Iran J Public Health, Vol. 54, No.8, Aug 2025, pp.1754-1764

Original Article

Simulation-Based Performance Scenarios for a Health House and Health Post: An Empirical Study

Seyed Hadi Hosseini [1,2], ****Amirhossein Takian*** [3,4,5,6], ***Mohammad Amerzadeh*** [7], ***Yasaman Poormoosa*** [5]

1. *Department of Healthcare Services Management, School of Health, Alborz University of Medical Sciences, Karaj, Iran*
2. *Social Determinants of Health Research Center, Alborz University of Medical Sciences, Karaj, Iran*
3. *Centre of Excellence for Global Health (CEGH), Department of Global Health and Public Policy, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran*
4. *Health Equity Research Center (HERC), Tehran University of Medical Sciences, Tehran, Iran*
5. *Department of Health Management, Policy & Economics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran*
6. *National Center for Health Insurance Research, Iranian Health Insurance Organization, Tehran, Iran*
7. *Non-communicable Diseases Research Center, Research Institute for Prevention of Non-Communicable Diseases, Qazvin University of Medical Sciences, Qazvin, Iran*

***Corresponding Author:** Email: takian@tums.ac.ir

(Received 12 Mar 2025; accepted 11 Jun 2025)

Abstract

Background: Enhancing the performance of healthcare provider units, such as Health Houses (HHs) and Health Posts (HPs), is vital for improving service delivery. We aimed to develop simulation-based scenarios to optimize performance and minimize risks associated with decision-making.

Methods: Conducted in 2021, this empirical study utilized operational research methods at one HH and one HP in southern Tehran. The operational characteristics of these units were modeled using Arena 20 simulation software. Additional performance scenarios were iteratively developed based on expert recommendations. Key performance metrics from the simulations were evaluated and ranked using the nominal group technique and Expert Choice software.

Results: Four distinct scenarios were developed for both units. The fourth scenario emerged as the optimal model, receiving the highest expert scores for both the HH (score: 349) and HP (score: 418). This scenario demonstrated significant improvements in key indicators, including the number of patients admitted (HH: 24; HP: 31), patients served (HH: 23; HP: 33), health worker productivity (HH: 95%; HP: 47%), and reduced patient waiting times (HH: 4.45 min; HP: 0 min).

Conclusion: The study recommends adopting the fourth scenario as a benchmark for HHs and HPs in suburban areas of major Iranian cities. The employed simulation methodology and evidence-based scenarios can be applied to other healthcare units, aiding in performance forecasting and system optimization.

Keywords: Health house; Health post; Simulation-based scenario; Performance scenario

Introduction

Promoting public health is a global priority, with healthcare networks forming the backbone of healthcare systems. Decision-making in this domain is particularly sensitive due to its direct impact on population well-being. Achieving Universal Health Coverage (UHC) is crucial, as it enhances healthcare indicators and overall health outcomes. However, UHC success relies on improving the performance of healthcare delivery units (1-6).

Urbanization in low- and middle-income countries (LMICs), including nations in the World Health Organization's Eastern Mediterranean Region (EMRO) such as Iran, has created significant challenges in delivering healthcare services (7-9). These numerous urbanization challenges (10, 11) are particularly pronounced in underserved suburban areas (12-15). Tehran, with a population exceeding 9 million, exemplifies the complexity of addressing urban healthcare needs (16).

In Iran's healthcare system (Fig. 1), Health Houses (HHs) and Health Posts (HPs) are critical units delivering primary care. HHs serve approximately 1,500 rural residents, offering services ranging from family health to disease control and education, delivered by two Village Health Workers (Behvarz) under the supervision of Rural Comprehensive Health Centers (17, 18). In urban areas, HPs provide similar services to around 12,500 residents, staffed by midwives and public health experts under Urban Comprehensive Health Centers (19).

Demographic trends, including aging populations and the rise of chronic diseases, have significantly increased the demand for healthcare services. These factors, combined with improved health literacy, geographical dispersion, and rising costs, have amplified the need for efficient healthcare delivery (20-22). Enhancing the performance of HHs and HPs is essential to improving well-being, raising living standards, and supporting economic growth (1). Studies highlight the pressing need for targeted interventions to optimize the performance of HHs and HPs (23, 24). In Italy, enhancing healthcare provider performance improves service integration (24). Iraqi Health Houses exhibited low productivity rates (29%), underscoring the importance of addressing workforce efficiency (25). Iranian studies in Qom and Zahedan similarly emphasized the necessity of effective human resource management to increase service delivery and improve the productivity of Behvarz (26, 27).

Simulation tools are invaluable for performance optimization, providing a structured approach to analyze and predict outcomes. They help improve access to healthcare, minimize waiting times, and optimize staff productivity while mitigating risks and costs (28-30). By enabling dynamic system analysis, these tools enhance understanding of operational interrelationships and organizational efficiency (31).

