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Where Does the Rural EMS Response-Time Gap Arise? A Town-Level Decomposition of Prehospital Response Intervals in Connecticut

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ABSTRACT

Background: Rural communities experience longer emergency medical services (EMS) response times than urban communities, but aggregate response-time measures do not identify where within the response process these differences emerge. Distinguishing delays occurring before unit mobilization from those occurring during travel may identify different targets for EMS system improvement. This study evaluated contemporary geographic differences in EMS response time across Connecticut and decomposed the rural–urban difference into mobilization and travel components. **Methods:** A cross-sectional ecological analysis was conducted using publicly available municipality-level data from the Connecticut Department of Public Health Office of Emergency Medical Services 2025 Annual Report. All 169 Connecticut municipalities were included and classified by the state as rural ($n=91$), suburban ($n=33$), or urban ($n=45$). Municipality-level mean total EMS response time, first-service-tone-to-en-route time, and en-route-to-scene time were analyzed. Kruskal–Wallis tests assessed differences across geographic classifications, followed by pairwise Mann–Whitney U tests with Holm correction. Rank-biserial correlations were calculated as effect-size measures. Differences in mean tone-to-en-route and en-route-to-scene intervals were additionally used for a descriptive decomposition of the rural–urban component gap. **Results:** Municipality-level mean total response time was 12.18 minutes ($SD=3.63$) among rural municipalities, 8.83 minutes ($SD=1.82$) among suburban municipalities, and 7.75 minutes ($SD=1.09$) among urban municipalities ($H=69.39$, $p<.001$). Rural municipalities had longer tone-to-en-route intervals than suburban municipalities (3.30 vs 2.05 minutes; $U=2245.5$, Holm-adjusted $p<.001$; rank-biserial correlation=0.50) and urban municipalities (3.30 vs 1.43 minutes; $U=3530.5$, adjusted $p<.001$; rank-biserial correlation=0.72). Rural en-route-to-scene intervals were likewise longer than those of suburban municipalities (8.95 vs 7.07 minutes; $U=2208.5$, adjusted $p<.001$; rank-biserial correlation=0.47) and urban municipalities (8.95 vs 6.54 minutes; $U=3352.0$, adjusted $p<.001$; rank-biserial correlation=0.64). Compared with urban municipalities, rural municipalities averaged 1.87 additional minutes between first tone and en route and 2.41 additional minutes between en route and scene arrival. Of the combined 4.28-minute difference across these two municipality-level component averages, 43.7% occurred during the tone-to-en-route interval and 56.3% during the en-route-to-scene interval. **Conclusions:** Rural Connecticut municipalities experienced longer EMS response intervals during both unit mobilization and travel to the emergency scene. Travel represented the larger descriptive share of the observed two-component rural–urban difference, although a substantial difference was already present before units became en route. These findings suggest that the contemporary rural EMS response-time disparity is distributed across more than one operational phase and may therefore require locally tailored strategies addressing both unit readiness and geographic deployment.

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1. Introduction

Emergency medical services constitute a critical link between the onset of acute illness or injury and definitive medical care. For several time-sensitive emergencies, delays in the arrival of professional medical assistance may have important clinical consequences. Shorter ambulance response intervals have been associated with improved survival following out-of-hospital cardiac arrest, while prolonged prehospital intervals remain an important concern in trauma and other acute conditions [1][2][3]. Geographic differences in the time required for emergency care to reach a patient may therefore represent both an operational challenge and a healthcare-access disparity.

Rural populations consistently experience longer EMS response intervals than populations in more densely populated areas. In a national analysis, Mell et al. found substantially longer median EMS arrival intervals in rural areas than in suburban and urban areas [4]. Subsequent literature has similarly documented rural disadvantages in prehospital response and transport intervals [5]. Potential contributors include larger geographic coverage areas, lower station density, longer travel distances, limited personnel availability, volunteer or combination staffing models, mutual-aid dependence, and differences in ambulance deployment.

