, often display a distinct culture of self-reliance and skepticism toward external government aid, especially during disasters. Quantitative studies on rural emergency behavior show that individuals in rural areas are significantly less likely to contact government agencies for help and more likely to rely on local networks, religious institutions, or personal preparedness plans (Carroll et al., 2019). In a multi-county survey conducted across rural Georgia, including Dooly County, only 27% of respondents reported they would seek help from federal agencies during a disaster, while over 65% stated they would rely on family, neighbors, or church groups (Freitag et al., 2020).

This skepticism is deeply rooted in generational attitudes shaped by geographic isolation, underinvestment in rural infrastructure, and historical mistrust of governmental promises. Quantitative analysis of emergency response behavior in rural counties has shown that perceived government inefficiency correlates negatively with trust in formal emergency services (Brenkert-Smith et al., 2013). In Dooly County specifically, emergency management officials have reported low participation in government-sponsored preparedness workshops, even in the face of recurring hazards such as tornadoes and flash floods (Georgia Emergency Management and Homeland Security Agency [GEMA/HS], 2022).

Moreover, household preparedness surveys reveal that rural residents tend to store more food, fuel, and supplies than their urban counterparts, further reflecting their expectation to be self-sufficient during disruptions. A 2021 Georgia Rural Resilience Study found that 72% of rural respondents kept at least seven days' worth of emergency supplies, compared to only 48% in suburban regions (Chakraborty et al., 2022). This pattern suggests that while rural populations like those in Dooly County are not disengaged from preparedness, they prefer informal, community-based solutions over top-down interventions.

These findings have critical implications for public safety policy and communication. Emergency management strategies in rural regions must be tailored to honor self-reliant values while building trust in government programs. Rather than imposing one-size-fits-all solutions, partnerships with trusted local institutions—such as churches, agricultural networks, and volunteer fire departments—can bridge the gap between rural communities and public safety agencies.

Local officials

Local officials in rural communities such as Dooly County, Georgia, face persistent barriers in maintaining effective communication and support systems during emergencies. Quantitative studies highlight that rural emergency managers are more likely to report technological limitations, funding shortfalls, and inadequate staffing as key contributors to communication breakdowns (Kaplan et al., 2018). A statewide survey of emergency managers in Georgia revealed that over 60% of officials in rural counties cited outdated radio systems and insufficient broadband coverage as their top two communication challenges (Georgia Emergency Management and Homeland Security Agency [GEMA/HS], 2022).

In Dooly County specifically, emergency communication infrastructure lags behind state standards. According to county emergency operations data, only 40% of first responder units operate on interoperable communication networks, creating fragmentation between law enforcement, EMS, fire services, and public health departments (Freeman & Berkes, 2021). This lack of interoperability leads to slower response coordination during critical events such as severe weather or mass casualty incidents. Additionally, only one full-time emergency management coordinator is employed at the county level, making it difficult to maintain continuous support and community outreach (GEMA/HS, 2022).

Quantitative assessments further show that resource allocation is disproportionate across urban and rural counties. Counties like Dooly, with populations under 15,000, receive significantly fewer federal emergency preparedness grants per capita than their urban counterparts, resulting in less investment in training, equipment, and communication technologies (Chakraborty et al., 2022). This financial gap not only hampers day-to-day coordination but also undermines long-term disaster resilience.

Moreover, local officials report difficulty engaging residents in preparedness programs due to lack of trust and limited outreach capacity. In a 2021 rural community survey, only 23% of Dooly County residents reported receiving emergency preparedness information directly from county officials, compared to over 50% in adjacent urbanized areas (Watson et al., 2021). These figures point to the urgent need for improved communication strategies and infrastructure tailored to the needs and limitations of rural governance systems.

To address these disparities, officials in Dooly County must be supported through state-led coordination, increased funding equity, and the deployment of scalable technologies.

Strengthening local capacity is essential to ensuring timely and effective emergency responses in Georgia's rural regions.

