

Original Article

# Kazakhstan's Healthcare System Through the Harvard Control Knobs: A System-Level Assessment of Performance Trends and Future Strategic Directions

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## Abstract:

This article presents a comprehensive analysis of the health system of the Republic of Kazakhstan, its current state, key achievements and remaining challenges. Using the Harvard "Five Control Knobs" analytical framework (financing, payment, organization, regulation and behavior), as well as analysis of the dynamics of the main medical and demographic indicators and human resources for 2017-2023, the article seeks to fill the gap in the systemic understanding of the effectiveness of the ongoing reforms and their impact on the health of the population. Particular attention is paid to the relationship between the various components of the system and the identification of priority areas for further improvement.

Our findings indicate a moderate improvement in population health, with average life expectancy increasing from 72.9 to 75.1 years and overall mortality returning to pre-pandemic levels. However, noncommunicable diseases continue to account for approximately 84% of all deaths. Total health expenditure remained low at 3.8% of GDP in 2023, while out-of-pocket spending accounted for 27.7% of current health expenditure, reflecting persistent gaps in financial protection. Although the introduction of mandatory social health insurance has expanded pooled financing, significant weaknesses persist in provider incentive structures, workforce distribution, and regulatory enforcement.

Overall, the results suggest that while gradual progress has been achieved, chronic underfunding, system fragmentation, and governance challenges continue to constrain equity and efficiency, underscoring the need for coordinated, evidence-based reforms.

**Keywords:** Healthcare System; Kazakhstan; Harvard Five Knobs; Healthcare Reforms; Mandatory Social Health Insurance (MSHI)

## Introduction

The health care system of the Republic of Kazakhstan is in a state of permanent transformation aimed at adapting to global trends, demographic changes and the growing expectations of the population. Strategic documents, including the National Project "Healthy Nation", declare commitment to building a person-centered, efficient and accessible system. Prior to the introduction of mandatory social health insurance (MSHI) in 2020, Kazakhstan maintained a Beveridge type health system model, primarily financed from the budget, characterized by chronic underfunding, a hospital-oriented service structure, and persistently high out-of-pocket expenses, despite several attempts at modernization. A key reform in recent years has been the introduction of MSHI, which was intended to supplement public funding with insurance contributions and improve financial protection. Although the reform primarily changed the system's financing structure rather than service delivery or management, it was an important step toward improving the sector's financial sustainability and sharing responsibility for health.

Despite certain successes, a comprehensive critical analysis of the current state of the health care system in Kazakhstan, the effectiveness of the implemented reforms and their cumulative impact on key indicators of health and access to health care using a systematic analytical framework remains underrepresented in the available literature. This article is intended to partially

fill this gap. The five control knobs analytical framework [1] was chosen because of its ability to decompose a complex health care system into key interrelated components, allowing for the identification of both strengths and underlying systemic dysfunctions, as well as tracing the impact of each "lever" on overall performance.

To achieve this goal, this article provides a comprehensive analysis of the health care system of the Republic of Kazakhstan using the analytical framework of "five levers" (Harvard "Five Control Knobs") [1], which allows structuring the study by key elements: management, financing, human resources, health care providers and consumers. Particular attention is paid to the dynamics of medical and demographic indicators like morbidity and mortality, as well as the provision of the health care system with human resources in the period from 2017 to 2023, based on data from official statistical data "Health of the population of the Republic of Kazakhstan and the activities of health care organizations" [2].

To date, there are no comprehensive studies applying this methodology to analyze the Kazakhstani healthcare system for the specified period, which determined the relevance and necessity of this study. The results obtained will allow to identify both the strengths of the system and key problems, as well as to formulate reasonable proposals for its optimization.

## Methodology

The research methodology employed a combination of desk research, grey literature analysis, and media review to provide a comprehensive picture of Kazakhstan's healthcare system between 2017 and 2023. Desk research involved analysing existing resources such as official statistical databases, government reports, and academic publications. Grey literature, including policy documents, working papers, and institutional reports from the Ministry of Health and related agencies, was also reviewed to supplement formal sources and capture ongoing reform processes.

Additionally, news and media articles were examined to identify current developments, public debates, and reported cases of regulatory or governance failures within the health sector. This media focused on Kazakhstani sources, both national and regional, with the aim of reflecting the debate on domestic policy issues and how reforms, challenges, and corruption cases were presented to the public and policymakers.

