REVIEW AND ASSESSMENT OF THE SUFFICIENCY OF FIRE AND EMERGENCY MEDICAL SERVICES IN THE COMMONWEALTH OF VIRGINIA

VCU

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LIST OF ACRONYMS

AFG: Assistance to Firefighters Grant

ATL: Aid to Localities

CPP: Center for Public Policy

DSCSA: Drug Supply Chain Security Act

EMS: Emergency Medical Services

FY: Fiscal Year

ISO: Insurance Services Office

JLARC: Joint Legislative Audit and Review Commission

MLR: Multilinear regression

NFPA: National Fire Protection Association

NIBRS: National Incident-Based Reporting System

OEMS: Office of Emergency Medical Services

OSHA: Occupational Safety and Health Administration

RSAF: Rescue Squad Assistance Fund

SAFER: Staffing for Adequate Fire and Emergency Response

VDFP: Virginia Department of Fire Programs

VEST: Virginia Emergency Support Team

VFIRS: Virginia Fire Incident Reporting System

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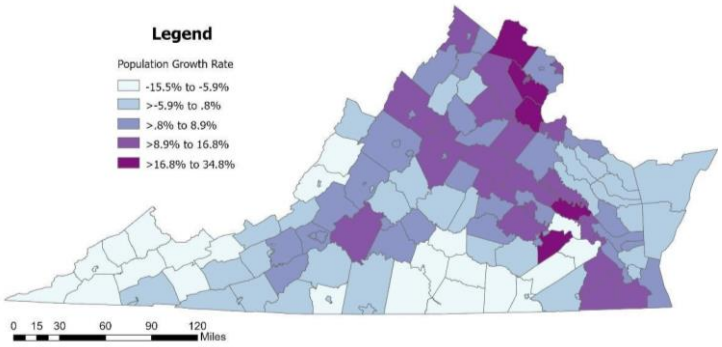
EXECUTIVE SUMMARY

Localities struggle to fully fund fire and rescue services across the state, especially in rural areas with declining populations, primarily in Southwest and Southside Virginia, and also in other regions throughout the state. The confluence of current restrictions on funding sources, declining volunteerism, national competition for a small pool of federal funds, and increasing EMS calls strain these services. Local fire chiefs and EMS directors need additional support to meet the needs of their communities. Limited funding results in a direct loss of services and can jeopardize the ability of fire and EMS teams to provide quality life-saving services in the time needed.

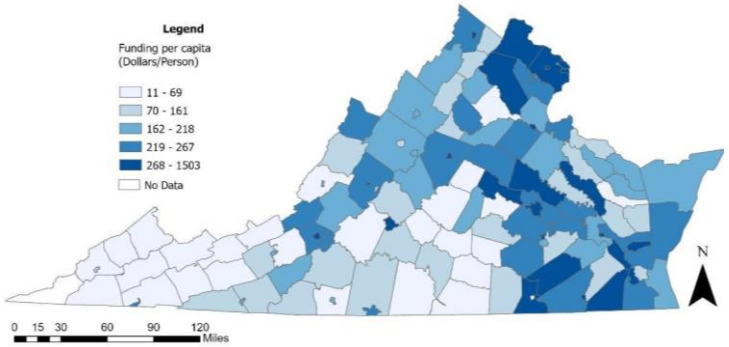
Summary of Key Research Findings

- As shown in the flowchart on pg. 9, approximately 97.15% of the $6.2 billion spent on fire and EMS in Virginia in the three years from Fiscal Year 2021-2023 came from local governments. An estimated 1.13% came from federal sources, and 1.72% from the State.
- Localities among the ten lowest funded in the state in relation to their population, land area, and EMS call volume are concentrated in Southside and Southwest Virginia, are largely rural, generally experience population declines, and universally report a decrease in volunteerism. These localities include:
    - Dickenson County
    - Wise County
    - Russell County
    - Appomattox County
- Geospatial analysis helps make sense of funding trends and further illuminate their geographic dimensions. For example, patterns in the population growth map below mirror geographic patterns in funding maps. As shown in the two maps here, the population growth centers of Northern Virginia, the Urban Crescent, and parts of the Shenandoah Valley are also the areas with the highest fire and EMS expenditures per capita:

Population Growth Rate (2010-2020)



Local Fire/EMS Expenditures per Capita (FY 21-23)

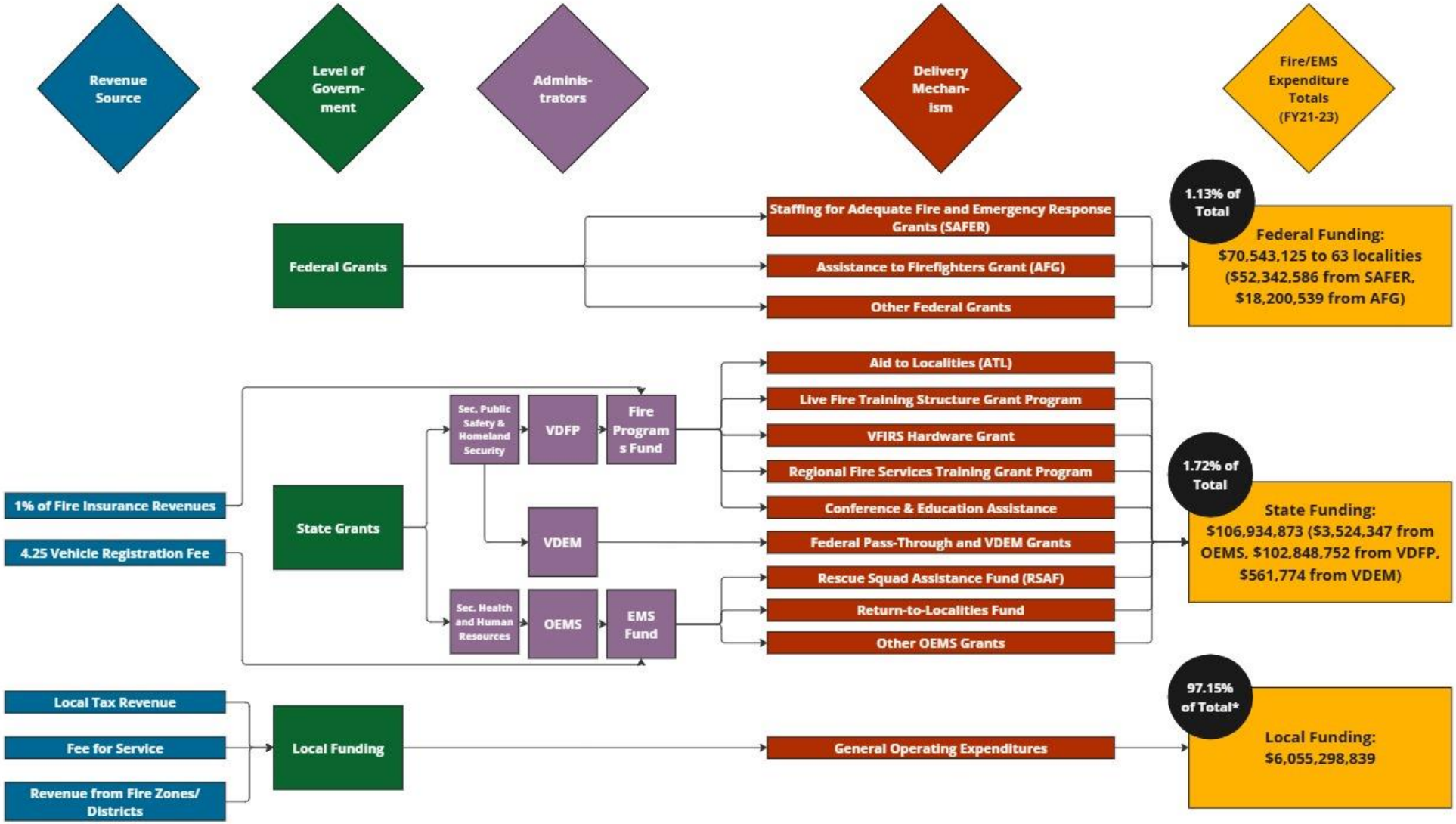


- Alarmingly, there are 29 localities with average EMS call response times of more than one hour. Several of these localities are among the lowest funded localities in the state, indicating that localities that struggle to fund these services also struggle to meet their residents' needs promptly. These localities are among the most vulnerable in terms of their ability to fund fire/ EMS services and the impact of funding needs on services.
- Localities that report average EMS call response times of over 60 minutes and are among the lowest-funded localities include:
    - Bath County
    - Lunenburg County
    - Norton City
    - Prince Edward County
    - Scott County
    - Smyth County
    - Wise County

Recommendations Summary

1. **Increase State Revenue for use by Fire and EMS Agencies:** Increase the revenue received from vehicle registration fees and increase the percentage of the State's gross premium income from fire insurance.
2. **Create a Fund for At-Risk Localities:** Target additional state funding to localities most vulnerable to negative outcomes due to insufficient fire and EMS funding. Include an analysis of local funding contributions, population, land area, call volume, and reported need in allocation decisions.
3. **Increase Flexibility of Use for State Fire and EMS Funds**: For state grants, increase flexibility to allow funding to be used for all major fire and EMS needs, including personnel costs, fire truck and ambulance purchase and/or maintenance, facilities, equipment, training, and communication systems.
4. **Support Volunteer Recruitment:** Create a state campaign for fire/ EMS volunteer recruitment, including tools for training and recruitment, and incentives for employers and volunteers.
5. **Improve Efficiency and Streamline Collaboration:** Initiate collective purchasing processes for equipment, apparatuses, and ambulances; facilitate regional collaboration for inter-locality dispatch systems and mutual aid; create a collective grant writing resource; incentivize and facilitate reporting of fire service calls; and support investment in infrastructure for 5G cell service in rural areas.
6. **Move OEMS under the Secretary of Public Safety and Homeland Security:** Convene an implementation committee to outline a new organizational structure that includes OEMS within the Public Safety and Homeland Security Secretariat. Among other items, the committee should consider merging the Office of Emergency Medical Services (OEMS) into the Virginia Department of Fire Programs (VDFP) versus creating a co-equal Department of EMS; and how to effectively support personnel funding needs with state funds to facilitate sustainable funding structures.

Sources of Funds and Total Expenditures for Fire and EMS in Virginia from FY21-FY23



*Local funding totals do not include local fundraising by fire and/ or EMS departments, who frequently raise money through private donations

INTRODUCTION

The following report outlines the efforts of the Center for Public Policy (CPP) to answer five questions about the sufficiency of fire and EMS funding throughout the Commonwealth of Virginia. It begins with a literature review describing the universality of challenges related to fire and EMS service provision across the United States, followed by an overview of how local, state, and federal funds are directed toward resolving those challenges in Virginia. It then drills down on existing data to determine which of Virginia's localities have the least funding to address local fire and EMS challenges.

From there, the report examines several frameworks for determining which factors most influence the sufficiency and sustainability of fire and EMS funding. Next, stakeholder input and a peer-state comparison inform an exploration of the costs and benefits of consolidating fire and EMS administration at the state level.

Finally, the report outlines recommendations to support fire services and EMS provision throughout the Commonwealth in the years ahead.

PROJECT BACKGROUND

History

Virginia's fire and emergency medical services (EMS) face significant challenges that impact their effectiveness and safety. The sector is struggling with a drop in volunteer numbers, increasing equipment costs, and a surge in emergency call volumes. These problems are compounded by insufficient funding, which fails to keep pace with rising expenses and inflation. As a result, response times are getting longer, equipment is deteriorating faster than it can be replaced, and there are growing concerns about the safety of first responders. Addressing these issues is crucial to ensure that Virginia's fire and EMS services can continue to respond effectively to emergencies and protect the communities they serve.

VA Budget Item 377#1c

In 2024, the General Assembly extended the efforts initiated by HB 2175 through VA Budget Item 377#1c. This budget item directs the Secretary of Public Safety and Homeland Security to secure technical experts to thoroughly review and assess fire and EMS funding in Virginia. The review encompasses the following aspects:

- **Identification of Funding Sources**: An assessment of all local, state, and federal funding sources, including trends and variations by locality or region.
- **Funding Needs Assessment**: Examination of the specific funding needs across different regions.

- **Factors Influencing Funding**: Analysis of factors affecting regions' abilities to meet funding needs, including economic conditions.
- **Comparison of Peer State Administrative Models**: Evaluation of the benefits and drawbacks of centralizing state-level administration of fire and EMS services, with comparisons to models used in other states.
- **Stakeholder Engagement**: The review will include at least three stakeholder meetings involving representatives from key fire and EMS organizations.

The Secretary of Public Safety and Homeland Security is required to submit a comprehensive report on the findings and recommendations by November 1, 2024.

LITERATURE REVIEW

Fire and EMS provision, which used to be seen as a primarily local responsibility, is in a new era in the United States. Changing call types, reduced volunteerism, and new financial burdens have driven more and more states to contribute to local fire and EMS services.

A New Chapter in Fire/EMS Provision

Firefighting and EMS have long been local matters in the United States, largely handled by community volunteers.[1] From the first structural fire at the Jamestown Colony in 1608, to the establishment of the nation's first independent volunteer rescue squad in Roanoke (1928),[2] to the establishment of the nation's first volunteer paramedic program in 1970,[3] Virginians have been at the forefront of addressing community safety through volunteer actions.

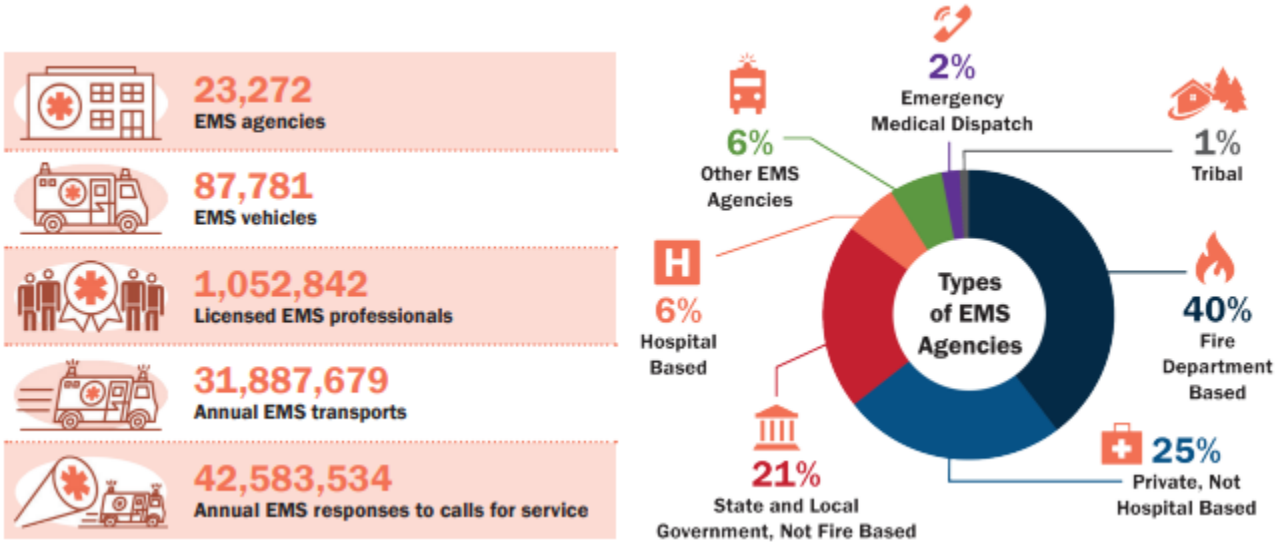
Despite the commitment of volunteers, many localities in Virginia and throughout the U.S. have introduced paid fire and EMS professionals into their communities over the years. Richmond, VA, for example, established its first paid fire department in 1858.[4] Changes like these have resulted in a firefighting workforce that is now 54% volunteer nationally, with 70% of registered fire departments being fully staffed by volunteers (see Figure 1).[5]

[1] Merrimack NH. (n.d.). The history of firefighting. https://www.merrimacknh.gov/about-fire-rescue/pages/the-history-of-firefighting
[2] Virginia Department of Health. (n.d.). About EMS: Historical highlights. https://www.vdh.virginia.gov/emergency-medical-services/about-ems-historicalhighlights/
[3] Virginia Association of Volunteer Rescue Squads. (n.d.). History of the VAVRS. https://www.vavrs.com/site_page.cfm?pk_association_webpage_menu=9297&pk_association_webpage=20932
[4] Google Arts & Culture. (n.d.). Stop, drop, and roll: Firefighting in 20th century Richmond. *Google Arts & Culture*. https://artsandculture.google.com/story/stop-drop-and-roll-firefighting-in-20th-century-richmond-the-valentine-richmond-history-center/gQXRgtW4QAoA8A?hl=en
[5,6,7] U.S. Fire Administration. (2022). Emergency services sector profile. https://www.cisa.gov/sites/default/files/2023-02/emergency-services-sector-profile_12-2022_508_1.pdf

Figure 1. Fire - Emergency Services Sector Profile, U.S. 2022[6]

The national EMS workforce is more complex as approximately one million licensed EMS professionals work across seven different types of EMS agencies (See Figure 2).

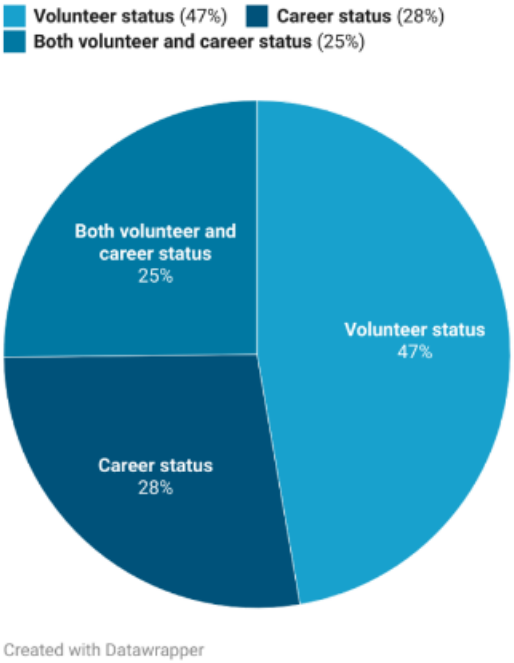
Figure 2. EMS - Emergency Services Sector Profile, U.S. 2022[7]

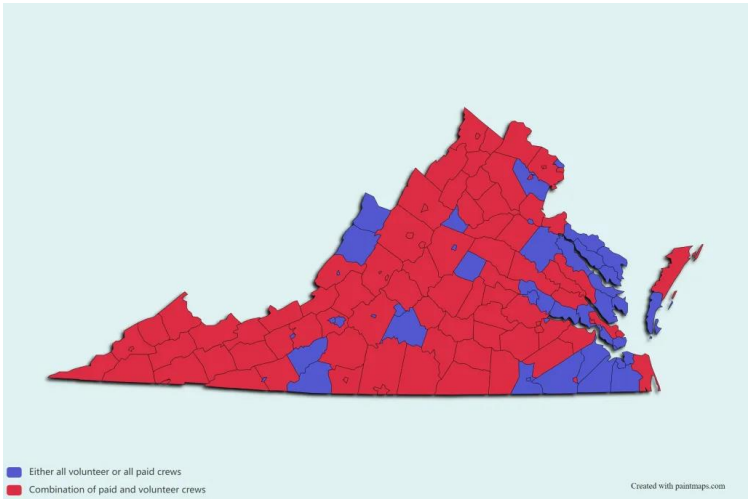


As shown in Figure 3, in Virginia, nearly half (47%) of licensed EMS agencies have a volunteer organizational status while an additional 25% have a status of both volunteer and career. The remaining 28% of licensed EMS agencies have career status.[8]

[8] Mamon, G. (2024, May 24). Paid EMS services can be costly and controversial. But they may be the only solution to declining volunteerism. *Cardinal News*. https://cardinalnews.org/2024/04/29/paid-ems-services-can-be-costly-and-controversial-but-they-may-be-the-only-solution-to-declining-volunteerism/

Figure 3. Licensed EMS Agencies by Type





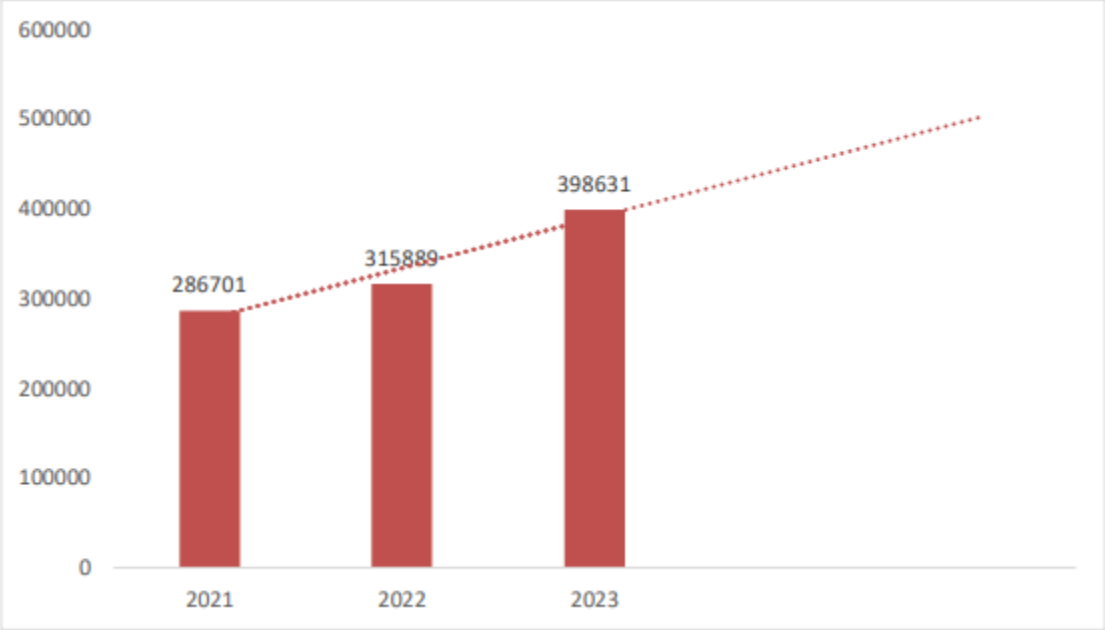
The following three subsections outline important nuances in how the landscape of fire and EMS provision is changing once again.

Changing Call Types

Changes in the firefighting and EMS workforce can be informed by changes in the nature of fire and EMS calls over the years.

In 2023, the HB2175 workgroup found a 40% increase in fire and EMS calls across the Commonwealth over three years (see Figure 4).[9]

Figure 4. Fire and EMS Call Volume Reported by Localities - From HB2175 Workgroup

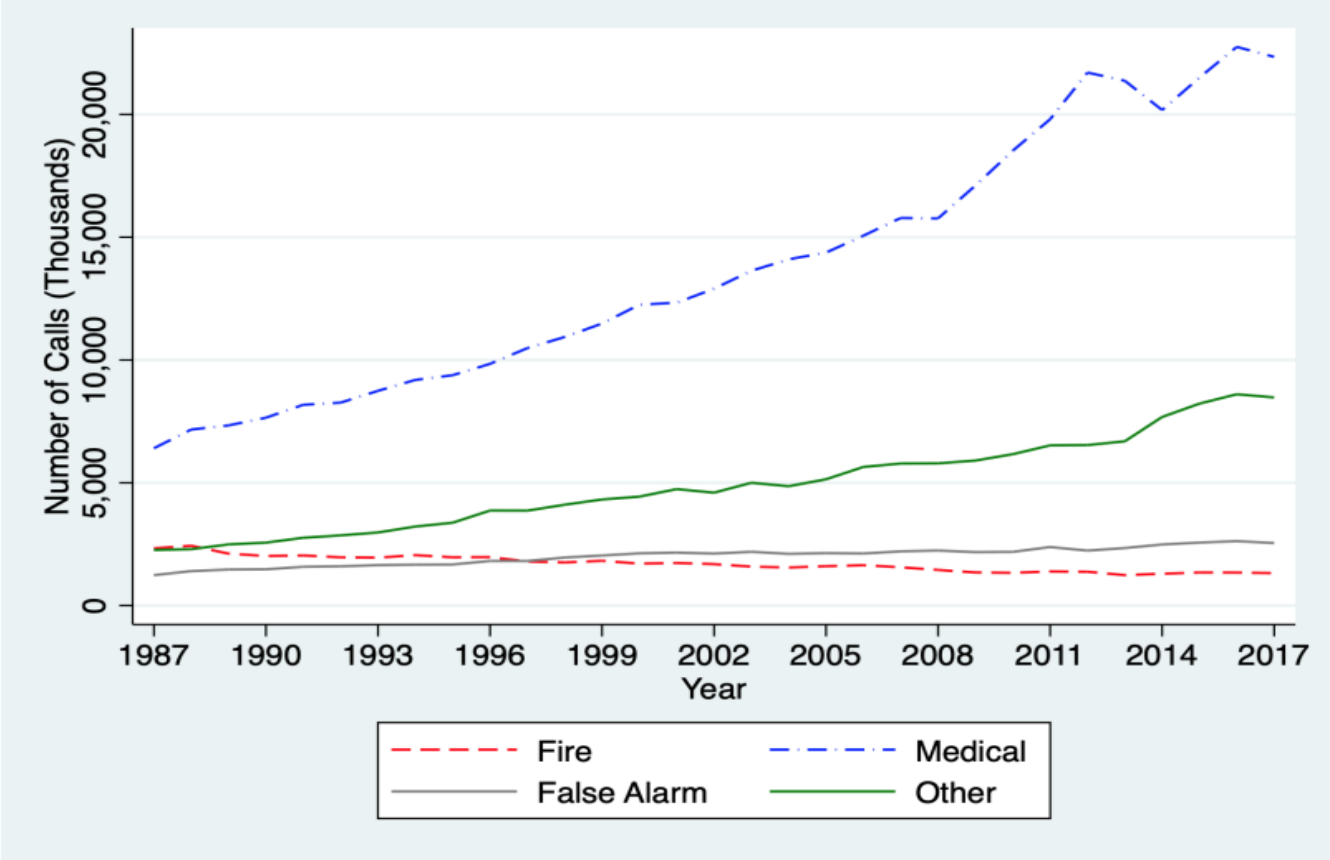


This substantial increase is emblematic of patterns seen throughout the nation.

In his 2021 Harvard dissertation, Dr. Hurwitz provides valuable data for examining fire and EMS changes in the U.S. over a 30-year period.[10] In Figure 5, Dr. Hurwitz illustrates how medical calls to fire departments have increased dramatically between 1987 and 2017 while fire calls have steadily declined.