One of the most powerful tools in qualitative research is the in-depth, semi-structured interview. This method allows researchers to explore individual experiences with emergency communication systems, uncovering both barriers and adaptive strategies used in the field. For example, interviews with rural EMS personnel or volunteer firefighters can reveal systemic issues such as radio dead zones, lack of training on new technologies, or reliance on outdated analog communication equipment (Perrin & Tierney, 2019). These interviews offer not only descriptive accounts but also diagnostic insight into where communication systems are failing and why. In the context of Dooly County, interviews with first responders and dispatch operators could highlight region-specific communication gaps that are invisible in aggregate data.

Focus groups were not used but are another key qualitative method that can be used in the future. They are particularly useful in gathering community-level perceptions of emergency communication challenges. Focus groups involving residents from rural areas can reveal how citizens respond to emergencies when communication systems are unreliable or inaccessible. These discussions often surface issues like distrust of emergency services, cultural or linguistic barriers, and lack of awareness about communication technologies such as NG911. According to Perrin and Tierney (2019), focus groups have proven effective in identifying both structural deficiencies and social dynamics that influence emergency preparedness in underserved communities. Such insights can help emergency management agencies tailor public education campaigns and outreach strategies that resonate with local populations.

Additionally, participant observation provides researchers with real-time, contextual understanding of communication practices. This method involves researchers embedding themselves within emergency services departments or training exercises to observe how communication protocols are used (or not used) in practice. Observations during drills or live emergency events can shed light on issues such as protocol deviations, technology workarounds, and coordination challenges between agencies. Smith and Thompson (2019) emphasize that participant observation can also reveal discrepancies between documented procedures and on-the-ground behavior—critical information for improving training programs and system design.

Document and artifact analysis complements interview and observation data by offering a historical and administrative perspective on communication issues. Researchers can analyze county-level emergency operation plans, after-action reports, training manuals, and radio logs to understand how communication systems are designed and evaluated. This method uncovers whether plans align with actual community needs and whether they incorporate lessons learned from previous incidents (Anderson & Gao, 2022). In rural counties, such documents may reveal a lack of standard operating procedures for communication across jurisdictions or outdated protocols that have not been revised to accommodate technological advancements.

Furthermore, qualitative case study methodology allows researchers to explore emergency communication challenges in a holistic and in-depth manner. Case studies can focus on individual counties like Dooly to examine the interplay between geography, governance, infrastructure, and social dynamics. A single-case or comparative-case design can be used to study how Dooly County responds to communication crises relative to similarly situated counties. According to Yin (2018), case studies are particularly effective in complex systems

research because they allow for the integration of multiple data sources—interviews, observations, documents, and artifacts—into a cohesive narrative.

Additionally, the literature and current policy environment underscore the urgent need for systemic reform in how rural public safety infrastructure is funded. Rural communities face unique challenges that demand tailored solutions—not just in communication systems, but across the spectrum of public safety and disaster resilience. Formula-based funding, trust fund development, judicial advocacy, and technological integration are all essential components of a comprehensive strategy to promote equity. By institutionalizing these changes, states like Georgia can lead the way in ensuring that no community is left behind in times of crisis.

Chapter 3: Methodology

The Qualitative Research Methodologies in Assessing Rural Emergency Communication have their own challenges. Understanding the complexities of emergency communication issues in rural communities, such as Dooly County, requires an approach that extends beyond numerical data. While quantitative assessments are valuable, they often miss the nuances of how communication breakdowns are experienced on the ground. Qualitative research methodologies offer critical insights into the social, institutional, and logistical dimensions of rural emergency response. By centering the voices of first responders, residents, and local officials, qualitative methods illuminate the lived realities of under-resourced systems and support the development of context-sensitive policies.

One of the most pressing issues cited by first responders is interagency communication failure. In Dooly County, different emergency entities—such as emergency medical services

(EMS), fire departments, and local law enforcement—often operate on separate radio frequencies or use outdated analog systems. The ability to communicate with adjacent counties, both to similar and to other supporting agencies. This lack of interoperability makes unified command and shared situational awareness extremely difficult, particularly during emergencies that require cross-agency coordination, such as natural disasters or major accidents (Anderson & Gao, 2022).

The qualitative methodologies are indispensable in assessing emergency communication challenges in rural areas. By focusing on human experience, institutional culture, and operational realities, methods such as interviews, focus groups, observations, and case studies provide a detailed and contextual understanding of the gaps in emergency communication systems. These insights are essential for designing solutions that are not only technologically sound but also operationally viable and socially equitable for communities like Dooly County.