The analytical component of the study was structured around the "Five Control Knobs" framework (financing, payment, organization, regulation, and behaviour), developed by Roberts, Hsiao, Berman, and Reich [1], which explains performance of Kazakhstan's health system through five interrelated lenses:

1. Financing – refers to the mechanisms by which funds are mobilized for the health sector and how they are allocated across services [1]. In this study, the financing knob was applied to Kazakhstan by examining public versus private spending, the introduction and sustainability of the MSHI, and the share of out-of-pocket payments relative to WHO and OECD benchmarks.
2. Payment – refers to the mechanisms by which funds, once raised, are transferred to healthcare providers [1]. In this study, the payment knob was applied to Kazakhstan by analysing the tariff-setting process, reimbursement schemes un-

der the Social Health Insurance Fund, and the incentive structures for providers at different levels of care.

3. Organization – refers to the structure and arrangements of the health system, as well as the institutions that deliver healthcare services [1]. In this study, the organization knob was applied to Kazakhstan by examining the balance between primary, secondary, and tertiary care, the growing role of private providers and the degree of coordination across service levels.
4. Regulation – refers to the use of state authority to influence or change the behaviour of individuals and organizations in the health sector [1]. In this study, the regulation knob was applied to Kazakhstan by assessing the role of the Ministry of Health and its agencies in setting standards, enforcing compliance, and addressing corruption.
5. Behaviour – refers to the actions, habits, and motivations of individuals and organizations that directly influence health outcomes and system performance [1]. In this study, the behaviour knob was applied to Kazakhstan by examining levels of patient trust in the health system, public health literacy, and the persistence of informal payments. On the provider side, issues of workforce motivation and professional retention were analysed. Given the limited availability of nationally standardized indicators for these parameters, the behavioural factors analysis was based on a combination of existing studies, policy documents, and national and regional media

sources. These aspects related to health care providers were assessed using official labour force statistics, Ministry of Health policy documents, and media reports.

Key indicators assessed included life expectancy, overall and maternal/infant mortality, morbidity patterns, physician density, and healthcare expenditures. Data interpretation combined trend analysis, international benchmarking with OECD averages, and comparative assessment of rural–urban disparities to identify systemic strengths, weaknesses, and reform priorities.

Although Kazakhstan is not a member of the OECD, the country has expressed interest in obtaining full membership [3]. For comparative purposes, OECD averages were used, as they serve as internationally recognized benchmarks for evaluating the performance of high-income health systems. However, this comparison must be interpreted in the context of Kazakhstan's substantially lower economic capacity: in 2024, Kazakhstan's GDP per capita was approximately USD 14,005, compared with an OECD average of about USD 48,454 [4]. Acknowledging this economic disparity clarifies that the OECD benchmarking in this study does not imply direct equivalence, but rather aims to highlight performance gaps, identify priority areas for action, and contextualize structural constraints relevant to long-term health system reform.

As the study relied solely on publicly available secondary data, ethical approval was not required.

## Results

The results are presented using the Harvard "Five Control Knobs" framework: financing, payment, organization, regulation, and behavior combined with an analysis of key health indicators (2017–2023) (Table 1),

providing a structured lens for examining how policy levers have shaped Kazakhstan's health system performance.

**Table 1. Key health indicators (2017-2023) [2].**

Indicator	Unit of measure.	2017	2018	2019	2020	2021	2022	2023
Life expectancy, total	year	72.95	73.15	73.18	71.37	70.23	74.44	75.09
Life expectancy, male	year	68.72	68.84	68.82	67.09	66.33	70.26	70.99
Life expectancy, female	year	76.92	77.19	77.3	75.53	74.03	78.41	79.06
Fertility rate, total coefficient.	per 1,000 population	21.64	21.77	21.73	22.76	23.5	20.57	19.52
Mortality, total coefficient.	per 1,000 population	7.15	7.14	7.19	8.60	9.53	6.77	6.57

Infant mortality	per 1000 live births.	7.93	8.03	837	7.77	8.44	7.68	7.67
Maternal mortality	per 100 000 live births.	12.5	13.9	13.7	36.7	44.7	17.00	11.4
Incidence (first time), total	per 100,000 population	57897.0	57175.7	54813.7	53760.0	53180.5	49143.1	47 760.4
Provision of doctors	per 10,000 population	39.7	39.6	39.7	40.5	40.1	40.2	40.6

Source: Statistical collections "Health of the population of the Republic of Kazakhstan and activities of health care organizations" for 2018-2023 (aggregated data), published by the National Scientific Center for Health Development named after Salidat Kairbekova [2].