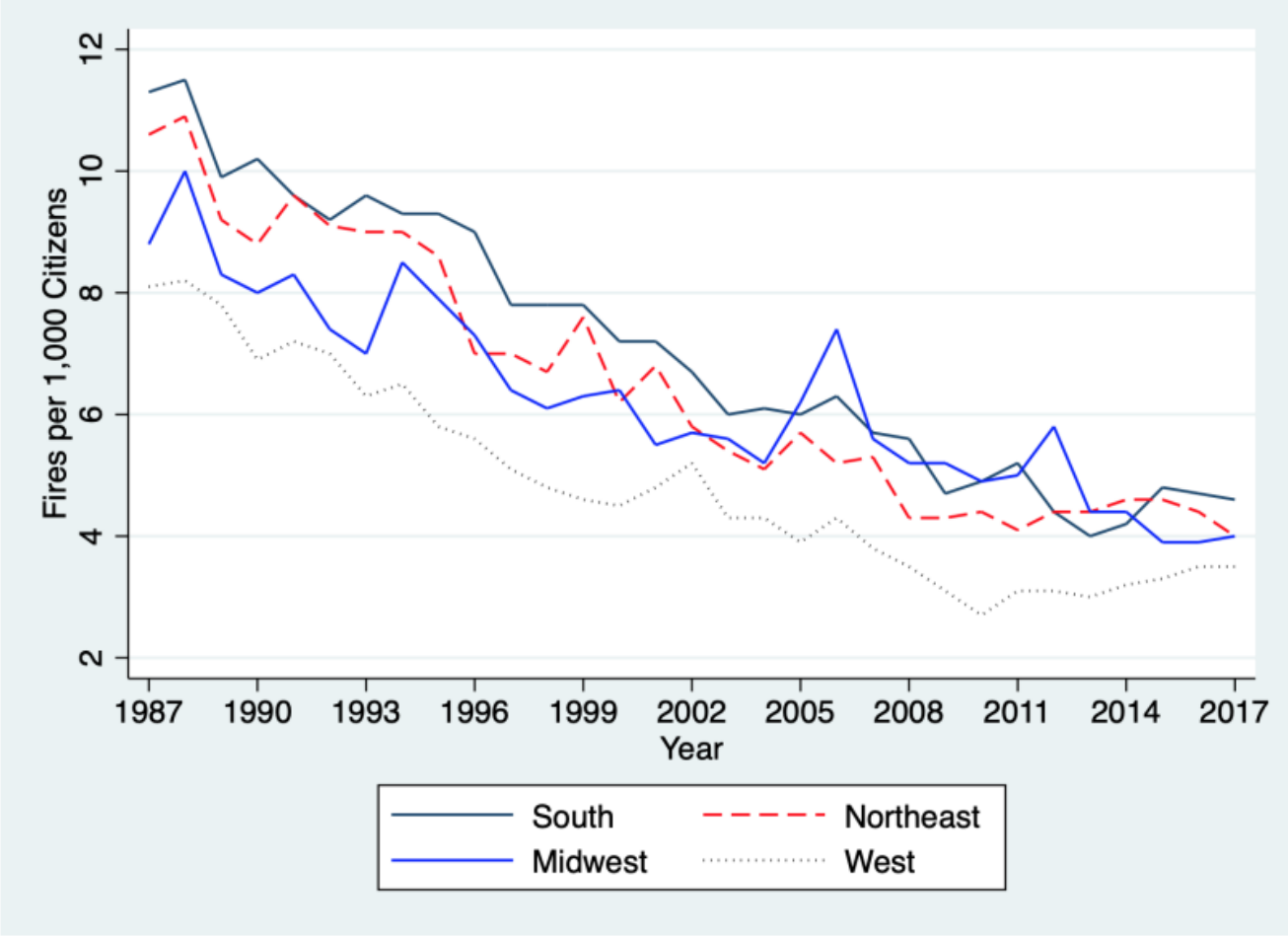
[10] Hurwitz, Joshua. 2021. *Essays on the Economics of U.S. Firefighting* (Doctoral dissertation). Harvard University Graduate School of Arts and Sciences. https://dash.harvard.edu/bitstream/handle/1/37368375/Joshua%20Hurwitz%20Dissertation%20-%20May%202021.pdf?sequence=1&isAllowed=y

Figure 5. Number and Type of Fire Department Calls (1987-2017)



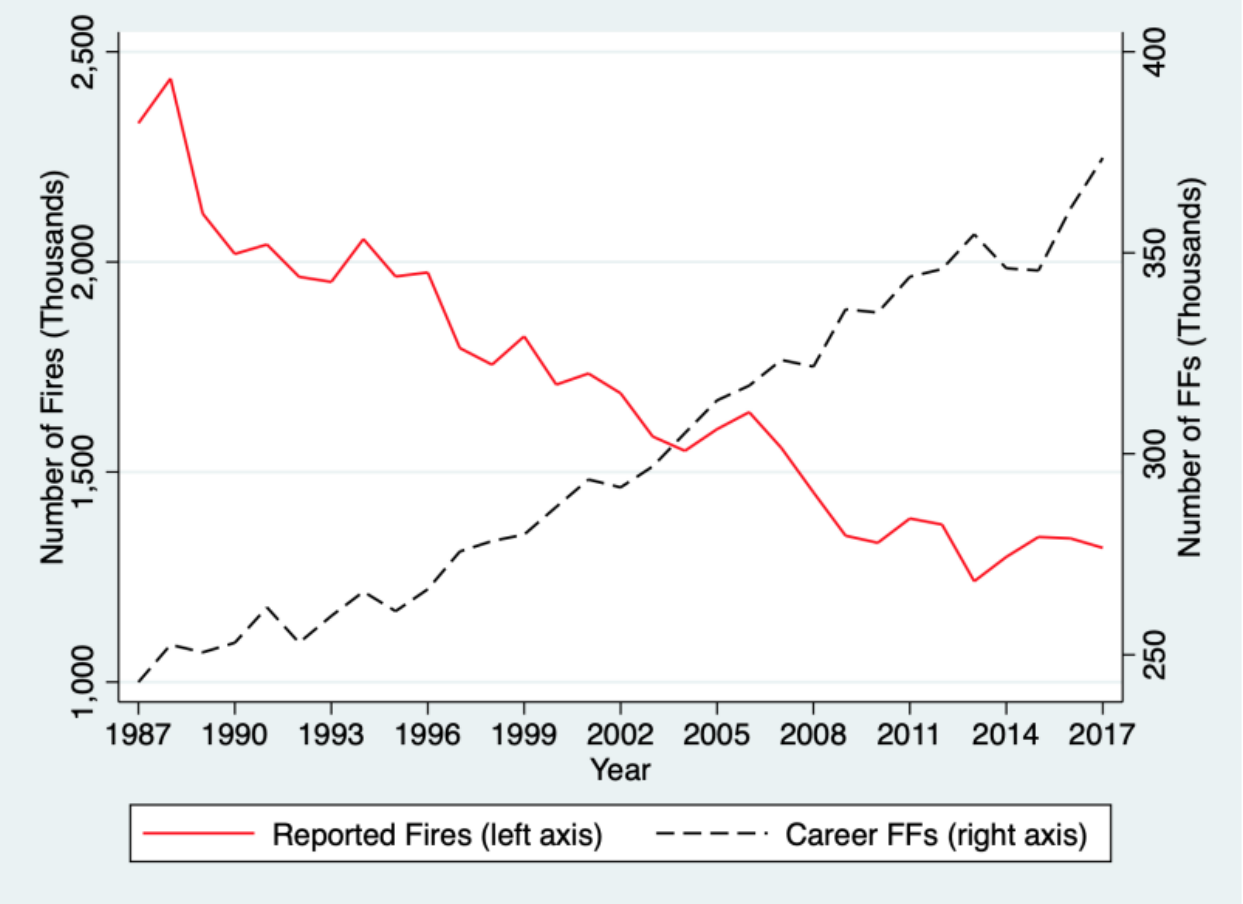
The data depicted in Figure 6 further show that this reduction in fire calls is similar by region.

Figure 6. Number of Annual Fire Incidents per 1,000 Citizens, by Region (1987-2017)



Despite the decreasing number of fire calls, Dr. Hurwitz shows in Figure 7 that the number of career firefighters has steadily grown.

Figure 7. Number of Annual Fire Incidents and Career Firefighters in the United States (1987-2017)



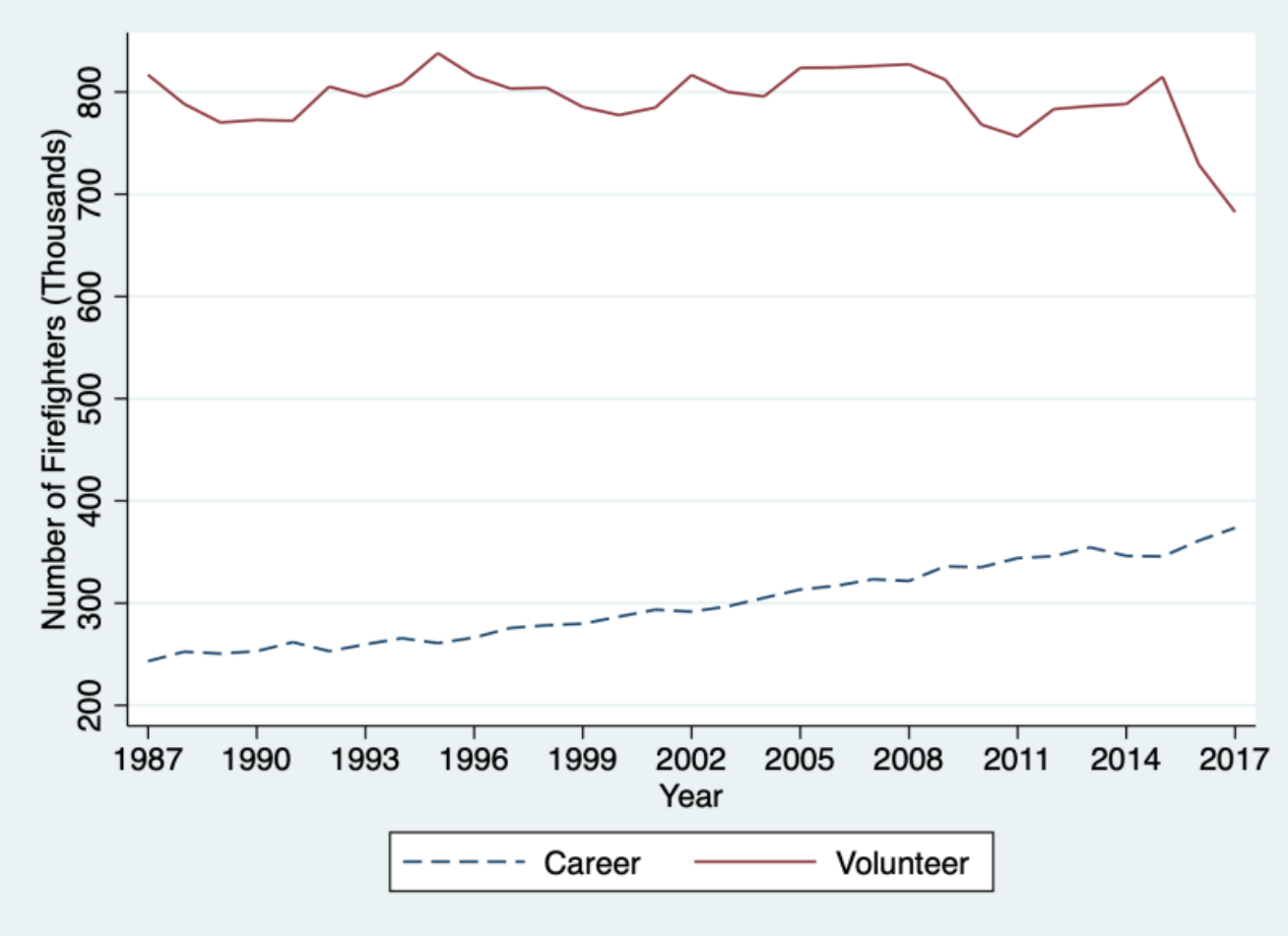
Taken together, these charts illustrate an important trend. Dr. Hurwitz explains:

> Despite the sharp decline in fire incidents across the US, the total number of calls received by fire departments has nearly tripled over the last three decades. In 2017, fire departments responded to 34.7 million calls, implying an average total call volume of 1,163 per department. In 1987, the average call volume was only about 411. This call growth has been driven in large part by EMS calls, which more than tripled from 6.4 million in 1987 to 22.3 million in 2017 [see figure above]. EMS calls now account for nearly two-thirds of all fire department activity, whereas fire calls represent only 4 percent. (22).

Reduced Volunteerism

Additionally, Dr. Hurwitz shows a sudden and sharp decline in the number of volunteer firefighters beginning in 2014-2015, depicted in Figure 8. This decline follows a generally steady, decades-long pattern in volunteerism.

Figure 8. Number of Career and Volunteer Firefighters in the United States (1987-2017)



Dr. Hurwitz explains:

> Compositional changes have also been occurring at the fire department level in recent decades. Between 1987 And 2017, the number of all-volunteer departments decreased from 23,088 to 19,313, while the number of all-career departments increased from 1,683 to 2,785, and the number of mixed departments increased from 4,970 to 7,721 [...]. These trends suggest that some portion of the recent growth in career firefighter rolls has occurred on the extensive margin through replacement or conversion of volunteers, rather than just intensive growth at existing all-career fire departments. (17)

By 2020, data in Table 1 from the National Fire Protection Association (NFPA) shows that firefighter volunteerism in the South trailed all other regions of the nation for populations below 25,000,[11] generally.

Table 1. Median Rates of Volunteer Firefighters per 1,000 People by Region and Population Protected, 2020[12]

Population Protected	Northeast	Midwest	South	West
10,000 to 24,999	0.98	0.99	0.39	1.01
5,000 to 9,999	3.38	3.98	2.72	2.29
2,500 to 4,999	6.63	7.87	5.86	5.00
Under 2,500	20.91	16.67	16.90	20.00

Larger populations in the South generally received career firefighter support at higher rates than other regions, with the exception of the Midwest, in 2020 (see Table 2).

Table 2. Median Rates of Career Firefighters per 1,000 People by Region and Population Protected, 2020[13]

Population Protected	Northeast	Midwest	South	West
250,000 or more	1.42	1.05	1.37	0.83
100,000 to 249,000	1.17	2.03	1.53	0.97
50,000 to 99,999	1.11	1.72	1.53	0.89
25,000 to 49,999	1.14	1.78	1.51	1.01

With fewer new volunteers entering the firefighting and EMS workforce, the remaining volunteers continue to age. The concerns around aging volunteers in the fire and EMS fields are well documented. In 2017, shortly after the decline noted by Hurwitz, a National Public Radio story covered the topic.[14] The story included quotes from volunteers in Kansas articulating their experience:

[11] Fahy, R., Evarts, B., & Stein, G. P. (2022). *U.S. fire department profile 2020: Supporting tables*. National Fire Protection Association. https://www.nfpa.org/News-and-Research/Data-research-and-tools/Emergency-Responders/US-Fire-Department-Profile
[12] Source: NFPA Survey of Fire Departments for US Fire Experience, 2020.
[13] Source: NFPA Survey of Fire Departments for US Fire Experience, 2020.
[14] Morris, F. (2017, August 16). Fighting fires for free, aging volunteers struggle to recruit the next generation. *NPR*. https://www.npr.org/2017/08/16/543670294/fighting-fires-for-free-aging-volunteers-struggle-to-recruit-the-next-generation

> ‘When I first started all we did was fires,’ recalls Mortimer. ‘Now we're power line arcing, to accidents, hazmat, technical rescue. You know, all of the above.
>
> Now, this volunteer ambulance service is the only medical provider in Norwich, and it covers nearly 300 square miles. ‘Call volumes are up tremendously, and I don't see that changing, except to increase,’ frets Bartell.

A paper from Colibaba, Russell, and Skinner documents the same phenomenon in rural Canada four years later (2021).[15] While this year (2024), a Cardinal news story highlights how declining volunteerism among EMS personnel is driving counties in southern Virginia to contract with private EMS providers.[16] The story characterizes private EMS providers as a “controversial and costly” option, but a necessary solution to this widespread change in the EMS workforce.

New Financial Burdens - OSHA, Pharmacies, and Equipment

The federal government recently acknowledged the need to keep up with the new era of changing trends in fire and EMS service provision. The Occupational Safety and Health Administration (OSHA) explains:[17]

> Current OSHA emergency response and preparedness standards are outdated and incomplete. They do not address the full range of hazards facing emergency responders, lag behind changes in protective equipment performance and industry practices, conflict with industry consensus standards, and are not aligned with many current emergency response guidelines provided by other federal agencies (e.g., DHS/FEMA).

To address these concerns, OSHA has developed new regulations that local fire and EMS units are expected to comply with. These new rules are not expected to go into effect until at least another year, but there is significant concern among stakeholders around what these regulations will mean for their service-provision.

OSHA continues:

> In recognition of the inadequacy of the outdated safeguards provided by the current OSHA standards, the proposed rule seeks to ensure that workers involved in Emergency Response activities get the protections they deserve from the hazards they are likely to encounter while on the job.

Chief David Pratt in Maine summarized the reaction to these regulations well:

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[15] Colibaba, A., Russell, E., & Skinner, M. W. (2021). Rural volunteer fire services and the sustainability of older voluntarism in ageing rural communities. *Journal of Rural Studies*, *88*, 289–297. https://doi.org/10.1016/j.jrurstud.2021.08.016

[16] Mamon, G. (2024, May 24). Paid EMS services can be costly and controversial. But they may be the only solution to declining volunteerism. *Cardinal News*. https://cardinalnews.org/2024/04/29/paid-ems-services-can-be-costly-and-controversial-but-they-may-be-the-only-solution-to-declining-volunteerism/

[17] Occupational Safety and Health Administration. (n.d.). *Emergency response rulemaking*. U.S. Department of Labor. https://www.osha.gov/emergency-response/rulemaking

> While no one can argue about improving firefighting and emergency responder safety, and this revamp of fire regulations is widely supported in the fire service across the country, what is a significant issue and concern by all fire departments is that this federal mandate is unfunded – meaning, local towns and municipalities will be fully expected to bear the financial burden of implementing these changes. Additionally, the time period in which OSHA is expecting departments to comply is widely regarded to be unachievable.[18]

In addition to the expense of the new OSHA regulations, the federal government announced its intention to begin enforcing the Drug Supply Chain Security Act (DSCSA) on November 27th, 2024.[19] This change creates several concerns for EMS agencies using hospital-owned medicines in their operations, as hospitals cannot verify the chain of custody for the drugs dispensed by these units. The exact impact of this change is unknown, with pending questions related to its enforcement.

In response, localities are establishing their own pharmacies and drug tracking operations in order to equip EMS agencies with emergency medicine. Loudoun County's Board of Supervisors estimates that four new full-time employees will need to be hired to comply with the DSCSA and expects the fiscal impact to be approximately $1.3 million in fiscal year 2025, followed by $870,000 in fiscal year 2026.[20]

Loudoun is among the localities in Virginia most able to handle this new financial burden, but county leaders expressed concern over how less-resourced localities might fare. Loudoun's County Administrator Tim Hemstreet put it clearly: "If you're not in a metropolitan area after Nov. 27, don't get in a car accident."[21]

Virginia's Board of Pharmacy worked closely with EMS stakeholders to facilitate this transition and Virginia's Regional EMS Medication Kit Transition Workgroup, established by the State EMS Advisory Board, has also contributed to efforts to help localities adhere to the DSCSA requirements. In addition to these efforts, the Virginia Association of Counties is continuing to explore "additional options with state and federal partners to further reduce any administrative burdens or unfunded mandates imposed by these federal requirements…"[22]

Lastly, fire and EMS equipment costs continue to increase driven by new technologies and inflation associated with the COVID-19 pandemic. A 2023 report from Watertown, NY cited the cost for firefighter turnout gear at $18,000 per firefighter, an 18% increase over 2022.[23] Modern fire trucks

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[18] Pratt, D. (2024, September 2). Chief's column: Fire department operating costs and new federal OSHA regulations. *Boothbay Register*. https://www.boothbayregister.com/article/chief-s-column-fire-department-operating-costs-and-new-federal-osha-regulations/190691

[19] U.S. Food and Drug Administration. (n.d.). *DSCSA compliance policies: Establish 1-year stabilization period for implementing electronic systems*. U.S. Department of Health and Human Services. https://www.fda.gov/drugs/drug-safety-and-availability/dscsa-compliance-policies-establish-1-year-stabilization-period-implementing-electronic-systems

[20] Loudoun County Government. (n.d.). *Board of supervisors business meeting: ZOAM-2020-0003, SPEX-2021-0043* [Meeting document]. https://loudoun.granicus.com/MetaViewer.php?view_id=89&clip_id=7739&meta_id=249998

[21] Loudoun Now. (n.d.). Loudoun scrambles to establish fire-rescue pharmacy following federal regulation changes. *Loudoun Now*. https://www.loudounnow.com/news/loudoun-scrambles-to-establish-fire-rescue-pharmacy-following-federal-regulation-changes/article_0218acc0-755d-11ef-8beb-6f7237a43de0.html

[22] Virginia Association of Counties. (n.d.). Federal regulatory changes could impact prescription drug box program and impose significant unfunded mandates. *Virginia Association of Counties.* https://www.vaco.org/county-connections/federal-regulatory-changes-could-impact-prescription-drug-box-program-and-impose-significant-unfunded-mandates/

[23] WWNY TV. (2023, September 27). *Prices skyrocket for firefighter turnout gear*. *WWNY TV.* https://www.wwnytv.com/2023/09/27/prices-skyrocket-firefighter-turnout-gear/

(apparatus), can cost over $1 million dollars now[24] and can take between 3 and 4 years to deliver.[25] Modern ambulances can cost over $300,000[26] and can take between 12 and 18 months to deliver.[27] Relying on data from Virginia's Office of EMS (OEMS), the HB2175 work group found that the following supply cost increases had occurred in less than a year in 2023 (see Table 3).

Table 3. EMS Supply Cost Increases (OEMS) - From HB2175 Workgroup

Item	Cost Increase from Spring 23' to Fall 23'
Automatic External Defibrator	45%
Ambulance Remount	17%
Chest Compression Devices	17%
Monitors with 12 Lead Capability	10.6%
Power Stair Chairs	40%

Alexandria, Virginia has proposed increasing the costs for ambulance rides in response to the concerns.[28]

Table 4: Fire Equipment Estimated Costs

Item	Reported Costs in 2022 ($)	Expected Increase with Inflation from FY22 to FY24 ($)
Personal Protective Equipment	3,000	3,232.14
Self-Contained Breathing Apparatus (SCBA)	5,000	5,386.91
Fire Engine (Pumper)	1.2 million	1,292,857.46
Aerial Device (Ladder Truck)	2 million	2,154,762.43

Novel State Funding

The long history of fire and EMS service provision being considered a local matter primarily handled by volunteers is already coming to an end. A review of state funding sources from 2023 finds that states

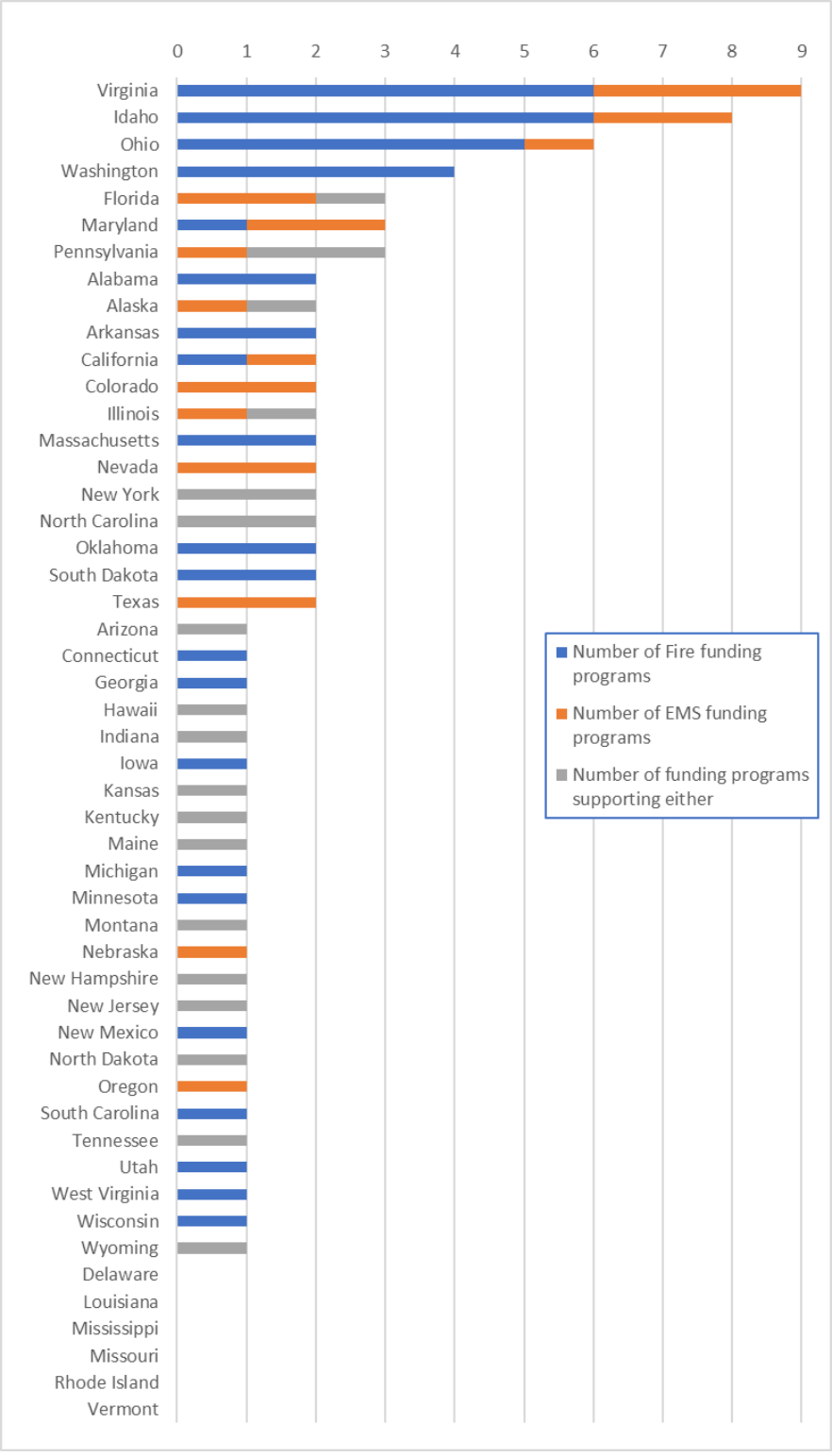
[24] Firehouse. (2023). Despite Fire Act grant, Export, PA, fire department says rising fire apparatus costs a challenge. *Firehouse.* https://www.firehouse.com/apparatus/news/53068052/despite-fire-act-grant-export-pa-fire-department-says-rising-fire-apparatus-costs-a-challenge
[25] Fire Apparatus Magazine. (n.d.). 2024 outlook: Improvement but not out of the woods. *Fire Apparatus Magazine.* https://www.fireapparatusmagazine.com/magazine/2024-outlook-improvement-but-not-out-of-the-woods/
[26] Arrow Ambulances. (n.d.). New ambulances for sale. *Arrow Ambulances.* https://arrowambulances.com/new-ambulances/
[27] Firehouse. (n.d.). Braun ambulances: Shorter lead times for ambulances made possible with Braun ambulances. *Firehouse.* https://www.firehouse.com/apparatus/type/ambulance/press-release/55139508/braun-ambulances-shorter-lead-times-for-ambulances-made-possible-with-braun-ambulances
[28] ALXnow. (2024, March 20). Ambulance costs could increase in current budget cycle. *ALXnow.* https://www.alxnow.com/2024/03/20/ambulance-costs-could-increase-in-current-budget-cycle/

overwhelmingly provide funding to localities to support fire and EMS services.[29] Specifically, 44 states provide funding to localities for fire and EMS provision while only 6 states do not. Only 2 states in 2023 provided funding that could be spent on personnel and both programs specified that funding was only available for EMS personnel (California and Florida).

