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Category 4 emergency care at the primary health care level: A population-based approach to resource optimisation

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Abstract. The aim of the study was to analyse the impact of the Category 4 call routing reform on the dynamics of structural and operational indicators of the emergency medical service in the Republic of Kazakhstan from 2019 to 2024. The methodological basis was a retrospective population study based on aggregated official state statistics. The calculation of the population load rate (IR) per 1,000 population, the ineffective workload rate (IUR), the workforce transformation index, the basic growth rate assessment method, and a comparative analysis of structural shares were used. The population load rate (IR) demonstrated a V-shaped trajectory: a decrease from 426.2 to 374.6 per 1,000 population in 2020 (-12.1%), followed by a recovery to 416.9 in 2024. An analysis of the call structure revealed that after 2019 (30.2%), Category 4 calls became the dominant type. From 2020 to 2024, such calls consistently led, accounting for over 36% of the total number of service calls. The rate of late arrivals for Category 4 calls among primary care teams was 2.8%, compared to 5.1% among ambulance teams. The ineffective workload rate (IUR) remained in the range of 4.04-4.94% despite the structural restructuring of its components: unjustified calls decreased by 60.3%, while unsuccessful dispatches increased by 55.8%. Physician staffing in 2024 was 75.8%, and the physician shortage reached 471.25 positions (+39.1% compared to 2023). Ambulance vehicle depreciation returned to a critical level of 60.4%. The successful resuscitation rate increased from 38.3% to 53.1% (+14.8 percentage points). The results obtained can be used to improve inter-tier routing of ambulance calls, inform regional management decisions on primary health care infrastructure development, and plan service staffing

Keywords: call structure; routing reform; unsuccessful dispatches; late arrival rate; inter-tier interaction; timely response

Introduction

Emergency Medical Service (EMS) is one of the most resource-intensive segments of the healthcare system, operating under conditions of ever-increasing population demand, staff shortages, and deteriorating equipment. The problem of inefficient use of EMS resources – in particular, the high proportion of calls that do not require an emergency response – imposes an organisational and economic burden on the healthcare system, reducing the availability of emergency care for patients with life-threatening conditions and contributing to the overload of ambulance crews. This necessitates the search for new organisational solutions at the routing level and inter-level interaction. The healthcare development strategy of the Republic of Kazakhstan is based on a socially oriented model of primary health care (PHC). The priority is the integration of medical care at all levels. According to A.B. Qumar *et al*. [1], key reforms included the introduction of family medicine and the strengthening of multidisciplinary teams, which redistributed the workload and increased accessibility to primary care. The coronavirus disease 2019 (COVID-19) pandemic further pointed out the role of primary care as a filtering element capable of ensuring the sustainability of emergency services during crisis situations. This suggests that strengthening primary care is seen as one of the mechanisms for reducing the burden on the emergency medical care system.

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The COVID-19 pandemic placed unprecedented pressure on emergency medical care systems. A systematic analysis by H. Richter *et al*. [2] documented heterogeneity in the response of emergency medical services: the number of calls in different regions of European and non-European countries varied from -50% to +121%, while the actual number of team dispatches decreased by 12.2% on average, reflecting both changing population behaviour and the overload of the system during the peak period of morbidity. For the Central Asian region, the pandemic had significant epidemiological consequences. According to A.L. Lundberg *et al*. [3], the region experienced a nearly continuous outbreak from November 2020 to April 2022, destabilising healthcare infrastructure and placing additional strain on emergency services. The impact of the pandemic on EMS capacity at the level of individual city systems was documented for Astana. In the study, A. Mussina *et al*. [4] found that the total number of calls in the city increased from 50,488 in the pre-pandemic period to 135,911 at the peak of the outbreak, and geospatial analysis confirmed a direct correlation between urban density and call frequency, highlighting the need for adaptive EMS resource planning in the context of large-scale public health crises.

Systemic barriers to access to primary health care are a structural factor that contributes to the persistently high burden on emergency medical services in Central Asian countries. In particular, B. Rechel *et al*. [5] found that, despite the introduction of per capita financing and retraining of family medicine specialists in Central Asian countries, the exclusion of outpatient medications from state benefit packages forced patients to seek free medications from emergency medical services and hospitals, creating a persistent flow of inappropriate visits. This indicates that limitations in the availability of primary care and drug provision lead to the inappropriate use of emergency medical services resources. The inefficient use of emergency medical services resources is exacerbated by demographic trends. The study by G.G. Tuzcu & A. Ekşi [6] demonstrated that population ageing creates a persistently high demand for prehospital services due to comorbidity, polypharmacy, and cognitive impairment in older patients, and achieving sustainable results requires comprehensive strategies that combine the efforts of medical personnel, caregivers, and government institutions within the framework of adaptive health policy.

The experience of reforming the EMS in neighbouring countries of the Central Asian region is of comparative interest. Studying the system in Kyrgyzstan, S. Moldoisaeva *et al*. [7] described how a key stage of reform was the transfer of EMS units to Family Medicine Centres to ensure continuity with primary care. However, deterioration of vehicles and the lack of air ambulances remain common systemic problems in the region, requiring the search for new resource management models in a context of limited budgets. This demonstrates that the integration of EMS with PHC can improve continuity of care, but persistent resource constraints reduce the effectiveness of the reforms. The development of primary health care as a resource for reducing the burden on emergency medical services is associated with behavioural barriers from the population. Using Kyrgyzstan as an example, A. Asanbek Kyzy *et al*. [8] documented persistent public mistrust of general practitioners and a pronounced preference for highly specialised inpatient care, which increases the burden on ambulance crews. This suggests that public behavioural attitudes, including mistrust of primary health care and a preference for inpatient care, contribute to the persistent high burden on the emergency medical care system. Categorisation and routing of calls based on urgency serve as a key tool for optimising patient flows in emergency medical care systems. Using a large Italian hospital as an example, M. Boresta *et al*. [9] demonstrated how a four-tier triage system determines patient routing between departments based on the severity of the condition, while the use of simulation modelling allows for a detailed analysis of patient trajectories and reduces the burden on key emergency medical care capacities. Experience demonstrates that the resilience of EMS systems under high load is determined not only by the operational parameters of the service itself, but also by the effectiveness of inter-level interactions – primarily, routing mechanisms to the primary health care level. Additionally, some studies focus on individual aspects of the problem (call structure, behavioural barriers, pandemic consequences, or staffing constraints), without an integrative analysis of the relationship between EMS and primary health care. The aim of this study was to assess the dynamics of structural and operational indicators of the emergency medical care system of the Republic of Kazakhstan in the context of the reform of Category 4 call routing to the primary health care level for the period 2019-2024. The study objectives included: analysing the dynamics of the population load on EMS; assessing the effects of the Category 4 call routing reform; characterising the staffing, logistical, and clinical indicators of EMS; and conducting a separate analysis of indicators in the largest urbanised centres.