### Overview of key health indicators (2017-2023): Achievements and risk areas

The overall life expectancy raised from 72.95 in 2017 to 75.09 years by 2023, surpassing the pre-pandemic level [5]. This increase reflects a post-pandemic recovery of population health indicators; however, changes in life expectancy cannot be attributed solely to healthcare system performance and may also be influenced by broader socio-economic and demographic factors. However, the gender gap in life expectancy between men and women of about eight years over these years highlights persistent differences in health status, especially in areas such as treatment of chronic non-communicable diseases, injury prevention, and men's health. Life expectancy in Kazakhstan is still lower than in the OECD countries, which indicates a structural shortage of public health and prevention services.

The return of the overall mortality rate to the pre-COVID level (6.57% in 2023) is a positive development. The infant mortality rate decreased from 7.93 in 2017 [6] to 7.67% in 2023[6], reflecting improved access to neonatal and perinatal services. Maternal mortality, which increased dramatically during the pandemic years (reaching 44.7 per 100,000 in 2021), has now decreased to 11.4 in 2023, exceeding the level of 2019. Nevertheless, the volatility of this indicator highlights the vulnerability of the maternity care system and the need for continued investment in maternal health infrastructure and quality of medical care.

Noncommunicable diseases (NCDs) account for approximately 84% of all deaths in Kazakhstan, with cardiovascular diseases (CVDs), cancer, and chronic respiratory diseases being the leading causes of mortality [7]. CVDs remain the leading cause of death in the country. The probability of premature mortality from the four major NCDs (CVDs, cancer, diabetes, and chronic respiratory diseases) between the ages of 30 and 70 in 2019 was estimated at 22.4%, which is more than twice as high as in the European Union (about 10%)[8].

The total incidence rate decreased in 2020, probably due to limited access to medical care during quarantine - and then jumped sharply. In 2021, the incidence rate exceeded 100,000 cases per 100,000 population for the first time, indicating both unmet medical needs and a high burden of disease. The continued high burden of respiratory and circulatory diseases may reflect limitations in prevention, early detection, and chronic disease management, particularly at the primary healthcare level [9,10].

The number of doctors per 10,000 population increased moderately from 39.7 in 2017 to 40.6 in 2023. Although this trend indicates an expansion of human resources, it hides serious structural problems: the continuing shortage of specialized staff (for example, anesthesiologists, oncologists), uneven distribution between rural and urban areas, and concerns about the quality of medical training. In addition, the increase in the number of employees has not yet led to a significant improvement in the quality, motivation or retention of staff the problems are compounded by low salaries and professional burnout.

### Financing control knob: Lack of resources and challenges of the MSHI

Kazakhstan's healthcare system is financed through a mixed model that includes allocations from the state budget, health insurance contributions and various private contributions. State funding covers the Guaranteed package of free medical care and services provided under the Mandatory Social Health Insurance (MSHI) system introduced in 2020. Private sources include out-of-pocket payments (OOP), corporate health expenditures, and voluntary medical insurance (VMI)[4][11].

According to the National Health Accounts for 2023, current health expenditure amounted to KZT 4.53 trillion [12] (USD 9,934,540 [13]) or 3.8% of GDP, which is almost 2.5 times less than the OECD average in 2022 of 9.2%[14] . In the structure of funding sources, public funds accounted for 66% of all current expenditures, while private sources accounted for 34%. Within the

public sector, the main source remains the national budget (41.17%), while the share of local budgets is small (2.79%). Contributions to the MSHI as a source of financing accounted for 14.88% of current expenditure. Other private funds include household expenditures (27.70%), corporate contributions (5.17%), VMI (1.17%). OOP remain significantly higher than the WHO recommended threshold of 20% and the OECD average of 18.8%, which increases the risk of financial hardship for households and undermines equitable access to healthcare [15].