Total EMS response time, however, combines multiple operational phases. A response requires an emergency to be processed and dispatched, a responding service and unit to be notified and mobilized, and the unit to travel to the incident location. Delays arising during these phases may have fundamentally different implications for EMS system design.

A prolonged interval between service notification and a responding unit becoming en route may be associated with crew availability, staffing configuration, station readiness, concurrent call burden, or other mobilization processes. In contrast, a prolonged interval after a unit is already en route may be associated with travel distance, ambulance location, road networks, geographic dispersion, mutual aid, or the availability of a closer unit. Examining total response time alone therefore cannot identify the portion of the response sequence in which geographic disparities are observed.

Connecticut provides a useful setting in which to examine this distinction. Although geographically compact relative to many states, Connecticut includes densely populated cities, suburban communities, and sparsely populated rural municipalities. EMS delivery also varies locally. The Connecticut Office of Emergency Medical Services describes a statewide system incorporating municipal, commercial, hospital-based, volunteer, and other EMS organizations, while individual jurisdictions play important roles in establishing local service arrangements.

Previous Connecticut research demonstrated a substantial rural–non-rural difference in ambulance response time. Using 2016 data, Krishna reported a mean response time of 12.98 minutes among rural municipalities compared with 8.26 minutes among non-rural municipalities [6]. Median household income was not significantly associated with response time, suggesting that the observed geographic difference could not be explained by municipal household income alone. That study highlighted staffing, local policies, and other operational characteristics as potential areas for further investigation and identified the age of the underlying EMS data as a limitation.

The Connecticut Department of Public Health Office of Emergency Medical Services (OEMS) subsequently expanded its statewide reporting. Its 2025 annual report, released in 2026, provides municipality-level

response-time information for all 169 Connecticut municipalities and reports multiple components of the EMS response sequence, including first service tone to en route and en route to arrival on scene [7].

These data provide an opportunity to move beyond determining whether a rural response-time disparity exists and instead examine where within the response sequence the disparity is observed. The primary objective of this study was therefore to determine whether the contemporary rural EMS response-time difference in Connecticut is concentrated primarily during unit mobilization or during travel after the responding unit becomes en route. A secondary objective was to characterize contemporary differences in overall EMS response time among rural, suburban, and urban Connecticut municipalities. We hypothesized that rural municipalities would demonstrate longer intervals during both mobilization and travel, with the larger absolute rural–urban difference occurring during travel to the emergency scene.

2. Methods

2.1. Study design and data source

A cross-sectional ecological analysis was conducted using publicly available aggregate data from the Connecticut Department of Public Health Office of Emergency Medical Services 2025 Office of Emergency Medical Services Annual Report. Connecticut OEMS reported 831,904 emergency-response electronic patient care records before response-time cleaning. The state excluded observations in the extreme upper and lower 1% of the response-time distribution as well as records lacking necessary time information. Following these procedures, 789,024 emergency responses remained in the statewide response-time dataset, with an encounter-level mean response time of 8.32 minutes [7].

The municipality was the unit of analysis in the present study. All 169 Connecticut municipalities were included.

2.2. Geographic classification

Municipality classifications were obtained directly from Connecticut OEMS. The state classified 91 municipalities as rural, 33 as suburban, and 45 as urban. Urban municipalities were defined by OEMS as having population densities of at least 1,000 persons per square mile. Suburban municipalities had densities below 1,000 but at least 500 persons per square mile. The rural classification incorporated the Connecticut State Office of Rural Health definition used in the OEMS report, including communities with population density below 500 persons per square mile and populations of 10,000 or fewer [7].

Municipality-level classification was retained because municipalities are operationally relevant units for Connecticut EMS organization and because broader county-level classifications would obscure substantial local heterogeneity.

2.3. Outcome measures

The principal outcome was municipality-level mean total emergency response time obtained from Table 11 of the OEMS annual report. Connecticut OEMS defines emergency response time as the interval between Unit Notified by Dispatch and Unit Arrived on Scene [7].

