Overview of Public Safety Center (PSC) 119 Call Patterns in Semarang City in 2024 as a Basis for Strengthening the Emergency Response System

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Abstrak: Layanan Public Safety Center (PSC) 119 merupakan sistem pelayanan gawat darurat terintegrasi yang berperan penting dalam sistem kesehatan pra-rumah sakit di Indonesia. Permintaan layanan PSC-119 dapat dipengaruhi oleh berbagai faktor termasuk kondisi cuaca dan mobilitas masyarakat. Di Kota Semarang, belum ada penelitian yang menggambarkan tren mingguan panggilan PSC-119 berdasarkan jenis kasus dan hubungannya dengan parameter cuaca. Penelitian ini bertujuan untuk mendeskripsikan pola tren mingguan panggilan PSC-119 berdasarkan jenis kasus dan perbandingannya dengan pola perubahan cuaca di Kota Semarang tahun 2024. Penelitian ini menggunakan metode kuantitatif-deskriptif dengan pendekatan time-based descriptive analysis. Data sekunder meliputi panggilan PSC-119 berdasarkan jenis kasus (transportasi, *homecare*, gawat darurat umum, kecelakaan lalu lintas, dan non-gawat darurat) serta data cuaca mingguan (suhu, kelembaban, curah hujan) dari Stasiun Klimatologi Jawa Tengah periode Januari-Desember 2024. Analisis dilakukan secara deskriptif dengan visualisasi menggunakan grafik pola mingguan.Total panggilan PSC-119 tahun 2024 menunjukkan variasi mingguan dengan puncak tertinggi pada minggu ke-8 sebanyak 633 panggilan. Kategori transportasi mendominasi dengan 11.825 panggilan, diikuti homecare (4.339 panggilan). Puncak panggilan terjadi pada kondisi cuaca relatif kering (curah hujan 3,1 mm, suhu 29,6°C, kelembaban 77,7%). Analisis perbandingan menunjukkan bahwa perubahan variabel cuaca tidak membentuk pola yang sejalan dengan fluktuasi jumlah panggilan mingguan. Fluktuasi panggilan PSC-119 Kota Semarang lebih dipengaruhi oleh pola aktivitas dan mobilitas masyarakat dibandingkan variabel cuaca. Cuaca berperan sebagai faktor pemudah (enabling factor) yang mendukung peningkatan mobilitas, bukan sebagai determinan langsung kejadian darurat.

Kata Kunci: psc-119, layanan gawat darurat, tren mingguan, cuaca, mobilitas masyarakat, kota semarang

Abstract: The Public Safety Center (PSC) 119 service is an integrated emergency medical system that plays a crucial role in Indonesia's pre-hospital healthcare system. The demand pattern for PSC-119 services can be influenced by various factors, including weather conditions and community mobility. In Semarang City, no research has described the weekly trends of PSC-119 calls based on case types and their relationship with weather parameters. This study aims to describe the weekly trend patterns of PSC-119 calls based on case types and compare them with weather pattern changes in Semarang City in 2024. This study employed a quantitative-descriptive method with a time-based descriptive analysis approach. Secondary data included PSC-119 calls categorized by case type (transportation, homecare, general emergency, traffic accidents, and non-emergency) and weekly weather data (temperature, humidity, rainfall) from the Central Java Climatology Station for January-December 2024. Descriptive analysis was performed with visualization using weekly trend charts. Total PSC-119 calls in 2024 showed weekly variations with the highest peak in week 8 at 633 calls. Transportation category dominated with 11,825 calls, followed by homecare (4,339 calls). Peak calls occurred during relatively dry weather conditions (rainfall 3.1 mm, temperature 29.6°C, humidity 77.7%). Comparative analysis showed that weather variable changes did not form patterns consistent with weekly call fluctuations. Fluctuations in PSC-119 calls in Semarang City were more influenced by activity patterns and community mobility than by weather variables. Weather acts as an enabling factor that supports increased mobility, rather than as a direct determinant of emergency incidents.