Materials and Methods

The present study was conducted using a retrospective population-based design based on aggregated official state statistics data from the Republic of Kazakhstan for 2019-2024. The six-year observation horizon was chosen to encompass three different organisational contexts: the pre-pandemic period (2019), the period of restrictive measures and the peak burden of the COVID-19 pandemic (2020-2021), and the post-pandemic period of reform of the emergency medical care system (2022-2024). This timeframe made it possible

to assess both short-term effects and medium-term trends associated with institutional transformations.

The primary data sources were annual statistical digests of the Ministry of Health of the Republic of Kazakhstan [10-11], reflecting population health indicators and the activities of healthcare organisations. These collections were selected as official state publications that ensured comparability of population-level indicators over time and represented the only systematically updated open source of aggregated healthcare statistics in the Republic of Kazakhstan. Departmental annual analytical reports on the activities of the emergency medical service of the Republic of Kazakhstan for 2020, 2021, and 2022, prepared by the National Coordination Centre for Emergency Medicine (NCCEM) [12-14], were selected as the main profile source of operational indicators of the EMS, which were not available in the collections of the Ministry of Health of the Republic of Kazakhstan (MOH RK). The NCCEM reports for 2023 and 2024 were included to ensure the relevance of the analysis and coverage of the post-pandemic period of system reform [15-16]. Data on the structure of calls by urgency categories for 2019 (the base year), including the absolute distribution across four categories, were selected as the only available source of a categorical breakdown of calls for the pre-pandemic period, necessary for comparing the structure of the workload over time [17]. All sources used were publicly available and represented aggregated system-level data; individual patient data were not included in the study. The use of aggregated sources made it impossible to independently verify the correspondence between the indicators of the number of people and the number of visits, as well as the inability to control for internal system changes in accounting algorithms that could affect the values of individual indicators in different years.

The object of the study was the system of emergency and urgent medical care provision at the population level. The following groups of indicators were included in the analysis: the absolute volume of the outpatient workload and its distribution by urgency categories; population-based contact rates (number of calls per 1,000 population); indicators of operational and non-targeted resource losses (unsuccessful dispatches and unjustified calls); indicators of the personnel structure and staffing of ambulance teams; indicators of the quality of care (timeliness of response, pre-hospital mortality, successful resuscitation); indicators of logistical support; indicators of the functioning of ambulance teams at primary health care organisations handling Category 4 calls. The population load rate (IR) was calculated using formula (1):

$$IR = \frac{N}{P} \times 1{,}000, \quad (1)$$

where N – the total number of calls; P – the average annual population, determined according to data from the Bureau of National Statistics [18].

IR growth rates were calculated using the baseline method with a fixed baseline of 2019. The study distinguished between two sub-indicators: IR as the number of calls per 1,000 population (according to data from the Ministry of Health of the Republic of Kazakhstan) and the total number of visits, used to calculate the growth rate and components of the ineffective workload rate (IUR) (IUR). Correspondence was not independently verified due to limitations of aggregated sources. To assess resource misuse, the IUR was calculated (formula (2)):

$$IUR = \frac{n_u + n_i}{N} \times 100, \quad (2)$$

where n_u – the number of unjustified calls; n_i – the number of unsuccessful dispatches; N – the total number of calls.

The two components of the IUR were considered separately due to the different management natures: unsuccessful dispatches reflected operational losses of the system, while unjustified calls characterised the mismatch between public demand and the emergency medical services profile. The Personnel Transformation Index (PTI) was calculated using formula (3):

$$PTI = \frac{F}{D}, \quad (3)$$

where PTI – the personnel transformation index; F – the number of paramedic teams of the independent EMS stations; D – the number of physician teams of independent EMS stations.

Starting in 2020-2021, some paramedic teams were administratively transferred to the primary health care level to handle Category 4 calls and were no longer included in the reports of the independent EMS. Consequently, data on the team composition for 2019 (based on statistical data from the Ministry of Health of the Republic of Kazakhstan) and for 2020-2024 (based on departmental reports from the National Coordination Centre for Emergency Medicine) reflected different team compositions, which limited the comparability of PTI over time and was taken into account when interpreting. The transfer of Category 4 calls to the primary health care system was a key organisational change during the observation period. Call categorisation was regulated by Order No. KR DSM-225/2020 [19]. According to this document, a Category 4 call was defined as a patient's condition caused by an acute illness or exacerbation of a chronic illness, without sudden and severe organ or system dysfunction, and in the absence of an immediate or potential threat to life and health. Calls in this category were transferred to mobile teams of primary health care organisations during primary health care opening hours (8:00-19:00 on weekdays); outside these hours, these calls were transferred to independent EMS teams.

The dynamics of all indicators were assessed in comparison with the baseline period (2019) and by the stages of the system reform. A separate analysis was conducted for the cities of Almaty and Astana. Almaty and Astana were selected as the largest urbanised centres of the Republic of Kazakhstan with the highest absolute volume of calls and density of population demand for EMS services. The results were interpreted taking into account organisational changes associated with the transfer of Category 4 calls to the primary health care system starting in 2020-2021. Data on the distribution of Category 4 calls between independent EMS and PHC teams were available in departmental reports of the National Centre for Emergency Medicine starting in 2021 [12-14], which limited this analysis to the period 2021-2024. Data on EMS teams at PHC organisations for servicing Category 4 calls were available starting in 2020, since this routing mechanism was introduced by Order of the Minister of Health of the Republic of Kazakhstan No. KR DSM-225/2020 [19], which limited this analysis to the period 2020-2024. The statistical analysis was primarily descriptive. To assess the dynamics of the indicators, comparative analysis of absolute and relative values, calculation of growth rates, and structural shares were used. The results were presented as absolute values, percentages, and rates per 1,000 population. Due to the use of aggregated population data and the lack of individual-level observations, inferential statistics were not used.