Figure 9 below illustrates that some state grants can only be used by EMS *or* fire departments, while others can be used for either service. Notably, Virginia currently provides the highest number of local fire and EMS funding mechanisms among all states. It is beyond the scope of this analysis to compare the amount of funds dispersed by each state through the funding mechanisms below, but Virginia's funding mechanisms, taken together, constitute approximately 1.72% of local fire and EMS funding in the Commonwealth, as detailed below. The large number of funding mechanisms could also present an administrative barrier to access for localities with limited grant-finding and -writing resources.

[29] Wieder, M. A., Roche, K. M., & Nau, N. R. (2023). Funding alternatives for emergency medical and fire services. In B. Troup & J. Brasko (Eds.), *FA-360.* https://www.usfa.fema.gov/downloads/pdf/publications/funding-alternatives-for-emergency-medical-and-fire-services.pdf

Figure 9. Count of State Funding Mechanisms for locally provided Fire and EMS Services[30]



[30] Federal Emergency Management Agency's (FEMA) U.S. Fire Administration

The factors described in the literature review above - changing call types, reduced volunteerism, and new cost burdens - serve as a confluence of factors that have led many states to examine new ways to ensure the provision of fire and EMS services to their citizens.

In August of 2024, New Mexico became the first US state to provide funding to localities for firefighter personnel alongside EMS personnel.[31] In a diminishing three-year grant design, $24.9 million was allocated for 190 firefighter and EMS positions across 59 localities.

Given the centuries-long transition from primarily volunteer to career and volunteer fire and EMS provision, it is likely that more states will increase investments in local fire and EMS services in the years ahead as they acclimate to the dissipating volunteer composition of the workforces.

Firefighter health has become an increasing concern in the United States as recent research reveals the effects of turnout gear, firefighting foam, and carcinogenic environments on firefighters and other emergency responders. Although Virginia has employed strategies to mitigate these effects, there are concerns about the tracking and treatment of firefighters exposed to these environments. Without a dedicated process to fund or track exposure, Virginia's emergency responders are vulnerable to long-term medical expenses without the benefits owed. The issues highlighted in this report should be considered in this light, as Virginia, its localities, and the first responders who serve will require efforts to mitigate exposures, track them, and treat them if health problems develop. This will no doubt incur additional costs for all parties involved.

METHODOLOGY

Data Analysis

Collection and Preparation

The CPP compiled data from many sources to create a master dataset, which will be available to the Secretary of Public Safety and Homeland Security. To transform the data into a usable format, CPP transformed variables in SPSS, Excel, and R for use in statistical and mapping analyses. These sources and a brief description of data collected are as follows:

- Department of Fire Programs Fire and EMS Needs Assessment Survey

[31] New Mexico Department of Finance and Administration. (2024, August 7). State funds 190 new firefighter and EMT positions statewide. *New Mexico Department of Finance and Administration.* https://www.nmdfa.state.nm.us/2024/08/07/state-funds-190-new-firefighter-and-emt-positions-statewide/

*For starred variables, not all respondents reported these numbers in the same way, e.g. some localities included State grant money in their operating budget totals, others only included local expenditures, etc. For that reason, we could not rely on these data points to analyze local trends, and used other state-reported data, where possible.

- Distributed by VDPF as part of the HB2175 workgroup, generating 163 responses (87% of Cities and Counties)
- Distributed again by CPP to localities that did not respond to the previous distribution, generating an additional 4 viable responses
- Information collected includes:
  - Self-reported operating budgets*
  - Funding sources utilized
  - Level of agreement/ disagreement that the locality is sufficiently funded
  - Ranked list of biggest funding gaps and needs
  - Staff numbers (career and volunteer) *
  - Perceived trends in volunteerism, mutual aid, and service delays
  - Apparatus and ambulance inventory and age
  - Call volume*
  - Frequency of meeting federal staffing requirements

- U.S. Census Bureau
  - American Community Survey population data for towns[32] and cities/counties[33]
  - Decennial Census population data to calculate the population growth rate for towns[34;35] and cities/ counties[36;37] from 2010-2020.
  - Urban and rural classification for towns[38] and cities/ counties[39]
    - Calculating the percentage of the population living in rural places from both sources yielded a bimodal trend in the distribution of percentage, which guided the setting of thresholds at 10% and 95%. Between 0 and 10% is considered 'Urban', between 10 and 95% is considered 'Mixed', and between 95 and 100% is considered 'Rural'.
- Virginia Auditor of Public Accounts
  - Local government reports on local expenditures for fire/EMS services, as well as total local expenditures, from FY21-FY23[40]
  - Where there were gaps in the Auditor's data, CPP searched local government websites for archived budget documents from FY21-FY23
- National Incident-Based Reporting System (NIBRS) data on crime statistics

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[32] U.S. Census Bureau. "ACS Demographic and Housing Estimates." *American Community Survey, ACS 5-Year Estimates Data Profiles, Table DP05*, 2022, https://data.census.gov/table/ACSDP5Y2022.DP05?g=040XX00US51$1600000&y=2022.
[33] U.S. Census Bureau. "ACS Demographic and Housing Estimates." *American Community Survey, ACS 5-Year Estimates Data Profiles, Table DP05*, 2022, https://data.census.gov/table/ACSDP5Y2022.DP05?g=040XX00US51$0500000&y=2022.
[34] U.S. Census Bureau. "RACE." Decennial Census, DEC Redistricting Data (PL 94-171), Table P1, 2010, https://data.census.gov/table/DECENNIALPL2010.P1?g=040XX00US51$1600000&y=2010.
[35] U.S. Census Bureau. "RACE." Decennial Census, DEC Redistricting Data (PL 94-171), Table P1, 2020, https://data.census.gov/table/DECENNIALPL2020.P1?g=040XX00US51$1600000&y=2020.
[36] U.S. Census Bureau. "RACE." Decennial Census, DEC Redistricting Data (PL 94-171), Table P1, 2010, https://data.census.gov/table/DECENNIALPL2010.P1?g=040XX00US51$0500000&y=2010.
[37] U.S. Census Bureau. "RACE." Decennial Census, DEC Redistricting Data (PL 94-171), Table P1, 2020, https://data.census.gov/table/DECENNIALPL2020.P1?g=040XX00US51$0500000&y=2020.
[38] U.S. Census Bureau. "URBAN AND RURAL." Decennial Census, DEC Demographic and Housing Characteristics, Table P2, 2020, https://data.census.gov/table/DECENNIALDHC2020.P2?q=urban rural&g=040XX00US51$1600000.
[39] U.S. Census Bureau. "URBAN AND RURAL." Decennial Census, DEC Demographic and Housing Characteristics, Table P2, 2020, https://data.census.gov/table/DECENNIALDHC2020.P2?q=urban rural&g=040XX00US51$0500000.
[40] Virginia Auditor of Public Accounts. (FY 21- FY23). "Local Government Reports." https://www.apa.virginia.gov/local-government/reports?type=comparative-reports

    - Includes all crime types by locality[41]
- Virginia Department of Taxation tax rates for 2022[42]
- OEMS-supplied data for FY21-FY23, including
    - Grant allocations
    - EMS call volume
    - EMS response times
    - EMS staffing
- VDFP data on fire grant allocations for FY21-FY23

Please see Appendix A for a complete code book of each variable used in this analysis.

Data Limitations

Lack of town data: Across the board, there was a lack of data on towns, and inconsistencies with how towns support fire/EMS services, as some towns are served by their county's fire/ EMS departments, and others have their own departments. Therefore, CPP focused the analysis on Counties and Cities, but have included town data in the master dataset in case it is useful for future analysis.

Local budget data gaps: Another challenge was that the Virginia Auditor's locality budget data had gaps. Where possible CPP filled in data for localities that had no data reported by searching localities' websites for archived budget documents from FY21-FY23. Since some gaps remained, local funding data is incomplete. In particular, many towns did not report their budgets to the state, and due to capacity limitations, CPP was unable to collect and sift through all town budget documents.

Limitations of the survey data: Lastly, as noted in the footnote above, the self-reported numbers on operating budgets, staffing, and call volume from the 2023 survey were inconsistent (not everyone reported the numbers in the same way) and had gaps (not all respondents included their locality's numbers for each question). Thus, CPP used Virginia Auditor budget data instead of the self-reported budget data. In addition, unless otherwise noted, analysis in this report is based on OEMS data on call volume, staffing, and response time. CPP recognizes that this does not include comprehensive data on fire services, but nonetheless provides useful insight into local services, especially considering that many fire and EMS services are provided by the same departments on the local level, and some localities report fire calls with their EMS calls.

Overlap in state data on fire and EMS: When OEMS staff shared data with the CPP team, they expressed that some data on EMS staffing numbers includes staff that also serve as firefighters. Similarly, some data on EMS call volume includes calls for fire suppression services. Knowing that it is imperfect, this analysis nevertheless relied on this data given its more uniform and comprehensive nature compared with the self-reported survey analysis.

[41] Beyond 20/20. "NIBRS Data." https://va.beyond2020.com/va_public/Browse/browsetables.aspx?PerspectiveLanguage=en.
[42] Virginia Department of Taxation. (2022). "Rates of County Levies for County Purposes." https://www.tax.virginia.gov/sites/default/files/inline-files/2022-local-tax-rates.pdf

Statistical Analysis Techniques

Correlation Analysis:

Analysis using R assessed relationships between dependent and independent variables with Pearson correlations.[43] These correlations represent the strength and direction of the relationship between two chosen variables.

Multiple Linear Regression:

Multilinear regression models created in R examined the impact of certain variables on variables of interest. A multilinear regression model can be helpful in predicting an outcome using multiple predictor variables. It functions as an extension to the simple linear regression model: Y=aX+b, but with multiple X variables[44].

Geographic Mapping and Analysis

ArcGIS software aided in the visualization of variables of interest to reveal geographic patterns. Then geoprocessing tools facilitated overlay analysis to highlight localities and regions with multiple overlapping vulnerabilities.

Stakeholder Meetings

Stakeholder Group Members

Following VA Budget Item 377#1c, CPP convened stakeholder meetings with representatives from the Department of Fire Programs, the Office of Emergency Medical Services, the Virginia Fire Services Council, Virginia's Regional EMS Councils, the Virginia Fire Chiefs Association, the Virginia Association of Counties, and the Virginia Municipal League. Additional members were added to provide a comprehensive stakeholder perspective. The full list of stakeholders invited to participate is shown below.

Name	Position	Organization/Agency Represented
Justin Adams	President	Virginia Association of Governmental EMS Administrators
Walt Bailey	President	Virginia State Firefighters Association
Jeremy Bennett	Director of Intergovernmental Affairs	Virginia Association of Counties
Bubby Bish	Executive Director	Virginia Association of Volunteer Rescue Squads
Bill Boger	President, IAFF Local 1568 (Henrico)	Virginia Professional Firefighters

[43] ScienceDirect. "Pearson Correlation." Accessed 2024. https://www.sciencedirect.com/topics/computer-science/pearson-correlation#featured-authors

[44] ScienceDirect. "Multiple Linear Regression Analysis." Accessed 2024. https://www.sciencedirect.com/topics/medicine-and-dentistry/multiple-linear-regression-analysis

John Bolling	Vice Chair	State EMS Advisory Board
Vance Cooper	President	Virginia Fire Chiefs Association
Brad Creasy	Executive Director	Virginia Department of Fire Programs
Jay Cullinan	Fire Chief, Spotsylvania County	Virginia Fire Services Council
Sonny Daniels	Deputy Secretary	Office of the Secretary of Public Safety
Tim Estes	Fire Chief	Abingdon Fire Department
Michelle Gowdy	Executive Director	Virginia Municipal League
Josh Humphries	Deputy Secretary	Office of the Secretary of Public Safety
Karen Owens	Deputy Director of Planning and Operations	Office of Emergency Medical Services
David Reynolds	Legislative Fiscal Analyst	House Appropriations
Catie Robertson	Legislative Fiscal Analyst	Senate Finance and Appropriations
Mike Tweedy	Senior Legislative Fiscal Analyst	Senate Finance and Appropriations
Zachery Villegas	Budget and Policy Analyst	Department of Planning and Budget
Spencer Willett	Government Affairs Manager	Virginia Department of Fire Programs

Stakeholder Meeting Schedule and Topics

The stakeholder group met three times over two months to intentionally discuss key aspects of funding sufficiency for fire and EMS services in Virginia. The meeting schedule and topics discussed are listed below.

- Stakeholder Meeting #1 (September 6, 2024): The first stakeholder meeting was held virtually using Zoom. Through a combination of large and small group activities, the group explored the current state of funding for fire and EMS services in Virginia. They discussed funding challenges, opportunities, and the impact of funding restrictions on service provision.
- Stakeholder Meeting #2 (September 26, 2024): The second stakeholder meeting was held in person at the Virginia Department of Fire Programs Office in Glen Allen. This meeting focused on understanding the unique complexities of regions across the state as well as the needs specific to urban, rural, and mixed areas.
- Stakeholder Meeting #3 (October 10, 2024): The final stakeholder meeting was held in person at the Christiansburg Fire Department, with an option for virtual participation via Zoom. During this meeting, the group discussed the administrative structure of fire and EMS services in Virginia and peer states. The group contributed to conversations on the pros and cons of a consolidated administrative structure for Virginia.

RESEARCH FINDINGS

The research findings address the primary questions included in VA Budget Item 377#1c and are organized to correspond with those key considerations. Thus, the findings are structured as follows: an overview of funding sources for fire and EMS currently available to Virginia localities; a needs assessment of fire and EMS funding including several frameworks for need-based prioritization of

support; an investigation into which factors influence funding, as well as local and regional trends in how those factors impact a locality's ability to adequately fund fire and EMS provision; and a comparison of models for administering fire and EMS funding in peer states. Input from the stakeholder meetings weaves throughout, enhancing data-driven findings and adding personal stories about impact.

Overview of Virginia Funding Sources

Stakeholder input, literature review, and data analysis reveal a complex and dynamic funding landscape. Localities are braiding funding from a variety of sources, but ultimately rely most heavily on local funding sources because of the small scope of other sources. Stakeholder input and a review of government data and reports identified important sources of federal, state, and local funding, outlined and investigated below, and depicted in Figure 10.

Importantly, this investigation identified a total of $6,232,776,837 that went towards fire/ EMS services in Virginia in FY21-FY23. Of that total, $70,543,125 came from Federal Grants, $106,934,873 from State Grants, and $6,055,298,839 from local government budgets. This means that 97.15% of all funding put towards these services in Virginia came from local governments, with only 1.13% coming from Federal sources and 1.72% from the State.

Federal

On the Federal level, stakeholders consistently talked about two sources of grants that support their work. First, the Staffing for Adequate Fire and Emergency Response (SAFER) Grants are designated to increase the number of trained firefighters. During the three years from FY21-FY23, Virginia localities received $52 million in SAFER Grants.[45] The Assistance to Firefighters Grant (AFG) is another FEMA grant that supports equipment, vehicle, and training needs, and awarded $18 million to Virginia localities from FY21-FY23.[46] According to stakeholder feedback, US localities made $5 billion worth of requests to AFG alone, and only $700 million dollars were distributed, speaking to the inadequacy of current grant funding to meet the needs of localities.

Other federal grants that could be explored for use fire and EMS provision (with restrictions/ limitations on use) include:[47]

- Community Development Block Grant
- Indian Community Development Block Grant
- Volunteer Fire Assistance Grant
- Western States Wildland Urban Interface Grant Program
- Federal Excess Personal Property Program

[45] FEMA. (2024). Staffing for adequate fire and emergency response. FEMA. https://www.fema.gov/grants/preparedness/firefighters/safer
[46] FEMA. (2024). Assistance to firefighter grants. FEMA. https://www.fema.gov/grants/preparedness/firefighters/assistance-grants
[47] The United States Fire Administration, FEMA. (n.d.) Funding alternatives for fire and emergency services. https://www.iaff.org/wp-content/uploads/2024/06/FundingforFireandEMS.pdf

- State Fire Assistance
- Hazard Mitigation Grant Program

Stakeholders mentioned that they believed Virginia localities are at a disadvantage when applying for these federal grants because Virginia is a financially healthy state. However, when the state contributes relatively little towards local fire and EMS needs, Virginia's state budget surplus does not translate to local stakeholders to support funding for fire and EMS services.

State

Virginia administers several grants through the VDFP, under the Secretary of Public Safety and Homeland Security. These grants are administered through the Fire Programs Fund, which is funded by 1% of the State's Fire Insurance Revenues.[48] Based on data shared by VDFP staff, from FY21-FY23, VDFP awarded approximately $103 million to Virginia's localities through the following grants:

- Aid to localities
- Live Fire Training Structure Grant Program
- VFIRS Hardware Grants
- Regional Fire Services Training Grant Program
- Conference & Education Assistance Program

The OEMS, under the Secretary of Health and Human Resources, administers additional grants to fund local EMS services through the state's EMS Fund. This fund is replenished from a $4.25 vehicle registration fee on all motorized vehicles in the Commonwealth.[49] This fee was increased by $2 in the 2010 budget, but the additional revenue from this increase goes to the Department of State Police for med-flight operations and to the general fund, rather than supporting EMS directly. According to data shared by the OEMS, from FY 21-23, their office awarded $3.5 million to localities for training, recruitment and retention of volunteers, equipment, and other non-personnel needs.

The Virginia Department of Emergency Management (VDEM) also contributes a modest sum of money to support fire and EMS in the Commonwealth. Specifically, VDEM administers a small Shelter Upgrade Fund,[50] which contributed $ 213,602 from FY21-23 for new generators for fire and EMS stations. VDEM also administers a Hazard Mitigation Grant Program, which allocates FEMA pass-through dollars and some state funds to localities impacted by presidentially-declared disasters.[51] From FY21-23, VDEM allocated a total of $348,172 in state and federal funds to localities in Virginia through

[48] Code of Virginia. (n.d.) § 38.2-401. Fire programs fund. https://law.lis.virginia.gov/vacode/title38.2/chapter4/section38.2-401/
[49] Code of Virginia. (n.d.) § 46.2-694. (Contingent expiration date) Fees for vehicles designed and used for transportation of passengers; weights used for computing fees; burden of proof. https://law.lis.virginia.gov/vacode/title46.2/chapter6/section46.2-694/
[50] Code of Virginia. (n.d.) § 44-146.29:3. Emergency Shelter Upgrade Assistance Fund.
[51] FEMA. (n.d.) Hazard Mitigation Grant Program (HMGP). https://www.fema.gov/grants/mitigation/learn/hazard-mitigation

this program. According to stakeholders, these VDEM funds are declining.

VDEM officials shared that some additional grants that are designated for emergency management purposes sometimes benefit fire or EMS departments in localities where these departments house the local emergency management department as well. However, VDEM staff was unable to differentiate how much of the funding ultimately goes to fire and EMS versus emergency management. These funds represent a gap in the flowchart below but would not significantly increase the total amount of funding going into fire and EMS provision.

Local

A large majority of fire/ EMS funding comes from local governments. An analysis of local expenditures for "Fire and Rescue Services" reveals that localities contributed over $6.1 billion to these services from FY21-FY23 from their local budgets.[52] Localities can raise money for these services in a limited number of ways. The first is local tax revenue.

The second is through charging fees for their fire and EMS departments' services. Limitations to this source of funding include:

- Restrictions on how much volunteer fire departments can bill for services.
- Local governments' power to decide if fees collected by local EMS departments go into the locality's general fund or if they stay within the EMS department. For this reason, it's difficult to quantify how much funding this approach generates.[53]

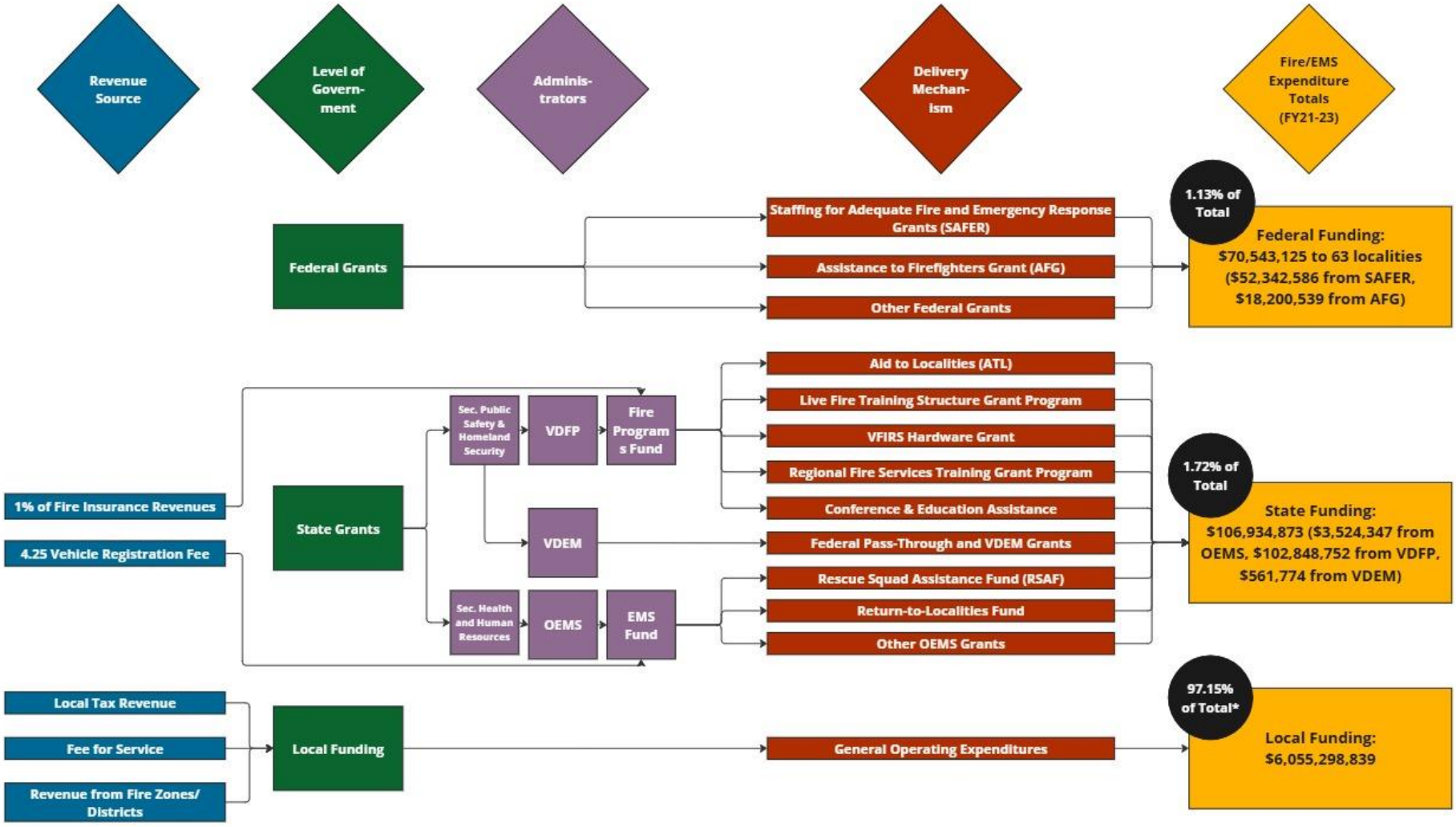
Lastly, Cities and Counties can establish fire zones or districts encompassing several localities; the localities can then levy an additional tax to fund the operation and maintenance of fire departments serving residents of the zone/ district.[54]

Figure 10 does not include total revenue from fundraising efforts led by local fire/EMS departments. Stakeholders shared that fundraising represents an important source of funds for both volunteer and career departments, but one that is not reported as part of localities' budgets.

A simplified version of this information is presented in the flowchart below, in Figure 10.

[52] Auditor of Public Records. (n.d.) Local government reports. https://www.apa.virginia.gov/local-government/reports?type=comparative-reports
[53] Code of Virginia. (n.d.) § 27-14. Ordinances as to fire departments and fire companies. https://law.lis.virginia.gov/vacode/title27/chapter2/section27-14/
[54] Code of Virginia. § 27-23.1. (n.d.) Establishment of fire zones or districts; tax levies. https://law.lis.virginia.gov/vacode/title27/chapter2/section27-23.1/

Figure 10. Sources of Funds and Total Expenditures for Fire and EMS Services in Virginia from FY21-FY23



*Local funding totals do not include local fundraising by fire and/ or EMS departments, who frequently raise money through private donations

Identifying Needs and Priorities

Locality Funding Needs

This section examines locality needs, and how need differs by locality. Several approaches to identifying who should be prioritized for state funding are presented, including analyzing self-reported needs, data analysis on where funding is lowest as it relates to locality population, land area, and EMS call volume, and reviewing high Insurance Services Office (ISO) fire ratings. This section concludes with an economic impact analysis of how state investment in the lowest-funded localities would impact their local economies, pointing to potential ripple effects of supporting these services.

Figure 11 maps local survey respondents' level of agreement that they have sufficient funding to provide fire and EMS services. Almost all respondents said they disagreed or strongly disagreed, as seen in the preponderance of red and dark red localities on the map. There is a slight trend of localities reporting sufficient funding in the "urban crescent," i.e., the area stretching from Northern Virginia to Richmond to the Hampton Roads/ Virginia Beach area.

Figure 11. Map of Self-Reported Level of Agreement that Locality Receives Sufficient Funding to Provide Fire/ EMS Services

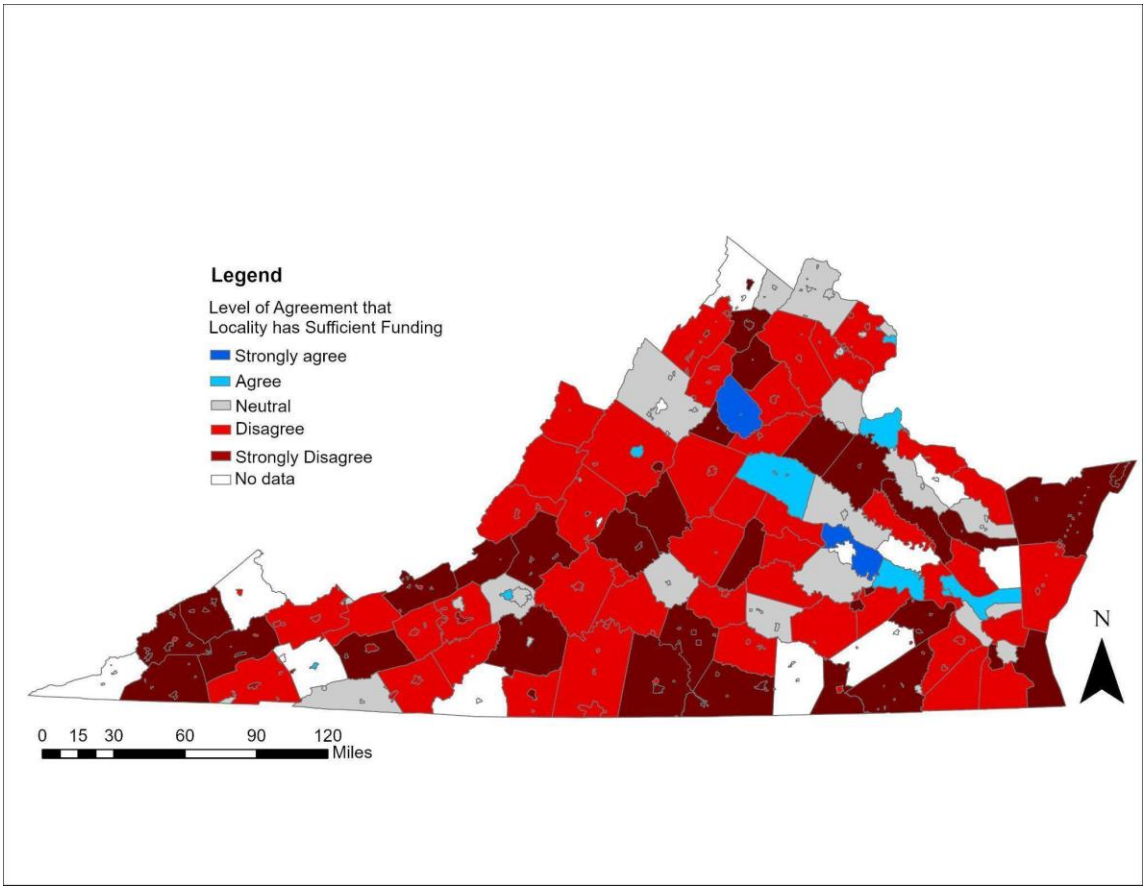


Table 5 outlines the ten localities with the lowest funding per capita, which are predominantly rural (6 out of 10), with 3 mixed and 1 urban area. Funding levels range from $11 to $42 per capita, averaging $28.70 across these localities. Emporia City tops the list with no career staff, while Lunenburg and Appomattox Counties are the only ones relying on career staff rather than volunteers. All localities report a decrease in volunteerism. Each locality engages in some form of mutual aid, with 4 providing aid monthly, another 4 daily, and 2 weekly. Despite their financial constraints, all localities provide mutual aid.