Keywords: psc-119, emergency medical services, weekly trends, weather, community mobility, semarang city

INTRODUCTION

Global climate change has a significant impact on health systems, including patterns of demand for emergency services. Numerous studies indicate that climate change influences emergency medicine practice by amplifying climate-sensitive diseases and shifting the epidemiological profile of conditions diagnosed and managed in emergency departments. Extreme weather events, rising average temperatures, and unpredictable climatic incidents contribute to increased emergencies and surges in medical emergency calls (1). Health organizations and emergency medicine professional bodies, such as the World Health Organization (WHO) and the American College of Emergency Physicians (ACEP), emphasize the importance of understanding the impacts of climate change on emergency health systems as a basis for preparedness planning and preventive measures to strengthen health system resilience (1).

Globally, Emergency Medical Services (EMS) constitute a critical component of pre-hospital health systems. Over the past two decades, the demand for EMS has shown a consistent upward trend across many countries, placing substantial pressure on health system capacity. In the United States, EMS call volumes have continued to rise, with estimated growth reaching 17.4 million calls per year. Similar trends have been observed in other high-income countries, such as in Victoria, Australia, and London, United Kingdom, which report sustained increases in ambulance service utilization. These patterns indicate that the growing demand for emergency care represents a systemic challenge on a global scale (2).

Cross-country studies also indicate that trends in emergency call demand fluctuate depending on regional characteristics and local climatic conditions. Countries in the European region tend to experience increased emergency calls during periods of extreme cold temperatures, whereas in parts of Asia, such as Taiwan, higher call volumes are more frequently observed during periods of extreme heat (3)(4). These differing patterns suggest that the climate's impact on emergency care demand is context-specific and strongly influenced by regional climatic characteristics. Empirically, a study in King County, Washington demonstrated a significant association between extreme temperatures and increased emergency medical calls, showing that rising temperatures correlate with seasonal increases in Emergency Medical Services (EMS) responses (5).

Unlike subtropical countries, Indonesia has a tropical climate characterized by relatively high temperatures and consistently elevated humidity throughout the year. These conditions may produce patterns of emergencies and demand for emergency services that differ from those in other regions, thereby requiring a more contextualized analysis at the national and local levels. To respond to these needs, Indonesia developed an integrated emergency medical service system with the national access number 119, known as the Public Safety Center (PSC) 119, beginning in 2016. This system forms part of the Integrated Emergency Management System (SPGDT), as mandated by the Regulation of the

Minister of Health of the Republic of Indonesia No. 19 of 2016 and Presidential Instruction No. 4 of 2013 (6).

PSC 119 functions as the central coordination hub for emergency medical services, providing initial action guidance based on emergency algorithms, coordinating the dispatch of personnel and ambulances, and directing patients to appropriate healthcare facilities (7). According to the 2014 Health Sector Review, Indonesia has experienced an epidemiological transition, with the three leading causes of death being cerebrovascular diseases, traffic accidents, and ischemic heart disease (8). The high burden of emergency conditions has driven the strengthening of the 119 service, which is integrated with the National Command Center (NCC) at the national level and PSC units at the district and municipal levels. As of October 2024, the 119 service has been integrated with the SATUSEHAT Mobile application, enabling the public to access emergency medical services more quickly (9). Nevertheless, the implementation of PSC 119 across regions continues to face challenges, including limited numbers of operator personnel, shortages of healthcare workers, and an insufficient ambulance fleet (7).

In practice, PSC 119 responds to various categories of calls that reflect different levels of urgency and patient care needs. These service categories include emergency care for life-threatening conditions, traffic accident (KLL) responses focused on trauma management, non-emergency medical calls, medical transport for inter-facility patient transfers, and homecare services that provide direct medical care at patients' homes based on clinical indications. This diversity of service types illustrates the complexity of PSC 119's operational workload and highlights the importance of analyzing demand patterns based on case categories (10).

At the regional level, Central Java Province has established Governor Regulation Number 15 of 2017 on the Integrated Emergency Management System as the basis for strengthening the implementation of PSC 119 across all districts and municipalities (11). In addition, the Central Java Provincial Government regularly organizes the provincial-level PSC 119 Jamboree as an effort to enhance coordination, commitment, and human resource capacity among PSC units, with the aim of improving response times and reducing mortality and disability related to emergency conditions (12)(13).