Two municipality-level response components reported in Table 10 were examined separately: first service tone to en route, representing the interval

between the first service notification tone and documentation that the responding unit became en route; and en route to scene, representing the interval between the responding unit becoming en route and its arrival at the emergency scene.

For interpretation, the first interval is referred to as the mobilization interval and the second as the travel interval. These labels describe operational phases and do not establish the underlying cause of a prolonged interval. For example, a prolonged tone-to-en-route interval cannot by itself establish that a staffing shortage occurred.

2.4. Statistical analysis

Municipality-level descriptive statistics were calculated separately for rural, suburban, and urban municipalities. For total response time, tone-to-en-route time, and en-route-to-scene time, the mean, standard deviation, median, and interquartile range were calculated.

Because municipality-level response-time distributions were right-skewed and differed in distributional shape, nonparametric methods were used for inferential group comparisons. Kruskal–Wallis H tests were used to evaluate differences among rural, suburban, and urban municipalities for each outcome. When an omnibus test was statistically significant, two-sided Mann–Whitney U tests were conducted for rural versus suburban, rural versus urban, and suburban versus urban comparisons. The Holm procedure was applied within each family of three pairwise comparisons to control the family-wise error rate.

Rank-biserial correlation was calculated for each Mann–Whitney comparison as an effect-size measure. Statistical significance was defined as $\alpha=0.05$, and all statistical tests were two-sided.

2.5. Descriptive decomposition

Municipality-level differences in mean tone-to-en-route and en-route-to-scene intervals were additionally used to provide a descriptive decomposition of the rural–urban component difference. For each interval, the urban municipality mean was subtracted from the rural municipality mean. Each component difference was subsequently divided by the sum of the two component differences.

These percentages describe the relative distribution of municipality-level differences across the two analyzed intervals. They were not interpreted as causal mediation estimates or as exact partitions of individual EMS encounters.

2.6. Municipality versus encounter weighting

The principal analyses treated each Connecticut municipality as one observational unit. Consequently, a municipality with a high annual call volume did not receive greater statistical weight than a municipality with a lower call volume. This approach was intentional because the primary research question concerned geographic differences among Connecticut communities.

For contextual comparison, encounter-weighted statewide averages published directly by Connecticut OEMS were also reported. These values were not substituted for the municipality-level observations used in inferential testing.

2.7. Statistical software

Analyses were performed using Python 3 and SciPy. A reproducible

analytic dataset containing all 169 municipalities and the variables analyzed in the study should accompany the final manuscript as Supplementary Table S1, together with the analysis script used to reproduce the statistical results.

2.8. Ethics

This study used publicly available, aggregate municipality-level data and involved no direct interaction with participants or access to individually identifiable private information. Any institutional determination required by the University of Connecticut or the target journal regarding human-subjects research status should be obtained before submission.

3. Results

All 169 Connecticut municipalities were included in the analysis: 91 rural, 33 suburban, and 45 urban.

Rural municipalities had a mean total response time of 12.18 minutes (SD=3.63) and median response time of 11.61 minutes (IQR 9.51–14.42). Suburban municipalities had a mean response time of 8.83 minutes (SD=1.82) and a median response time of 8.50 minutes (IQR 7.70–9.81). Urban municipalities had the shortest response times, with a mean of 7.75 minutes (SD=1.09) and median of 7.61 minutes (IQR 7.10–8.53). The distributions differed significantly across geographic classifications (Kruskal–Wallis $H=69.39$, $p<.001$).

Rural municipalities had significantly longer total response times than suburban municipalities ($U=2395.5$, Holm-adjusted $p<.001$; rank-biserial correlation=0.60) and urban municipalities ($U=3697.0$, adjusted $p<.001$; rank-biserial correlation=0.81). Suburban municipalities also had significantly longer total response times than urban municipalities ($U=1040.5$, adjusted $p=.0026$; rank-biserial correlation=0.40).