Results

Analysis of the dynamics of the population load on the ambulance service in Kazakhstan

The analysis of the dynamics of the population load on the ambulance service was conducted based on data from official departmental reports and statistical collections of the Ministry of Health of the Republic of Kazakhstan for 2019-2024. The analysis distinguishes between two indicators: the IR calculated using formula (1) and the absolute volume of on-call workload. The dynamics of IR in Kazakhstan are presented in Table 1.

Table 1. Dynamics of the population load emergency medical services in the Republic of Kazakhstan, 2019-2024

Year	Total calls (abs.)	IR (per 1,000 population)	IR growth rate by 2019, %
2019	7,838,544	426.2	- (basis)
2020	7,171,707	374.6	-12.1
2021	8,252,281	424.3	-0.4
2022	8,482,373	430.2	+0.9
2023	8,568,761	428.0	+0.4
2024	8,531,652	416.9	-2.2

Note: IR – the number of calls per 1,000 population. The 2020 figure was adjusted based on the annual report of the National Coordination Centre for Emergency Medicine (NCCEM) (7,171,707 calls; 374.6 per 1,000). The growth rate was calculated using the baseline method, with the baseline year being 2019

Source: compiled by the author based on Ministry of Health of the Republic of Kazakhstan [10-11], Results of the Emergency Medical Service's Work in 2020 [12], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 12 months of 2021 [13], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for the 12 months of 2022 [14], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 2023 [15], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 12 months of 2024 [16], Key indicators of emergency medical care for 10 months of 2019-2020 [17], Bureau of National Statistics [18]

Table 1 data makes it possible to identify three structurally distinct periods in the dynamics of the population load on emergency medical services. The first period (2019-2020) is characterised by a sharp decline in both the absolute number of calls and the Population load rate (IR) (a 12.1% drop from the baseline). This trend is related to a set of restrictive measures introduced in response to the COVID-19 pandemic: a reduction in planned visits, restrictions on the movement of citizens, and a portion of the population's hesitation to seek medical care in conditions of high infection risk. The second period (2021-2022) demonstrates a recovery and stabilisation of indicators. The volume of calls and the Population load rate (IR) almost returned to baseline values, and in 2022, the load indicator slightly exceeded the pre-crisis level. This coincided with the end of the main phase of the pandemic and an increase in the deferred flow of calls for urgent and chronic conditions. The third period (2023-2024) is characterised by mixed dynamics: the absolute number of calls in 2023 reached its historical maximum, but the IR indicator began to decline moderately. This trend is explained by intense demographic growth (a faster rate of population growth than the absolute number of calls to the emergency medical service). Thus, during the analysed period, the emergency medical service system of the Republic of Kazakhstan demonstrated a V-shaped trajectory of load. After a short-term pandemic decline, there was an intense return to baseline indicators, and the service's development vector in the latest years shifted toward stabilising the relative population load at a level close to pre-crisis levels.

Call distribution by urgency category and routing reform

Analysis of call structure by urgency category is key to assessing the potential for optimising system resources by transferring Category 4 calls to the primary care level. Call distribution data for 2019-2024 are presented in Table 2. Analysis of the call structure presented in Table 2 shows that Category 4 calls remained dominant throughout the observation period. It formed the dominant share of the non-targeted workload on the EMS system. From the pandemic year of 2020 until 2022, the share remained stable at peak values (37-38%), reaching an absolute maximum in 2022 (more than 3.2 million calls). A positive trend reversal was observed in 2023-2024, when a gradual decrease in both the absolute number of calls in this category and the share was recorded (to 36.4% by the end of the period). Against this background, a redistribution of the internal structure in favour of emergency calls is noted: the share of Category 2 calls reached its maximum by 2024 (29.7%), while the share of the most critical Category 1 calls remained stable (approximately 5%). This shift indicates an increase in the number of moderate emergency conditions registered directly at the ambulance dispatch centre. Data on the distribution of Category 4 calls between independent EMS station teams and PHC teams are presented in Table 3.

Table 2. Structure of emergency medical services calls by urgency category in the Republic of Kazakhstan, 2019-2024

Year	1 cat. (abs.)	1 cat. (%)	2 cat. (abs.)	2 cat. (%)	3 cat. (abs.)	3 cat. (%)	4 cat. (abs.)	4 cat. (%)
2019	262,748	3.4	1,768,166	22.6	1,694,230	21.6	2,367,983	30.2*
2020	315,599	4.4	2,102,218	29.3	2,021,768	28.2	2,732,853	38.1
2021	416,007	5.0	2,356,510	28.6	2,404,010	29.1	3,075,754	37.3
2022	417,165	4.9	2,299,839	27.1	2,540,500	30.0	3,224,869	38.0
2023	424,917	5.0	2,381,210	27.8	2,608,014	30.4	3,154,620	36.8
2024	418,879	4.9	2,537,064	29.7	2,467,344	28.9	3,108,365	36.4

Note: * – in 2019, the sum of absolute values for the four categories does not coincide with the total number of calls (7,838,544), which is due to the possible presence of calls not assigned to categories or differences in the accounting databases of the sources
Source: compiled by the author based on Results of the Emergency Medical Service's Work in 2020 [12], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 12 months of 2021 [13], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for the 12 months of 2022 [14], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 2023 [15], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 12 months of 2024 [16]

Table 3. Distribution of Category 4 calls between independent EMS station teams and PHC teams, 2021-2024

Year	Total Category 4	Independent EMS teams (abs.)/(%)	PHC teams (abs.)/(%)	Share of primary health care (%)
2021	3,075,754	697,264/22.7%	2,378,490/77.3%	77.3
2022	3,224,869	790,672/24.5%	2,434,197/75.5%	75.5
2023	3,154,620	925,399/29.3%	2,229,221/70.7%	70.7
2024	3,108,365	914,812/29.4%	2,193,553/70.6%	70.6

Source: compiled by the author based on Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 12 months of 2021 [13], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for the 12 months of 2022 [14], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 2023 [15], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 12 months of 2024 [16]

The data in Table 3 reveal the mixed dynamics of the implementation of the routing reform. After the initial period of full implementation of the new regulatory framework, when mobile primary care teams accounted for the majority of the least critical calls, the involvement of outpatient clinics in this process began to gradually decrease. This led to a proportionate increase in pressure on emergency response teams at the end of the analysed period. Regional unevenness remains significant: in a number of territories (Zhetysu region – 80.5%, Almaty city – 76.0% in 2024), independent EMS teams handle the majority of Category 4 calls [16]. A quantitative assessment of the flow splitting effect confirms the high resource-saving significance of the reform for the hospital and prehospital sectors. The transfer of a significant portion of calls to the outpatient clinic link made it possible to prevent a critical overload of emergency response teams. Without this distribution mechanism, the total workload of emergency medical services would have increased,

which would inevitably have paralysed emergency response lines. Thus, the implemented interdepartmental routing mechanism proved its effectiveness, preventing critical overload of the emergency service by redistributing non-core patient flows to outpatient services. However, the potential of this practice is constrained by the emerging decline in the activity of outpatient teams and the regional unevenness in the involvement.