Semarang City, as the capital of Central Java Province, has a tropical climate characterized by temperatures ranging from 24–32°C and consistently high humidity throughout the year (14). Seasonal weather variations, particularly the differences between the rainy and dry seasons, have the potential to influence community health patterns and the incidence of emergency conditions. Within this context, PSC 119 Semarang City holds a strategic role in providing pre-hospital emergency medical services for the residents of Semarang and surrounding areas.

To date, there remains a limited number of local-level publications that describe weekly trends in PSC-119 calls by case type and relate them to weather parameters such as temperature, humidity, and rainfall, particularly in Semarang City. Therefore, this study aims to describe the weekly trends of PSC-119 calls by case type in comparison with weather pattern variations throughout 2024 in Semarang City. The findings of this study are expected to provide a comprehensive situational overview of the emergency care workload and serve as a foundation for improving and strengthening PSC 119 services at the regional level.

METHODS

This study employed a quantitative-descriptive method using a time-based descriptive analysis approach, which is utilized to illustrate the weekly trends in PSC 119 call volumes by case type and weather patterns in Semarang City throughout 2024, without conducting causal inference or multi-year trend analysis (14). The research was conducted in 2025 at the Public Safety Center (PSC) 119 Unit of Semarang City as the primary site for data collection.

The data used in this study consisted of secondary data obtained from the 2024 PSC-119 call database managed by the Semarang City Health Office, which included weekly call counts categorized by case type: transportation, homecare, general emergencies, traffic accidents, and non-emergencies. Additional data were sourced from the Central Java Climatology Station, comprising weekly weather data including average temperature, average humidity, and weekly rainfall. All data were obtained through formal permission from the respective institutions.

The research variables included the number of PSC-119 calls by case type as well as weather variables. Case types were classified as nominal variables, while weekly call counts, average temperature, humidity, and rainfall were treated as ratio-scale variables. The analysis covered weeks 1 through 52 of the year 2024. Data analysis was conducted descriptively to present patterns and weekly trends. The analysis steps involved presenting the distribution of weekly call counts by case type, presenting weekly weather trends, and visualizing the data in tables and line-chart trend graphs. All data processing and visualization were performed using Microsoft Excel. The interpretation of results was conducted to understand the patterns of call volume fluctuations throughout the year.

This study did not involve personal identifiable information, thereby ensuring the confidentiality of all data. Access to PSC-119 data was conducted through formal procedures and authorization from the Semarang City Health Office in accordance with research ethics principles.

RESULTS

This study analyzes the weekly trends of PSC-119 calls in Semarang City in 2024 based on case types and weather conditions. The data are presented in tables and graphs to illustrate the patterns of weekly fluctuations.

1. **Weekly Distribution of Emergency Calls**
   From January to December 2024, the number of PSC-119 emergency calls showed a fluctuating pattern. Call volume increased at the beginning of the year and reached its peak in Week 8 with 633 calls. After the peak, the number of calls gradually decreased toward the end of the year, reaching 239 calls in Week 52.
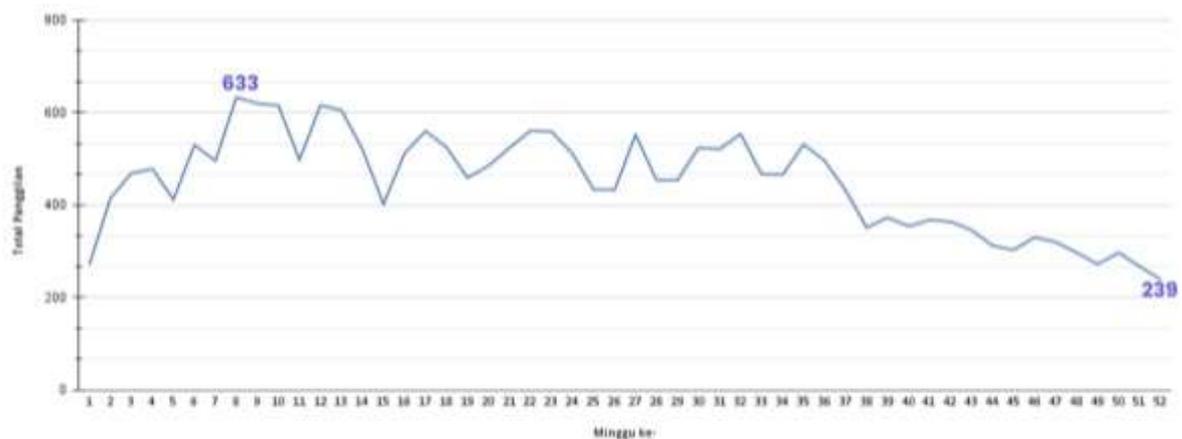