The municipality-level results were consistent with encounter-weighted descriptive statistics independently reported by Connecticut OEMS. The state reported mean response times of 11.82 minutes across 112,859 rural emergency responses, 8.43 minutes across 110,843 suburban responses, and 7.69 minutes across 547,537 urban responses.

Geographic differences were also observed during the interval between the first service tone and the responding unit becoming en route. Rural municipalities had a mean tone-to-en-route interval of 3.30 minutes (SD=1.86), with a median of 2.73 minutes (IQR 2.18–3.94). Suburban municipalities averaged 2.05 minutes (SD=1.47), with a median of 1.68 minutes (IQR 1.10–2.39). Urban municipalities averaged 1.43 minutes (SD=0.67), with a median of 1.42 minutes (IQR 0.92–1.88). The distributions differed significantly across the three classifications ($H=52.35$, $p<.001$).

Rural municipalities had significantly longer tone-to-en-route intervals than suburban municipalities ($U=2245.5$, Holm-adjusted $p<.001$; rank-biserial correlation=0.50) and urban municipalities ($U=3530.5$, adjusted $p<.001$; rank-biserial correlation=0.72). The suburban–urban difference was smaller and did not remain statistically significant after adjustment for multiple comparisons ($U=915.5$, adjusted $p=.081$; rank-biserial correlation=0.23).

Geographic differences persisted after responding units were already en route. Rural municipalities had a mean en-route-to-scene interval of 8.95 minutes (SD=2.88), with a median of 8.50 minutes (IQR 7.17–9.96). Suburban municipalities averaged 7.07 minutes (SD=1.40), with a median of 6.85 minutes (IQR 6.08–8.11). Urban municipalities averaged 6.54 minutes (SD=0.93), with a median of 6.46 minutes (IQR 5.73–7.20). The

distributions differed significantly ($H=41.98$, $p<.001$).

Rural municipalities had significantly longer en-route-to-scene intervals than suburban municipalities ($U=2208.5$, Holm-adjusted $p<.001$; rank-biserial correlation=0.47) and urban municipalities ($U=3352.0$, adjusted

$p<.001$; rank-biserial correlation=0.64). The suburban–urban difference was not statistically significant after Holm adjustment ($U=880.5$, adjusted $p=.164$; rank-biserial correlation=0.19).

Table 1. Municipality-level EMS response intervals by geographic classification

Measure	Rural (n=91)	Suburban (n=33)	Urban (n=45)	Omnibus p
Total response, mean $\pm$ SD, min	12.18 $\pm$ 3.63	8.83 $\pm$ 1.82	7.75 $\pm$ 1.09	<.001
Total response, median (IQR), min	11.61 (9.51–14.42)	8.50 (7.70–9.81)	7.61 (7.10–8.53)	
Tone→en route, mean $\pm$ SD, min	3.30 $\pm$ 1.86	2.05 $\pm$ 1.47	1.43 $\pm$ 0.67	<.001
Tone→en route, median (IQR), min	2.73 (2.18–3.94)	1.68 (1.10–2.39)	1.42 (0.92–1.88)	
En route→scene, mean $\pm$ SD, min	8.95 $\pm$ 2.88	7.07 $\pm$ 1.40	6.54 $\pm$ 0.93	<.001
En route→scene, median (IQR), min	8.50 (7.17–9.96)	6.85 (6.08–8.11)	6.46 (5.73–7.20)	