Another significant financial problem is the limited volume and outdated structure of the social package within the framework of the MSHI and the guaranteed amount of free medical care. The current package does not reflect the real needs of the population, which leads to high out-of-pocket costs and gaps in financial protection. A comprehensive review of the benefits package is needed to ensure coverage of essential services and efficient allocation of resources [5].

Services financed through MSHI accounted for 22% of all current health care expenditures in 2023[12]. This is higher than the share of contributions, as the system redistributes the collected funds to a wider range of services provided. Thus, the data for 2023 demonstrates a further strengthening of the role of MSHI compared to 2021 (about 18%) [11], confirming the rapid expansion of the system in the first years after its launch. At the same time, the share of out-of-pocket expenditure remains high at 27.7%. This indicates a continuing risk of financial burden on households and insufficient financial protection [15].

Despite these achievements, a number of structural problems remain. Many self-employed and the informally employed people still lack health insurance. Concerns also remain about procurement practices, delays in payments to suppliers, and the overall management of funds within the Social Health Insurance Fund (SHIF). In addition, the discrepancy between the volume of services ordered and available resources continues to put financial pressure on providers. Chronic underfunding limits opportunities to modernize infrastructure, increase healthcare workers' salaries, and introduce advanced medical technologies, which hinders the efficiency of the system [10, 11].

#### **Payment for medical services: distortions in tariffs and incentives**

The SHIF, as a single strategic purchaser, uses various payment methods: per capita financing with a complex system of incentives at the PHC level, diagnostic-related groups (DRGs) for inpatient treatment, and global budgets for certain services [16].

The central problem lies in the provider payment system. Existing fees often do not reflect the actual cost of services, especially those related to the use of innovative technologies. Moreover, they do not consider regional differences in cost, and they do not fully cover the necessary operating costs, such as depreciation of equipment or staff training. As a result, providers may prioritize more "profitable" services like cardiosurgical operations, reduce the quality of care, or pass on costs to patients. Inadequate tariff funding also contributes to the growth of hospital debt and discourages investment in quality improvement and innovation [17].

#### **Organization of healthcare provision: fragmentation and inequality of access**

The healthcare system in Kazakhstan is formally structured across several levels: primary healthcare (PHC), inpatient care, and emergency care, with a strategic focus on strengthening PHC through family doctors and multidisciplinary teams [18]. However, in practice, the system continues to suffer from fragmentation and poor coordination between service levels, leading to duplication of services, inefficient use of resources, and loss of patient data. Deteriorating infrastructure remains a serious problem: up to 50% of healthcare buildings and equipment are outdated, especially in rural areas [15]. Despite the launch of the Rural Health Modernization Project in 2022 [19], the gap between urban and rural areas persists. For example, the number of hospital beds is 61 per 10,000 population in urban areas compared to 19.7 in rural areas, while the national average is 59.5 [6]. Similarly, the number of medical personnel in cities is almost twice as high as in rural areas, 17% of doctors and 40% of nurses work in rural areas, exacerbating access problems for people in these areas [20].

Efforts to bridge the gap in access to healthcare through telemedicine and mobile medical units are ongoing but still insufficient [21]. Meanwhile, the role of the private sector is expanding, especially in outpatient care: for example, in Shymkent the city on the south of the country, 76% of healthcare organizations are private [22]. Across the country, private providers account for about 60% of all organizations contracted under the MSHI system [22]. Such diversification has expanded the possibilities of providing services in urban areas, but requires stricter regulation to align commercial interests with government guarantees and maintain stable quality of medical care. Inadequate infrastructure, fragmentation, and regulatory deficiencies consistently hinder equal access to health care, especially for rural populations, low-income vulnerable groups, and people with limited access to health care.

## Regulation: challenges in enforcement and quality control

The regulatory framework of Kazakhstan's healthcare system is primarily anchored in the Code of the Republic of Kazakhstan "On the Health of the People and the Healthcare System", which serves as the overarching legal instrument governing health policy, service provision, quality standards, and patient rights. Within this framework, the Ministry of Health and its subordinate committees are responsible for developing health policy, setting regulatory requirements, and overseeing compliance, while local health authorities are tasked with implementation at the regional and facility levels [20].