Figure 1. Weekly Trend of Total PSC-119 Calls in 2024

2. **Patterns of Call Types**
   Throughout 2024, transport-related calls were the most frequent type of call received by PSC-119. Transport calls peaked in Week 8 with 385 calls and gradually declined to their lowest point of 65 calls at the end of the year. Homecare calls ranged between 46–127 calls per week, while emergency (gawat darurat) calls showed a relatively stable pattern, fluctuating between 49–109 calls per week. Traffic accident (KLL) calls ranged from 20–51 calls per week, whereas non-emergency calls constituted the lowest category, ranging from 6–42 calls per week. Overall, all categories demonstrated a downward trend toward the end of the year.
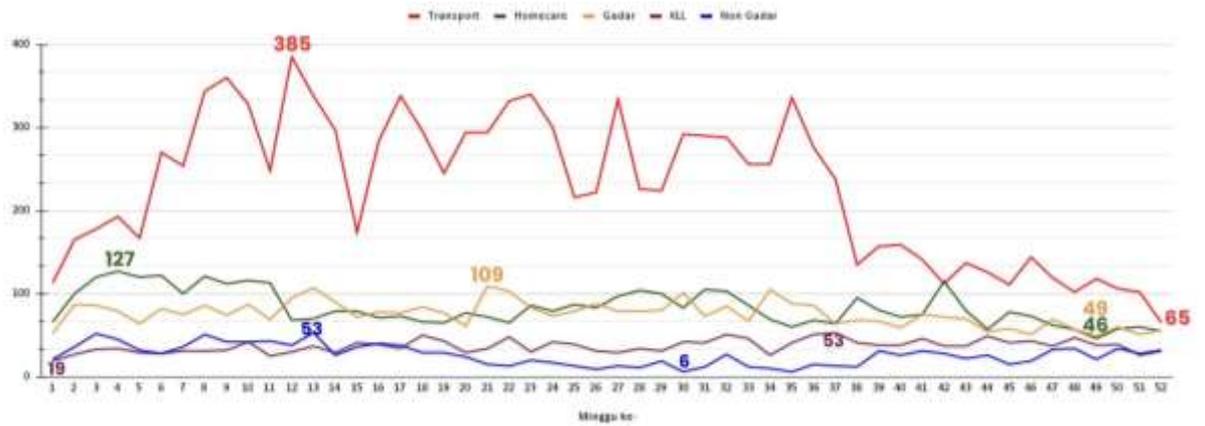
Figure 2. Patterns of Call Types