The specifics of emergency medical service operation in megacities

An analysis of the workload of emergency medical services in urban centres was conducted for the cities of Almaty and Astana, as the areas with the highest concentration of calls and the most sensitive to organisational changes. The indicators for the number of calls, IR, and components of the ineffective workload are presented in Table 4.

Table 4. Emergency medical services indicators in urbanised centres of the Republic of Kazakhstan, 2019-2024

City	Year	Calls (abs.)	IR (per 1,000 population)	Unsuccessful dispatches	Unjustified calls
Almaty	2019	983,274	521.4	46,289	87,701
Almaty	2020	795,417	408.6	32,534	79,020
Almaty	2021	849,833	487.6	45,516	133,114
Almaty	2022	1,035,362	393.7	46,084	86,186
Almaty	2023	1,040,668	467.0	28,760	5,939
Almaty	2024	1,109,784	490.9	35,415	8,368
Astana	2019	583,561	530.8	27,486	77
Astana	2020	509,809	439.4	21,729	191
Astana	2021	638,941	527.1	25,401	417
Astana	2022	685,463	468.9	29,936	379
Astana	2023	693,075	484.6	34,299	347
Astana	2024	615,304	415.9	41,038	332

Note: IR (number of calls per 1,000 population) is based on data from the Ministry of Health of the Republic of Kazakhstan. Unsuccessful and unjustified calls are absolute values based on independent emergency medical service data

Source: compiled by the author based on Ministry of Health of the Republic of Kazakhstan [10-11], Results of the Emergency Medical Service's Work in 2020 [12], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 12 months of 2021 [13], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for the 12 months of 2022 [14], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 2023 [15], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 12 months of 2024 [16], Key indicators of emergency medical care for 10 months of 2019-2020 [17], Bureau of National Statistics [18]

Table 4 shows that IR values in Almaty and Astana consistently exceeded the national average for most of the analysed periods. In Almaty, by the end of the observation period, the call rate recovered to 490.9 calls per 1,000 residents, while the gross number of calls increased, exceeding the historical mark of 1.1 million. This trend indicates a high and stable demand for emergency services among the city's population. In Astana, the IR dynamics were undulating, with a pronounced decline by 2024 to 415.9 calls per 1,000 residents, which occurred simultaneously with a reduction in the absolute volume of work performed to 615.3 thousand calls. Comparing these trends with the increase in operational losses in the capital, where the number of unsuccessful trips increased almost 50% by 2024, reaching 41,038 cases, indicates unequal effectiveness in separating patient flows in the two largest cities. Against this backdrop, in Almaty, despite overall workload, the number of unsuccessful dispatches by emergency teams was maintained at 35,400 cases, significantly below the pre-pandemic peak.

At the same time, the number of unjustified calls in Almaty underwent a sharp structural change: after a critical peak in 2021 (133,114 cases), such calls decreased significantly by the final observation point, reaching 8,368 registrations. This more than 15-fold drop is due to strict modifications to internal accounting policies and algorithms for automated classification of incoming calls [13,16]. In Astana, this parameter was artificially recorded at a level of a few hundred for all six years (from 77 in 2019 to 332 in 2024). Given the comparable scale of the city's infrastructure and the comparable overall call volume, this confirms profound interregional differences in departmental statistical accounting practices [13,18]. Thus, the functioning of the ambulance service in megacities is characterised by a higher incoming flow density and a pronounced specificity in recording ineffective workload. Optimising the work of urban emergency response units requires a shift from universal approaches to differentiated management that takes into account the local specifics of statistical accounting and the actual involvement of outpatient services.

Ambulance team staffing transformation and staffing indicators

The structure and staffing of emergency medical service teams were analysed using departmental reports from the National Coordination Centre for Emergency Medicine for 2019-2024. The PTI, calculated using

formula (3), reflects the ratio of paramedic teams to physician teams in independent ambulance teams. The dynamics of the team structure and staffing are presented in Table 5.

Table 5. Team structure and staffing of independent emergency medical services in the Republic of Kazakhstan, 2019-2024

Year	Physician teams	Paramedic teams	PTI	Physician staffing (%)	Mid-level medical worker staffing (%)
2019	168	1,817	10.8	n/a	n/a
2020	307	1,163	3.8*	80.9	n/a
2021	290	1,194	4.1*	79.9	87.8
2022	273	1,217	4.5*	75.6	86.9
2023	279	1,235	4.4*	81.9	92.8
2024	269	1,230	4.6*	75.8	88.7

Note: * – data for 2020-2024 on the composition of teams are based on departmental reports from the National Coordination Centre for Emergency Medicine and reflect a different accounting base compared to the data in the statistical collections of the Ministry of Health of the Republic of Kazakhstan for 2019. The ratio of physician and paramedic teams at EMS stations remained stable at 18/82 for all reporting periods from 2020-2024. NMWs are mid-level medical workers

Source: compiled by the author based on Results of the Emergency Medical Service's Work in 2020 [12], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 12 months of 2021 [13], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for the 12 months of 2022 [14], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 2023 [15], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 12 months of 2024 [16], Key indicators of emergency medical care for 10 months of 2019-2020 [17]

Analysis of the team structure and staffing indicators presented in Table 5 reveals a wave-like dynamic in staffing, with a downward trend toward the end of the study period. Following a brief decline and subsequent rise to a peak of 81.9% in 2023, physician staffing levels declined again to 75.8% by 2024, a 6.1 percentage point drop over the last year. This confirms the continued systemic shortage of senior medical specialists in operational units; the total number of medical teams by the end of the period had fallen to 269 units. A coordinated decline of 4.1 percentage points by the end of the analysed period (to 88.7%) was also recorded for mid-level medical workers (NMWs), with the greatest overall need for human resources traditionally remaining localised in large metropolitan areas and several industrial regions of the republic. At the same time, the PTI index increased from 3.8 to 4.6, reflecting the gradual replacement of scarce physician positions with paramedic personnel (Table 6).