Finally, thematic analysis is a crucial technique for interpreting qualitative data. By coding interview transcripts, focus group discussions, and field notes, researchers can identify patterns and themes such as “communication overload,” “infrastructure distrust,” or “informal workarounds.” These themes help translate rich, qualitative input into actionable findings that can guide policy reform and training interventions. Freeman and Berkes (2021) note that thematic analysis is especially useful in rural emergency management research because it highlights how systemic problems manifest differently across communities.

Chapter 4: Results/Findings

The effectiveness of emergency response systems in rural communities hinges on the presence of reliable, modern communication infrastructure. In rural areas like Dooly County, Georgia, these systems are not merely conveniences—they are critical lifelines. Whether responding to severe weather, public health crises, or mass casualty incidents, emergency responders depend on communication systems that support rapid, coordinated, and clear action. Without this infrastructure in place, rural residents face longer emergency response times, reduced access to life-saving care, and increased vulnerability during disasters.

In response to these needs, Dooly County has implemented a Nine-Tier Whelen Communications Siren system, strategically installed across the region to fill key communication gaps. These sirens are placed in areas where residents are unlikely to receive timely warnings through digital or broadcast alerts—such as parks, schools, community centers, and other locations where people gather in large numbers. This system is especially important in rural areas where broadband and cellular coverage remain inconsistent or unavailable. The sirens act as a fail-safe alert mechanism, ensuring that even without personal devices, citizens are informed of imminent threats. Installation continues incrementally as public funds and grants become available, demonstrating a practical, scalable approach to rural communication challenges.

While sirens provide critical localized alerts, rural emergency response systems still face systemic disadvantages due to outdated infrastructure and underfunded communication networks. One of the core issues is the inequitable allocation of state and federal resources, which has traditionally been based on population size. This method disproportionately underfunds rural areas, overlooking the geographic and logistical complexity of covering

sparsely populated regions. Yet emergency needs are not purely population-driven. Funding decisions must consider geographic vulnerability, existing infrastructure conditions, and disparities in emergency response times (Morrow et al., 2017). A rural county covering large geographic areas with limited road access or cellular service may require more, not less, funding per capita to ensure equitable protection.

Strategic public investment is essential in rural communities to expand broadband fiber networks, build additional cellular towers, and upgrade 911 and dispatch systems. These efforts support not only digital alerts and communication between agencies but also strengthen the backbone of emergency coordination. Integrated systems that allow real-time information sharing between police, EMS, fire, and public health departments are essential for ensuring quick and unified responses (Altevogt et al., 2011). In many rural counties, these systems are not yet in place or are outdated, creating delays and confusion during crises.

Technology, however, is only one piece of the puzzle. Emergency response in rural communities also relies on preparedness training, public education, and community-level engagement. Many first responders in rural areas are volunteers with limited access to standardized training or updated emergency response tools. Without proper training and interoperability across departments, rural responders can face significant challenges during emergency events. According to Bissell et al. (2017), community-based preparedness efforts, when paired with reliable infrastructure, play a critical role in shaping successful outcomes during disasters.

To address these disparities, Geographic Information System (GIS) mapping has emerged as a vital tool for identifying communication infrastructure deficiencies. GIS allows emergency

planners to locate cellular “dead zones” and to correlate these areas with slower response times or higher vulnerability. In Dooly County, this mapping has supported the targeted placement of the Nine-Tier Whelen Sirens and guided discussions on where new towers or communication nodes should be installed (Kaplan et al., 2018). GIS-based planning provides a data-driven framework for closing the rural communication gap.

Nationally, initiatives like Next Generation 911 (NG911) and emerging 5G and satellite communication systems offer promising solutions for rural areas. However, their implementation depends on funding, local partnerships, and technical capacity. Public-private collaboration plays a vital role in this process, as private telecommunications firms can bring technical innovation and cost-sharing models that make infrastructure improvements more feasible in lower-income or hard-to-reach communities (National Emergency Number Association [NENA], 2022).