Table 5. Table of Ten Localities with the Lowest Funding per Capita in FY21-FY23

Locality	Career Staff	Active Volunteers	Volunteerism Trend	Mutual Aid Request Frequency	Provides Mutual Aid?	Increase in Mutual Aid?	Increase in Service Delays?	Locality Type	Population Growth Trend	Funding per Capita
Emporia City	0		Decrease	Monthly	Yes	No	No	Urban	Stable	$11
Appomattox County	226	176	Decrease	Daily	Yes	Yes	Yes	Rural	Moderately Increasing	$22
Russell County	0	138	Decrease	Daily	Yes	Yes	Yes	Rural		$22
Wise County	19	40	Decrease	Daily	Yes	Yes	No	Mixed	Moderately Decreasing	$22
Dickenson County	0	7	Decrease	Monthly	Yes	No	Yes	Rural	Moderately Decreasing	$28
Scott County	37	228	Decrease	Weekly	Yes	Yes	Yes	Rural	Moderately Decreasing	$33
Bland County	1	107	Decrease	Monthly	Yes	No	No	Rural	Moderately Decreasing	$34
Smyth County								Mixed	Moderately Decreasing	$35
Montgomery County	20		Decrease	Daily	Yes	Yes	Yes	Mixed	Moderately Increasing	$37
Lunenburg County	130	66	Decrease	Weekly	Yes	No	No	Rural	Moderately Decreasing	$43

Figure 12 shows a geographic representation of the localities in the previous table. The map reveals that these localities are concentrated in the Southwest and Southside regions of Virginia.

Figure 12. Map of Ten Localities with the Lowest Funding per Capita in FY21-FY23

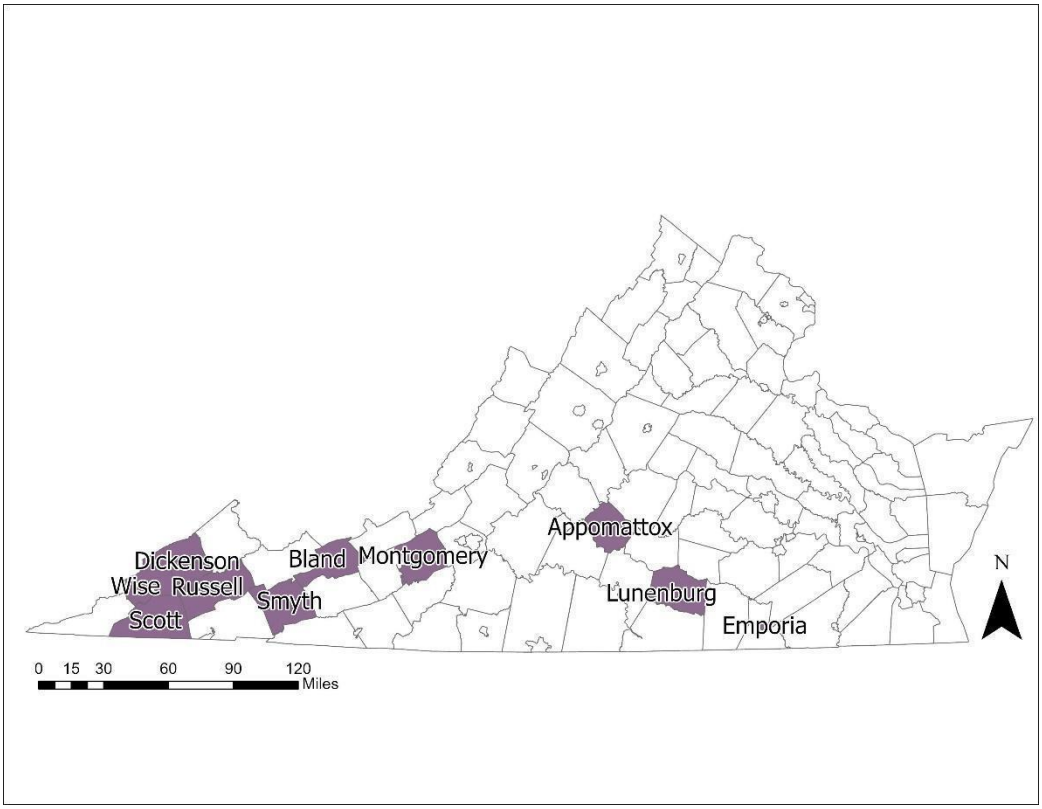


Table 6 presents the top ten localities with the lowest funding per square mile, ranging from $599/ mile in Bland County to $1,998/ mile in Buckingham County. Nine of the ten are rural, with localities like Bath, Russell, and Dickinson relying solely on declining volunteer staffing. In contrast, Lunenburg, Wise, and Appomattox have a mix of career and volunteer staff. Six localities are experiencing moderately decreasing populations, which may reduce local revenue. Some areas are stable or moderately increasing. All localities receive mutual aid requests; nine provide assistance. Five localities report increased service delays, while the other five do not, reflecting varied service responsiveness

Table 6. Table of Ten Localities with the Lowest Funding per Square Mile in FY21-FY23

Locality	Career Staff	Active Volunteers	Volunteerism Trend	Mutual Aid Request Frequency	Provides Mutual Aid?	Increase in Mutual Aid?	Increase in Service Delays?	Locality Type	Population Growth Trend	Funding per Sq Mi
Bland County	1	107	Decrease	Monthly	Yes	No	No	Rural	Moderately Decreasing	$599
Appomattox County	226	176	Decrease	Daily	Yes	Yes	Yes	Rural	Moderately Increasing	$1052
Bath County	0	70	Decrease	Weekly	Yes	Yes	Yes	Rural	Moderately Decreasing	$1091
Russell County	0	138	Decrease	Daily	Yes	Yes	Yes	Rural		$1171
Dickenson County	0	7	Decrease	Monthly	Yes	No	Yes	Rural	Moderately Decreasing	$1181
Highland County	9	32	Decrease	Monthly	No	Yes	No	Rural	Stable	$1191
Lunenburg County	130	66	Decrease	Weekly	Yes	No	No	Rural	Moderately Decreasing	$1194
Scott County	37	228	Decrease	Weekly	Yes	Yes	Yes	Rural	Moderately Decreasing	$1339
Wise County	19	40	Decrease	Daily	Yes	Yes	No	Mixed	Moderately Decreasing	$1974
Buckingham County	35	0	Decrease	Weekly	Yes	Yes	No	Rural	Stable	$1998

The map of localities with the lowest funding per square mile, shown in Figure 13, has more regional diversity. A majority of the localities identified here are also in Southwest and Southside, but a few are located in Central Virginia and the Western Shenandoah Valley. Highland and Bath Counties are notably the least populous counties in Virginia, speaking to the connection between a small local tax base and insufficient funding.

Figure 13. Map of Ten Localities with the Lowest Funding per Square Mile in FY21-FY23

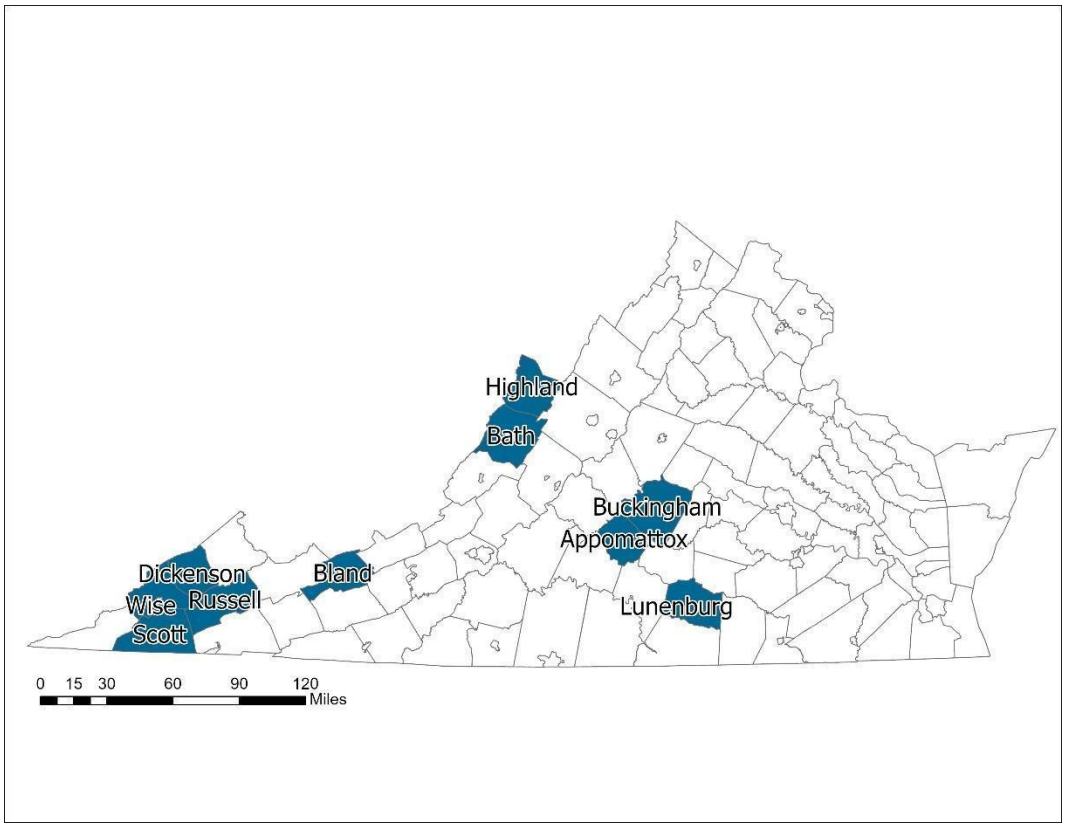


Table 7 outlines the ten localities with the lowest funding per EMS call, with Emporia City at the lowest, receiving $26 per call, and funding levels rising to $214 in Mecklenburg County. The data shows a reliance on volunteer staffing, particularly in rural areas like Russell County and Dickenson County, which lack career staff. In contrast, Appomattox County employs a significant number of career staff. All localities report a decrease in volunteerism. Most (8 out of 10) provide mutual aid, with Norton City and Appomattox County indicating increased mutual aid requests. Six localities show a moderately decreasing population trend, while Appomattox is moderately increasing. Service delays are reported in 5 localities, highlighting varied responsiveness across communities.

Table 7. Table of Ten Localities with the Lowest Funding per EMS Call in FY21-FY23

Locality	Career Staff	Active Volunteers	Volunteerism Trend	Provides Mutual Aid?	Increase in Mutual Aid?	Increase in Service Delays?	Locality Type	Population Trend	Funding per EMS Call
Emporia City	0		Decrease	Yes	No	No	Urban	Stable	$26
Norton City	1	47	Decrease	Yes	Yes	Yes	Urban	Moderately Decreasing	$74
Russell County	0	138	Decrease	Yes	Yes	Yes	Rural		$77
Wise County	19	40	Decrease	Yes	Yes	No	Mixed	Moderately Decreasing	$90
Smyth County							Mixed	Moderately Decreasing	$124
Prince Edward County	0	25	Decrease	Yes	Yes	No	Mixed	Moderately Decreasing	$126
Appomattox County	226	176	Decrease	Yes	Yes	Yes	Rural	Moderately Increasing	$154
Dickenson County	0	7	Decrease	Yes	No	Yes	Rural	Moderately Decreasing	$171
Giles County	0	240	Decrease	No	Yes	No	Rural	Stable	$210
Mecklenburg County	137	238	Decrease	Yes	Yes	Yes	Mixed	Moderately Decreasing	$214

As with the lowest-funded localities per capita, the lowest-funded localities per EMS call, shown in Figure 14, are concentrated in Southwest and Southside Virginia, emphasizing the regional disparities in fire and EMS funding.

Figure 14. Map of Ten Localities with the Lowest Funding per EMS Call in FY21-FY23

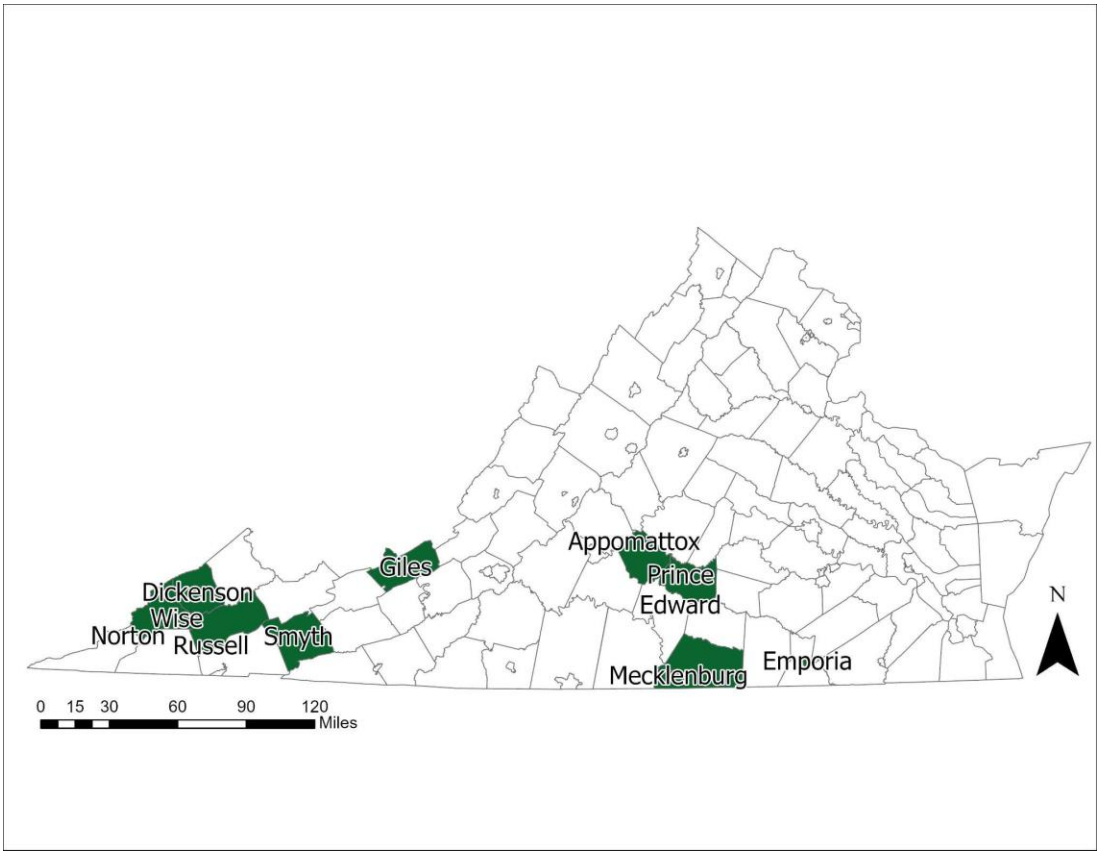


Table 8 outlines localities with critical funding vulnerabilities, highlighted by their repeated placement in the bottom 10 for funding per capita, per square mile, and per EMS call. Identifying localities with low funding in relation to their population, geographic scope, and EMS call volume represents a straightforward approach to identifying those places that should be prioritized in state funding decisions.

Appomattox County employs 226 career staff, handling an average EMS call volume of 2,299. With funding at $154 per call, $22 per capita, and $1,052 per square mile, the county is witnessing a moderately increasing population, alongside rising mutual aid requests and service delays.

Dickenson County operates without career staff, relying solely on 7 active volunteers. It faces a moderately decreasing population and an average call volume of 2,300, receiving $171 per call, $28 per capita, and $1,181 per square mile. While it provides mutual aid, there has been no reported increase in requests.

Russell County also lacks career staff, relying on 138 active volunteers to manage an average EMS call volume of 7,201. It receives only $77 per call, $22 per capita, and $1,171 per square mile. The county is experiencing an uptick in mutual aid requests and service delays, while its population remains stable.

Wise County employs 19 career staff and has 40 active volunteers, handling the highest average call volume of 8,938. Despite receiving $90 per call, $22 per capita, and $1,974 per square mile, it has not seen an increase in mutual aid requests, and its population is trending moderately downward.

Across these localities, several trends emerge:

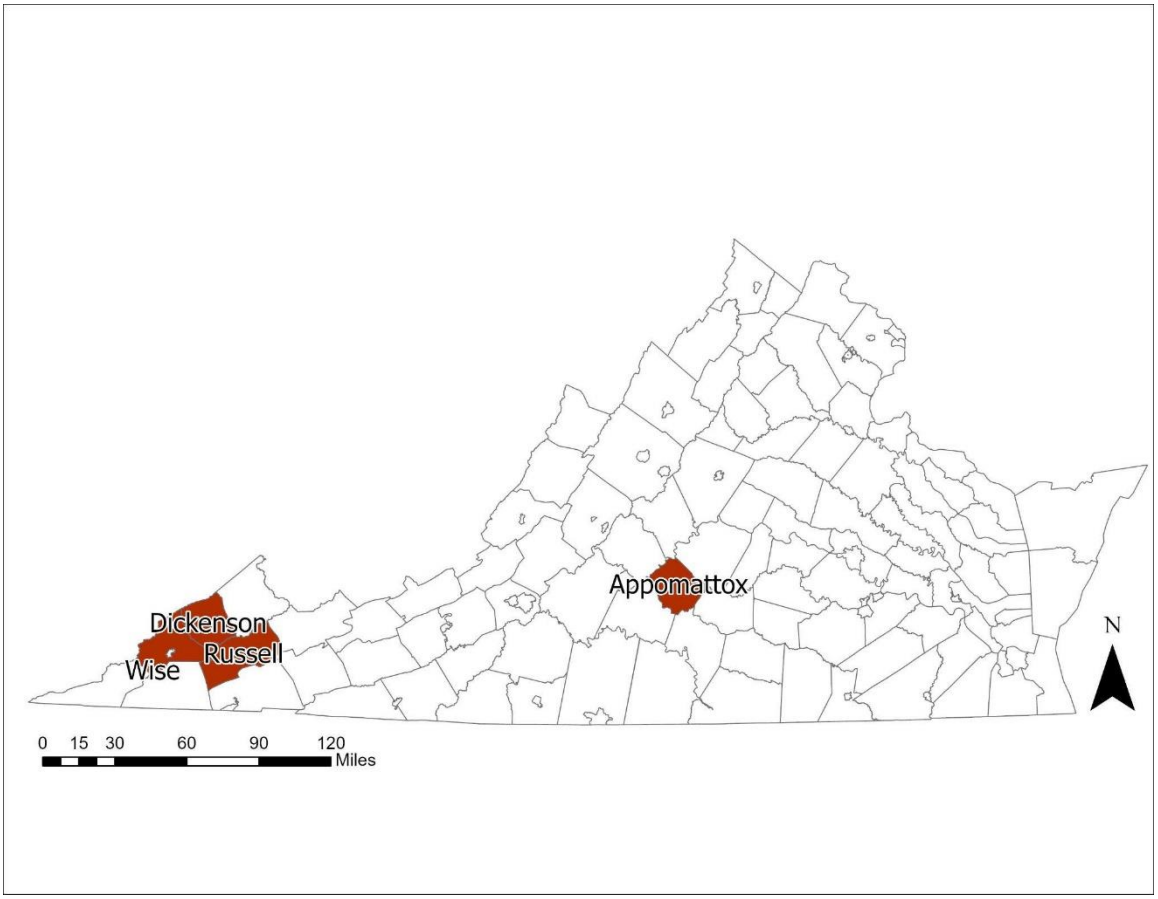
1. Volunteer Reliance: Many localities, particularly Dickenson and Russell Counties, rely heavily on volunteers.
2. Population Trends: While Appomattox County shows a slight population increase, the others either maintain stable populations or face declines, which may lead to decreasing tax revenue.
3. Mutual Aid Dynamics: All counties provide mutual aid, with most experiencing an increase in requests.
4. Service Delays: Several counties are reporting delays in service delivery.
5. Extended Response Times: All localities report average EMS call response times exceeding 50 minutes.
6. Rural-Urban Divide: Three out of the four counties are predominantly rural, with only one being mixed rural/ urban.

Table 8. Table of Localities with Overlapping Funding Vulnerabilities in FY21-FY23 (I.e. in the Bottom 10 for Funding per Capita, per Square Mile, and per EMS Call)

Locality	Career Staff	Active Volunteers	Provides Mutual Aid?	Mutual Aid Increase?	Service Delay Increase?	Locality Type	Population Growth Rate	Avg EMS Call Volume	Avg EMS Call Response Time (Minutes)	Funding per EMS Call	Funding per Capita	Funding per Sq Mi
Appomattox County	226	176	Yes	Yes	Yes	Rural	Moderately Increasing	2299	51.79	$154	$22	$1052
Dickenson County	0	7	Yes	No	Yes	Rural	Moderately Decreasing	2300	57.694	$171	$28	$1181
Russell County	0	138	Yes	Yes	Yes	Rural		7201	53.141	$77	$22	$1171
Wise County	19	40	Yes	Yes	No	Mixed	Moderately Decreasing	8938	295.561	$90	$22	$1974

These localities are depicted geographically in Figure 15, which again highlights the heightened vulnerability of localities in Southside and Southwest Virginia.

Figure 15. Table of Localities with Overlapping Funding Vulnerabilities in FY21-FY 23 (I.e. in the Bottom 10 for Funding per Capita, per Square Mile, and per EMS Call)



Underscoring the findings above, a review of the ISO fire insurance ratings from 2023 reveal that many areas within these counties received low public protection classifications (PPC). The ISO PPC ratings are designed to inform insurance companies offering fire insurance and are built on the Fire Suppression Rating Schedule (FSRS) from Verisk.[55,56,57] FSRS measures a community's fire protection based on the effectiveness of emergency communications systems, availability and type of water supply, community risk reduction (including fire prevention, education, and safety), and characteristics of fire departments themselves. According to Verisk, important fire department characteristics include:

[55] ISO Mitigation. (n.d.). *PPC®—Public protection classification overview*. ISO Mitigation. Retrieved October 14, 2024, from https://www.isomitigation.com/ppc/
[56] Gibbons, J., & Hobart, M. (2018). *The distance fallacy in fire protection*. Verisk. https://www.verisk.com/495b99/siteassets/media/campaigns/gated/underwriting/the-distance-fallacy-in-fire-protection.pdf
[57] ISO Mitigation. (n.d.). *FSRS—Fire suppression rating schedule overview*. ISO Mitigation. Retrieved October 14, 2024, from https://www.isomitigation.com/ppc/fsrs/

- Type and extent of training provided to fire company personnel
- Number of people who participate in training
- Firefighter response to emergencies
- Maintenance and testing of the fire department's equipment

Communities with the highest level of fire protection receive an ISO rating of 1 while those with the lowest receive a 10. Table 9 below articulates the number of communities in each vulnerable county identified above that have received an ISO rating of 8 or higher.

Table 9. ISO Ratings of Vulnerable Counties

County	Communities with an ISO Rating of 8 or above
Appomattox	1 out of 4 communities (Best ISO Rating = 4)
Dickenson	1 out of 6 communities (Best ISO Rating = 4)
Russell	3 out of 10 communities (Best ISO Rating = 5)
Wise	2 out of 15 communities (Best ISO Rating = 4)

ISO ratings can influence economic outcomes for communities as well. Primarily, fire prevention and containment directly reduce economic losses from businesses or homes being damaged or burned to the ground. A 2014 study found that the city of Phoenix enjoyed nearly one billion dollars in economic impact due to successful fire prevention.[58]

Secondly, an economic development case can also be made. While research is scarce, the article cited above suggests that ISO ratings can inform a company's site selection process. Stakeholder feedback confirmed this phenomenon. Positive ISO ratings indicate robust communities where employees will enjoy effective public services and where a new business's fire insurance premiums will be low.

To examine the potential economic impacts of allocating state funds to the local provision of fire and EMS services, the CPP turned to the economic modeling software IMPLAN. A model was created for each of the four vulnerable counties identified above. The model imagined a scenario where $1 million was provided for local government personnel at each of these localities.

[58] Rielage, R. (2017, December 4). *Using ISO rating and accreditation to justify fire service budget*. FireRescue1. https://www.firerescue1.com/fire-chief/articles/using-iso-rating-and-accreditation-to-justify-fire-service-budget-ufoRgYmQntUFDbJ9/

Table 10 articulates some of the economic characteristics of the counties identified above. These characteristics are factored into the hypothetical models allocating $1 million to each county.

Table 10. Economic Attributes of Vulnerable Counties

County	Employment	Economic Output	Real Estate Tax Rate, 2022	% of Local Budget to Fire and Rescue (FY21-FY23 Avg)
Appomattox	5,884	$747M	0.63	0.69%
Dickenson	4,171	$926M	0.6	0.89%
Russell	9,657	$2B	0.63	-–
Wise	15,000	$2B	0.69	0.6%

Table 11 shows the theoretical economic impacts of $1 million being allocated to local government personnel in each county. The results of the economic impact analysis below show how many jobs would be directly created from this investment, how many would be induced through additional money flowing through the local economy due to the spending of these employees, how much the local economy would grow, and how much additional tax revenue would be generated to the local, state, and federal government.

For example, in Appomattox County, $1 million directed toward fire/EMS personnel would support approximately 16 full-time Fire or EMS positions and an additional 1.71 jobs from the subsequent spending of those full-time employees, which would support employment in other sectors. IMPLAN defines jobs as “an industry specific mix of full-time, part-time, and seasonal employment”.[59] The results also show that while the counties would be able to hire fire and EMS personnel and enjoy healthy amounts of subsequent economic output from the spending of those employees, the majority of taxes would accrue to the federal government rather than the state or county due to the federal income tax.

Table 11. Economic Impact in Vulnerable Counties from $1 Million of Fire/EMS Personnel Funding

County	Fire & EMS Full-Time Employees	Induced Employment	Additional Economic Output	County Taxes	State Taxes	Federal Taxes
Appomattox	16.2	1.71	$1,439,897	$9,170	$36,518	$254,312
Dickenson	16.7	1.32	$1,415,933	$9,542	$34,918	$276,648
Russell	15.7	1.93	$1,489,206	$10,853	$37,610	$263,408
Wise	14.5	1.54	$1,442,564	$8,290	$35,284	$224,401

Note: The results above were produced using the Industry Employee Compensation event type and IMPLAN code 544 - Employment and payroll of local govt, other services. The table displays direct, indirect, and induced economic impacts.