Table 6. Emergency medical services teams at primary health care organisations for handling Category 4 calls, 2020-2024

Year	Total number of teams at primary health care	including urban	including district
2020	548	n/a	n/a
2021	536	n/a	n/a
2022	532	n/a	n/a
2023	466	260	206
2024	454	259	195

Note: n/a – data on the breakdown by city/district is not provided in the available sources

Source: compiled by the author based on Results of the Emergency Medical Service's Work in 2020 [12], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 12 months of 2021 [13], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for the 12 months of 2022 [14], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 2023 [15], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 12 months of 2024 [16]

Table 6 shows a gradual reduction in the total number of primary health care teams over the estimated period, from 548 in 2020 to 454 in 2024, representing a 17.2% overall decline in this service's capacity. This trend, which began immediately after the regulatory separation of this structure at the end of 2020, contrasts with the initial plans for the large-scale deployment of outpatient ambulance services. This trend reflects both internal network optimisation processes and the marked unevenness in the regional implementation of relevant regulations. Specifically, in Almaty, the number of outpatient teams fell to a mere handful (only 4 active units by the end of the period), while the Turkestan region maintained the largest regional resource

in the republic throughout the entire period, with 75 teams [13,16]. In the context of a previously verified shortage of physicians at independent stations, the reduction in the density of outpatient teams, especially due to the reduction in district branches to 195 units by 2024, poses systemic risks to the stability of the entire service and hinders the development of primary health care as a less resource-intensive alternative for handling Category 4 calls. Thus, the staffing situation in the emergency care system is characterised by a growing shortage of specialists and the forced replacement of physician positions by paramedics, amid a decline in staffing levels by 2024. This crisis is exacerbated by a 17.2% reduction in the number of mobile outpatient teams, which weakens the capacity of primary health care and limits its ability to handle non-core cases.

Assessing the misuse of resources and the structure of the system's ineffective load

An analysis of the misuse of emergency medical services resources was conducted using data from the Republic of Kazakhstan for 2019-2024. The IUR, calculated using formula (2), was defined as the ratio of the sum of unsuccessful and unjustified calls to the total number of calls. The dynamics of these indicators are presented in Table 7.

Table 7. Indicators of misuse of emergency medical services resources in the Republic of Kazakhstan, 2019-2024

Year	Total number of calls	Unsuccessful dispatches	Unjustified calls	Total	IUR, %
2019	7,838,544	201,888	149,328	351,216	4.48
2020	7,171,707	180,361	121,359	301,720	4.21
2021	8,252,281	228,878	178,807	407,685	4.94
2022	8,482,373	248,902	131,910	380,812	4.49
2023	8,568,761	289,222	56,734	345,956	4.04
2024	8,531,652	314,557	59,264	373,821	4.38

Note: The IUR is calculated as a share of the total number of unsuccessful and unfounded calls. The absolute number of calls for 2020 was adjusted based on the departmental report of the National Coordination Centre for Emergency Medicine (NCCEM) (7,171,707)

Source: compiled by the author based on Ministry of Health of the Republic of Kazakhstan [10-11], Results of the Emergency Medical Service's Work in 2020 [12], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 12 months of 2021 [13], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for the 12 months of 2022 [14], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 2023 [15], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 12 months of 2024 [16], Bureau of National Statistics [18]

An analysis of the indicators presented in Table 7 shows that the integrated IUR index remained relatively stable from 2019 to 2024, fluctuating between 4.04% and 4.94%. The maximum value was recorded in 2021, which is associated with the post-pandemic recovery in calls and the resumption of non-emergency calls that were postponed during the strict quarantine restrictions of 2020. The dynamics of the two IUR components were divergent: unfounded calls consistently decreased throughout the period, while unsuccessful dispatches, in contrast, demonstrated a steady increase, reaching an increase of more than 1.5 times relative to the baseline by 2024. Thus, despite management success in reducing unfounded calls, the total unsuccessful caseload exceeded the starting level by the end of the period. This indicates the need to refocus control: from limiting incoming flows to optimising the dispatching phase and minimising the proportion of unsuccessful dispatches during the rapid response process.

Clinical quality indicators and the state of the service's material and technical resources

Another measure of system effectiveness, reflecting the consequences of the redistribution of workload between independent emergency medical services and primary health care, are quality indicators: timeliness of response, prehospital mortality, and resuscitation success. The dynamics of these indicators are presented in Table 8.

Table 8. Emergency medical services quality indicators in the Republic of Kazakhstan, 2019-2024

Indicator	2019	2020	2021	2022	2023	2024
Rate of delays (%)	5.9	5.9	4.3	3.3	4.0	4.7
Prehospital mortality (%)	0.20	0.20	0.47	0.42	0.46	0.47
Successful resuscitation (%)	38.3	40.4	38.4	40.8	45.7	53.1

Table 8. Continued

Indicator	2019	2020	2021	2022	2023	2024
Wear and tear transport (%)	61.3*	32.0	31.0	33.0	43.3	60.4
Availability of medical equipment (%)	80.9*	n/a	97.0	100	98.3/97.5	98.8/98.1

Note: * – 2019 data on vehicle depreciation and equipment are taken from the 2020 National Coordination Centre for Emergency Medicine (NCCEM) report (data as of the beginning of the comparison period). For medical equipment availability in 2023-2024, values are provided separately for urban and rural areas, separated by a "/." N/A – data not provided in available sources

Source: compiled by the author based on Results of the Emergency Medical Service's Work in 2020 [12], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 12 months of 2021 [13], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for the 12 months of 2022 [14], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 2023 [15], Analysis of the activities of the emergency medical service of the Republic of Kazakhstan for 12 months of 2024 [16], Key indicators of emergency medical care for 10 months of 2019-2020 [17]

An analysis of the data in Table 8 shows that EMS quality indicators in the Republic of Kazakhstan from 2019 to 2024 are characterised by mixed dynamics: improvements in individual clinical indicators occurred simultaneously with a deterioration in operational parameters. Specifically, the proportion of calls with delayed response times, after a significant improvement in 2021-2022 (decreasing from 5.9% to 3.3%), again increased by 2024, reaching 4.7% (+0.7 percentage points over the last year). The prehospital mortality rate, after a sharp increase in 2021, stabilised within a narrow range and stood at 0.47% by 2024, showing a slight increase compared to 2023 (0.46%). On the contrary, the long-term effectiveness of resuscitation measures demonstrates a distinct positive trend: the overall resuscitation success rate increased from 38.3% in 2019 to 53.1% in 2024 (+14.8 percentage points), indicating a significant improvement in clinical protocols and the professional training of resuscitation teams.