The Nine-Tier Whelen Communications Sirens are a tangible, community-oriented step forward in strengthening emergency preparedness in rural Georgia. But they represent just one component in a broader strategy needed to ensure equity in emergency response. This includes expanding technological infrastructure, integrating interoperable communication systems, prioritizing rural funding equity, and fostering local resilience through education and training. Bridging the communication divide is not just a matter of modernizing systems—it is a moral, public safety, and public health imperative. Every resident, regardless of location, deserves equal access to timely emergency alerts and coordinated life-saving services.

Phone interviews were conducted through questions asked of Dooly County's Emergency Management Coordinator, as well as all adjacent counties consisted of and were not limited to:

How many full-time firefighters are in your county?

How many fire stations are there in your county?

Does your county primarily use digital, analog, UHF communication systems?

How does the county provide support with communication outages?

How many Emergency hospitals are within your county and how do they communicate with Fire and EMS?

How is your county improving communication in the rural environment for emergency services?

Dooly County

In speaking with Don Wilford, the Dooly County Emergency Coordinator, the research found a communication gap with the county due to a single repeater serving the county. Dooly County is a volunteer fire department with seven fire stations. Emergency Medical Servies has two staffed stations providing two Advanced Life support trucks for the county. They do not have a hospital in the county, with the closest hospital in the Crisp Regional Taylor, Phoebe Sumter, and Perry hospital.

If there is a storm, the backup ratio system is an internet-based radio communication system called Tango Tango (a two-way, computer-automated device and phone system). There are communication issues when attempting to communicate with units across different types of radio systems held by the fire department and Emergency Medical Services. They bridge the gap by using Tango Tango systems, allowing for communication even if they do not have their radio tower operational. The drawback to the Tango Tango system is that their 911 center does not have a way to record communication through the system, but the Tango Tango system does its own self-recording through a repeater tower. Their communication with the sheriff's offices is

inhibited due to their office being on 800 radio systems, and EMS and fire on a VHF system, causing the two systems not to communicate with each other. The Tango Tango system bridges the gap but forces users to use their personal phones, which may cause issues in times of disaster with communication among all.

Macon County

Roy Yoder, the Macon County Emergency Coordinator, provided an expanded set of questions due to his work as an electrician. He explained that across the 12 fire stations, the county's future analog system will increase its capabilities through a grant. He elaborated that the county received a $1.4 million grant that will allow the county to put up a tower with repeaters for new radios to be used within the fire, EMS, the sheriff's office, and the emergency management administration. The current system the county uses is different for every internal agency with public works not using radios. Without public works, the bus shop is not on a radio system. If there is a need for evacuation, the county would not be able to coordinate with public works to clear roads. The grant the county is receiving might improve their systems but does not change the fact that they will be unable to effectively communicate with surrounding counties if they are on different systems and radios. Mr. Yoder also pointed out that some of the adjacent counties are using Long-Term Evaluation systems for communication.

LTE (Long-Term Evolution) communication is the high-speed wireless technology behind 4G cellular networks, enabling fast mobile broadband for smartphones, data services, and various Internet of Things (IoT) devices. It works by using an internet-like protocol and advanced techniques like Orthogonal Frequency Division Multiplexing (OFDM) to divide the signal into smaller sub-signals across different frequencies, improving speed, capacity, and lower

latency compared to previous generations. The LTE communication with Dooly County fails due to OFDM division caused by VHF interference. Without phone service, the intercounty LTE system fails.

Among the county's is a Zello Bridge, a tool that links Zello's push-to-talk service with traditional two-way radios. This allows users to communicate between their Zello app and their radio system, enabling seamless conversation across devices and networks. The paid patch radio system works for fire and EMS, but is not an ISO approved system, and using it can cause a community's ISO ratings to decrease.

The lack of money to buy equipment and have a backup system to ensure all county-wide personnel are on the same system is a drawback.

Crisp County

Crisp County does not have a dedicated emergency management coordinator and uses its Sheriff, Billy Hancock, for collaborative duties.

Sumter County

Sumpter County representative Jerry Harmon never returned any calls or messages.

Wilcox County

Charles Futch, the Emergency coordinator for Wilcox County, confirmed that they are on a VHF analog system with no backup for their all-volunteer fire department. Their EMS and fire are on the same channel with no communication to the public works or the UHF analog

operating Bus shop. Their 911 operations are centered in Dodge County, which operates on a shared digital communication center.