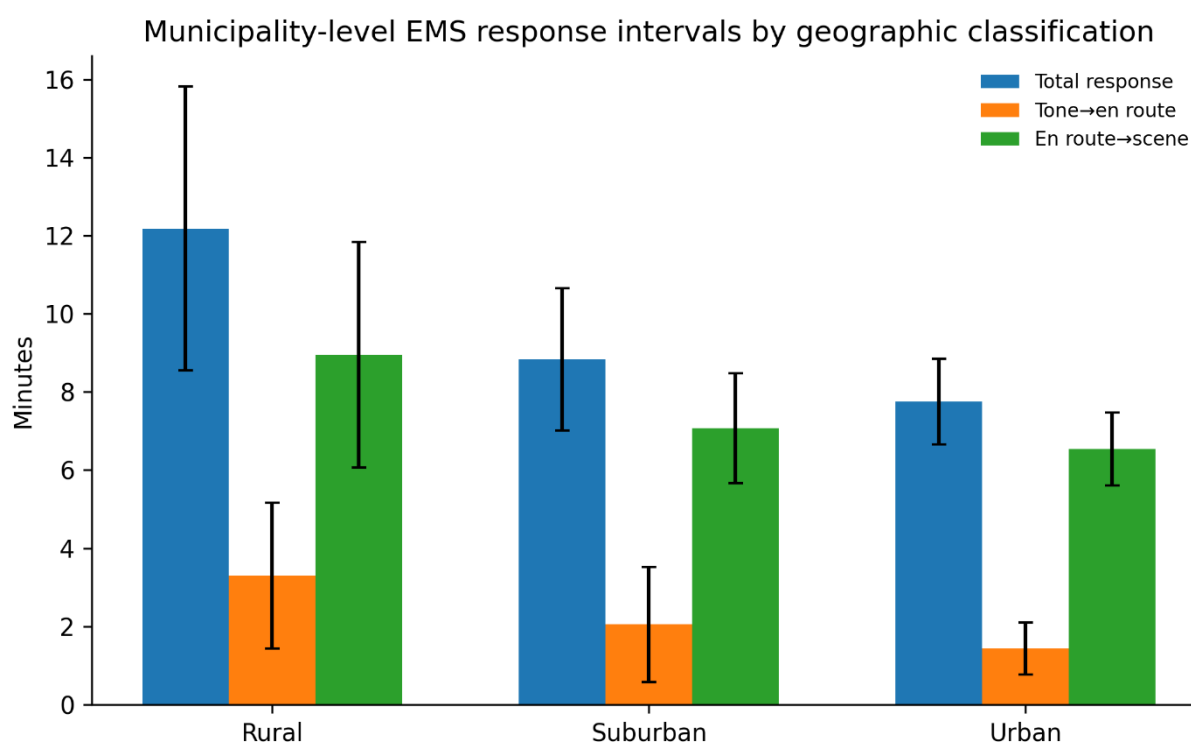


Figure 1. Municipality-level mean total response, tone-to-en-route, and en-route-to-scene intervals by rural, suburban, and urban classification. Error bars show one standard deviation.

Table 2. Pairwise comparisons of municipality-level response intervals

Outcome	Comparison	Mann–Whitney U	Holm-adjusted p	Rank-biserial correlation
Total response	Rural vs suburban	2395.5	<.001	0.60
Total response	Rural vs urban	3697.0	<.001	0.81
Total response	Suburban vs urban	1040.5	.0026	0.40
Tone→en route	Rural vs suburban	2245.5	<.001	0.50
Tone→en route	Rural vs urban	3530.5	<.001	0.72
Tone→en route	Suburban vs urban	915.5	.081	0.23
En route→scene	Rural vs suburban	2208.5	<.001	0.47
En route→scene	Rural vs urban	3352.0	<.001	0.64
En route→scene	Suburban vs urban	880.5	.164	0.19