[59] IMPLAN Group. (n.d.). *Jobs*. IMPLAN Support. https://support.implan.com/hc/en-us/articles/115009668628-Jobs

As covered elsewhere in this report, states overwhelmingly do not provide funding for local fire and EMS personnel, opting instead to provide funding for equipment and training, if at all. This distinction can be minor if the funding of equipment and training by the state frees up local funds for localities to pay for fire and EMS personnel.

Locality Funding Priorities

As shown in Figure 16, the vast majority of localities ranked career and volunteer personnel as the top funding gap. There were a few significant gaps ranked second place by localities, with 32.7% of localities ranking apparatus/ambulance second and 24.8% of localities indicating that facilities are the second most important gap.

Figure 16. Chart of Funding Gaps Ranked by Localities

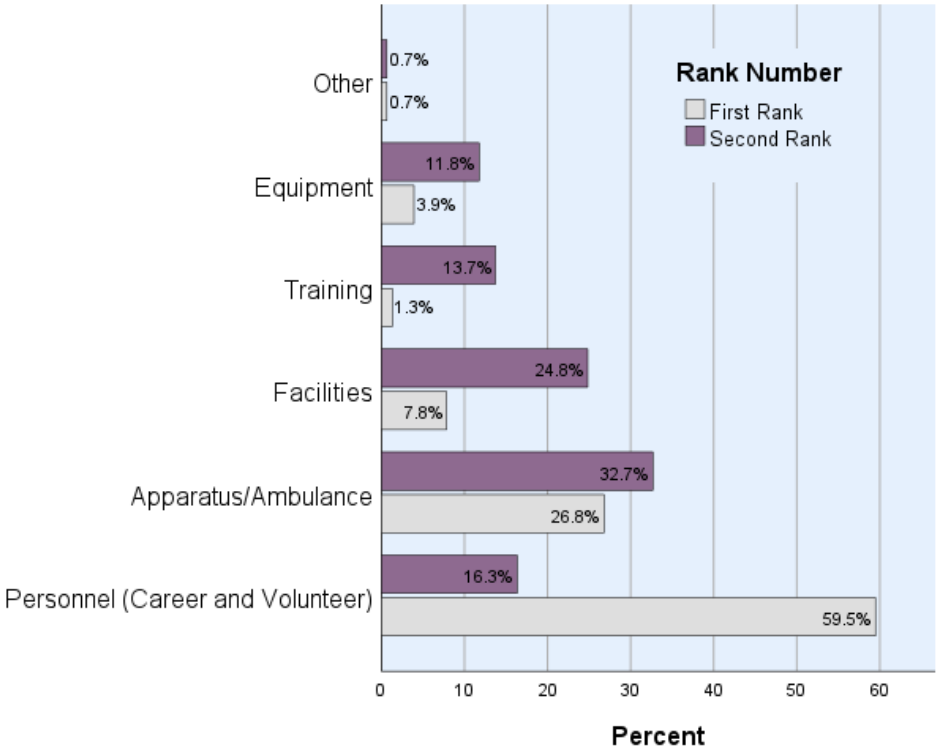
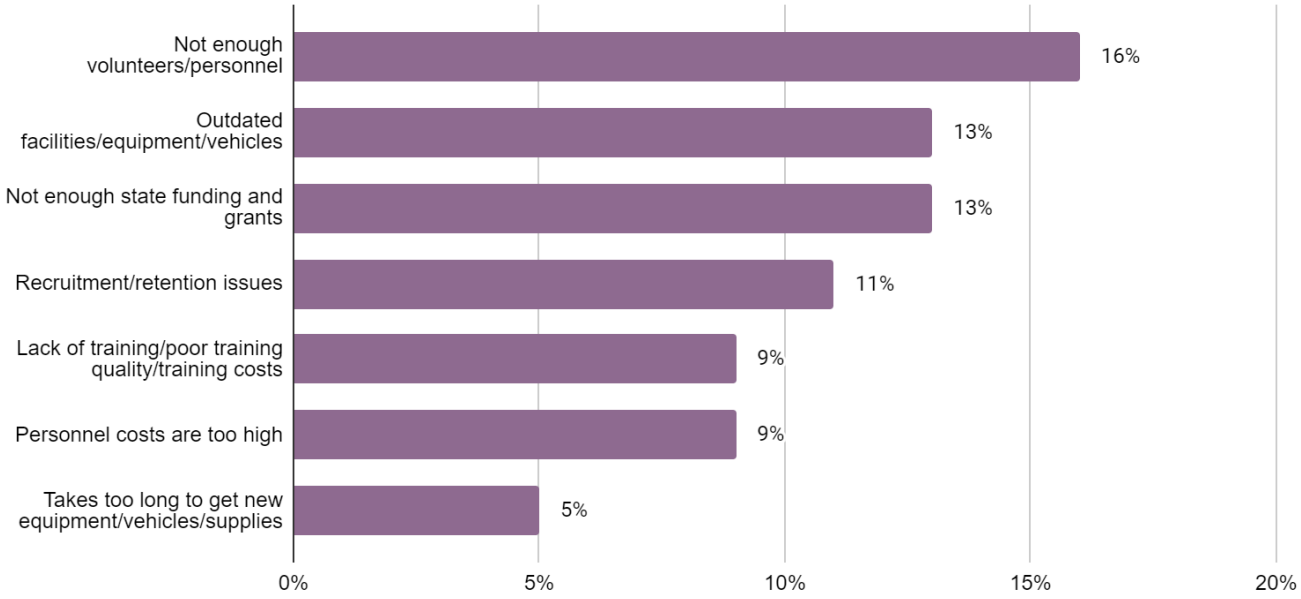


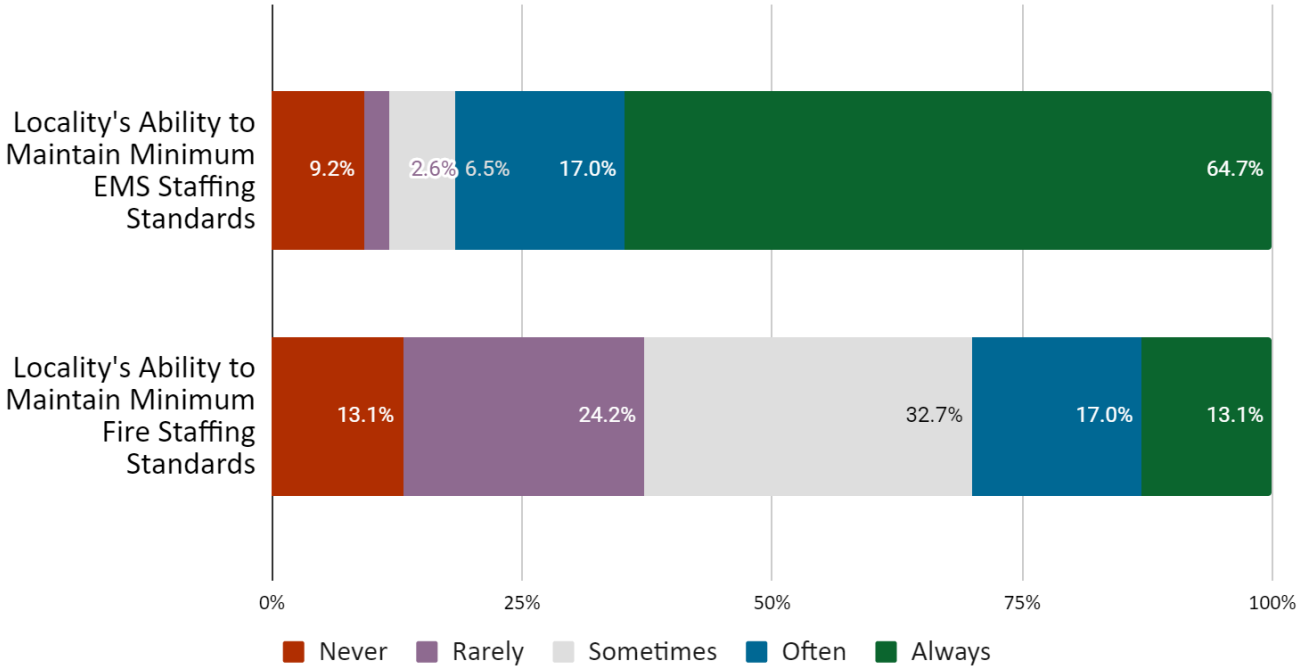
Figure 17 below shows the number of times survey respondents cited specific factors contributing to the gaps discussed above. The most commonly cited reason was that equipment, vehicles, and/ or facilities are too expensive, with 18% of respondents mentioning that factor. Lack of personnel (volunteer and career), outdated equipment, vehicles, and facilities, and lack of state funding were the other top factors.

Figure 17. Factors Contributing to Top Funding Gaps



The Virginia Fire and EMS Needs Assessment and Survey asked respondents for their perceptions of their locality's ability to maintain minimum staffing standards for EMS and fire services. Figure 18 illustrates that for EMS staffing, a significant majority, 64%, believe the locality consistently meets the required levels, with an additional 18% stating that staffing is adequate most of the time. In contrast, only 6% think staffing is sufficient sometimes, while a small percentage, 3% and 9%, feel it is rarely or never sufficient. The perceptions of fire staffing are less favorable; only 13% of respondents believe the locality consistently meets standards. While 17% feel it is often adequate, a larger proportion indicate that staffing is sometimes or rarely sufficient (33% and 24% respectively), and 13% say it is never sufficient.

Figure 18. Distribution of Survey Responses about Ability to Maintain Minimum Staffing Standards



Factors Influencing Funding Sufficiency and Sustainability

Analysis of What Factors are Most Influential Statewide

The Center for Public Policy reviewed a series of factors influencing funding sufficiency and sustainability in Virginia. Declining volunteerism, increasing mutual aid requests, escalating costs for equipment and fire/ rescue vehicles, and increasing competition for federal resources all emerged as significant factors affecting funding.

Figure 19 shows that volunteerism in Virginia's fire and EMS services has significantly declined over the last 3 years, according to self-reported data from localities responding to the Virginia Fire and EMS Needs Assessment and Survey. The results indicate that 91% of respondents noted a decrease in

volunteerism, while only 9% observed an increase. A thematic analysis of the responses from the participants revealed several common factors contributing to this trend, which is represented in Figure 20. Respondents had the option to select more than one contributing factor. 43% of respondents cited time, lifestyle, employer, or military constraints as a major obstacle. Additionally, 29% pointed to certification training and education requirements as a barrier to participation. Lastly, 22% expressed a lack of interest and awareness as a contributing factor to the decline in volunteerism.

Figure 19: Frequency of Survey Responses for Trend in Volunteerism Over the Past 3 Years

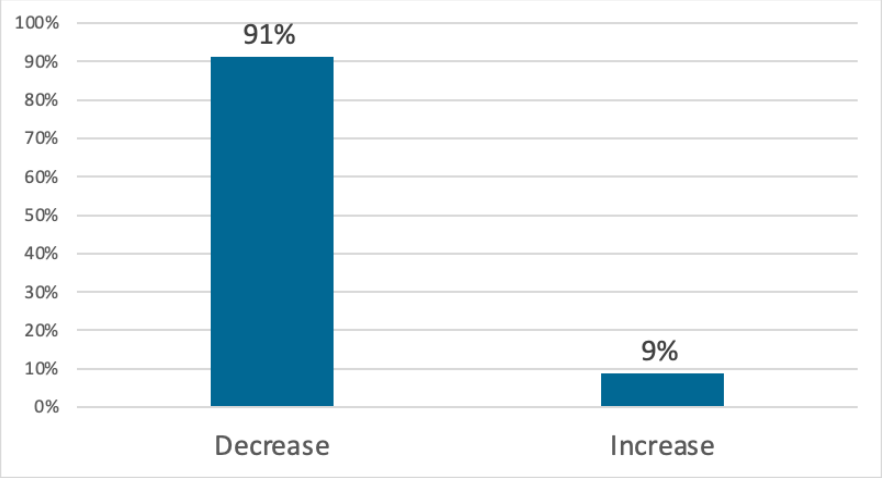
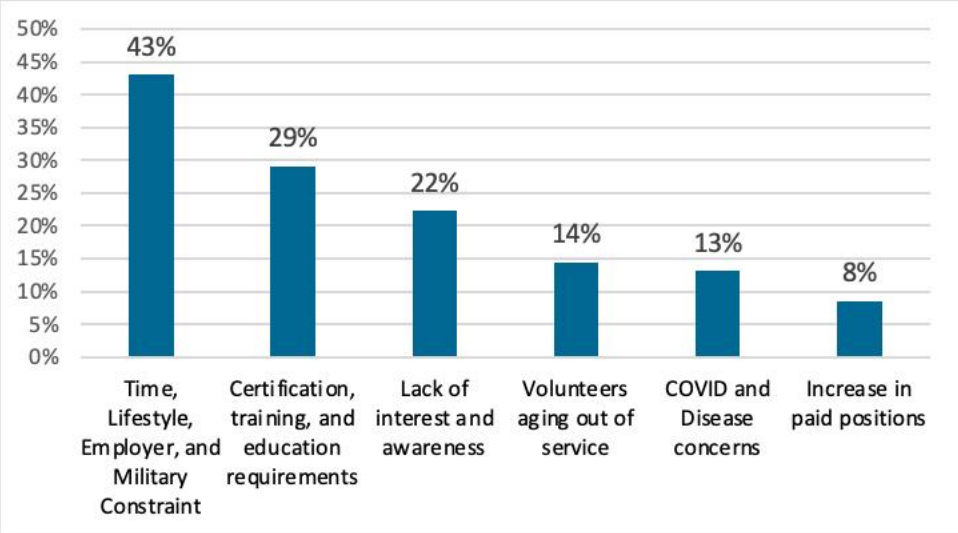


Figure 20. Frequency of Survey Open-Ended Responses for Reasons for the Trend in Volunteerism Over the Past 3 Years



A primary aspect of fire and EMS provision is the elaborate network of mutual aid agreements and automatic aid agreements. Localities turn to these agreements to address the unmet emergency response needs of their neighboring localities.

The figures below illustrate how common mutual aid requests are and how they are increasing among all locality types. Figure 21 shows that cities on average have higher mutual aid request rates than towns and counties. According to this data, the majority of cities request mutual aid on a daily basis, towns rarely, and counties on a weekly basis.

Figure 21: Mutual Aid Request Frequency by Locality Type

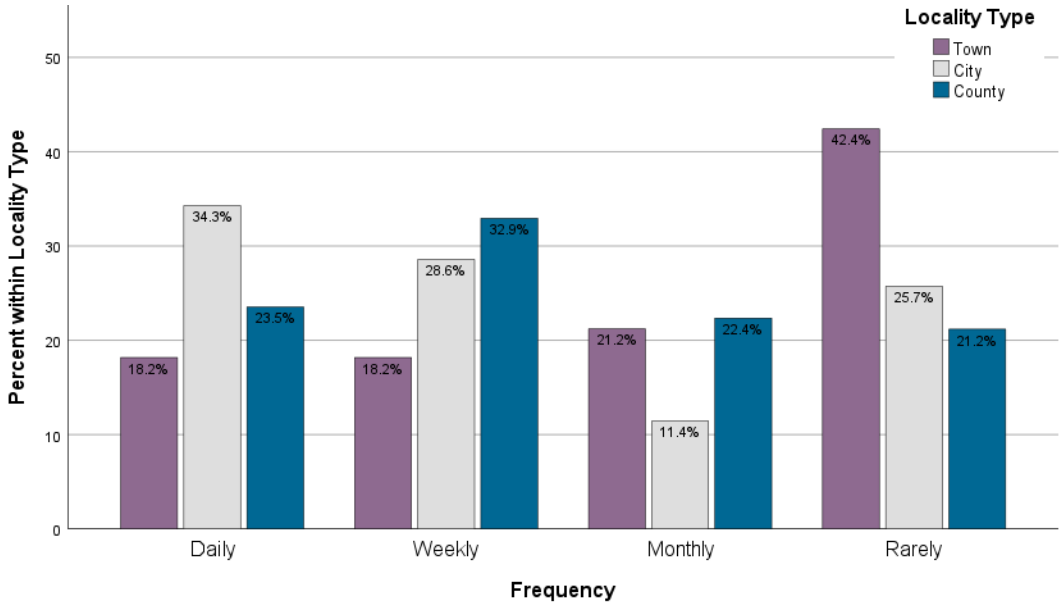


Figure 22 shows that the majority of each locality type provides mutual aid services. The highest percentage of localities within a locality type that provide mutual aid are cities, followed by towns, then counties.

Figure 22: Frequency of Mutual Aid Provision by Locality Type

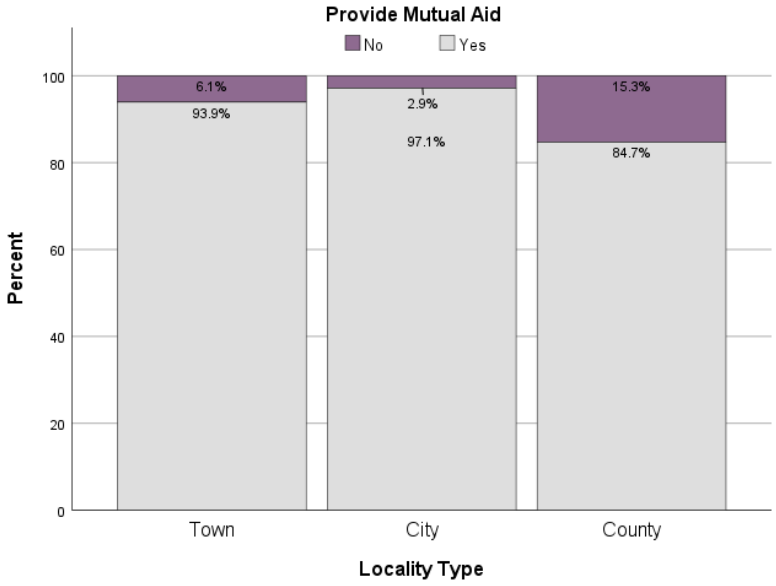
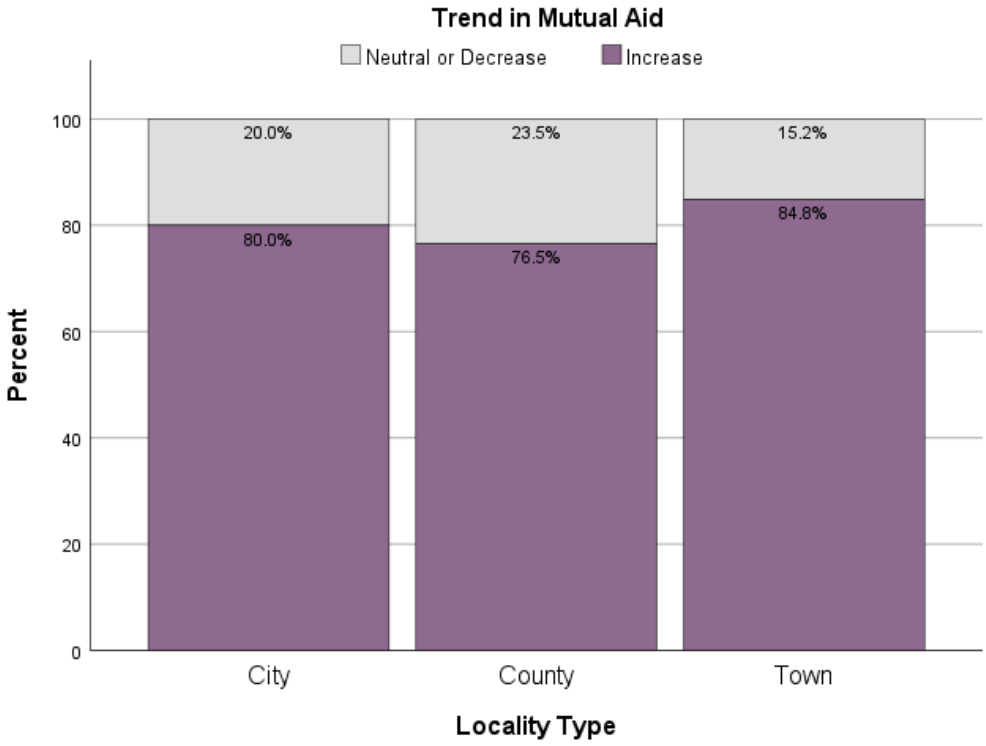


Figure 23 indicates that the majority of localities across all types have seen an increase in the frequency of mutual aid requests over the last few years. The highest percentage of localities within a locality type that have seen an increase in the trend of mutual aid are towns, followed by cities, then counties.

Figure 23: Mutual Aid Trends by Locality Type



Stakeholder Input on the Influence of Different Factors

Stakeholders expressed commonalities in challenges facing recruitment and retention of personnel. For paid positions, the field is seeing significant movement year to year as other localities work to incentivize personnel with larger wage offerings. This is experienced statewide in the settings that utilize a hybrid or all career approach. The process of lateral transfers due to pay wars between localities creates challenges for service sustainability and community connections. Many stakeholders shared that volunteerism is significantly impacted by the amount of time required for fundraising to keep operations running. The time needed for fundraising far exceeds the amount of time needed to serve the community in emergency response. Many stakeholders list challenges across the commonwealth in the coordination of and compensation for resource deployment among neighboring counties. Additional time and financial resources are needed at the county level to account for the new financial burdens outlined in the literature review. The combination of fundraising time, training, integrating new regulations, and call response needs leaves little time for grant writing efforts. Finally, stories shared by the stakeholder group show the importance of having resources and personnel needed for localities to

have a low ISO rating. A low ISO rating can attract businesses to the area and support economies to grow.

Statistical Analyses on which Factors are Most Influential

Several statistical techniques, including multi-linear regression modeling, K-means clustering, and an original "trouble index," yielded incongruent findings that point to data limitations and the heterogeneity of Virginia localities. That all methods resulted in similar conclusions indicates that this finding is reliable. The data collected across localities in Virginia show vast diversity among funding scenarios, which are extremely difficult to summarize using regional or categorical strata. However, this process did highlight several variables–the percentage of a locality's total expenditures allocated towards Fire/EMS, population growth rate, and percentage of a locality that is rural–as significant factors related to a locality's ability to sustainably fund its fire and EMS needs. However, this does not lead to any concrete conclusions about the predictive relationships between data variables and localities' funding needs, as this analysis has shown that such a straightforward answer to these crises is not apparent.

Please see Appendix B for a detailed description of the statistical analysis process, including detailed tables and graphs. A brief summary of the process is as follows:

Correlations Analysis: Two variables, the percentage of a locality's total expenditures allocated towards Fire/EMS and population growth rate are both relatively significant in their correlations with average call response time. This tells us that, more than other variables, as these variables increase, average response time slightly decreases.

Multilinear Regressions: Running multilinear regressions to understand which variables influence average response time and funding per capita resulted in statistically significant models that highlighted the percentage of a locality that is rural as the strongest predictor of both of these dependent variables. This finding indicates that differences of regional urbanity/rurality are likely to be prominent in the search for clear delineations of need.

K-Means Clustering: This analysis attempted to categorize localities based on certain metrics, such as average EMS response time, EMS staff count, and average EMS call volume, in order to categorize them based on these similarities. While this was possible based on individual metrics, localities do not behave similarly across multiple metrics. Localities are distinct enough that the K-Means clustering procedure was unable to identify subgroups useful for decision-making.

Trouble Index: The CPP attempted to manufacture a typology of localities using three variables: average EMS response time, EMS staff count, and average EMS call volume. For each variable, the data were split into quintiles ranking their values in ascending order. Those with the highest, most troubling values would be in the 5th quintile and receive a score of 5, while those with the lowest, least troubling values would be in the 1st quintile and receive a score of 1. The resulting scores were then summed creating what the CPP team termed a "Trouble Index." The research team anticipated identifying a handful of thriving localities with a score of 3 and a handful of struggling localities with a score of 15. Instead, no localities received a score of 15 or a score of 1-5. This method yields strong evidence that each locality in the Commonwealth is facing unique circumstances that resist quantitative categorization.

Urban and Rural Differences

Stakeholder Input on Urban and Rural Differences

Stakeholders contributed their lived experiences to the broader conversation on the unique needs of urban, rural, and mixed-population areas. Rural areas are experiencing an increase in medically underserved populations leading to an increase in medical-related calls. Some of these calls come from residents in non-emergency situations, who nonetheless need medical attention for chronic conditions, while others require transport to facilities far away, even out of state, for specialized treatment. A declining population and lower wages impact overall funding and volunteerism in rural areas. The local tax base cannot keep pace with the need for funding. Fundraising efforts are challenging as they draw from the community where families work to meet their needs with limited incomes. Those who may want to volunteer find it difficult to have the time and flexibility in their schedules for training and volunteering due to employment needs and opportunities. Road infrastructure is challenging as some roads are unable to accommodate the weight or size of the apparatuses and roads in poor condition damage current equipment. Cellular service in rural areas has been significantly impacted when cell companies changed to 5G connectivity. Many rural areas do not have the cellular infrastructure to support 5G connectivity so service is either unavailable or unreliable. This impacts a volunteer's ability to be informed of calls and also diminishes the ability to communicate with hospitals and complete some needed in-field assessments for medical response, such as the use of an EKG machine. The large distance between counties in rural areas also impacts their ability to form regional partnerships for coordinated services and purchasing. Overall, stakeholders see that the decline in population and volunteers in combination with the other challenges listed above lead to higher response times to calls and a lack of opportunity to fund apparatus, facilities, and personnel to meet the growing needs of the community.

Urban areas have a unique set of conditions influencing their funding sustainability. Factors influencing call response time and capacity are increasing population density, city infrastructure (high-rise buildings, street restrictions, bridge load restrictions), cellular reception in buildings, and traffic congestion. Many urban areas in Virginia are vibrant with cultural and linguistic diversity. As such, additional funding and time are needed to meet the linguistic needs of the population. In some areas, personnel are paid a higher differential for being bilingual or multilingual. Realtime phone-based translation services are available but using them comes at an additional cost to the department and slows the process of meeting urgent needs in a fire or medical emergency.

Counties with mixed urban and rural areas require fire and EMS personnel with the skills, training, and resources for both settings. These communities have high population density in some areas and low density in others, raising questions about equity in services and funding burden. Some of these areas provide services to surrounding counties that do not provide reciprocal assistance, further impacting the funding requirements for emergency response. In response to the decline in volunteerism and growing need for services, many of these communities have evolved into a hybrid staffing model, with a combination of career (paid) and volunteer personnel. This can lead to cultural challenges as the two groups learn to cohesively work together.

Data Analysis on Urban and Rural Differences

Despite the differences in urban and rural landscapes, their funding priorities are very similar. When disaggregated by urban, rural, and mixed-type localities, the Fire and EMS Needs Assessment Survey question on funding gaps reveals that Personnel is the top ranked priority for all locality types, apparatus/ ambulance is second, and facilities is third, as shown in Figure 24. This communicates the urgency of meeting personnel and apparatus/ ambulance needs across the commonwealth in all locality types.