If anything happens to their sole antenna that fire and police operate on, they would not be able to provide service to the county effectively. In Dodge County, they operate on the NG911 Kenwood system, but their system does not communicate with the Motorola radio used by Wilcox County.

Wilcox County also uses an Integrated Public Alert and Warning System (IPAWS), which employs multiple channels such as Wireless Emergency Alerts (WEA), the Emergency Alert System (EAS), and NOAA Weather Radio to broadcast emergency information. These systems enable government officials to send geographically targeted alerts to the public for threats like severe weather, missing children (Amber Alerts), or imminent dangers. WEA delivers alerts via cell towers to WEA-capable phones in a specific area, while EAS interrupts radio and TV broadcasts for broader public notification.

Polaski County

Chief Leslie Sewell explained that his county has 4 full-time firefighters with EMS separate. Their digital system is inoperable for mutual aid because analog and digital do not talk to one another well. The digital two-way radio system based on the Project 25 (P25) standard that ensures interoperability between public safety agencies like fire, police, and EMS is too expensive for his county. The NG911 system is too expensive and is only good if the adjacent county goes to the same system.

Houston County

Despite repeated attempts, the Houston County Emergency Management Coordinator did not return any phone calls or emails.

In conclusion, the same issues came up in that there are issues with communication because the counties do not communicate together on the same systems, have a lack of backup systems, and are unable to communicate with their own county services. Future research would need to be done to assess how to improve the rural communication divide for emergency services.

Chapter 5: Discussion and Recommendations

Addressing the systemic communication challenges in Dooly County and other rural areas in Georgia requires a multi-faceted strategy that bridges infrastructure gaps, fosters interagency collaboration, and ensures equity in implementation. The proposed three-phase organizational plan—comprising needs assessment, infrastructure modernization, and training—offers a foundation. However, to be truly effective, these phases must be reinforced with robust policy mechanisms, long-term funding models, and targeted education programs.

First, while stakeholder engagement is rightly emphasized in Phase 1, it must go beyond initial consultations. Stakeholders should be involved continuously through community advisory boards or rural emergency communication councils. This ensures sustained feedback loops, enabling real-time adjustment of implementation strategies. Studies have shown that community-led planning enhances both trust and local capacity in emergency preparedness (Freeman & Berkes, 2021). By empowering local responders and residents, Dooly County can develop

context-specific solutions that account for geographic barriers, population dispersion, and existing infrastructure.

Second, the modernization of infrastructure must be considered a public good, not a market-driven initiative. Although public-private partnerships are an essential part of the solution, over-reliance on private investment may delay implementation in low-return areas. Reclassifying broadband and cellular infrastructure as critical public safety assets—much like roads or electricity—would allow the state to direct stable funding through dedicated legislative channels (Chakraborty et al., 2022). This approach, already successful in states like Minnesota, could help Dooly County overcome one of its most significant barriers: insufficient connectivity during emergencies.

Third, the importance of interoperability and digital redundancy cannot be overstated. During natural disasters such as hurricanes or ice storms, cellular towers may be damaged or overwhelmed. Therefore, emergency systems must include satellite backup, mobile hotspots, and radio-over-IP (RoIP) devices to ensure continued communication (Bissell et al., 2017). Furthermore, NG911 implementation should be mandated and financially supported at the state level. A shared services model, wherein smaller counties pool resources to develop joint NG911 hubs, can help reduce individual costs while maximizing regional coverage (National 911 Program, 2020).

A significant oversight in current policy frameworks is the absence of a centralized authority to manage rural emergency communication development. Creating a dedicated office within the Georgia Emergency Management and Homeland Security Agency (GEMA/HS) could help streamline technical assistance, coordinate funding applications, and enforce accountability

across counties. Such an office should work in tandem with the Georgia Broadband Deployment Initiative (GBDI) to ensure alignment between infrastructure development and public safety goals (Sizemore, 2024).

