

Executive Summary

Broadband Connectivity Among Rural First Responders in Pennsylvania

By: Christopher Ali, Ph.D., Abigail Simmerman, and DongWook Jeong, The Pennsylvania State University

First responders, including law enforcement, firefighters, and emergency medical services providers (EMS), along with 911 operators and dispatchers, rely on a host of digital communication technologies to do their jobs and keep the public and themselves safe. Rural first responders, however, face unique challenges in both accessing and using devices such as radios, smartphones, tablets, computers, and applications. The reasons for these struggles are threefold: (1) the lack of ubiquitous broadband and mobile network signals, leading to dead zones and dropped calls; (2) the astronomical cost of contemporary devices; and (3) the overall lack of funding for rural first responder departments.

As a large, rural state, Pennsylvania struggles with universal digital connectivity. This struggle has immediate and impactful consequences for the work of first responders living and working in rural areas of the Commonwealth. Despite these circumstances, there has been little research—either in Pennsylvania or throughout the United States—on the experiences of rural first responders with digital communication technologies and how the lack of access impacts their work and public safety. Given this dearth of knowledge, coupled with the crucial role played by rural first responders in assuring public safety, this report details the experiences of first responders working in rural areas of Pennsylvania with information communication technologies (ICTs) and the digital networks that support them. Through a series of focus groups and interviews with law enforcement officers, firefighters, EMS, 911 center representatives, and county officials from eight rural counties in Pennsylvania, we learned about the challenges and opportunities brought about by digital communication technologies for the work of rural first responders.

Methods

We employed three qualitative methods of data collection to address the above research questions: (1) document analysis, (2) focus groups, and (3) interviews. First, we conducted document analyses of relevant laws, policies, and regulations from local, state, and federal entities. Specifically, we examined the laws and policies governing emergency communication platforms like FirstNet and NextGen 911, using documents from the Federal Communications Commission, Congressional legislation, the Congressional Research Service, the National Telecommunications and Information Administration (NTIA), and the FirstNet Authority. From the federal level, we also examined the laws

and regulations governing broadband funding programs, notably the ongoing Broadband Equity Access and Deployment (BEAD) program of the NTIA as a potential source of funding for Pennsylvania. At the state level, we examined the Pennsylvania-specific laws, policies, and regulations regarding telecommunications infrastructure, first responder operations, organization, and funding.

Next, we engaged in focus groups and interviews with rural first responders in eight counties. Focus groups consisted of a mix of law enforcement, firefighters, EMS, 911 center representatives, and county officials (such as supervisors, coroners, and directors). While interviews were originally

planned to be with just 911 personnel, we experienced difficulty in recruiting for focus groups. This difficulty mandated a shift in strategy for certain counties, and interviews with law enforcement and EMS officials took place instead. Through 10 focus groups and eight interviews, we ultimately heard from 59 individuals representing eight counties.

Results

Over 700 pages of transcripts were generated from the interviews and focus groups. The qualitative data from both the documents and the focus groups were analyzed using thematic coding analysis. Our analysis revealed four key themes:

- 1) Technology, including both use and lack of access to technology
- 2) Interoperability/Interconnection, meaning the interconnection of communication networks, including inter-county communication and intra-county communication
- 3) Ingenuity, meaning the ways in which first responders coped with a lack of connectivity or technology, including increasing connectivity with the tools available, knowing your area and people, and using analog technologies
- 4) Funding, including affordable equipment, trade-offs, and feelings of de-prioritization

Conclusions

From these themes, we conclude that digital technologies and communication networks fail Pennsylvania's rural first responders in three distinct ways:

- 1) Technology, including access to communication networks and infrastructure
- 2) Labor, notably the extent to which first responders must work to ensure connectivity or improvise in moments without connectivity
- 3) Resources, in the inability to access necessary funds

Despite the dedication of these public servants, without the necessary corrections, their safety, and the public's safety, may be threatened. The crisis of connectivity in Pennsylvania, therefore, is a direct threat to the health and well-being of Pennsylvanians across the Commonwealth. Crucially, there is the will and the desire to do great things among our rural first responders even with these challenges.

Policy Considerations

Unused Federal Broadband Non-Deployment Funds

To rectify the failings of connectivity we outline in this report, we offer a series of policy recommendations for state-level elected officials and stakeholders. Funding is a major challenge with rural first responder departments, and much of what we suggest requires additional funds. As a potential source, we note that Pennsylvania's portion of the federal government's BEAD program has a surplus of over \$400 million. The federal government is in the process of deciding how these non-deployment funds can be used by states. Should the funds be released to Pennsylvania, we recommend that the Pennsylvania Broadband Development Authority (PBDA) allocate a portion to be used for first responder and public safety purposes.

Connectivity Assessment and Tower Construction

First responders experience a lack of ubiquitous mobile phone coverage leading to numerous dead zones, regardless of provider; this is clear in both theme 1 (technology) and theme 2 (inter-connectivity). This creates a safety hazard for both first responders and for the public. In theme 3 (ingenuity), we note how this has forced additional labor on first responders, such as going door-to-door to use a landline phone. On the public side, as noted in the background section, a lack of ubiquitous mobile connectivity across the Commonwealth means that some in rural areas cannot call for help through the NextGen 911 system. Based on what we have learned about towers, the PBDA could conduct a Commonwealth-wide assessment of mobile connectivity, including the FirstNet network. As

part of this assessment, we recommend that the PBDA assess vertical assets (towers and other tall structures) in Pennsylvania to plan for greater mobile coverage in rural areas. Based on that assessment, any improvements suggested by the PBDA could be funded with the BEAD non-deployment funds to create an incentive program for mobile network deployment and tower construction.