The state of the material and technical infrastructure is a destabilising factor. The depreciation of ambulance vehicles, which decreased in 2020-2021 to 31.0-32.0% thanks to a large-scale state fleet renewal, returned to a critical 60.4% by 2024 (+17.1% in just one year), closely approaching the baseline of 2019 (61.3%). At the same time, the overall availability of medical equipment remained consistently high, ranging between 97.5-100%, with a minimal gap between urban and rural areas. Thus, the data obtained indicate that Category 4 calls are structurally the dominant component of the EMS system's workload throughout the entire observation period. The primary care routing reform demonstrates a sustainable resource-saving effect both in terms of reducing the workload of EMS and in terms of response timeliness. However, the growing staffing shortage, critical depreciation of the vehicle fleet, and the regional unevenness of reform implementation make the further development of this mechanism a systemic priority.

Discussion

The data from this study demonstrate a persistent structural dominance of Category 4 calls in the overall workload of the EMS system of the Republic of Kazakhstan: from 2019 to 2024, the share accounted for 30-38% of the total volume of calls, and the transfer of more than 70% of this flow to the primary health care level prevented an increase in the workload of independent stations by approximately 25.7%. The decrease in IR in 2020 and the subsequent post-pandemic recovery in the workload reproduce the pattern documented in other systems. For Osaka, Japan, Y. Katayama *et al*. [20] recorded a decrease in the number of acute transports (from 41,095 to 36,981) with a simultaneous increase in the proportion of cases with serious difficulties during hospitalisation by more than twofold (OR 2.17), and the time the teams spent on-site for over 60 minutes increased (OR 2.81), that is, the reduction in flow was accompanied by an increase in the complexity of each call. In data from the Republic of Kazakhstan, a similar phenomenon was reflected in an increase in the share of Category 4 calls from 30.2% to 38.1% in 2020, when non-core calls concentrated in the system at a time of greatest resource shortages. Z. Ren *et al*. [21] also showed a nearly fourfold increase in the share of non-emergency transports (from 1.18% to 4.40%) for Beijing, China, while the overall volume of EMS tasks decreased to 69% of pre-pandemic levels. This indicates a redistribution of the call structure toward relatively lower-complexity and non-emergency cases amid a general decline in the availability and use of acute care.

The prevalence of low-urgency calls in this study is comparable to data from South Korea: H.A. Park *et al*. [22] showed that 53.4% of emergency department visits were classified as levels 4-5 of the Korean Triage and Severity Scale (KTAS), while critical conditions accounted for only 5.9%, and 77.3% of patients were discharged without hospitalisation. A similar picture was observed in Israel, where R. Leshinski *et al*. [23] found that 49.4% of all visits resulting in discharge were classified as potentially non-urgent, with 68.1% of cases not requiring laboratory tests and 91.5% requiring intravenous manipulations. The coincidence of structural proportions in systems of different levels indicates the universal nature of the phenomenon of excessive use of

emergency medical care with low clinical significance of visits, which points to a systemic problem of inefficient distribution of patients between levels of medical care, regardless of the organisational model of healthcare.

In the present study, the proportion of late arrivals among primary health care teams in 2024 was 2.8% versus 5.1% among independent emergency medical services teams. This observation is consistent with the Polish experience. K.M. Mitura *et al*. [24] found that with an increase in the proportion of non-core calls from 20.9% to 58.7% over 2019-2023, an increase in team density did not eliminate the systematic violation of the standard arrival time, confirming the need for structural integration with the primary care. In addition, an increase in unsuccessful dispatches in the Republic of Kazakhstan from 201,888 (2019) to 314,557 (2024, +55.8%) with a decrease in unjustified calls by 60.3% reflects a structural restructuring of the ineffective workload. A similar phenomenon was identified in Germany: J. Brock *et al*. [25] found that a 16% decrease in the number of calls during lockdown was accompanied by a more than 10% increase in average task completion time, meaning the reduction in flow did not proportionally free up resources, and each call became more complex. Taken together, these results indicate that the effectiveness of emergency and primary care services is determined not so much by the absolute volume of calls as by the structure and distribution across system levels.

The personnel shortage examined in this study in the EMS system of the Republic of Kazakhstan (471.25 full-time physician positions as of January 1, 2025) and the stable ratio of physician and paramedic teams of 18/82 create a systemic risk similar to that described for Austria. G. Prause *et al*. [26] showed that only 18% of on-site medical calls required specific Category I procedures, while in 35% of cases, qualified medical care was not needed – this indicates a structural excess of medical resources for low-urgency calls. As for the experience of Ukraine, B.I. Slonetsky *et al*. [27] documented that 39.2% of delivered patients did not have grounds for inpatient treatment, while there was a simultaneous shortage of more than 3,000 EMS physicians, which reproduces the general pattern of inappropriate use of emergency resources. Taken together, these data indicate that staffing shortages combined with an unbalanced team structure led to a decrease in the overall functional effectiveness of the EMS service, regardless of staffing levels. The regional unevenness in reform implementation in Kazakhstan – from 80.5% of independent EMS services handling Category 4 calls in the Zhetysu region to significantly lower figures in other regions – is parallelled by a European comparison. M. Rief *et al*. [28] defined differences between the Estonian model of high-density specialised medical teams (utilisation index of 7.336) and the Lithuanian hybrid model with the active participation of general practitioners (index of 1.075). Regional variability in organisational models of emergency care indicates heterogeneity in reform implementation and demonstrates differences in the intensity and nature of EMS resource utilisation, reproducing similar structural contrasts in European healthcare systems.