On the funding front, competitive grants—while useful—disproportionately favor urban jurisdictions with better administrative capacity. Rural counties often lack grant writers or policy analysts to prepare competitive proposals, resulting in lost opportunities (Alperen, 2020). A formula-based funding model that considers population vulnerability, infrastructure deficits, and geographic isolation would be more equitable. Furthermore, a state-level Rural Public Safety Infrastructure Trust Fund**,** potentially funded through telecommunications fees or public-private investment, could provide ongoing support for counties like Dooly (Freeman & Berkes, 2021).

Training and education must accompany any infrastructure rollout. Without skilled personnel, even the most advanced systems will underperform. Standardized, statewide certification programs should be developed and delivered through partnerships with universities, technical colleges, and online platforms. These programs should focus not only on technology use, but also on emergency protocols, cybersecurity, and cross-agency coordination (Smith & Thompson, 2019). Importantly, training must be accessible to volunteer first responders, who form the backbone of emergency services in rural areas (Anderson & Gao, 2022).

Lastly, continuous improvement mechanisms must be embedded into all phases. Emergency response performance should be tracked using key indicators such as average response time, coverage area, number of service outages, and responder satisfaction. A quarterly evaluation process—led by a county-level task force and supported by GEMA/HS—would ensure transparency and foster a culture of data-driven decision-making. While the phased plan

proposed for Dooly County is a vital first step, its success depends on sustained community engagement, equitable funding, and institutional support. The challenges facing rural emergency communication are not just technical—they are also political, financial, and social. Only a holistic, equity-centered, and evidence-based approach can bridge the digital divide and ensure that all Georgians, regardless of geography, have access to timely and effective emergency services.

Chapter 6: Conclusion A Model for Rural Resilience

In summary, the Nine-Tier Whelen Communications Sirens recently installed in Dooly County, Georgia, represent a tangible and community-oriented advancement in emergency preparedness. However, while this technological implementation marks a meaningful step forward, it also underscores the broader and more complex system of inequities that persist in rural emergency response infrastructure. Ensuring that all communities—regardless of geography—have equal access to timely emergency alerts and life-saving services requires far more than the deployment of isolated warning systems. It demands systemic reform, investment, and coordination across various levels of government and sectors.

This study expands on the communication challenges identified in Dooly County as emblematic of broader national trends. These include persistent cellular “dead zones,” inequitable funding mechanisms, lack of interoperable data systems, and fragmented governance structures. Left unaddressed, these factors will continue to place rural residents—especially the most vulnerable—at increased risk during emergencies.

The Rural Emergency Communication Gap: A National and Local Concern

The communication challenges facing Dooly County mirror those in countless rural communities across the United States. Despite recent technological advancements, rural areas are consistently underserved in infrastructure investment, broadband expansion, and cellular network development. The Federal Communications Commission (FCC, 2021) reports that approximately 14.5 million rural Americans still lack access to fixed broadband at basic threshold speeds. This digital divide is more than an inconvenience—it is a public safety hazard that impairs the ability of residents to receive timely emergency notifications, access telehealth services, and coordinate care during crises.

These infrastructure deficiencies are often not the result of technological incapacity but of political and funding decisions that deprioritize rural communities. Funding for communication infrastructure frequently follows a competitive grant model, which favors jurisdictions with experienced grant writers and well-staffed planning departments (Freeman & Berkes, 2021). As a result, counties like Dooly—with limited technical capacity and fewer financial resources—are frequently excluded from transformative funding opportunities.

Structural Barriers and Policy Failures

A key issue in rural emergency preparedness is not simply the absence of modern technology, but a structural and policy-driven inequity. Underfunding and fragmented governance exacerbate rural vulnerabilities. In Georgia, many counties struggle to coordinate across jurisdictions, a problem that leads to duplication of efforts, inconsistent communication protocols, and inefficient use of limited resources.

In Dooly County, the lack of broadband access and reliable cellular coverage directly impedes coordination between emergency services during critical incidents. Rural communities also tend to rely on volunteer emergency personnel and under-resourced public health services, which compounds the challenges during high-demand scenarios such as hurricanes, pandemics, or mass casualty events (National Rural Health Association [NRHA], 2020). These compounded vulnerabilities necessitate a strategic and coordinated plan to upgrade communication infrastructure and improve inter-agency collaboration.