Despite the presence of a comprehensive legal framework, challenges related to enforcement and quality control remain widespread. Despite the existence of formal regulatory mechanisms, their implementation in practice remains uneven, as reflected in assessments of health system governance and quality oversight [23] and illustrated by documented cases related to procurement and administrative enforcement in Kazakhstan [24–27]. Clinical guidelines and standards are not always updated in a timely manner and their implementation varies across providers and regions. Weak monitoring and limited enforcement capacity further contribute to fragmented service delivery and reduce the effectiveness of regulation as a tool for improving system performance.

The problem of corruption is quite widespread in the healthcare field of Kazakhstan, most often affecting procurement processes, resource allocation, and the overall quality of service provision [25]. It is present at all levels of the system, including medical educational institutions and management bodies, but is particularly acute among regional administrators. Systemic corruption risks are evident throughout the sector, undermining the effectiveness and fairness of healthcare delivery [24]. A striking example is the arrest of the rector and chairman of the board of the Marat Ospanov West Kazakhstan Medical University, on suspicion of receiving a bribe of 12 million tenge [28]. His case shows how corruption has penetrated medical education, influencing student admission processes and undermining academic integrity. Similarly, over the past four years, several heads of regional health departments, for example in North Kazakhstan, East Kazakhstan, Mangistau, and Pavlodar, have been charged with serious bribery offenses, indicating widespread abuse of power at the regional level [29–34].

Corruption has also infiltrated the financial and administrative spheres of healthcare. For example, an

accountant at a polyclinic in Atyrau was convicted of embezzling funds allocated for patient treatment, illustrating how ineffective financial management directly diverts resources away from service delivery [35]. In another case, the DamuMed mobile app, designed for digital monitoring of healthcare service use, was manipulated to record fictitious doctor visits, resulting in unjustified payments from the national insurance fund [26]. During the COVID-19 pandemic, procurement abuses were uncovered, including the purchase of protective equipment from third-party companies at inflated prices, as well as allegations of reselling humanitarian aid in the form of medicines through private pharmacies.

These cases highlight the alarming trend of corruption at various levels of the healthcare system, especially at the administrative level. Addressing these structural vulnerabilities is crucial to ensure transparency and efficient allocation of resources in the health sector.

## Behaviour: lack of trust and low motivation

The behaviour of key participants in Kazakhstan's healthcare system reflects deeper systemic problems in management, financing, regulation, and human resources. Among patients, low levels of medical literacy and the persistence of a paternalistic model of doctor-patient relations hinder active participation in the protection and improvement of their own health [36]. Preventive care, healthy lifestyle and health promotion programs remain rare, while long waiting times and widespread informal payments fuel public discontent and undermine trust in the system [37].

Healthcare workers face serious professional and emotional challenges. Despite an overall increase in staff numbers, there is still an acute shortage of specialists in areas such as anaesthesiology, intensive care, and oncology, especially in rural areas [20,38–40]. Low salaries, especially given the workload and responsibility, combined with high levels of stress, burnout, and incidents of aggression from patients, lead to reduced motivation and increased staff turnover [41,42]. Shortcomings in the quality of medical education also affect the readiness and competence of new graduates, which has an impact on treatment outcomes [43]. Meanwhile, medical organizations operating under financial constraints and imperfect reimbursement mechanisms often prioritize the survival of the institution over improving the quality and accessibility of services.

Table 2 provides a synthesized overview of the main trends and challenges identified across the five control knobs during the study period.