3. Weekly Weather Variation Pattern

Weekly weather conditions in Semarang City in 2024 exhibited a clear seasonal pattern. Air temperature remained relatively stable, ranging from 27–30°C, while humidity levels were consistently within 75–85% with a tendency to increase toward the end of the year. Meanwhile, rainfall showed the greatest fluctuation, peaking in week 11 and reaching very low levels from week 20 to week 30, indicating the dry season.
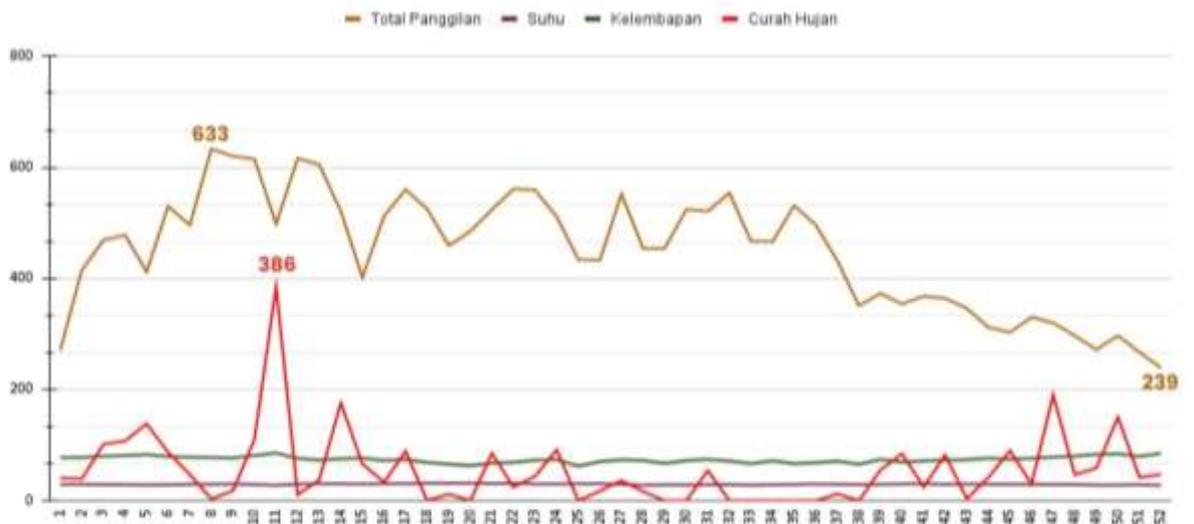

Figure 3. Weekly Weather Variable Trends in Semarang City in 2024

4. **The Highest PSC-119 Transportation Calls and the Weather Conditions in the Week**
   In week 12, the number of transport calls reached 385 cases, representing a high value, occurring under weather conditions of 29.8°C temperature, 76.0% humidity, and relatively low rainfall of 11 mm.

Table 1. The Highest PSC-119 Transportation Calls and the Weather Conditions in the Week of 2024e

Variable	Transportation
Total Calls	385 Case
Week	12
Temperature	29,8°C
Humidity	76,0%
Rain Fall	11 mm

5. **Weather Cinditions During Weeks with the Highest PSC-119 Call**
   The data show that the highest number of calls, ranging from 605 to 633 calls, occurred during weeks 8 to 13. During this period, air temperatures ranged from 29.2°C to 30.5°C with relative humidity levels between 73.1% and 81.3%. Meanwhile, rainfall varied from 3 mm (very low) to 111 mm (very high).

Table 2. Weather Cinditions During Weeks with the Highest PSC-119 Call in 2024

Total Calls	Week	Temperature	Humidity (%)	Rain Fall (mm)
633	8	29,6	77,7	3
620	9	29,8	76,9	18
616	12	29,8	76,0	11
615	10	29,2	81,3	111
605	13	30,5	73,1	38

DISCUSSION

The findings of this study indicate that the weekly call patterns of PSC-119 Semarang City throughout 2024 varied across case categories and did not show consistent associations with the observed weather variables—temperature, humidity, and rainfall. Descriptively, fluctuations in call volume appeared to move independently of weekly weather variations, suggesting that the relationship between weather conditions and PSC-119 call volume was not strong at the level of visual inspection. This finding aligns with Chen et al. (2022), who reported that the influence of weather on ambulance demand is contextual and does not always display consistent patterns, particularly in regions with relatively stable climatic characteristics (16).