Figure 24. Top-Ranked Funding Gaps by Regional Majority Type

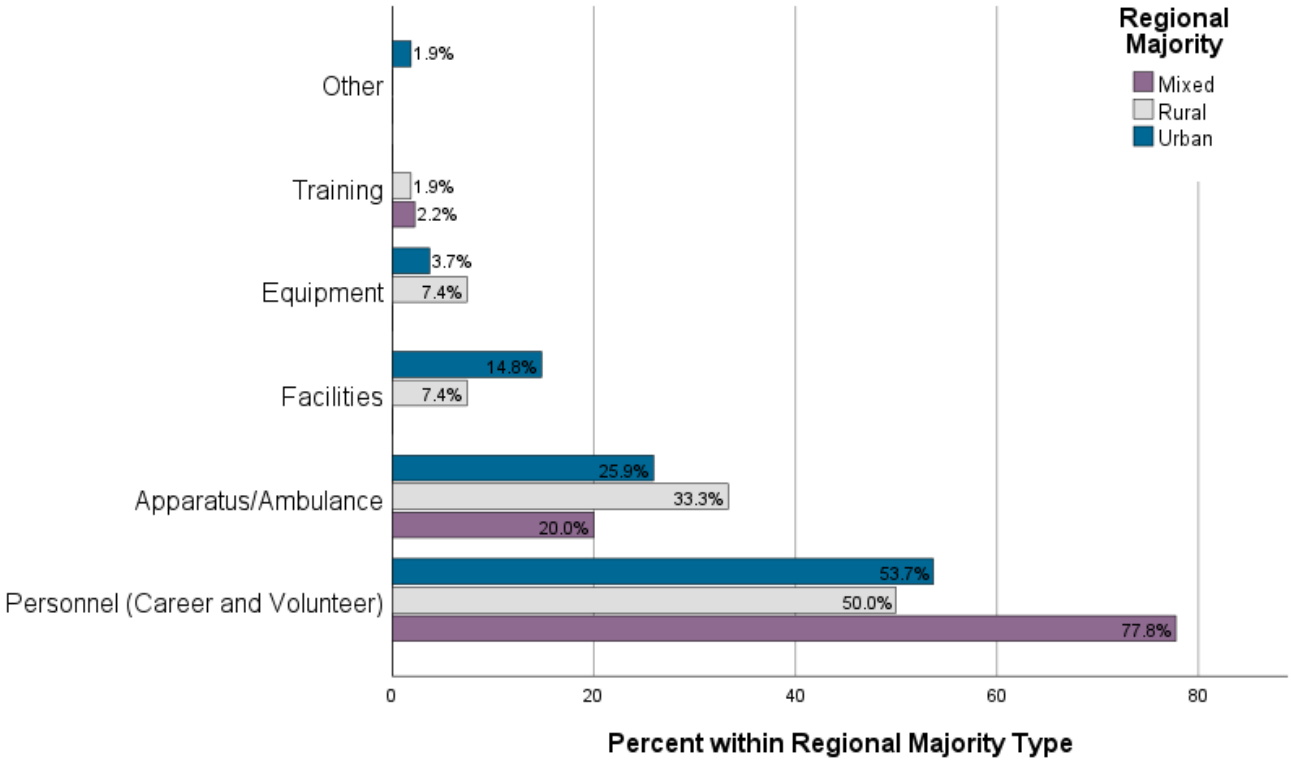


Figure 25 shows staffing levels per capita broken out by locality type, based on the OEMS staffing data. There are no striking differences amongst urban, rural, and mixed localities, though urban localities do appear to have slightly fewer staff per capita than mixed or rural.

Figure 25. EMS Staff per 1,000 People by Locality Type

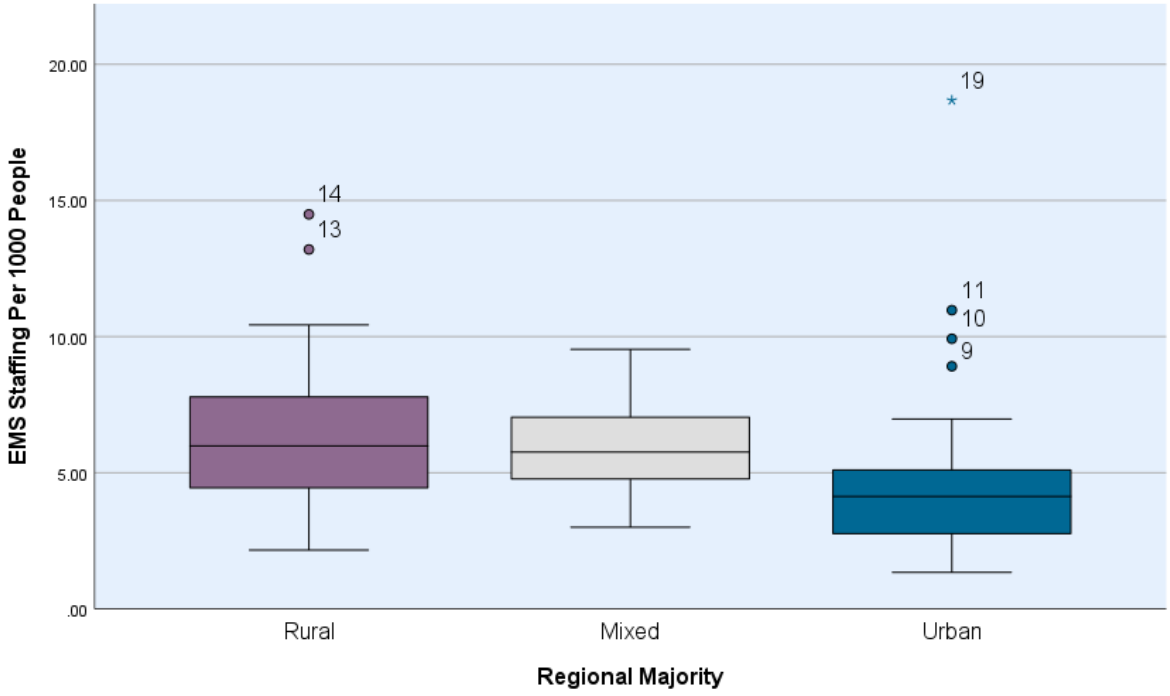


Figure 26 goes deeper into an analysis of regional differences in staffing adequacy by displaying self-reported data on staff numbers and type (career vs. volunteer) of fire and EMS staff. This data removes extreme outliers for ease of understanding, but a map that includes extreme outliers can be seen in Appendix B, Figure B6.

Here, mixed urban and rural localities appear to have the lowest staff per capita, followed by urban, with rural localities reporting the highest staffing to population ratio. In all three localities, volunteer staff are more numerous than career staff, but rural areas report the highest volunteer staffing numbers, suggesting that rural localities are most heavily reliant on volunteer staff.

Figure 26. A Comparison of Volunteer and Career staff per 1,000 People by Locality Type Without Extreme Outliers

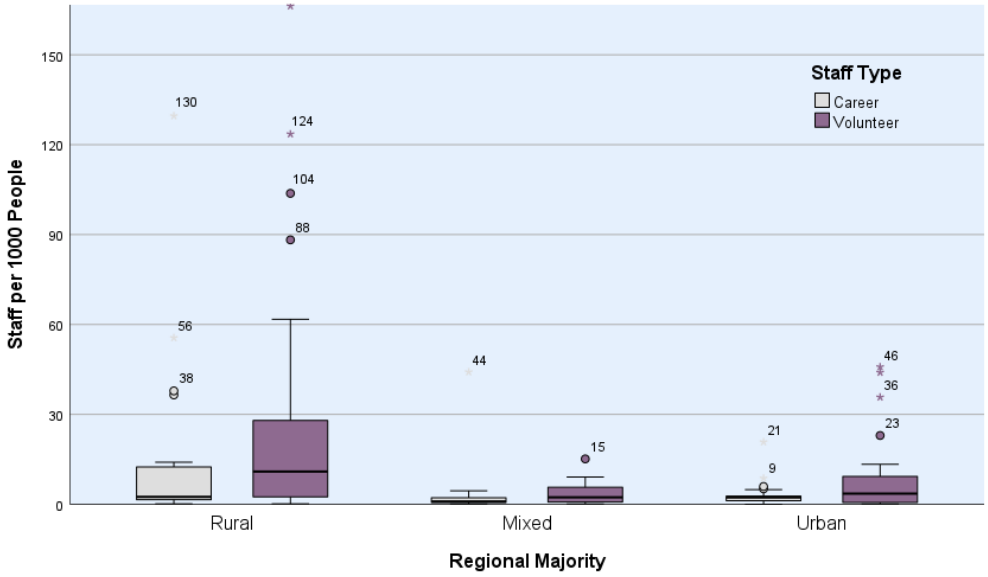
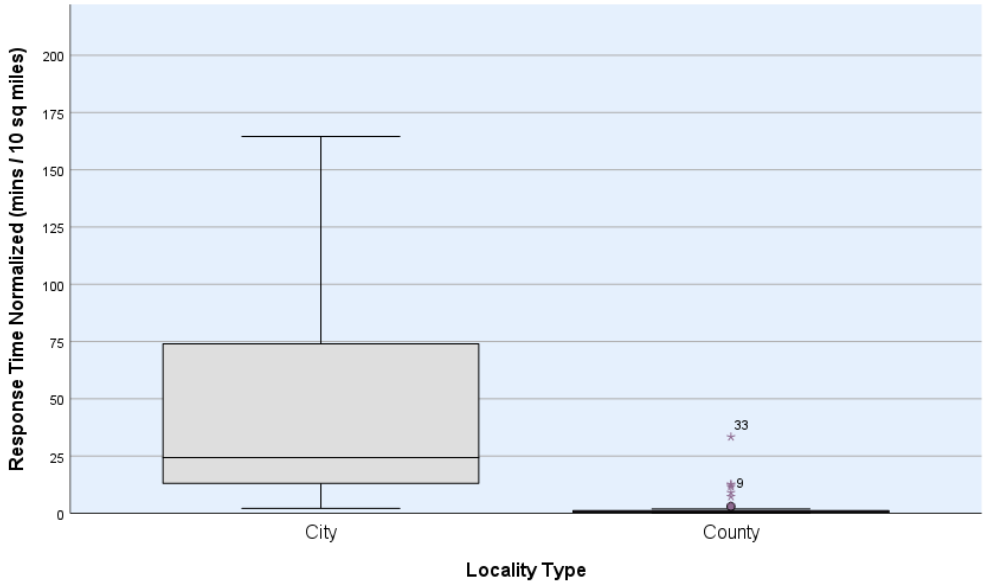


Figure 27 shows EMS Response time data broken down by City and County, and normalized by land area to account for the larger distances that rural EMS departments have to travel to deliver services within locality borders. To see a visual of this data with extreme outliers, see Appendix B, Figure B7. At first glance, this visual communicates the relatively longer response times reported for City EMS departments. However, given that all but 1 Virginia City reported providing mutual aid, these numbers may be skewed by the amount of time it takes urban first responders to reach callers in the counties.

Figure 27: Boxplot of Response Times (Normalized by Land Area - mins / 10 sq miles) by Locality Type Without Extreme Outliers



It is important to note that response time, normalized by land area, is an imperfect metric when distinguishing between locality types, as mutual aid is not accounted for. Because a city or a county may provide mutual aid services to nearby or internal towns/cities, their average response times are unrepresentative of the land area outside of their jurisdiction. Existing survey data on this issue was limited to whether localities participated in mutual aid, but future assessment of data specifically about which localities offer services to which others may prove helpful.

Regional Differences

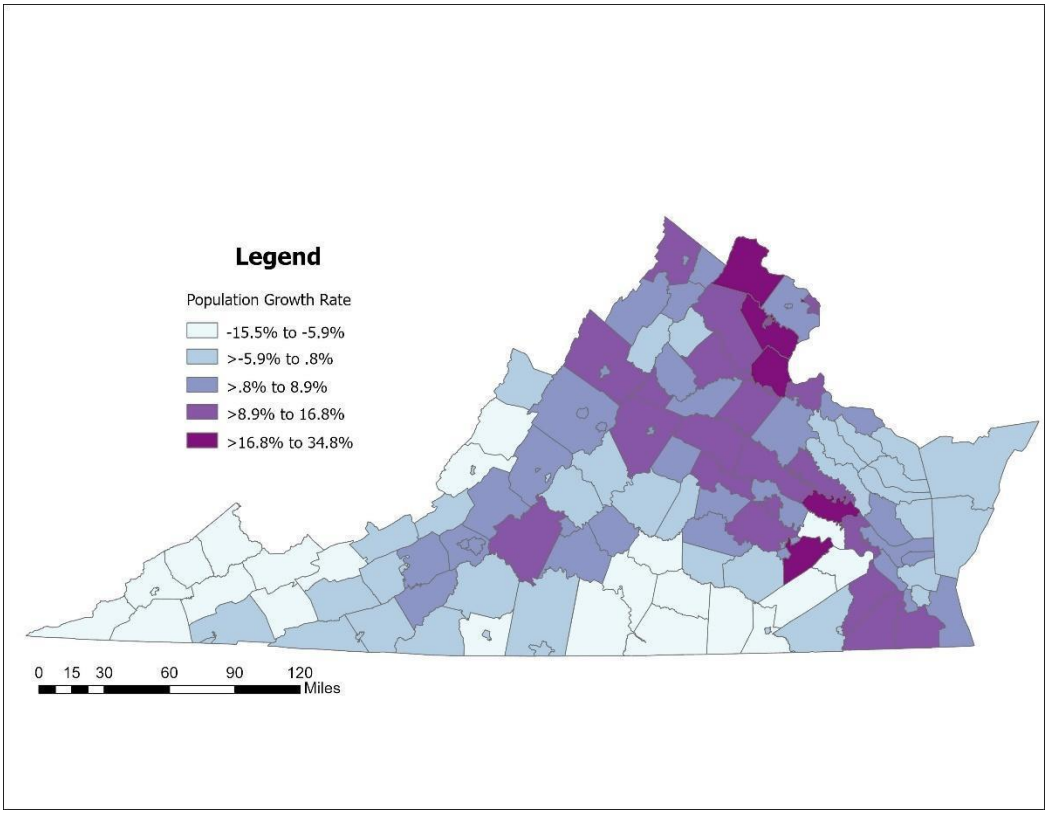
Stakeholder Input on Regional Differences

While many of the shared challenges across the commonwealth are discussed above as they relate to rural, urban, and communities with mixed populations, the stakeholders expressed additional regionally specific differences that impact their funding sufficiency. Most notably are the impacts to a region's ability to collect tax revenue from those in their communities. Tidewater is significantly impacted by the unrealized tax revenue on military operated property. Counties with primarily military operated land and land owned by religious institutions lose the ability to collect taxes on the property and thus have a smaller amount of overall revenue to allocate to fire and EMS operations. Similarly, communities with national park land are also unable to gain tax revenue from that land. Being primarily rural, Southwest Virginia experiences the compounded impact of the challenges listed above for rural areas. Their proximity to other states offers medical services that are often closer than those in Virginia, leading to transport out of state. The Northwest Region has seen an influx of residents relocating from Washington, DC. who often expect the same level of services they are accustomed to in DC when they now reside in more rural areas. Some localities within the Greater Richmond region experience a large number of mutual aid requests without receiving the same level of reciprocal service. This area does not have an efficient way to deploy available regional resources and localities do not get reimbursed when they respond to a mutual aid call.

Geospatial Analysis on Regional Differences

Additional data analysis on regional differences in funding capabilities sheds light on additional regional trends. As shown in the two darkest purple colors on the map in Figure 28, there is a clear trend of strong population growth in the urban crescent, as well as in part of Central Virginia stretching into the Shenandoah Valley Region. According to data from the Decennial Census, these areas experienced a growth rate of 8.9%-34.8% from 2010 to 2020. By contrast, Southside Virginia and Southwest Virginia, which are colored in the lightest blue color in the map, experienced significant population decline in this period, at a rate of negative 5.95% to negative 15.5%.

Figure 28. Map of Virginia County and City Population Growth Rate from 2010-2020



To understand the relationship between population growth and funding, the CPP team used the dollar contributions of local governments to fire/EMS services, and normalized them by population and call volume. With few exceptions, maps of these funding numbers closely follow the same patterns as population growth, as shown in Figures 29 and 30. In other words, where population growth is strong, funding per capita and funding per EMS call are also strong, but where the population is declining rapidly, funding levels are much lower. It is worth noting again here that, while it would have been more thorough to include calls for fire service in this analysis, the State does not require data reporting on fire calls, so the most accurate representation of local call volumes comes from the OEMS data on EMS calls for service.

Figure 29. Map of Fire/ EMS Funding per Capita in Virginia Cities and Counties in FY21-FY23

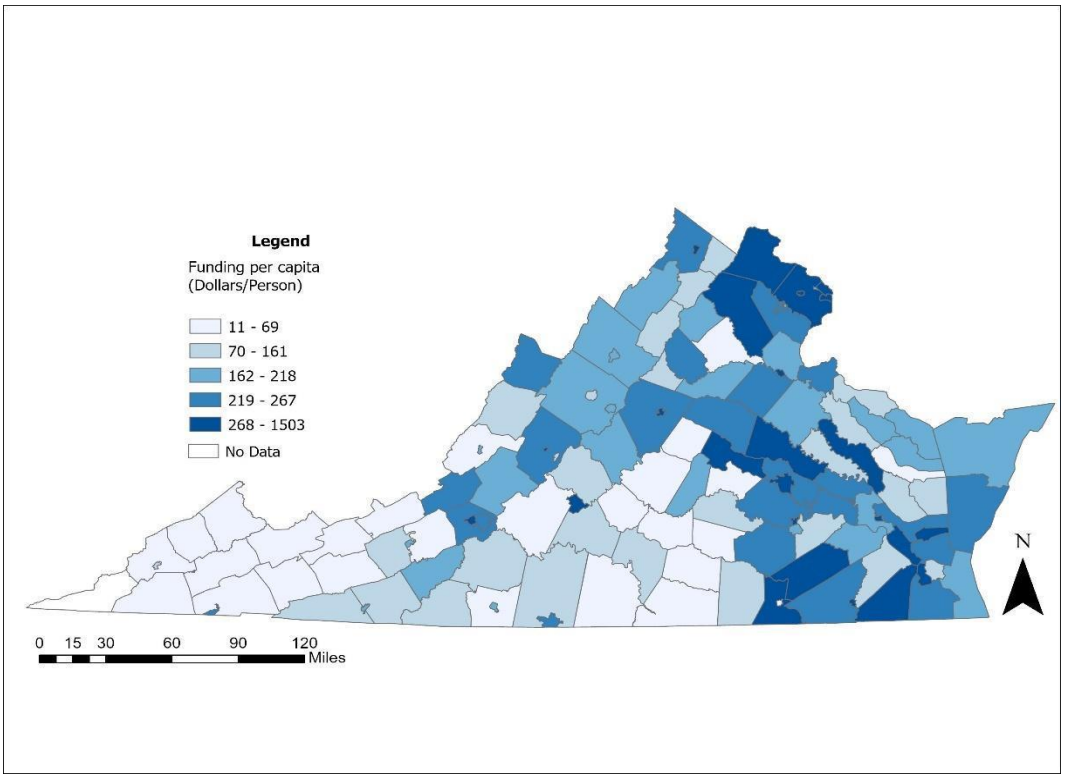
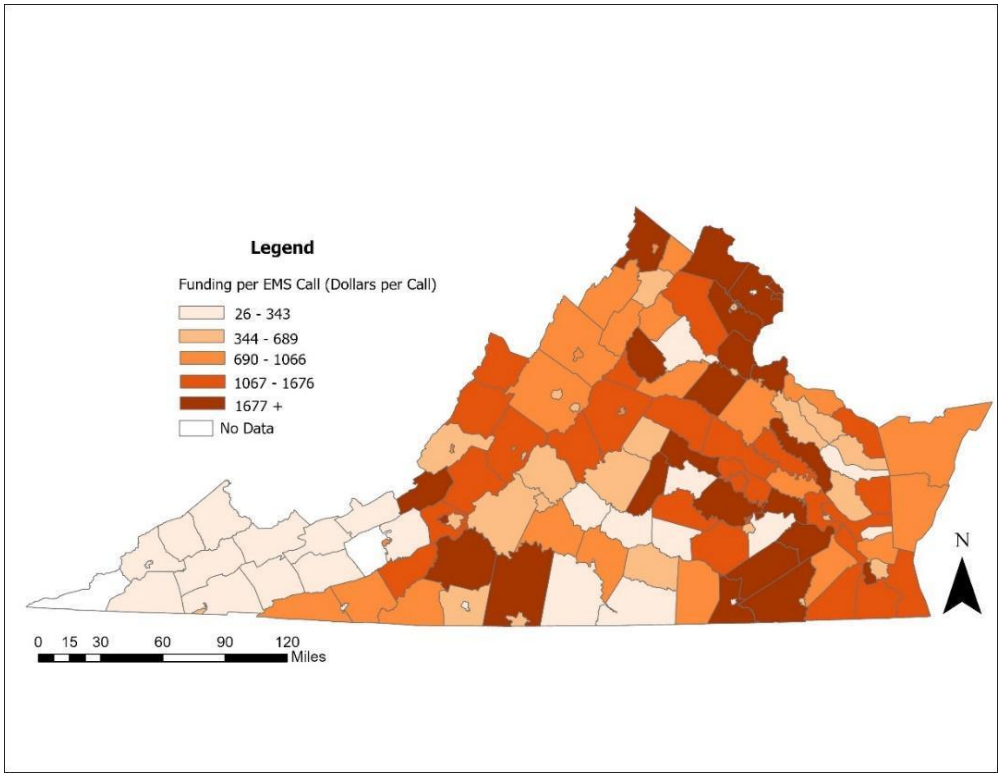
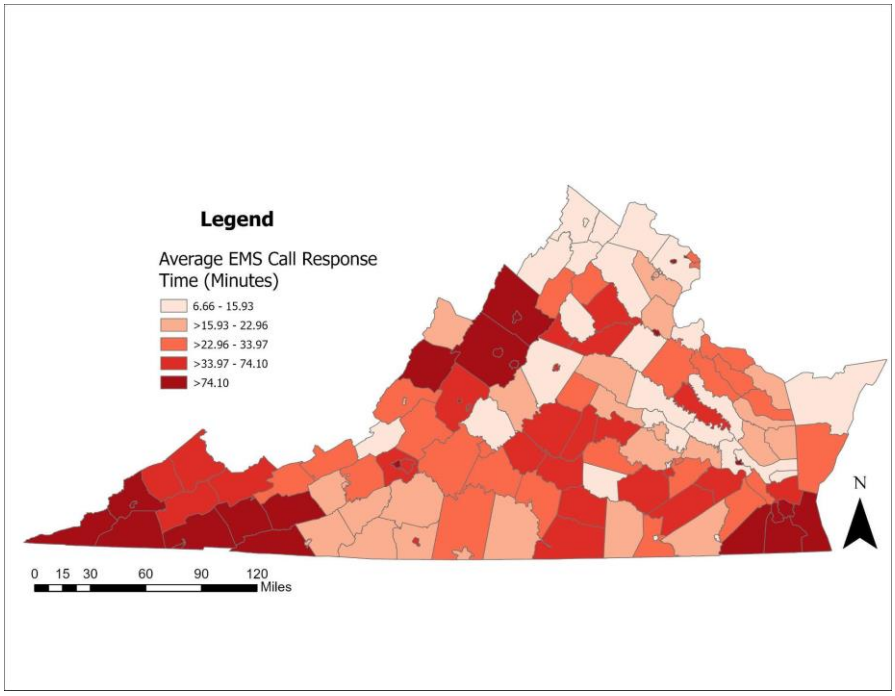


Figure 30. Map of Fire/ EMS Funding per EMS call in Virginia Cities and Counties in FY21-FY23



The data displayed in the response time map in Figure 31 represents a mirror of the trends above, though an imperfect one. Here, Southwest Virginia and parts of Southside are highlighted in the darkest red color for having the slowest response times, but parts of the Shenandoah Valley and far Southeast Virginia also appear to have extremely long response times. However, stakeholders commented that long response times may reflect localities responding to mutual aid requests for surrounding counties, which would extend their average response times. Therefore, response time alone may not be the most meaningful indicator of need.

Figure 31. Map of Average Response Times to EMS Calls in FY21-FY23



Alarmingly, there are 29 localities with average EMS call response times of more than one hour. Several of these localities are also on the lowest funding lists above, indicating that localities that struggle to fund these services also struggle to meet their residents' needs promptly. Localities that report average EMS call response times of over 60 minutes and are among the lowest funded localities from Tables 5- above include:

- Bath County
- Lunenburg County
- Norton City
- Prince Edward County
- Scott County
- Smyth County
- Wise County

These localities are likely among the most vulnerable in terms of their ability to fund fire/ EMS services and the impact of funding needs on services, and should thus be prioritized in considerations for additional State support.

Peer State Comparison of Fire and EMS Administrative Structures

This section of the report analyzes the administrative structures and funding sources for firefighters and emergency medical services (EMS) in five peer states: Delaware, New Jersey, Maryland, North Carolina, and West Virginia.

Overview of Administrative Systems in Virginia

The Office of Emergency Medical Services (OEMS)[60] operates under the Virginia Department of Health, which is overseen by the Secretary of Health and Human Resources. OEMS is responsible for planning and coordinating an effective and efficient statewide EMS system. Virginia programs and services are designed to ensure quality prehospital patient care, from the moment a call is received by the 911 center to the delivery of the patient to the trauma center or hospital.

The Virginia Department of Fire Programs (VDFP)[61], housed under the Secretary of Public Safety and Homeland Security, is responsible for key initiatives such as the Aid-to-Localities (ATL) grant, which offers financial assistance to fire services, along with various specialized grants. VDFP also provides nationally accredited training for both career and volunteer emergency responders and manages the Virginia Fire Incident Reporting System (VFIRS) for data collection and the promotion of best practices. As a Virginia Emergency Support Team (VEST) agency, VDFP delivers operational and technical assistance during emergencies and conducts fire safety inspections through the State Fire Marshal's Office. Additionally, the agency offers technical assistance to localities by conducting fire and EMS studies to address various operational challenges.

The Virginia Department of Fire Programs (VDFP) and the Office of Emergency Medical Services (OEMS) operate under different secretariats—Public Safety and Health and Human Resources, respectively—yet they function in similar areas focused on public safety and emergency response. This section aims to explore the potential benefits of consolidating these agencies under a single secretariat, examining whether such a move could enhance coordination, streamline resources, and improve overall emergency services across the Commonwealth.

[60] *Office of Emergency Medical Services*. Emergency Medical Services. (2024, October 9). https://www.vdh.virginia.gov/emergency-medical-services/

[61] Virginia Department of Fire Programs. (2022, August 9). *About Virginia Department of Fire Programs*. https://www.vafire.com/about-virginia-department-of-fire-programs/

Overview of Administrative Systems in Peer States

Maryland

Maryland provides a consolidated approach to fire and EMS services through the **Office of the State Fire Marshal (OSFM)**[62], which operates under the **Department of State Police**. This office oversees statewide fire investigations, enforces fire prevention codes, and coordinates fire prevention efforts. The **Emergency Medical Services Committee**[63] supervises EMS regulations and training. Funding for EMS primarily comes from the **Maryland Emergency Medical System Operations Fund (MEMSOF)**, supplemented by grants for fire services.

Delaware

In Delaware, fire services and EMS are administered through separate entities. The **Office of the State Fire Marshal**[64] functions under the **Department of Safety and Homeland Security**, focusing on fire prevention and training. Meanwhile, EMS oversight falls to the **Office of Emergency Medical Services**[65] within the **Department of Health and Social Services**. EMS can request ambulances through the fire website, facilitating efficient resource deployment in emergencies[66]

New Jersey

New Jersey also maintains distinct cabinet offices for fire and EMS services. The **Division of Fire Safety**,[67] part of the **Department of Community Affairs**, manages fire services, while the **Office of Emergency Medical Services**[68] operates under the **Department of Health**.