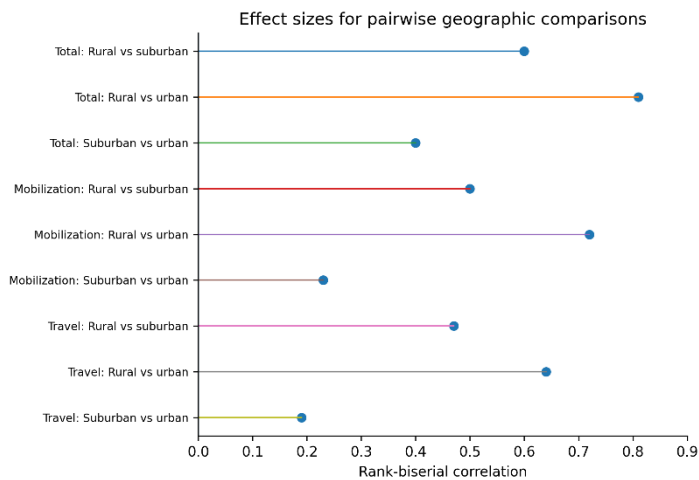
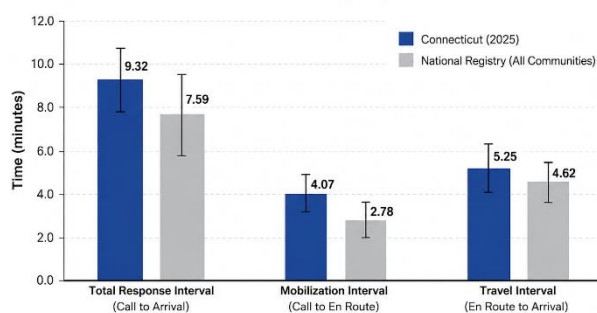


Figure 2. Rank-biserial correlations for pairwise comparisons of total response, mobilization, and travel intervals. Larger positive values indicate greater separation with longer intervals in the first-listed geographic group.

3.1. Descriptive decomposition of the rural–urban difference

Compared with urban municipalities, rural municipalities averaged an additional 1.87 minutes between first service tone and becoming en route ($3.30 - 1.43 = 1.87$ minutes). Rural municipalities also averaged an additional 2.41 minutes after becoming en route ($8.95 - 6.54 = 2.41$ minutes). The combined rural–urban difference across these two municipality-level component averages was therefore 4.28 minutes. Of this two-component difference, approximately 43.7% occurred during the tone-to-en-route interval, while 56.3% occurred during the en-route-to-scene interval. These percentages represent a descriptive comparison of municipality-level component averages and should not be interpreted as causal mediation estimates or as an exact decomposition of individual patient responses.



Note. Values above bars are means (minutes). Error bars represent ± 1 standard deviation. Connecticut values are from the 2025 Connecticut OEMS Response Time Performance Report. National benchmark values are from the NEMSQA National EMS Response Time Registry (All Communities).

Figure 3; Mean EMS response times are compared between Connecticut (2025) and the national registry benchmark across total response, mobilization, and travel intervals. Error bars represent ± 1 standard deviation.

3.2. Within-rural heterogeneity

Substantial heterogeneity was present among municipalities classified as rural. The OEMS source report lists Marlborough with a mean total response time of 24.99 minutes, a tone-to-en-route interval of 3.90 minutes, and an en-route-to-scene interval of 20.84 minutes. Woodbury had a total mean response time of 17.93 minutes, with a 6.72-minute tone-to-en-route interval and 9.50-minute en-route-to-scene interval.

In contrast, Somers had a total mean response time of 6.46 minutes, with corresponding component averages of 2.68 minutes from tone to en route and 5.53 minutes from en route to scene [8]. These examples demonstrate that prolonged total response time can arise through different combinations of mobilization and travel intervals even among municipalities within the same rural classification.

4. Discussion

In this statewide municipality-level analysis, the contemporary rural EMS response-time disparity in Connecticut was distributed across both unit mobilization and travel to the emergency scene. Rural municipalities differed markedly from urban municipalities in overall response time, but component analysis demonstrated that the disparity was already present before responding units became en route and widened further during travel. Approximately 56% of the observed two-component rural–urban difference occurred during the en-route-to-scene interval, while approximately 44% occurred during the tone-to-en-route interval. These percentages are descriptive rather than causal, but they demonstrate that the observed rural difference was not confined to travel after an ambulance began moving. This distinction advances the Connecticut literature beyond documenting the existence of a rural response-time disparity. Previous Connecticut research using 2016 data demonstrated significantly longer response times in rural municipalities but found no significant association between municipal household income and response time [9]. That study suggested that attention should shift toward nonfinancial characteristics of rural EMS systems, including staffing and local policy. The present study provides an operational extension of that work by demonstrating that rural differences are visible during both the interval before a unit becomes mobile and the subsequent travel interval.