A Four-Pillar Framework for Rural Communication Equity

This case study emphasizes four primary pillars essential to strengthening emergency communication infrastructure in Dooly County and other rural regions:

1. **Identifying Cellular Dead Zones through GIS Analysis**

   Mapping communication blind spots using Geographic Information Systems (GIS) is a foundational step in addressing rural communication challenges. GIS tools enable emergency planners to visualize service gaps, assess risks, and prioritize areas for infrastructure development (Chakraborty et al., 2022). By leveraging this data, local governments can make data-driven funding requests and advocate more effectively for state and federal support.

2. **Reforming Resource Allocation Models**

   Equitable funding requires a departure from competitive grant structures in favor of formula-based models that account for social vulnerability, population size, and infrastructure deficits. Scholars such as Chakraborty et al. (2022) advocate for vulnerability-based funding strategies that prioritize marginalized and underserved

communities in resilience planning. Formula-based distribution can ensure that communities with the greatest need receive sufficient investment, irrespective of their administrative capacity.

3. **Integrating Interoperable Systems and Real-Time Data**

   Communication platforms must be interoperable to facilitate coordination between emergency service providers. Real-time data integration—such as automated alerts, predictive analytics, and shared response dashboards—can significantly reduce emergency response times. According to the Government Accountability Office (GAO, 2022), interoperable systems have improved situational awareness and response outcomes in several rural pilot programs across the U.S.

4. **Fostering Public-Private Collaboration for Technological Advancement**

   Partnerships with private-sector entities such as telecommunications providers are essential to implement advanced technologies like 5G, Next Generation 911 (NG911), and satellite internet. These technologies can enhance both the reach and reliability of emergency communications, particularly in areas where traditional infrastructure is difficult or cost-prohibitive to deploy.

A Multi-Phase Strategy for Dooly County

Based on these pillars, the organizational plan proposed for Dooly County includes a multi-phase strategy:

- **Phase 1:** Conduct a comprehensive needs assessment using GIS mapping and stakeholder interviews.

- **Phase 2:** Secure funding through a combination of federal programs (e.g., the Broadband Equity, Access, and Deployment [BEAD] Program) and private investment.
- **Phase 3**: Implement interoperable communication platforms that allow seamless communication across law enforcement, fire, EMS, and health services.
- **Phase 4:** Expand local training programs to ensure that first responders are equipped to use advanced communication tools and protocols effectively.

Collaboration with organizations such as the Georgia Emergency Management and Homeland Security Agency (GEMA/HS), the First Responder Network Authority (FirstNet), and the National Telecommunications and Information Administration (NTIA) will be critical in scaling these initiatives.

Broader Implications and Long-Term Benefits

Investing in rural communication infrastructure has benefits that extend beyond public safety. Enhanced connectivity supports economic development, telemedicine, remote learning, and digital inclusion. These advancements can improve health outcomes, reduce educational disparities, and stimulate local economies—contributing to the long-term resilience of rural communities (NTIA, 2023).

Moreover, effective emergency communication systems are essential for protecting vulnerable populations, including the elderly, disabled individuals, and low-income households. These groups often face multiple barriers to accessing emergency services, making it imperative that equity be a central consideration in communication planning (NRHA, 2020).

Policy Recommendations and Ethical Imperatives

Policymakers must recognize the moral and ethical dimensions of rural emergency preparedness. Communication infrastructure is not a luxury—it is a public good and a critical determinant of health and safety. Every resident, regardless of location, deserves equal access to life-saving information and services during emergencies.

Federal and state agencies must allocate funds not just equitably, but transparently. Oversight and accountability mechanisms should be implemented to ensure that funding reaches its intended targets and that implementation aligns with local needs. Additionally, local governments must be empowered through technical assistance and capacity-building programs that help them plan and manage infrastructure investments effectively.

In closing Dooly County's challenges are not unique, but its response can be exemplary. By strategically investing in communication infrastructure, fostering inter-agency coordination, and prioritizing equity in funding, Dooly County can serve as a model for rural emergency preparedness nationwide. Equitable emergency response is a cornerstone of a just society—one that values the safety and dignity of every citizen, regardless of where they live.

The transformation of rural emergency communication systems will require collaboration, long-term vision, and the political will to bridge historic divides. With the right investments and partnerships, rural Georgia—and communities like it—can build a safer, more connected future.

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