North Carolina

North Carolina's fire and EMS services are supported by the **North Carolina Fire and Rescue Commission**[69] and the **Office of Emergency Medical Services**[70], both under different cabinet offices. The state's funding mechanisms include the **Volunteer Fire Department Fund**, which was created to assist fire departments to purchase equipment and make capital expenditures.

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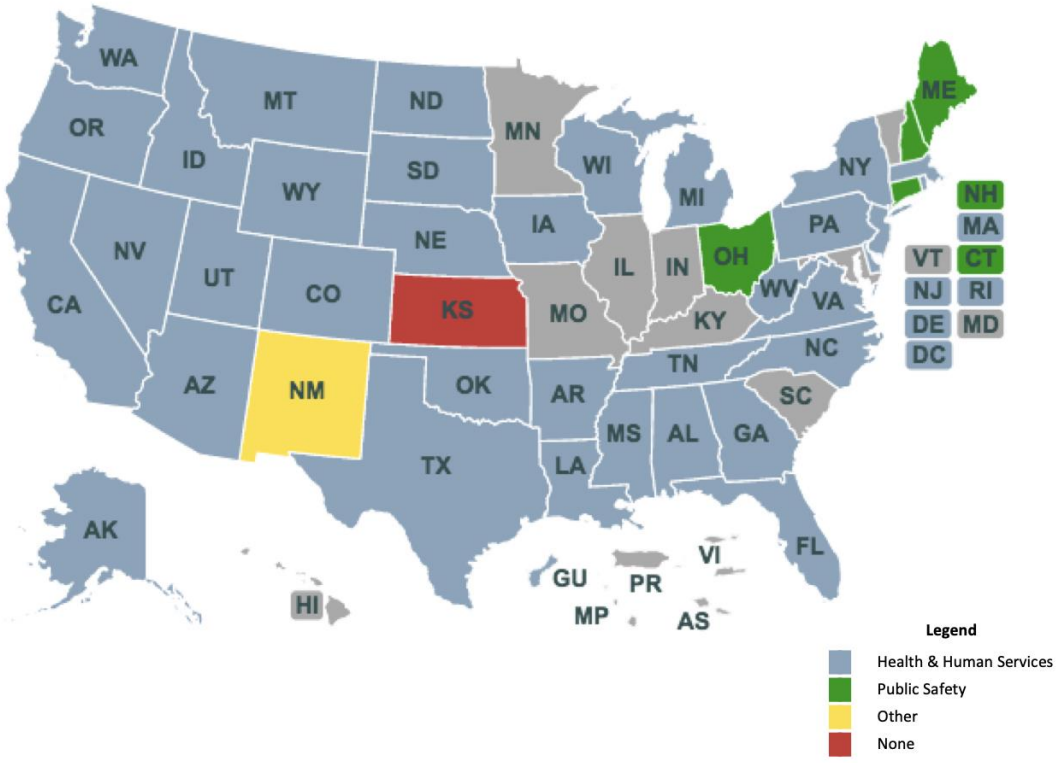
[62] *State police. Maryland State Police. (n.d.).* https://mdsp.maryland.gov/firemarshal/Pages/StateFireMarshal.aspx
[63] *Maryland Institute for Emergency Medical Services Systems. Home. (n.d.).* http://www.miemss.org/home/
[64] *Administrative division. State Fire Marshal - State of Delaware. (2024, October 7).* https://statefiremarshal.delaware.gov/administrative-division/
[65] *Delaware, T. S. of. (n.d.). Emergency medical services (EMS). DPH Services: Emergency Medical Services (EMS) - Delaware Health and Social Services - State of Delaware.* https://www.dhss.delaware.gov/dph/ems/ems.html
[66] *Ambulance applications*. State Fire Prevention Commission - State of Delaware. (2023, September 15). https://statefirecommission.delaware.gov/ambulance-applications/
[67] *New Jersey Department of Community Affairs (DCA) | Fire Safety. (n.d.) Official Site of the State of New Jersey.* https://www.nj.gov/dca/dfs/index.shtml
[68] *Emergency medical services. Department of Health | Emergency Medical Services. (n.d.).* https://www.nj.gov/health/ems/
[69] *Office of the State Fire Marshal (OSFM) | NC DOI. (n.d.-a).* https://www.ncdoi.gov/about-doi/office-state-fire-marshal-osfm
[70] *North Carolina Office of Emergency Medical Services. (n.d.). NCOEMS.* https://oems.nc.gov/about/

West Virginia

In West Virginia, the **State Fire Commission** and the **State Fire Marshal's Office**[71] function under the **Department of Military Affairs and Public Safety**. EMS services are managed by the **West Virginia Office of Emergency Medical Services**[72], which operates within the **Department of Health and Human Resources**.

Overview of United States EMS Office Administrative Structures



According to the NASEMSO report from 2017[73], four out of the fifty states—Ohio, Connecticut, Massachusetts, and New Hampshire—have consolidated their fire and EMS programs. 86% of states maintain separate fire and EMS programs, highlighting the diverse approaches to emergency management across the country.

[71] *West Virginia State Fire Marshal. (n.d.).* *https://firemarshal.wv.gov/about/Pages/StateFireMarshal.aspx*
[72] *West Virginia Office of Emergency Medical Services. (n.d.-b).* *https://www.wvoems.org/*
[73] NASEMSO. (2017). https://nasemso.org/nasemso-document/ems-officestructurefunction-2017-0428/

Takeaways from the Peer State Analysis

This section examines the potential benefits and challenges of consolidating the Office of Emergency Medical Services (OEMS) and the Virginia Department of Fire Programs[74] (VDFP) under a single secretariat. Currently operating in separate secretariats, these agencies share overlapping functions in public safety. The cost-benefit analysis below incorporates literature from relevant articles[75] and applicable factors identified through stakeholder engagement. This analysis seeks to understand how consolidation could improve service delivery, optimize resources, and enhance coordination among emergency services in Virginia.

Benefits of Consolidated State-Level Administrative Structures

Cost Savings:

- **Cost Efficiency:** Merging departments can lower operational costs through economies of scale and optimized resource allocation, especially in overlapping jurisdictions.

Improved Service Quality:

- **Enhanced Training and Staffing:** With a larger resource pool, training opportunities can be improved, leading to better-prepared responders. Coordination of shared training becomes easier under a unified department.
- **Streamlined Operations:** Consolidation reduces redundancy, allowing for more efficient deployment of resources and personnel.

Simplified Administration:

- **Unified Management:** A single administrative body simplifies oversight and reduces bureaucratic hurdles, streamlining policy implementation.
- **Lower Administrative Burden:** Centralized policies simplify management, reducing administrative overhead and confusion about agency responsibilities.

Improved Data Collection:

- A consolidated approach may enhance the quality and accessibility of data, as sharing training and data tracking systems can eliminate duplicative efforts.

[74] Wilson, J. M., & Grammich, C. A. (2017). The contribution of police and fire consolidation to the Homeland Security Mission. https://www.researchgate.net/publication/235098724_The_Contribution_of_Police_and_Fire_Consolidation_to_the_Homeland_Security_Mission

[75] Heiman, T. D. (2007). Evaluating models of a consolidated fire agency in Winnebago County. Town of Algoma Fire Department. FEMA.

Connection with Fire and EMS:

- Integrating the Office of Emergency Medical Services (OEMS) under the Secretary of Public Safety and Homeland Security would foster closer ties between EMS and fire services, compared to their current separation under public health and public safety.

Clearer Governance:

- Keeping two separate advisory boards is not recommended, as a unified voice for public safety could streamline communications with the government, allowing for a clearer policy focus.

Items to Consider with Consolidated State-Level Administrative Structures

- **Medical Oversight:** Changes in medical oversight may require a complete code revision or clarification of authority regarding EMS operations
- **Impact of Job Loss:** Consolidation could lead to job loss through position reinventions, as seen in municipal mergers, which often result in fewer stations and personnel
- **Public Perception of EMS:** EMTs may feel undervalued despite their contributions to public safety, emphasizing the need for recognition
- **Stakeholder Engagement:** Gaining support from all stakeholders, including government officials, is crucial for successful reorganization
- **Effective Messaging:** Clear communication about how reorganization will impact local operations is essential, particularly given that many current department members may lack experience with both fire and EMS
- **Need for Experienced Leadership:** Future leadership should include individuals with direct experience in fire and EMS to ensure informed decision-making
- **Quality of Service:** Residents deserve high-quality fire, EMS, and law enforcement services, and any consolidation should prioritize maintaining or enhancing this quality
- **Training and Proficiency:** Ensuring proficiency through effective onboarding and training is critical to achieving operational excellence across merged services

Stakeholder Input on Consolidated Administration

Stakeholders overwhelmingly support relocating the OEMS to be housed within the Secretary of Public Safety and Homeland Security. It is widely agreed that EMS personnel feel they are contributing to public safety in their communities. Stakeholders noted that 65 percent of EMS is completed by fire services. Having the two entities within the same secretariat can help constituents at all levels have one entity to go to with questions, concerns, and requests. Stakeholders are not aligned on exactly where the work and staff of OEMS should be within the larger agency structure, with some advocating for it to become a Department of EMS and others weighing the possibility of its incorporation into VDFP. Stakeholders acknowledged that further discussion is needed to determine a new organizational structure, and the relevant changes needed for VA Code, regulatory obligations, and other guidelines to reflect the new structure. The stakeholders recommend maintaining the current board structure without combining the boards. The group emphasized that messaging at the local level is extremely important. Once an administrative reorganization is planned, the group feels it is critical to communicate it well at the local level and share the impact it will have on their work. The stakeholder group recommended that those with decision-making power in fire and EMS state administration should have lived experience in the field so that they fully understand the scope of the work and challenges.

RECOMMENDATIONS

Increase State Revenue for Fire and EMS Departments

Increase the revenue received from vehicle registration fees and increase the percentage of the State's gross premium income from fire insurance, as was recommended in the HB 2175 report. Put the resulting revenue directly into fire and EMS services via the EMS Fund, the Fire Programs Fund, and the at-risk fund described below.

Justification: With localities providing over 97% of fire and EMS funding in Virginia, and impacts of insufficient funding growing, there is a need for the State to contribute more to these crucial services. Stakeholders noted that the "$4.25 for life" fee and 1% of fire insurance premiums do not keep up with inflation and increasing costs.

Create a Fund for At-Risk Localities

Target additional state funding to localities most vulnerable to negative outcomes due to insufficient fire and EMS funding, especially rural localities experiencing population decline. Allow flexible use of this fund.

Use the processes outlined in this report to prioritize localities with the greatest need for these funds, including consideration of the following criteria:

- Localities with the lowest funding per capita
- Localities with the lowest funding per square mile
- Localities with the lowest funding per EMS call
- Localities with the highest average response times
- Expression of need by knowledgeable stakeholders (i.e. local fire and EMS administrators)

High ISO ratings (8-10 out of 10) could also be considered as an indicator of greatest need.

Justification: Localities' ability to meet funding needs differs across regions. Those localities who experience population decline also experience increasing difficulties with funding fire and EMS services. Those localities with an inability to raise local tax revenue to sufficient levels need state support to make up the difference. Currently when the need and the funding don't match, personnel must spend considerable time writing grants and fundraising to make up the difference. This has a negative impact on sustainability and volunteerism, and takes time and resources away from providing quality, life-saving services.

Increase Flexibility of Use for State Fire and EMS Funds

For state grants, increase flexibility to allow funding to be used for all major fire and EMS needs, including personnel costs, fire truck and ambulance purchase and/or maintenance, facilities, equipment, training, and communication systems.

Justification: Current guidelines for state grants restrict funds to specific uses. Stakeholders voiced a desire to have the flexibility to spend state grant funding to best meet the local needs of the department. Financial needs change from year to year and having more flexibility on how to use the fund would allow local leaders to determine their specific priorities and use the funds accordingly.

Support Volunteer Recruitment

Encourage localities to create campaigns for fire/ EMS volunteer recruitment, including the following:

- Provide additional state assistance through the Fire Programs Fund and the EMS fund to train volunteer staff.
- Create workshop curriculum and customizable recruitment materials for localities.
- Provide a tax incentive for local employers who allow their employees to volunteer for local fire/EMS departments while on the clock.
- Encourage localities to recruit existing municipal employees to their local fire/ EMS departments by allowing employees to volunteer while on the clock, and consider other incentives, like a yearly stipend.

Justification: Fire and EMS volunteer numbers are decreasing nationally and in Virginia. More and more fire and EMS departments are moving to a hybrid model with at least some career staff, but rural, urban, and mixed localities all still rely heavily on volunteer staff.

Improve Efficiency and Streamline Collaboration

Implement the following measures to support cost-saving and grant-writing:

- Support collective buying agreements for equipment, fire trucks, and ambulances
- Support streamlined inter-locality coordination of requests and services by providing technical assistance to regional groupings to create dispatch systems similar to the Council of Government (COG) system used in Northern Virginia.
- Create a collective grant writing resource to support localities' knowledge of and ability to apply for fire and EMS grants.
- Incentivize reporting of firefighter staffing information and call volume through inclusion in the Aid to Localities Disbursement form to inform grant allocations.
- Support investment in infrastructure for 5G cell service in rural areas that currently experience lack of service.

Justification: By implementing resource and cost-saving measures, local fire and EMS departments can reduce their expenditures, thereby increasing effectiveness and reducing the amount of funding needed.

Move OEMS under the Secretary of Public Safety and Homeland Security

Convene an implementation committee to outline a new organizational structure that includes OEMS within the Public Safety and Homeland Security Secretariat. The committee should consider:

- Pros and Cons of merging OEMS into VDFP versus creating a co-equal Department of EMS.
- The changes needed for VA Code.
- How to meet regulatory obligations within the new structure (such as incorporating consultation with medical doctors for particular EMS decisions, something not currently included within VDFP's structure).
- How to effectively support personnel funding needs with state funds to facilitate sustainable funding structures.

Justification: On the local level, fire and EMS are often administered jointly, and EMS stakeholders shared a strong sense that their work contributes to public safety directly. In addition, having the two entities within the same secretariat can help constituents at all levels have one entity to go to with questions, concerns, and requests.

CONCLUSION

Nationally, EMS and fire departments have entered a new era in service provision. In the context of declining volunteerism, increasing EMS calls, rising costs of doing business, and resulting competition for existing state and federal resources, the funding landscape for these life-saving services is more complex and precarious than ever.

The Virginia-focused analysis in this report finds that there is a need for the State of Virginia to increase its partnership with localities to address the gaps in funding. Key recommendations include increasing state support for local fire and EMS departments through direct and flexible funding, creating administrative resources (e.g. for volunteer recruitment and grant writing), and consolidating state administration of fire and EMS programs. These recommendations acknowledge the modern circumstances of fire and EMS provision and position Virginia to continue to lead in supporting high-quality, life-saving fire and EMS services.

APPENDICES

Appendix A: Data Codebook

Locality Descriptor Data			
Data Type	Variable	Factors/Values	Source
Locality Name and Type	GIS_Locality_Name	Name of Locality	GIS, Census Data
	Locality_Type	County, City, or Town	GIS, Census Data

Locality Survey Data			
Data Type	Variable	Factors/Values	Source
Survey Completion	Completed_Survey	True or False	Survey
Self-Reported Operational Budget	SR_OB_FY21, SR_OB_FY22, SR_OB_FY23	Dollar Value	Survey
	Avg_SR_OB	Dollar Value	Function of SR_OB_FY2X
	TOTAL_SR_OB	Dollar Value	Sum of SR_OB_FY2X
Funding Sources	How_funded_select	Any combination of: Federal_Grants State_Grants Private_Grants Local_Funding Medicare_Medicaid Commercial_Insurance Private_Payers Other	Survey
	MRSet_Federal_Grants	True or False	Function of How_funded_select
	MRSet_State_Grants	True or False	Function of How_funded_select
	MRSet_Private_Grants	True or False	Function of How_funded_select
	MRSet_Local_Funding	True or False	Function of How_funded_select
	MRSet_Medicare_Medicaid	True or False	Function of How_funded_select
	MRSet_Commercial_Insurance	True or False	Function of How_funded_select
	MRSet_Private_Payers	True or False	Function of How_funded_select
	MRSet_Other	True or False	Function of How_funded_select
Sufficient Funding	Sufficient_funding	Strongly Disagree, Disagree, Neutral, Agree or Strongly Agree	Survey
Funding Gaps Ranking	Funding_gaps_rank	Ranking of: Personnel (career and volunteer), Training, Apparatus/Ambulance, Facilities, Equipment, Other	Survey
	Gap_First_Rank, Gap_Second_Rank	One of: Personnel (career and volunteer), Training, Apparatus/Ambulance, Facilities, Equipment, Other	Function of Funding_gaps_rank
Additional Funding Ranking	Additional_funding_rank	Ranking of: Personnel (career and volunteer), Training, Apparatus/Ambulance, Facilities, Equipment, Other	Survey
	Additional_Funds_First_Rank, Additional_Funds_Second_Rank	One of: Personnel (career and volunteer), Training, Apparatus/Ambulance, Facilities, Equipment, Other	Function of Additional_funding_rank
Staffing	Career_Staff_total	Number Value	Survey
	Career_Role_fire	1=True, 0=False	Survey

	Career_Role_ems	1=True, 0=False	Survey
	Career_Role_combo	1=True, 0=False	Survey
Volunteerism	Active_Volunteers	Number Value	Survey
	Volunteer_Role_fire	Number Value	Survey
	Volunteer_Role_ems	Number Value	Survey
	Volunteer_Role_combo	Number Value	Survey
	Volunteerism_trend	Increase or Decrease	Survey
Apparatus / Ambulance	Number_of_Apparatus	Number Value	Survey
	Apparatus_Over_20	Number Value	Survey
	Percent_Apparatus_Over20	Percentage Value	Function of Number_of_Apparatus and Apparatus_Over_20
	Number_of_Ambulances	Number Value	Survey
	Ambulances_Over_10	Number Value	Survey
	Percent_Ambulance_Over10	Percentage Value	Function of Number_of_Ambulancesand Ambulances_Over_10
Call Volume	Call_Volume_21, Call_Volume_22, Call_Volume_23	Number Value	Survey
	Avg_Call_Volume	Number Value	Function of Call_Volume_2X
Requirements	Requirement_Met_12VAC5	Never, Rarely, Sometimes, Often or Always	Survey
	Requirement_Met_NFPA	Never, Rarely, Sometimes, Often or Always	Survey
Mutual Aid	Request_mutual_aid	Rarely, Daily, Weekly or Monthly	Survey
	Provide_mutual_aid	Yes or No	Survey
	Trend_mutual_aid	Yes or No	Survey
Delays in Service	Trend_delays_service	Yes or No	Survey

Collected Data			
Data Type	Variable	Factors/Values	Source
Population	Census_Population_5year_2022	Number Value	Census Data
	FY21_Pop, FY22_Pop, FY23_Pop	Number Value	Auditor of Public Accounts
	Avg_Pop_21_23_Audit	Number Value	Auditor of Public Accounts
Fire/Rescue and Collective Expenditures	FY21_FireRescue_Expenditures, FY22_FireRescue_Expenditures, FY23_FireRescue_Expenditures	Dollar Value	Auditor of Public Accounts
	FY21_Total_Expenditures, FY22_Total_Expenditures, FY23_Total_Expenditures	Dollar Value	Auditor of Public Accounts
	Percent_Expend_Total_21, Percent_Expend_Total_22, Percent_Expend_Total_23	Percentage Value	Function of FY2X_FireRescue_Expenditures and FY2X_Total_Expenditures
	Total_FireRescue_Expenditures	Dollar Value	Sum of FY2X_FireRescue_Expenditures
	Total_All_Expenditures	Dollar Value	Sum of FY2X_Total_Expenditures
	Total_Percent_Expend_Total	Percentage Value	Function of Total_FireRescue_Expenditures and Total_All_Expenditures
	Avg_FireRescue_Expenditures	Dollar Value	Function of FY2X_FireRescue_Expenditures
OEMS Grant Allocation	OEMS_Grant_Total	Dollar Value	OEMS Grant Allocation Data
	Percent_OEMS_Grant_of_Total_Expend	Percentage Value	Function of OEMS_Grant_Total and Total_FireRescue_Expenditures
Regional Type	Percent_Rural	Percentage Value	Decennial Census Data
	Regional_Majority	Rural, Mixed or Urban	Function of Percent_Rural
	VDEM Region	Value 1-7	ArcGIS Server

Population Sprawl and Growth	Land_Area_sqmiles	Number Value	ArcGIS Calculation
	Population_Density	Number Value	Function of Land_Area_sqmiles and Census_Population_5year_2022
	Population_Growth_Rate	Number Value	Decennial Census Data, Function of 2020 and 2010 populations
	Population_Trend	Rapidly Decreasing, Moderately Decreasing, Stable, Moderately Increasing or Rapidly Increasing	Function of Population_Growth_Rate
OEMS Call Volume	EMS_Call_Volume_2021, EMS_Call_Volume_2022, EMS_Call_Volume_2023	Number Value	OEMS Data
	Average_OEMS_Call_Volume	Number Value	Function of EMS_Call_Volume_202X
	Total_OEMS_Call_Volume	Number Value	Sum of EMS_Call_Volume_202X
OEMS Response Time	Avg_EMS_Notified_to_EnRoute_Minutes	Number Value	OEMS Data
	Avg_EMS_EnRoute_to_OnScene_Minutes	Number Value	OEMS Data
	Avg_Response_Time	Number Value	Sum of Avg_EMS_Notified_to_EnRoute_Minutes and Avg_EMS_EnRoute_to_OnScene_Minutes
OEMS Staffing	EMS_Staff_Count	Number Value	OEMS Data
	EMS_Staffing_PerCapita	Number Value *per 1,000 people*	Function of EMS_Staff_Count and Census_Population_5year_2022
Specified Functions	Funding_perCV	Dollar Value	Function of Avg_FireRescue_Expenditures and Average_OEMS_Call_Volume
	Funding_perCapita	Dollar Value	Function of Avg_FireRescue_Expenditures and Census_Population_5year_2022
	Funding_perLandArea	Dollar Value	Function of Avg_FireRescue_Expenditures and Land_Area_sqmiles
Crime / Arson	Violent_Crime_Total	Number Value	Beyond Incident-Based Reporting - Crime Data
	Arson_Total	Number Value	Beyond Incident-Based Reporting - Crime Data
Real Estate Tax	Real_Estate_Tax_Rate_2022	Number Value	Tax.Virginia.gov - 2022 Local Tax Rates
Fire Grant Allocation	Fire_Grant_Allocation_FY_2021, Fire_Grant_Allocation_FY_2022, Fire_Grant_Allocation_FY_2023	Dollar Value	VDFP-supplied data
	Fire_Grant_Allocation_AVG	Dollar Value	Function of Fire_Grant_Allocation_FY_202X
	Fire_Grant_Allocation_TOTAL	Dollar Value	Sum of Fire_Grant_Allocation_FY_202X
Average Total Budget	AVG_Total_Budget	Dollar Value	Function of Avg_FireRescue_Expenditures, OEMS_Grant_Total, and Fire_Grant_Allocation_AVG

Appendix B. Statistical Analysis Details

Correlations Analysis

Using the Pearson Correlation technique in R, CPP calculated the correlations between select variables and two variables of interest for the analysis: Average Response Time and Funding per Capita. The former is sourced from OEMS Response Time data and the latter from Average Fire Expenditures, so this is an incomplete analysis based on the data CPP was able to obtain. However, CPP views the trends between them as closely related enough to serve as proxies for each other, especially since the focus of the analysis is on differences across localities.

Correlation Coefficients:

- Positive Coefficients indicate that the dependent variable increases as the independent variable increases
- Negative Coefficients indicate that the dependent variable decreases as the independent variable increases, or vise versa
- Coefficients close to -1 or 1 are considered strong, while those closer to 0 are weak

Table B1. Correlations Among Variables of Interest

Correlations with Average Response Time			**Correlations with Funding per Capita**		
Variable	Correlation	P-Value	Variable	Correlation	P-Value
Funding perCV	-0.568	0.499	Total Percent Expend Total	0.899	0.000
Total Percent Expend Total	-0.381	0.018	Funding perLandArea	0.751	0.000
Percent Rural	-0.379	0.820	Total FireRescue Expenditures	0.733	0.001
EMS Staffing PerCapita	-0.275	0.238	Avg FireRescue Expenditures	0.733	0.000
Population Growth Rate	-0.255	0.021	Funding perCV	0.694	0.000
Funding perCapita	-0.243	0.079	FY21 FireRescue Expenditures	0.682	0.001
Population Density	0.241	0.734	Population Growth Rate	0.555	0.079
Land Area sqmiles	-0.198	0.763	Population Density	0.385	0.053
Total FireRescue Expenditures	-0.181	0.377	Land Area sqmiles	-0.343	0.685
Avg FireRescue Expenditures	-0.181	0.427	Violent Crime Total	0.286	0.061
Average OEMS Call Volume	0.171	0.572	Percent Rural	-0.273	0.351
FY21 FireRescue Expenditures	-0.158	0.448	Total All Expenditures	0.264	0.014
OEMS Grant Total	-0.142	0.347	Fire Grant Allocation AVG	0.243	0.021
EMS Staff Count	-0.115	0.437	Avg Response Time	-0.243	0.079
VDEM Region	0.110	0.654	Average OEMS Call Volume	0.174	0.046
Real Estate Tax Rate 2022	-0.102	0.334	Arson Total	-0.154	0.075
Arson Total	0.101	0.547	Census Population 5 year 2022	0.143	0.025
Fire Grant Allocation AVG	-0.084	0.538	EMS Staff Count	0.140	0.169
Avg Pop 21 23 Audit	-0.063	0.638	Avg Pop 21 23 Audit	0.135	0.028
Census Population 5 year 2022	-0.061	0.516	VDEM Region	-0.121	0.475

Violent Crime Total	0.046	0.544	OEMS Grant Total	0.063	0.370
Total All Expenditures	0.017	0.575	EMS Staffing PerCapita	-0.049	0.831
Funding perLandArea	0.011	0.685	Real Estate Tax Rate 2022	0.036	0.910

The correlations with p-values that are highlighted in light green are statistically significant under the threshold of 5% due to random chance. Those highlighted in light yellow are statistically significant under the threshold of 10% due to random chance, so less significant than the former. The variables highlighted in light orange are both significant under one of these thresholds and also relevant to this analysis.

Based on this table, it is clear that there are no strong correlations between the selected variables and Average Response Time, though a few are significant enough to look into. The percentage of a locality's total expenditures that were allocated towards Fire/EMS and Population Growth Rate are both relatively significant in their correlations, which were weak and negative. This tells the research team that, more than other variables, as these variables increase, Average Response Time slightly decreases. This is unsurprising to us, as it is expected that with increasing populations and/or increased funding towards fire and EMS, that response time would decrease.

As for Funding per Capita, many more variables were strongly correlated than with Average Response Time. This collinearity is due to the fact that Funding per Capita is a function of total funding, as are a number of the other variables selected to compare to. For this correlation analysis, CPP can ignore certain strong correlations since they know this relationship is confounded. The percentage of a locality's total expenditures allocated towards Fire/EMS has a strong and moderate positive correlation with Funding per Capita, meaning that as it increases, Funding per Capita is bound to increase as well. OEMS Call Volume has a weaker, positive correlation, indicating that less so than the prior variable, as these variables increase, so does Funding per Capita slightly.

What is just as insightful from this table as those variables with significant or strong correlations are those without. CPP was specifically interested in the relationships between variables of interest and Call Volume, Local Tax Rate, Percentage of Local Budget for Fire/EMS, Population Growth Rate, and EMS Staffing per Capita. These variables are not strongly or significantly correlated with funding per capita or average response time, indicating that these variables are not as reliable as predictors than may have been expected.