The largest absolute component difference occurred during travel. Rural municipalities averaged 8.95 minutes between becoming en route and arriving at the emergency scene compared with 6.54 minutes among urban municipalities, a difference of approximately 2.41 minutes. Several mechanisms could be consistent with longer rural travel intervals, including larger service areas, greater distance between units and incidents, road configuration, unit positioning, simultaneous-call burden, or mutual-aid response. The present ecological data cannot distinguish among these mechanisms.

The mobilization finding is also important. Rural municipalities averaged approximately 3.30 minutes between first service tone and becoming en route compared with 1.43 minutes among urban municipalities. The resulting 1.87-minute difference represented more than two-fifths of the combined difference across the two analyzed intervals. This phase occurs before the responding unit is documented as traveling toward the emergency scene. Longer values may be consistent with differences in staffing configuration, unit availability, crew assembly, concurrent incidents, dispatch processes, or documentation practices, but the aggregate

interval cannot determine which mechanism was responsible.

The appropriate interpretation is therefore not that the present study demonstrates a rural staffing shortage. Rather, it demonstrates that a substantial portion of the geographic difference was observed before units were documented as en route, indicating that travel geography alone is insufficient to characterize the disparity.

This distinction has potential policy relevance. If a municipality's response delay is concentrated after units become en route, interventions involving station placement, geographic coverage, automatic mutual aid, dynamic deployment, or regional resource sharing may warrant investigation. If delays are concentrated before units become en route, strategies addressing readiness, unit availability, staffing arrangements, or turnout processes may be more relevant.

Marked heterogeneity within rural Connecticut further argues against treating rural EMS systems as homogeneous. Marlborough and Woodbury provide illustrative examples: Marlborough's unusually long total response time was accompanied by a particularly long en-route-to-scene interval, whereas Woodbury demonstrated a comparatively large tone-to-en-route interval in addition to a prolonged travel interval. Somers demonstrated substantially shorter performance despite being classified as rural.

These observations are descriptive and should not be used to rank individual EMS organizations because municipality-level intervals may reflect multiple agencies, mutual-aid responses, call distributions, documentation practices, and other contextual factors. Nevertheless, the variation suggests an important direction for future research: why do some rural municipalities achieve substantially shorter response intervals than other rural municipalities?

The findings also demonstrate an important distinction between municipality-weighted and encounter-weighted analysis. Connecticut OEMS reported encounter-weighted mean response times of 11.82 minutes for rural responses, 8.43 minutes for suburban responses, and 7.69 minutes for urban responses^[10]. The municipality-weighted means in the present analysis were 12.18, 8.83, and 7.75 minutes, respectively. The similarity in direction is reassuring, but the approaches answer somewhat different questions.

Response time should not be interpreted as the sole measure of EMS quality. Clinical outcomes are influenced by emergency severity, bystander intervention, dispatcher-assisted care, first-responder arrival, provider training, advanced life support availability, treatment quality, transport destination, and receiving-hospital capabilities. Response time nevertheless remains a fundamental measure of geographic access to emergency care and an important component of EMS system performance.

The present results therefore support a more nuanced interpretation of rural EMS disparities. Rural communities are not simply locations where ambulances must travel farther. In these Connecticut municipality-level data, additional response time was observed both before and after responding units became mobile.

5. Limitations

First, this was an ecological analysis using municipalities rather than individual EMS encounters as the unit of analysis. Municipality-level associations cannot be assumed to describe the experience or outcome of an individual patient.

Second, the source data were derived from electronic patient care records submitted to Connecticut OEMS. Timestamp accuracy depends on documentation and electronic reporting processes, and statewide EMS reporting involves multiple agencies and software systems. Consequently,

measurement and documentation heterogeneity may influence municipality-level estimates.