Throughout 2024, the Transportation category represented the highest number of calls, followed by Home Care, while general emergency calls and traffic accident calls contributed smaller proportions. The dominance of transport-related calls indicates that the workload of PSC-119 Semarang City is not primarily driven by acute emergency cases, but rather by patient mobility needs and health system referral support. Several factors may explain the high volume of transportation calls. First, PSC-119 functions as a referral coordination center and medical transport provider, making it widely utilized for inter-facility transfers and patient transport to referral hospitals (17). Second, Semarang City serves as a regional healthcare hub with multiple referral hospitals and advanced healthcare facilities, which naturally increases the volume of referrals and the need for coordinated medical transportation. Third, limited access to independent patient transport encourages the use of PSC-119 ambulances even for cases that are not classified as acute emergencies (17).

This pattern aligns with the international EMS literature, which shows that much of the workload of modern pre-hospital services arises from non-emergency cases and medical transport needs, while truly life-threatening cases constitute a relatively small proportion of total calls (17). Thus, the dominance of transportation calls in PSC-119 Semarang reflects a shift in pre-hospital service

functions, which now emphasize not only emergency response but also continuity of care and patient mobility.

The Home Care category, which consistently ranked second, indicates community demand for ongoing home-based healthcare services, including post-hospitalization monitoring and chronic disease management. These findings reinforce the role of PSC-119 within community-based healthcare systems. Previous studies suggest that the increasing utilization of non-emergency and home-based care within EMS systems is related to demographic transitions, a rising burden of chronic illnesses, and a greater need for accessible care within patients' homes (17).

The peak number of PSC-119 calls occurred in Week 8, with a total of 633 calls, predominantly in the transport category. Interestingly, this peak occurred during relatively stable and dry weather conditions, with an average temperature of 29.6°C, humidity of 77.7%, and minimal rainfall. Theoretically, extreme weather conditions such as heavy rainfall are often associated with increased traffic accident risk; however, this pattern was not observed in the current dataset. Instead, the surge in calls occurred during favorable weather, which facilitates greater population mobility. This suggests that increased human activity and movement contributed to the rise in PSC-119 service utilization, particularly for medical transport and non-emergency services.

Conversely, during the early rainy season—when rainfall increased—the number of PSC-119 calls tended to decline. This further supports the interpretation that weather is not a direct determinant of call volume fluctuations, but rather an enabling factor influencing the level of population activity and mobility. This aligns with Phung et al. (2023), who reported that in tropical climates, weather affects emergency service utilization more indirectly through changes in human behavior and mobility, rather than as a direct trigger of medical emergencies (18).

Overall, the weekly fluctuations in PSC-119 calls throughout 2024 are better understood as a reflection of community mobility dynamics and healthcare service utilization—particularly medical transport and home-based services—rather than as a direct effect of weekly weather variations. These findings highlight the importance of designing PSC-119 capacity planning and service strengthening efforts that take into account the dominance of non-emergency services, especially medical transportation and home-based care, as core components of the pre-hospital workload.

CONCLUSION

The call patterns of PSC-119 Semarang City in 2024 show weekly variation across case categories, with Transportation and Home Care being the dominant types of calls. These findings indicate that the service burden of PSC-119 is not primarily driven by acute emergencies but rather by patient mobilization needs and continued healthcare services as part of the referral system. Descriptive analysis also shows that fluctuations in PSC-119 call volume do not exhibit a consistent pattern with changes in weekly temperature, humidity, or rainfall. The peak in call volume occurred during relatively stable weather conditions, suggesting that weather variables are not direct determinants of call fluctuations. Overall, variations in PSC-119 calls in Semarang City are more influenced by patterns of service utilization and community mobility than by weather factors. These findings highlight the importance of PSC-119 service planning that accounts for the predominance of medical transport needs, home care, and temporal call patterns.

RECOMMENDATIONS

The management of PSC-119 Semarang City needs to adjust resource planning in accordance with the dominance of Transportation and Home Care services by strengthening ambulance capacity, optimizing service scheduling, and improving human resource management to ensure continuous preparedness for acute emergency responses. Weekly call-trend information can be utilized as a basis for pre-hospital service planning and for strengthening an integrated referral system connected with both primary and secondary healthcare facilities. Future studies are recommended to conduct inferential analysis and incorporate additional variables—such as public holidays, traffic density, and patient characteristics—to obtain a more comprehensive understanding of the factors influencing fluctuations in PSC-119 call volume.

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