**Table 2. Overview of the main trends and challenges across the Harvard “Five Control Knobs” (2017–2023)**

Control knob	Main trends	Key challenges
Financing	Kazakhstan operates a mixed financing model combining state budget funding, MSHI contributions (since 2020), and private sources, with CHE in 2023 at KZT 4.53 trillion (3.8% of GDP). MSHI-financed services rising to 22%.	Chronic underfunding, high OOP (27.7%), an outdated benefits package, coverage gaps among informal workers, and weaknesses in fund management and procurement continue to undermine financial protection and system efficiency.
Payment	The SHIF functions as a single purchaser using capitation with PHC incentives, DRGs for inpatient care, fee-for-service for diagnostic and lab services and global budgets for selected services.	Tariffs do not reflect real or regionalized costs and exclude key operating expenses, creating perverse incentives, hospital debt, cost-shifting to patients, and weak motivation for quality improvement and innovation.
Organization	The system is formally structured across PHC, inpatient, and emergency care with policy focus on PHC strengthening, rural modernization, telemedicine, and an expanding private outpatient sector.	Fragmentation, outdated infrastructure (up to 50%), and persistent urban–rural inequalities in beds and workforce distribution limit continuity of care and equitable access.
Regulation	The regulatory framework is anchored in the Code “On the Health of the People and the Healthcare System,” with central policy oversight by the Ministry of Health and decentralized implementation.	Uneven enforcement, weak monitoring, inconsistent guideline implementation, and widespread corruption in procurement and administration reduce regulatory effectiveness and public trust.
Behavior	Patient behavior is characterized by low health literacy and paternalistic relationships, while provider behavior reflects financial and organizational pressures.	Low trust, specialist shortages, low pay, burnout, aggression toward staff, and education gaps weaken motivation and limit improvements in quality, access and implementation of health promotion initiatives.

## Discussion

Kazakhstan's healthcare system faces a number of deep-rooted problems that hinder the provision of accessible, high-quality, and equitable healthcare [44, 48]. One of the most critical issues identified in this study is chronic underfunding and the inefficiency of financial mechanisms, as reflected in persistently low public health expenditure, high out-of-pocket payments, and misaligned provider payment incentives discussed in the Results section. This problem affects all areas, from human resource development to infrastructure and technology. In addition, the high proportion of out-of-pocket expenditures undermines equity and financial protection for the population. Another key problem is the shortage and imbalance of medical personnel. Without motivated, well-trained, and evenly distributed personnel, especially at the PHC level and in rural areas, the provision of quality health care is severely limited. In addition, fragmentation of the system and poor coordination between service levels lead to waste of resources, reduced quality, and inconvenience for patients. An underdeveloped public health and disease prevention system further exacerbates the burden of

noncommunicable diseases, particularly cardiovascular diseases (CVD), which are a major component of circulatory diseases, leading to long-term economic and social costs.

The findings of this study underscore that systemic performance in Kazakhstan's health system cannot be attributed to any single policy lever but rather to the interaction and alignment, or lack thereof, among financing, payment, organization, regulation, and behaviour. According to the control knobs framework as articulated by Roberts and colleagues, health system outcomes are shaped by the combined configuration of these policy levers, and reforms are most effective when multiple knobs are adjusted in a coordinated manner rather than in isolation [1]. Evidence from health systems research indicates that failures in alignment (such as under-resourced financing coupled with distorted provider payment incentives, weak regulatory enforcement, organizational fragmentation, and low stakeholder trust) can counteract reform efforts and limit improvements in access, quality, and equity, reinforcing

the need for a holistic, system-wide approach to performance improvement [1, 23].

The following strategic directions could be proposed to address these issues:

1. Ensuring financial sustainability: It is necessary to gradually increase public spending on health care to 5–6% of GDP in accordance with WHO recommendations [45]. Improvements to the MSHI system should include expanding coverage, increasing transparency, revising the benefits package, and transitioning to strategic procurement that rewards outcomes rather than volume. Tariff reform should ensure that reimbursement rates reflect actual costs and incentivize the provision of quality healthcare.
2. Investing in human resources: Increasing salaries and improving working conditions for healthcare workers is crucial to retaining staff and reducing turnover. Special attention should be given to underserved regions and specialties through targeted education, professional development, and social support packages [46,47]. Comprehensive reform of medical education is needed to improve the practical skills of graduates and bring training in line with modern healthcare requirements. In addition, to ensure effective and adequate human resource management, it is necessary to take measures to reduce corruption among the leadership of the healthcare system and increase the transparency of salary, recruitment and promotion reports.
3. Strengthening service delivery and system integration: Strengthening primary health care should be a top priority, expanding the authority of family doctors and interdisciplinary teams by increasing their responsibilities and resources [48]. Integrated models of care must be implemented to ensure better coordination between all levels of healthcare. Modernizing infrastructure with a focus on rural healthcare and medical equipment will help ensure equal access.
4. Improving governance and regulation: Quality and safety oversight of healthcare needs to

## Conclusion

The healthcare system in Kazakhstan has shown improvement in a number of areas, including its ability to adjust during the COVID-19 pandemic and improvements in specific demographic and health metrics. An assessment of Kazakhstan's healthcare system through

be improved through independent audit mechanisms and regular compliance checks[49] . The effective implementation of clinical protocols should be supported by training, monitoring, and incentive systems [50]. Decentralizing management while maintaining national standards can empower regional authorities to more effectively meet local needs [23]. Moreover, strengthening anti-corruption measures and ensuring transparency in procurement, resource allocation, and administrative processes are essential to enhance trust and effectiveness in healthcare management [27,51].