Third, Connecticut OEMS excluded records with insufficient timing information and trimmed observations in the extreme upper and lower 1% of the response-time distribution for its statewide response-time analysis. Although this approach reduces the influence of implausible values, it may also remove genuine unusually short or long responses.

Fourth, municipality-level component intervals should not be interpreted as reconstructing an individual patient's complete response trajectory. Table-level component averages may reflect differing numbers of records depending on timestamp completeness. Consequently, tone-to-en-route and en-route-to-scene averages should not necessarily be expected to sum exactly to independently reported municipality-level total response times.

Fifth, the tone-to-en-route interval was interpreted operationally as a mobilization interval but does not identify the cause of prolonged mobilization. Longer values could reflect staffing configuration, unit availability, crew assembly, concurrent incidents, dispatch processes, documentation practices, or other unmeasured factors.

Sixth, rurality is an imperfect proxy for EMS system structure. Municipalities belonging to the same geographic category may differ substantially in staffing model, station number and location, ambulance fleet, call volume, mutual-aid practices, tax base, population distribution, first-response resources, and relationships with neighboring agencies.

Seventh, the analysis did not stratify responses according to dispatch priority, diagnosis, patient severity, or clinical outcome. The clinical importance of a given response-time difference is likely to vary substantially among cardiac arrest, stroke, trauma, respiratory distress, and lower-acuity calls.

Eighth, the primary inferential analysis weighted municipalities equally despite substantial differences in annual EMS response volume. This was intentional because municipalities were the unit of analysis, but it means the results should not be interpreted as patient-level estimates of the average Connecticut EMS encounter.

Ninth, no adjustment was made for potential municipality-level confounders such as population density within geographic categories, road mileage, geographic area, ambulance station density, EMS call volume, staffing model, or socioeconomic characteristics. These factors represent important directions for subsequent explanatory research.

Tenth, Connecticut is geographically compact and relatively densely populated compared with many rural regions of the United States. The magnitude and operational composition of rural EMS response disparities may therefore differ in other states.

Finally, the study was cross-sectional. It identifies where differences are observed within the response timeline but cannot establish why those differences occurred or demonstrate that modifying a particular interval would causally improve patient outcomes.

6. Conclusion

Rural EMS response-time disparities in Connecticut were observed during both unit mobilization and travel to the emergency scene. Across all 169 Connecticut municipalities, rural communities had significantly longer total EMS response times than suburban and urban communities.

Compared with urban municipalities, rural municipalities averaged approximately 1.87 additional minutes between first service tone and becoming en route and approximately 2.41 additional minutes between becoming en route and arriving at the emergency scene. Of the combined difference across these two municipality-level component averages,

approximately 56% occurred during travel and 44% during mobilization. These proportions should be interpreted descriptively rather than causally. Nevertheless, they demonstrate that the contemporary rural response-time disparity is not confined to the period during which ambulances are physically traveling toward an emergency.

The findings suggest that efforts to improve rural EMS access may need to consider both the geographic deployment of emergency resources and the processes determining how rapidly units become mobile following notification. Future research should determine whether staffing models, station placement, ambulance availability, mutual-aid arrangements, call volume, geographic coverage, or other modifiable EMS system characteristics distinguish rural municipalities with shorter response intervals from those experiencing prolonged delays.

Ethics approval and consent to participate

This study used publicly available, aggregate municipality-level data and involved no direct interaction with human participants or access to individually identifiable private information.

CRedit authorship contribution statement

Abhijith Tippireddy: Writing – original draft, Methodology, Formal analysis, Conceptualization.

Declaration of generative AI and AI-assisted technologies in the writing process

The free versions of Grammarly were used for spell-checking and grammar corrections. After using these tools, the author(s) reviewed and edited the content as needed and took full responsibility for the content of the publication.

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Declaration of competing interests

The authors declare that they have no competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Availability of data and materials

The data analyzed in this study are publicly available in the Connecticut Department of Public Health Office of Emergency Medical Services 2025 *Office of Emergency Medical Services Annual Report*.

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