The experience of countries with similar historical vectors of healthcare system development and developing systems justifies the priority of redistributing low-urgency calls. F. Ismailova *et al*. [29] showed that in Osh, revising service boundaries and excluding suburban villages from the emergency care system reduced the caseload by 17% (from 271.6 to 231.5 per 1,000 population) and decreased arrival delays. B.A. Abdurahimov & N.A. Sotiboldiev [30] described for Uzbekistan how the introduction of unified call centres with physician dispatchers and triage principles allowed for separating patient flows: non-urgent conditions were handled on-site, while critical conditions were routed to specialised centres, which structurally corresponds to the Kazakh model of Category 4 care by primary health care teams. The forced use of emergency services with limited access to planned care as an independent burden factor was described for Chile. X. Alvial *et al*. [31] found that the length of stay for patients in categories C4-C5 reached 387-500 minutes, as the wait for a scheduled appointment exceeded a year. Noting Turkey's experience, S. Eriten [32] showed that upper respiratory tract infections (109,067 cases in 2023) and a high rate of repeat visits (26%) create a chronic non-core burden on emergency services. Both observations are consistent with the data of the present study that Category 4 is not a random but a structurally reproducible component of the burden, requiring a systemic rather than an ad hoc solution.

A steady increase in the successful resuscitation rate in the Republic of Kazakhstan (from 38.3% in 2019 to 53.1% in 2024, +14.8 percentage points) with a simultaneous decrease in the proportion of delays in category 1 (average arrival time 8.7 min. in 2024) indicates an increase in the clinical quality of response to life-threatening conditions, despite infrastructural limitations. L. McCormack *et al*. [33] recorded that in the state of Tennessee, United States of America (USA), after a decrease in the load on emergency services in 2020, the most vulnerable groups (patients with mental disorders and addictions) generated 26.7% and 8.5% of calls, respectively, indicating that unloading the emergency link should not be accompanied by a decrease in the availability of care for socially vulnerable patients. This provision is also relevant for the reform in the Republic of Kazakhstan, where the transfer of Category 4 calls to the primary health care level requires the simultaneous provision of sufficient accessibility to primary care for all population groups. Seasonal and daily load unevenness as a resource planning factor was documented in Iran. M. Karimifard *et al*. [34] determined

peak values for road traffic accidents (RTA) in September (1,304 cases) and the seasonality of carbon monoxide poisoning (predicted average of 25 cases per month), which allowed resources to be adapted to the predicted surges. G. Ganbat *et al*. [35] recorded a 74% excess of winter respiratory disease rates over summer rates, with peak loads in the evening in Mongolia. Kazakhstan's data on the maximum absolute number of calls in 2023 (8,568,761) with a moderate decrease in IR indicate a continued burden on the system while its temporal heterogeneity increases, highlighting the need to implement predictive resource planning that takes into account seasonal and daily fluctuations to improve the efficiency of EMS and PHC team allocation.

The experience of France reveals that the short-track system can serve as an organisational mechanism for routing non-urgent patients: D. Naouri *et al*. [36] showed that its implementation in 41% of departments and coverage of 25% of patients allowed for the first medical contact wait time to be maintained within one hour for 74% of patients. C. Mattiuzzi *et al*. [37] found that in Italy, the 28.7% decline in emergency department visits by 2023 was accompanied by an uneven recovery across regions, with the largest decline (-36.7%) in the island territories. This is consistent with the regional differentiation identified in this study: the share of the independent emergency medical services (EMS) in handling Category 4 calls varied from 80.5% in Zhetysu Oblast to lower values in other regions, indicating uneven implementation of the routing reform at the local level. The decrease in the number of PHC teams in the Republic of Kazakhstan from 548 to 454 (-17.2%), while the share of independent emergency medical services (EMS) in handling Category 4 calls increased to 29.4% in this study, indicates a risk of partial reform reversal. E. Coca-Boronat *et al*. [38] showed that in Spain, patients with multimorbidity and home oxygen therapy were 1.82 times more likely to be resolved on-site without hospitalisation, and that strengthening the role of family nurses and general practitioners was a factor in reducing the burden on emergency care. This emphasises that reducing the PHC infrastructure for Category 4 is counterproductive for those patients who most often do not require hospitalisation but need regular monitoring and accessible primary care, leading to a shift in the burden toward the independent emergency medical service and a decrease in the efficiency of patient routing at the system level.

B. Monev & Y. Peeva [39] showed that, in case of a 60% staffing shortage, approximately 30% of patients in emergency departments are self-referrals with mild symptoms, and the diagnostic limitations of primary care predispose citizens to seek emergency hospitals for access to free diagnostics in Bulgaria. G. Urs *et al*. [40] recorded that in India, over 119 million visits to emergency departments, although detailed categorical information is available for only 12.14% of cases, meaning the lack of data itself is a management problem. The experience of the Republic of Kazakhstan in this study, with systematic monitoring of the categorical structure and separate accounting of the share of primary health care/ independent emergency medical care in Category 4 services, represents in this context a management tool that allows for a quantitative assessment of the redistribution of patient flows between system levels and the identification of structural imbalances in the organisation of emergency care. Thus, the data of this study, together with international sources, demonstrate that Category 4 calls form a structurally reproducible component of the burden on emergency care systems, regardless of geography and the level of healthcare development.

Conclusions

Analysis of the population load on the emergency medical service in the Republic of Kazakhstan from 2019 to 2024 identified a V-shaped trajectory. The IR coefficient declined from 426.2 to 374.6 per 1,000 population in 2020, representing a 12.1% decrease from baseline due to pandemic restrictions. It subsequently recovered to 430.2 in 2022 and then moderately decreased to 416.9 in 2024, coinciding with accelerated population growth. In 2019, prior to the pandemic, Category 4 calls constituted 30.2% of total calls. From 2020 to 2024, these calls consistently represented the largest share of the workload, accounting for 36.4% to 38.1% of all service calls. The redirection of Category 4 calls to the primary care level resulted in significant resource savings. In 2024, primary care teams managed 70.6% of Category 4 calls (2,193,553 cases), enabling clinics to absorb 25.7% of all emergency medical service calls nationwide. The delay rate for this category was 2.8% for primary health care teams, compared to 5.1% for independent EMS teams. This reduction in delays, when applied to the total volume of transferred calls, prevented an estimated 50,000 to 60,000 delays annually. Notably, regional differences continue; for example, in Almaty, independent emergency medical service teams continue to handle 76.0% of Category 4 calls, indicating the need for regional-specific management strategies.