To better visualize an understanding of the relationships between these variables of interest and select others, CPP used R to create a correlation matrix. This diagram shows the strength and direction of relationships between variables where they meet on the axes. Those relationships with p-values of less than 0.05 (under the 5% probability of random chance threshold) have an X over them to indicate that they are not statistically significant.

Figure B1: Correlation Matrix

Looking at this matrix, it is evident that the strongest and most significant relationships are between Funding per Capita and Percentage of Total Expenditures toward Fire/EMS; OEMS Call Volume and Violent Crime; and Arson and EMS Staffing per Capita. CPP suspects that the latter two relationships are informed by population size, but they are interesting insights nonetheless. Again, as in the previous table, what is almost just as interesting to look at is what is not statistically significant. For instance, it is helpful to note that Funding per Capita is not statistically significant (at the 5% random chance threshold) in its association with Real Estate Tax Rate, Population Growth Rate, or EMS Staffing per Capita.

Multilinear Regression Model Analysis

Two models, one with Average Response Time as the dependent variable and the other with Funding per Capita as the dependent variable, built an analysis using assumption tests and methods of multilinear regression (MLR) to ensure statistical soundness. Ultimately, while the models produced statistically significant results, they were not practically applicable to the context of predicting need across the state for various reasons. Outlined here is a brief overview of the analysis and explanation for why CPP decided against this as a sound method for predicting funding needs:

- First, the initial models incorporate several relevant variables from the collected dataset, then narrow the data based on the following factors (in order):

    - Removing predictors with high collinearity with other variables
    - Removing predictors with low significance in the subsequent model (p-value > 0.05)
    - Removing cases (locality data) that were incomplete across the remaining variables in the model (a necessity for StepAIC / MLR to function properly)

- Then, the model-building process followed a stepwise approach, adding and removing variables from the list of remaining candidates.
    - StepAIC is a process in R that refines a model by minimizing complexity while maintaining predictive power. It iterates through different variations of the model to find an optimal version based on the Akaike Information Criterion (AIC).[76]
- Between each model iteration, the process checked for multicollinearity among predictors using the Variance Inflation Factor (VIF), ensuring they were not too highly correlated, as this would otherwise falsely attribute predictive power to strongly correlated variables.[77]
- Finally, a histogram of residual distribution and a Normal Q-Q (Quantile-Quantile) Plot assessed normality, both theoretically indicating a normal distribution when the model is well-fitted to the data.[78]
    - Residuals represent the difference between the sample's observed values and the model's theoretical values, so examining the distribution of residuals allows for evaluation of how well the model predicts outcomes within the data.

These steps resulted in us obtaining final models for each of the variables of interest (Average Response Time and Funding per Capita) as dependent variables. Both models feature Percent Rural as a main predictor, so we believe differences of regional urbanity/rurality are likely to be prominent in the search for clear delineations of need (see Tables B2 and B3 below). While these models are statistically significant for the data with which they were formulated, they do not seem adequate for use across the localities in Virginia nor representative of the data collected as part of this investigation for the reasons listed below.

Issues with MLR Modeling:

- Bias - By removing entire cases from the dataset in order to run a stepwise model-building function on the data, this reduced the size of the data pretty drastically. Regardless of how the models are shaped, there was bias introduced because of this step. Cases (localities) that have more complete data tend to be larger counties and cities rather than towns, who have very slim data representation. So, removing cases biases the models towards those localities who

[76] Zhang Z. (2016). Variable selection with stepwise and best subset approaches. *Annals of Translational Medicine*, 4(7), 136. https://doi.org/10.21037/atm.2016.03.35
[77] Kim J. H. (2019). Multicollinearity and misleading statistical results. Korean Journal of Anesthesiology, 72(6), 558–569. https://doi.org/10.4097/kja.19087
[78] Ford, C. 2015. "Understanding QQ Plots." UVA Library StatLab. https://library.virginia.edu/data/articles/understanding-q-q-plots

happened to have reported complete data, which is likely correlated with higher access to resources.

- Extreme Skews - Another feature of the data that complicated this MLR analysis was the presence of extreme skews. In assessing the normality of the models, through evaluation of the residual distribution graphs, both models observably tend to skew drastically to the right. Where otherwise normally distributed, there are localities with such high Response Times or Funding per Capita, that it makes these models unreliable in predicting their need. In other words, the model is under-predicting the variables of interest for these localities due to factors that are difficult to account for without removing them from the model, which undermines the approach (especially with already-limited data representation). For example, see Figures B2, B3, B4 and B5 below.

Table B2. MLR Model for Average Response Time

Avg_Response_Time ~ Percent_Rural + Population_Growth_Rate + Real_Estate_Tax_Rate_2022

Residuals:				
Min	1Q	Median	3Q	Max
-173.31	-69.10	-38.94	15.45	469.50

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	80.34	54.75	1.467	0.148534
Population_Growth_Rate ***	-990.24	275.52	-3.594	0.000743
Percent_Rural **	-183.45	55.91	-3.281	0.001888
Real_Estate_Tax_Rate_2022 *	217.12	86.19	2.519	0.015006

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
Residual standard error: 137.1 on 50 degrees of freedom
Multiple R-squared: 0.2688, Adjusted R-squared: 0.2249
F-statistic: 6.126 on 3 and 50 DF, p-value: 0.001245

Figure B2. Histogram of Average Response Time MLR Model Residuals

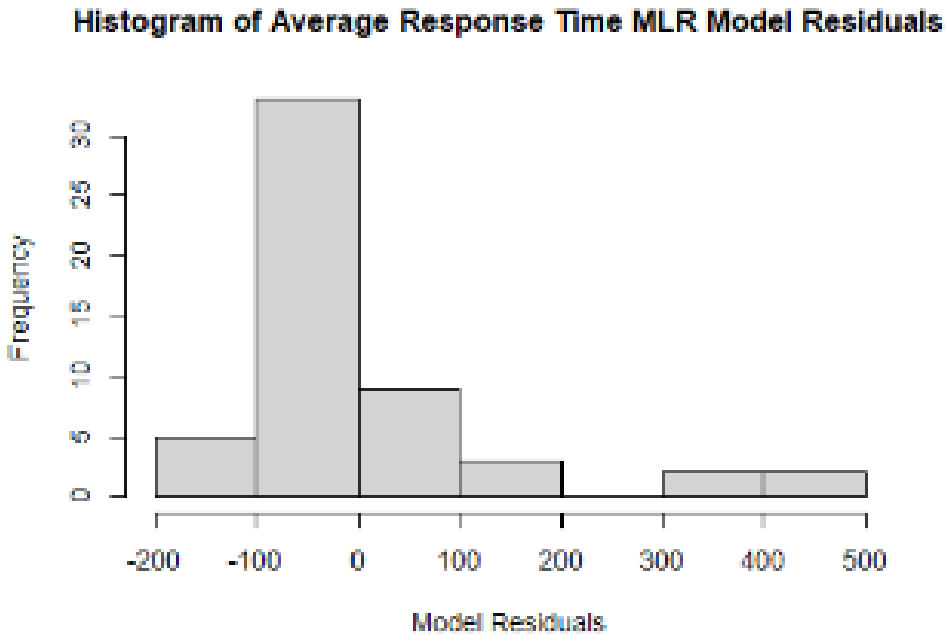


Figure B3. Average Response Time MLR Model Normal Q-Plot

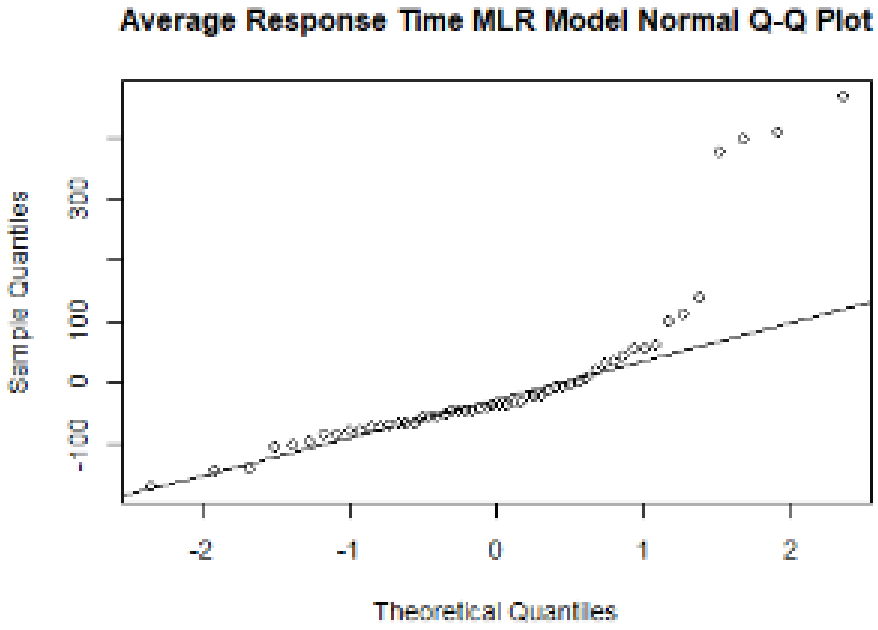


Table B3. MLR Model for Funding per Capita

Funding_perCapita ~ Percent_Rural + Population_Density + Avg_Response_Time

Residuals:				
Min	1Q	Median	3Q	Max
-227.2	-73.92	-8.49	41.61	1334.99

Coefficients:				
	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept) ***	227.98178	30.9289	7.371	1.86E-11
Percent_Rural .	-65.41561	39.44864	-1.658	0.0997
Population_Density .	0.01777	0.01	1.776	0.0781
Avg_Response_Time .	-0.13089	0.07241	-1.808	0.073

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 150.7 on 128 degrees of freedom
Multiple R-squared: 0.1258, Adjusted R-squared: 0.1053
F-statistic: 6.14 on 3 and 128 DF, p-value: 0.00062

Figure B4. Histogram of Funding per Capita MLR Model Residuals

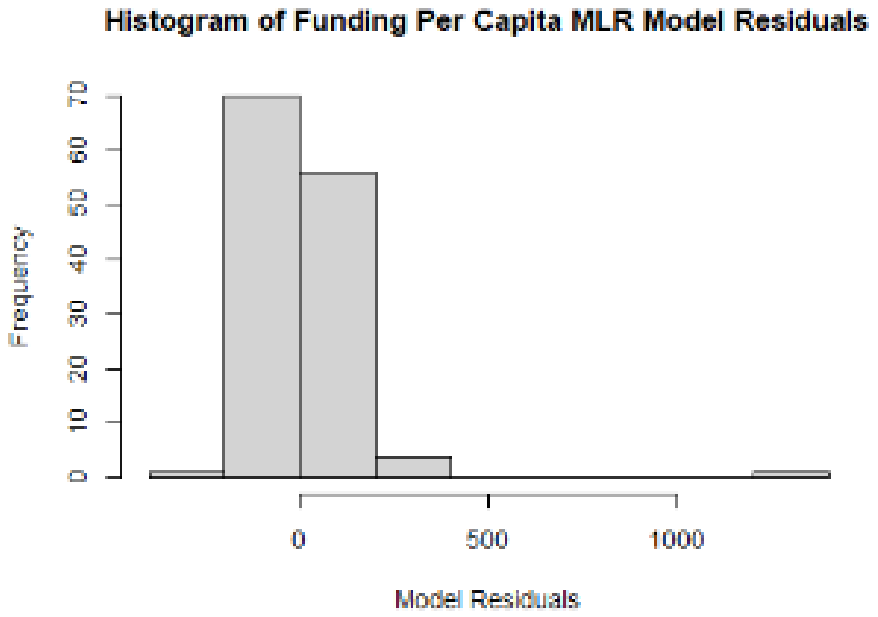


Figure B5. Funding per capita MLR Model Normal Q-Q Plot

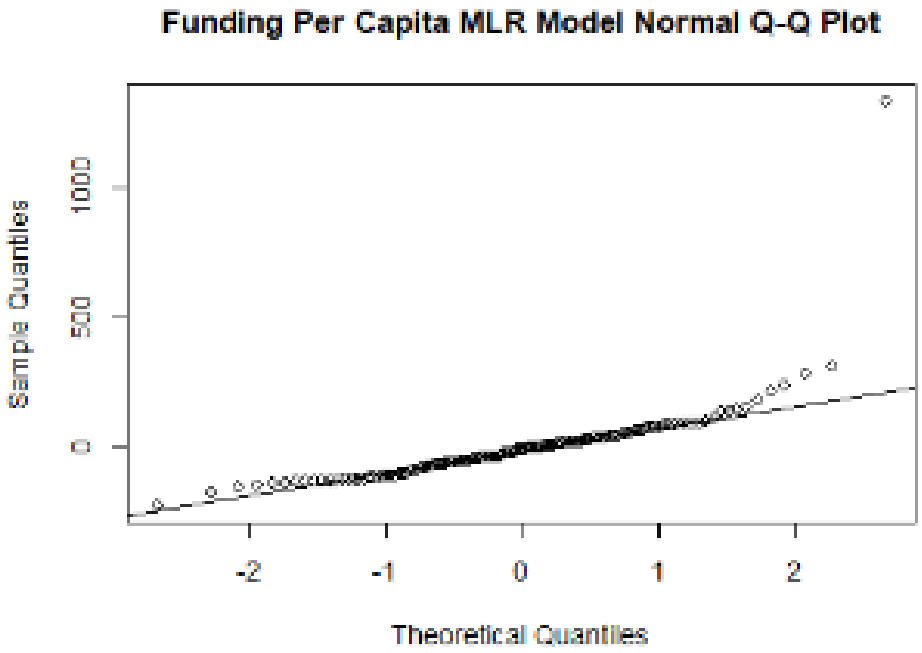


Figure B6. Self-reported staffing per capita by staffing type and regional majority, with extreme outliers

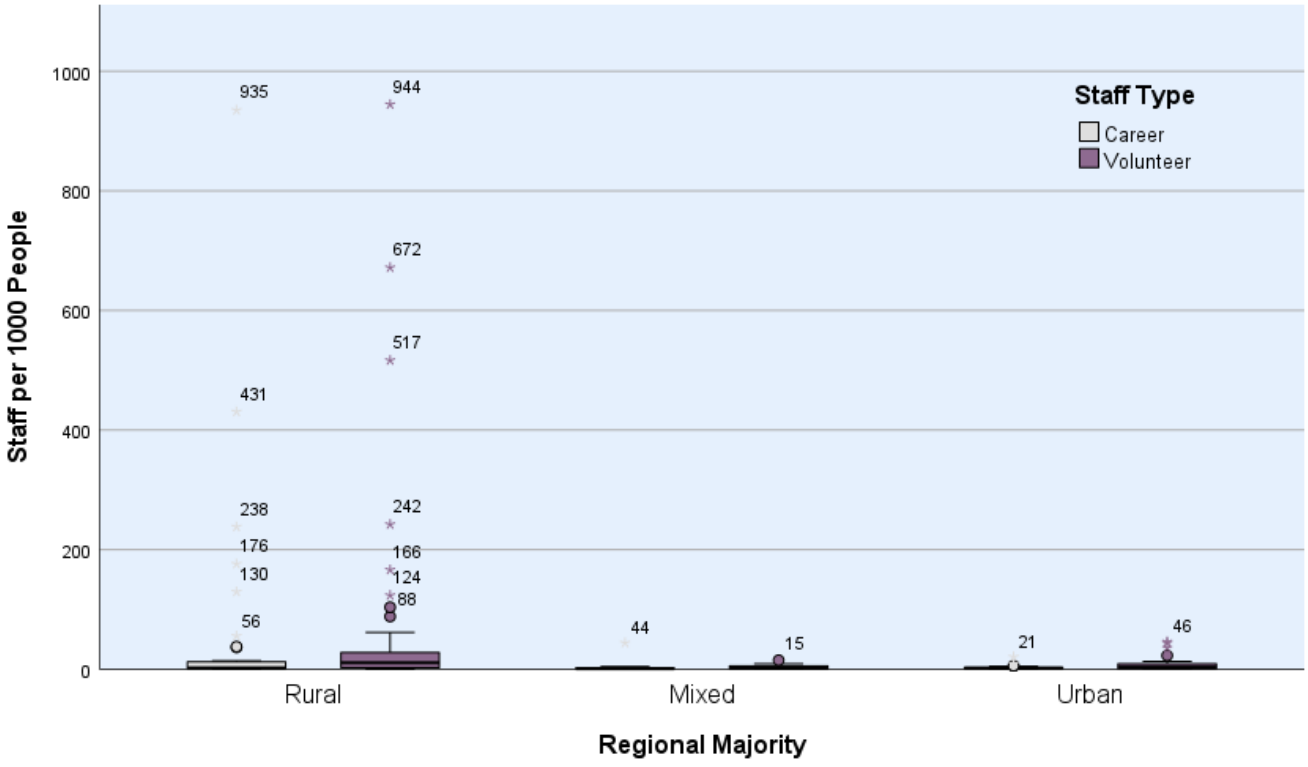
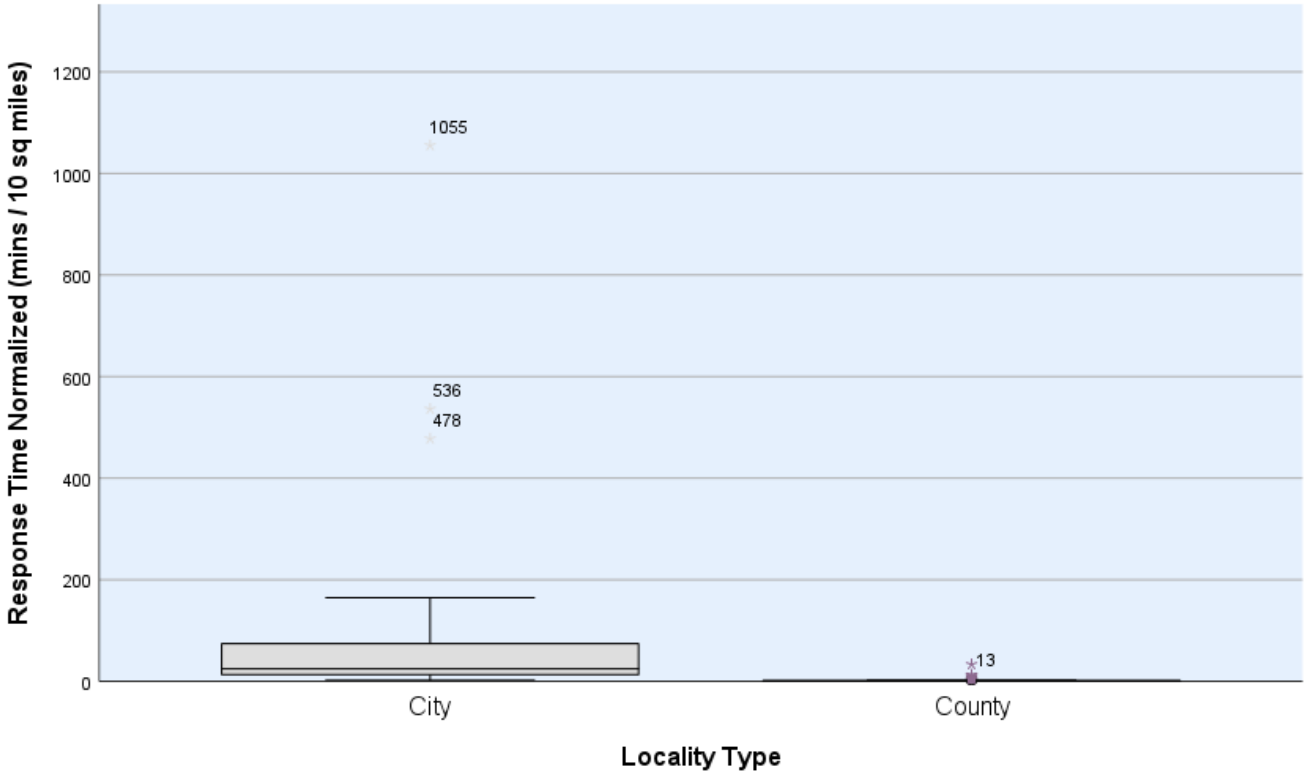


Figure B7. Boxplot of Response Times (Normalized by Land Area - mins / 10 sq miles) by Locality Type, with extreme outliers



- **Locality Diversity** - The localities across Virginia vary so drastically from town to town, city to city, county to county, that these differences make it difficult to compare metrics without some variable to control them by. What we've found however, is that even normalizing variables by dividing them by capita or as proportions rather than numbers does not take into account unpredictable differences between localities and their funding settings.

Based on the findings from MLR analysis, CPP determined that in order for this process to be successfully used to predict need across localities, more data needs to be collected and the drastically different circumstances of each locality need to be more adequately characterized. CPP could see modeling being helpful for broad stroke-level analysis across the state, but warn against using it as a formula to predict funding needs.

Other Analyses

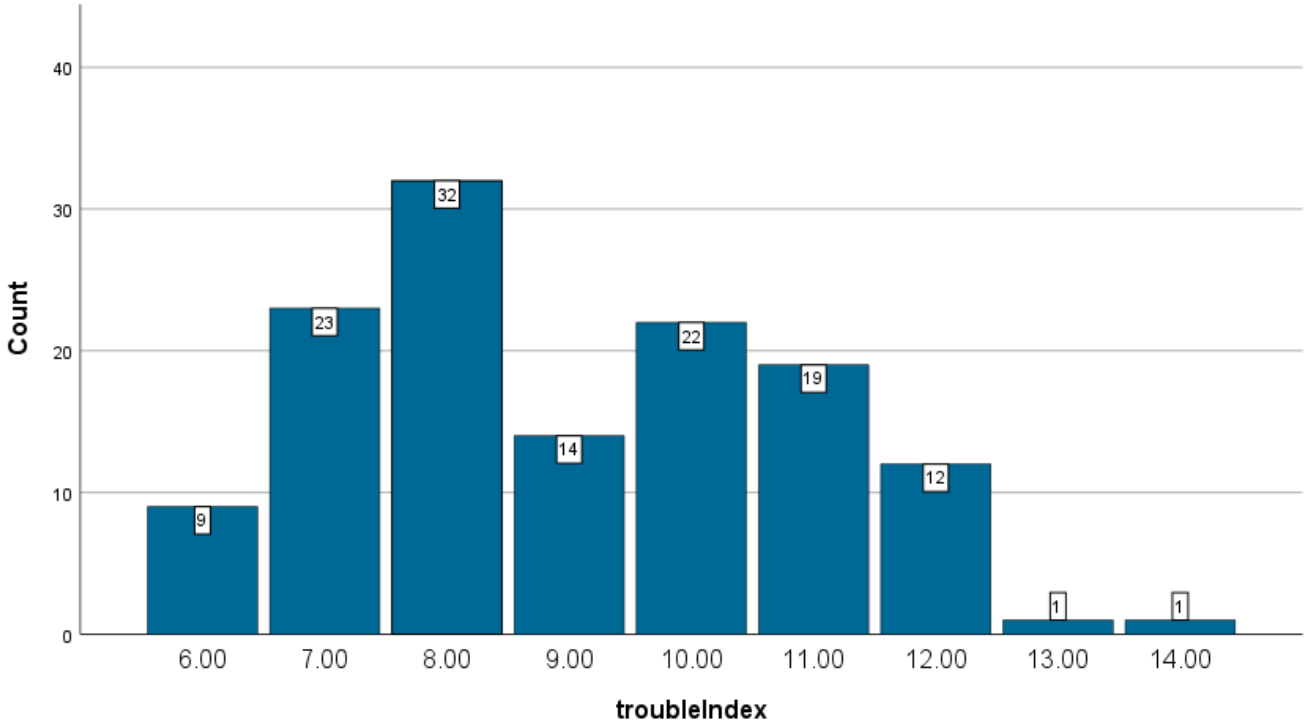
In addition to running programs to create multilinear regression models to answer the question of what factors influence funding sufficiency and sustainability, CPP looked at a few other methods of analyzing relationships among variables of interest.

Using SPSS, CPP ran a K-Means Clustering program, which groups data points into a set number of clusters based on their empirical similarities through an interactive process that minimizes variance

within the clusters[79]. In other words, CPP attempted to categorize localities based on certain metrics, such as average EMS response time, EMS staff count, and average EMS call volume, in order to categorize them based on these similarities. What CPP found was that, while CPP was able to do so based on individual metrics, these localities do not behave similarly across multiple metrics. Localities are distinct enough that the K-Means clustering procedure was unable to identify subgroups useful for decision-making.

Similarly, the Center for Public Policy attempted to manufacture a typology of localities using three variables: average EMS response time, EMS staff count, and average EMS call volume. For each variable, the data were split into quintiles ranking their values in ascending order. Those with the highest, most troubling values would be in the 5th quintile and receive a score of 5, while those with the lowest, least troubling values would be in the 1st quintile and receive a score of 1. The resulting scores were then summed creating what CPP termed a "Trouble Index". Localities in the top 20% of fewest calls, most staff, and fastest response times would receive a total score of 3. Localities in the bottom 20% for each category would be experiencing the most trouble. These localities would have the most calls, the least staff, and the highest response times, represented by a score of 15. The research team anticipated identifying a handful of thriving localities with a score of 3 and a handful of struggling localities with a score of 15. Instead, no localities received a score of 15 or a score of 1-5. The figure below illustrates the actual results:

Figure B8. Total Fire and Rescue Expenditures (FY 21-23) and Population Growth Rate by Locality



[79] IBM Documentation (2021). "K-means cluster analysis." https://www.ibm.com/docs/en/spss-statistics/beta?topic=features-k-means-cluster-analysis

Table B4. Trouble Index Lowest Scoring Localities

Least Trouble	Trouble Index	Average_OEMS_Call_ Volume	Quintile	EMS_Staff_ Count	Quintile	Avg_Response_ Time	Quintile
Albemarle County	6	16,371	4	536	1	15.412	1
Amherst County	6	5,577	3	214	2	15.578	1
Fauquier County	6	15,361	4	542	1	13.933	1
Frederick County	6	11,531	4	498	1	6.658	1
King George County	6	3,722	2	142	3	14.162	1
Madison County	6	1,450	1	84	4	10.719	1
New Kent County	6	5,207	3	180	2	13.003	1
Poquoson City	6	1,895	1	83	4	13.952	1
Southampton County	6	1,997	1	139	3	21.53	2

Table B5. Trouble Index Highest Scoring Localities

Most Trouble	Trouble Index	Average_OEMS_Call_ Volume	Quintile	EMS_Staff_ Count	Quintile	Avg_Response_ Time	Quintile
Petersburg City	14	16,837	5	45	5	50.894	4
Martinsville City	13	8,673	4	35	5	57.311	4
Bristol City	12	6,534	3	70	4	107.357	5
Falls Church City	12	5,168	3	68	4	97.596	5
Fredericksburg City	12	18,956	5	307	2	77.149	5
Lee County	12	3,581	2	48	5	540.064	5
Lexington City	12	2,441	2	37	5	133.962	5
Norton City	12	3,868	2	19	5	794.429	5
Portsmouth City	12	27,012	5	263	2	177.157	5
Smyth County	12	8,455	4	177	3	575.396	5
Staunton City	12	8,429	4	114	3	147.748	5
Williamsburg City	12	7,880	4	153	3	93.443	5
Wise County	12	8,938	4	161	3	295.561	5
Wythe County	12	7,856	3	85	4	137.548	5

Based on this method, CPP again finds strong evidence that each locality in the Commonwealth is facing unique circumstances that resist quantitative categorization.