Addressing the Multiplicity of Radio Frequencies in Use

Departments and counties use multiple radio frequencies which our focus group participants told us lead to interconnection and interoperability challenges. First responders noted that because different counties use different radio frequencies, and sometimes single counties make use of different frequencies, they often cannot connect with their counterparts. We note that the Commonwealth has adopted the P25 radio standard to ensure interoperability, but that this has been adopted sporadically across counties, exacerbating interconnection issues [see the background section and discussion of theme 2 (inter-connectivity)]. We also found that while the Pennsylvania State Police (PSP) make use of the P25 network, they do so using encrypted channels, complicating how local first responders connect with the PSP. The need for inter- and intra-county interoperability and interconnection is essential, especially for neighboring counties and with the PSP. We recommend that the Pennsylvania Emergency Management Agency (PEMA) consider mandating the Commonwealth-wide adoption of P25 and ensure that the cost of the transition is not placed on local departments or counties. PEMA could also work with the PSP to ensure that its frequencies are accessible to rural first responder agencies.

Replacing Outdated Radio Technology

In themes 1 (technology), 2 (inter-connectivity), and 3 (ingenuity), we note the reliance of rural first responders on their portable and mobile radios. We also note the expense of those devices and how this expense falls to local departments (who cannot afford it) when counties undergo frequency changes or when equipment becomes

outdated. In theme 4 (funding), moreover, we note that at least one county department is using radios almost two decades old. With this in mind, we recommend that PEMA, which oversees 911 infrastructure and the Commonwealth's transition to NextGen 911, and PSP, which oversees the P25 project, work together to negotiate jointly with radio manufacturers to secure a preferential rate for first responder organizations to make the purchase of equipment more affordable.

Funding Shortages

A key takeaway from this research is that rural first responder departments face extreme funding shortages that make digital improvements and other equipment purchases almost impossible. In themes 3 (ingenuity) and 4 (funding), we found that many departments lack adequate funds to ensure their digital equipment is up to date and up to the standards adopted by their counties and by the Commonwealth. The cost of digital devices, which can be upwards of \$10,000 for a radio, exacerbates the funding shortages. Departments are relying on fundraising efforts to fill the gaps in funding, but it is not enough. In the background section, we also found that local funding for first responders is capped for many municipalities through a set percentage of property taxes; this has prevented municipalities from funding first responder needs themselves. In 2024, PA Act 54 increased this limit for boroughs in three counties, while the proposed H.B. 393 (2025) promises to increase the limit for an additional 1,400 municipalities. We recommend that more funding be allocated to rural law enforcement, fire, EMS departments, and Public Safety Answering Points (PSAPs) from the General Government Operations (GGO) based on need and rurality. We also recommend that Governor Shapiro's \$30 million grant program for first responders be part of future Pennsylvania budgets and developed into an annual grant program. In terms of property assessments, we recommend the General Assembly expand PA Act 54 to include all municipalities in the Commonwealth and that County Assessment Offices ensure that all property tax assessments are current.

Funding for the NextGen 911 System

Our background research taught us that while the NextGen 911 system is operational in all Pennsylvania PSAPs, it still requires monitoring and improvements. As noted in the background section, in summer 2025, the Commonwealth's 911 system, which had only just completed its transition to NextGen 911 experienced intermittent outages for several hours. In theme 2 (interconnectivity), we also noted that while the NextGen 911 upgrades allow PSAPs to communicate with each other, first responders experience communication challenges when trying

to reach PSAPs that use different frequencies. We recommend the General Assembly make the \$1.95 911 fee permanent rather than sunseting it in 2029.

State Leadership Awareness

First responders in rural counties expressed the sense that leaders in Harrisburg do not understand the daily challenges of providing services. One possible solution is that the Center for Rural Pennsylvania should organize a rural first responder tour for elected leaders.

Center for Rural Pennsylvania Board of Directors

Chairman, Senator Gene Yaw

Vice Chairman, Representative Eddie Day Pashinski

Secretary, Dr. Nancy Falvo, Pennsylvania Western University Clarion

Treasurer, Stephen M. Brame, Governor's Representative

Senator Judy Schwank

Representative Dan Moul

Dr. David Abler, The Pennsylvania State University

Richard Esch, University of Pittsburgh

Dr. Jeffrey Hyde, Penn State Extension

Shannon M. Munro, Pennsylvania College of Technology

Dr. Charles Patterson, Shippensburg University of Pennsylvania

Susan Snelick, Northern Pennsylvania Regional College

Darrin Youker, Governor's Representative

Center For Rural Pennsylvania Staff

Dr. Zachary L. Adams, Executive Director

Dr. Laura R. Dimino, Assistant Director

Michaela Miller, Quantitative Data Analyst

Kaitlyn Goode, Data Visualization Specialist

Linda Hinson, Office Manager