The emergency medical service system continues to face staffing shortages and significant deterioration of equipment and technical resources. In 2024, physician staffing levels reached only 75.8%, corresponding to a shortage of 471.25 positions, a 39.1% increase compared to the previous year. Ambulance vehicle depreciation averaged 60.4%, where some regions experiencing rates between 70% and 86%. Regardless of these challenges, the resuscitation success rate improved from 38.3% to 53.1%, an increase of 14.8 percentage points, reflecting greater clinical effectiveness. Based on the results, it is recommended to increase the coverage of Category 4 calls by primary care teams within regions with the highest independent emergency medical

service utilisation, particularly in Almaty and the Zhetysu region. Management efforts should shift from monitoring unjustified calls to reducing unsuccessful dispatches. Additionally, fleet renewal should be accelerated, with priority given to zones experiencing high vehicle depreciation. Subsequent studies should focus on prospective multilevel studies that assess clinical outcomes by urgency category and service team type.

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Conflict of Interest

None.

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Неотложная помощь 4-й категории срочности на уровне первичной медико-санитарной помощи: популяционный подход к оптимизации ресурсов

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Аннотация. Целью исследования являлся анализ влияния реформы маршрутизации вызовов четвёртой категории срочности на динамику структурных и операционных показателей службы скорой медицинской помощи Республики Казахстан в 2019-2024 годах. Методологическую основу составило ретроспективное популяционное исследование на основе агрегированных данных официальной государственной статистики. Применялись расчёт коэффициента популяционной нагрузки на 1000 населения, коэффициента нерезультативной нагрузки, индекса кадровой трансформации, базисный метод оценки темпов прироста и сравнительный анализ структурных долей. Коэффициент популяционной нагрузки продемонстрировал V-образную траекторию: снижение с 426,2 до 374,6 на 1 000 населения в 2020 г. (-12,1%) с последующим восстановлением до 416,9 в 2024 г. Анализ структуры обращений показал, что после 2019 года (30,2%) вызовы четвертой категории срочности перешли в разряд доминирующих. На протяжении 2020-2024 годов они устойчиво лидировали, составляя более 36% от общего числа выездов службы. Доля опозданий по вызовам 4 категории у бригад первичной медико-санитарной помощи составила 2,8% против 5,1% у бригад скорой медицинской помощи. Коэффициент нерезультативной нагрузки сохранялся в диапазоне 4,04-4,94% при структурной перестройке его компонентов: необоснованные вызовы снизились на 60,3%, тогда как безрезультатные выезды выросли на 55,8%. Укомплектованность врачебными кадрами в 2024 г. составила 75,8%, дефицит врачей достиг 471,25 штатных единицы (+39,1% к 2023 г.). Износ санитарного автотранспорта вернулся к критическому уровню – 60,4%. Показатель успешной реанимации вырос с 38,3% до 53,1% (+14,8 п.п.). Полученные результаты могут быть использованы для совершенствования межуровневой маршрутизации вызовов скорой медицинской помощи, обоснования региональных управленческих решений по развитию инфраструктуры первичной медико-санитарной помощи и планирования кадрового обеспечения службы

Ключевые слова: структура вызовов; реформа маршрутизации; безрезультатные выезды; доля опозданий; межуровневое взаимодействие; своевременность реагирования

Баштапкы медициналык-санитардык жардам деңгээлиндеги 4-категориядагы тез жардам: ресурстарды оптималдаштырууга калкка негизделген мамиле

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Корутунду. Изилдөөнүн максаты 2019-2024-жылдары Казакстан Республикасынын тез медициналык кызматынын түзүмдүк жана операциялык көрсөткүчтөрүнүн динамикасына шашылыш жардам көрсөтүүнү багыттоо боюнча төртүнчү категориядагы реформанын таасирин талдоо болгон. Методологиялык негиз катары расмий мамлекеттик статистиканын жалпы маалыматтарына негизделген ретроспективдүү калкты изилдөө болгон. Калктын 1 000 адамга карата жүктөм коэффициентин эсептөө, натыйжасыз жүктөм коэффициенти, персоналдын трансформация индекси, өсүү темптерин баалоо үчүн негизги ыкма жана түзүмдүк үлүштөрдүн салыштырмалуу анализи колдонулган. Калктын жүктөм коэффициенти V формасындагы траекторияны көрсөттү: 2020-жылы калктын 1 000 адамга карата 426,2ден 374,6га чейин төмөндөө (-12,1%), андан кийин 2024-жылы 416,9га чейин калыбына келүү болгон. Чакыруулардын түзүмүн талдоо көрсөткөндөй, 2019-жылдан кийин (30,2%) шашылыш жардам көрсөтүүнүн төртүнчү категориясындагы чалуулар басымдуулук кыла баштаган. 2020-жылдан 2024-жылга чейин алар дайыма алдыда болуп, кызматтын жалпы чалууларынын 36% дан ашыгын түзгөн. Баштапкы медициналык жардам топторунун 4-категориядагы чакырууларынын кечигип келүү көрсөткүчү 2,8%ды түздү, ал эми тез жардам топторунун чакыруулары 5,1%ды түздү. Компоненттеринин кайра түзүлүшүнө карабастан, натыйжасыздык көрсөткүчү 4,04-4,94% диапазонунда калган: негизсиз чакыруулар 60,3%га азайган, ал эми ийгиликсиз чакыруулар 55,8%га көбөйгөн. 2024-жылы дарыгерлердин штаттык саны 75,8%ды түзүп, дарыгерлердин жетишсиздиги 471,25 кызмат ордуна жеткен (2023-жылга салыштырмалуу +39,1%). Тез жардам унааларынын эскириши 60,4% критикалык деңгээлге кайтып келген. Реанимациянын ийгиликтүү көрсөткүчү 38,3%дан 53,1%га чейин (+14,8 пайыздык пункт) жогорулаган. Жыйынтыктар тез жардам чакырууларынын аралык багытын жакшыртуу, баштапкы медициналык жардам инфраструктурасын өнүктүрүү боюнча аймактык башкаруу чечимдерин кабыл алуу жана кызмат үчүн кадрларды пландаштыруу үчүн колдонулушу мүмкүн

Негизги сөздөр: чалуулардын түзүмү; маршруттоо реформасы; ийгиликсиз чалуулар; кечигип келүү көрсөткүчү; деңгээлдер аралык өз ара аракеттенүү; жооп берүүнүн өз убагында болушу