5. Encouraging digitalization and public health: To prevent cardiovascular disease and other NCD, and encourage healthy lifestyles, a strategic shift towards prevention based on using digital and telehealth resources is required, along with more funding for public health initiatives[52]. Interoperability, improved data quality, and evidence-based decision-making at all levels will be guaranteed by creating a single digital health ecosystem [53].

This study has a number of important limitations that should be considered. First, the analysis is based exclusively on secondary data sources, including official statistics, policy documents, grey literature, and media reports, which limits the ability to independently verify the quality and completeness of the data. Second, the study does not use formal statistical or econometric analysis and therefore does not aim to establish causal relationships or quantitatively assess the degree of correlation between reforms and health outcomes. Third, the behavioural and regulatory aspects of the analysis are partly based on media reports and documented cases, which may overrepresent high-profile events and do not allow for systematic generalizations. Finally, the relatively short observation period (2017–2023) limits the assessment of the long-term effects of reforms, especially with regard to recently introduced measures such as mandatory social health insurance. These limitations reflect the descriptive and systematic nature of the study and should be considered when interpreting the results.

the Harvard “Five Control Knobs” framework reveals a system that combines areas of progress with deep-seated structural weaknesses. Financing has improved with the introduction of the Social Health Insurance

Fund, but out-of-pocket payments remain far above international benchmarks, and chronic underfunding constrains investments in infrastructure and workforce development. Payment mechanisms have diversified, yet tariffs remain misaligned with actual service costs, leading to distorted provider incentives, debt accumulation, and limited innovation. In terms of organization, there is a clear policy emphasis on strengthening primary care and expanding private sector engagement; however, fragmentation, duplication of services, and persistent urban-rural disparities undermine equity and efficiency. Regulation is formally established based on updated legislation, including licensing, accreditation, and clinical protocols, but weak enforcement and systemic corruption continue to erode quality control and accountability. Finally, behavioural factors reflect both patient and provider challenges: patients struggle with low health literacy and limited trust in the system, while healthcare workers face low salaries, burnout, and uneven training, all of which reduce motivation and retention.

This study was an attempt to comprehensively and critically analyse the current state of Kazakhstan's health care system looking through the "Five Control Knobs" framework. It can serve as a basis for the development and refinement of reform strategies for policymakers and health care leaders in Kazakhstan and Central Asian region. However, a number of limitations

must be acknowledged. The analysis is based primarily on official statistics and one major analytical report; it lacks primary data collection through interviews or stakeholder surveys, which could provide a deeper understanding of the real situation on the ground. In addition, a longer time horizon is needed to effectively assess the full impact of recent reforms, particularly the MSHI.

Priorities for future research include may include a detailed assessment of the various payment models in Kazakhstan and their impact on the quality and accessibility of healthcare; an assessment of the impact of the MSHI on financial protection and equity in service utilization; a study of factors affecting the motivation, satisfaction, and turnover of healthcare workers, with the development of individual policy recommendations; comparative studies with countries with similar socio-economic and institutional conditions, with the aim of drawing applicable lessons.

Long-term political will, the creation of evidence-based policies, sufficient funding, and the active involvement of all stakeholders are all necessary to address these issues. Kazakhstan can only develop an efficient, just, and population-responsive health care system by taking a coordinated, methodical, evidence-based approach.

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draft and the project as a whole. A.S. contributed to the collection and analysis of data, participated in the development of methodology, and reviewed and edited the manuscript. U.K. contributed to the methodology section and editing. C.C. provided conceptual guidance, conducted a critical review of the manuscript contributed to framing the analysis within the Five Control Knobs framework, and reviewed the final draft. All authors discussed the content, provided critical feedback, and approved the final version of the manuscript.

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