While simulation tools have been extensively applied in hospitals (32-35), clinics (36, 37), and diagnostic facilities (38, 39), their use in primary healthcare (PHC) units like HHs and HPs remains underexplored (40, 41). This knowledge gap highlights the need for research on performance optimization in these settings.

This study addresses the urgent need to enhance the performance of HHs and HPs through simulation-based methodologies. By developing and evaluating various performance scenarios, it provides an evidence-based framework for decision-making with minimal risk. The findings are not only applicable to the studied HHs and HPs but can also serve as benchmarks for similar healthcare units, facilitating broader implementation and improvement.

Optimizing HH and HP performance is vital to addressing the challenges posed by urbanization and increasing healthcare demands. By leveraging simulation tools, healthcare systems can achieve sustainable improvements in service delivery, staff productivity, and patient outcomes, thereby supporting the broader goals of public health. Therefore, the aim of this study was to present

various performance scenarios and to introduce an optimal performance scenario based on simulation for a HH and an HP.

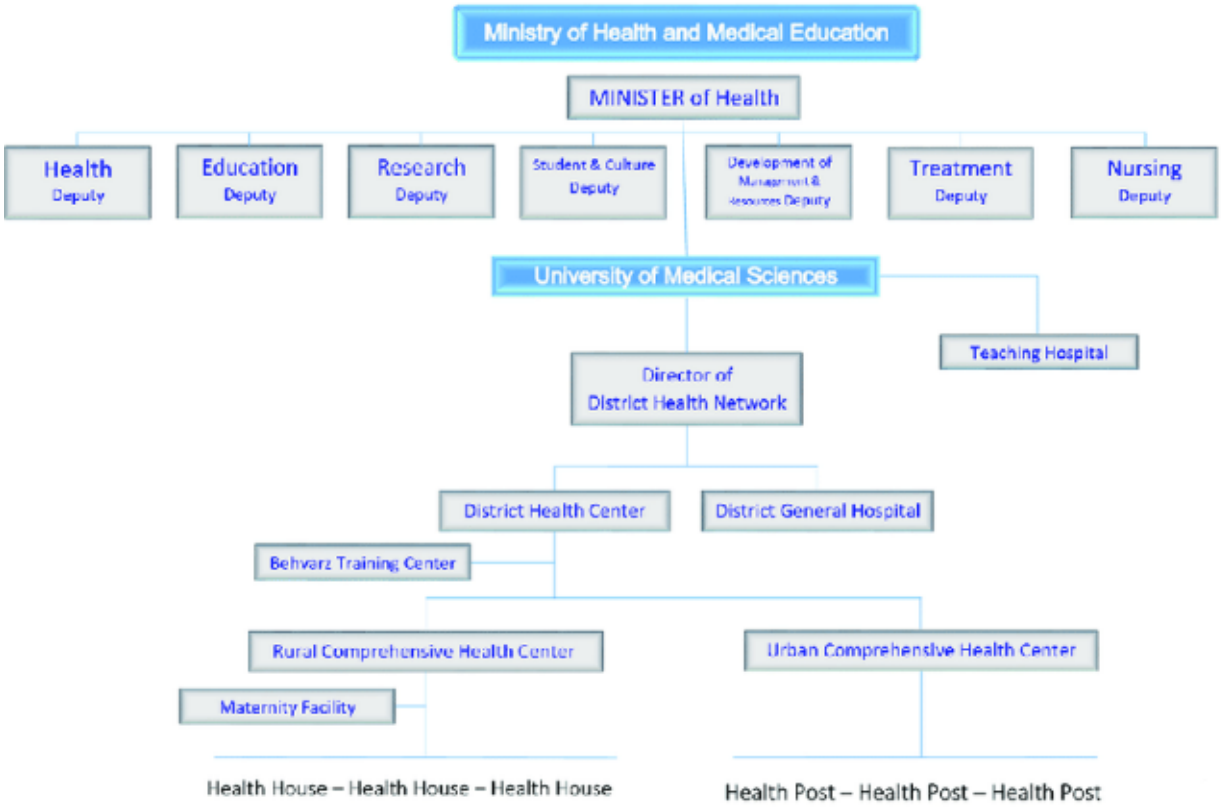

Fig. 1: The organization of health system in Iran (42)

Materials and Methods

This empirical study, conducted in 2021, employed an operational research approach at a HH in a Tehran Province village and a HP in southern Tehran city, both affiliated with Tehran University of Medical Sciences (TUMS). Preliminary explanations were provided to health workers at both sites. The study followed five stages:

1. Data Collection through Structured Interviews

Interviews were conducted with knowledgeable individuals to collect comprehensive information about the units. Data on internal processes, workflows, services provided, and the number and expertise of employees were systematically documented.

2. Field Observations and Service Measurements

Patient arrival times and service durations were recorded using a stopwatch and standardized forms. Data from 240 and 230 patients were collected at the HH and HP, respectively, over a working week, accounting for varying activity levels. Patient arrival rates were also documented.

3. Simulation Modeling

Using Arena20 simulation software, workflows and service delivery processes were modeled. Input parameters included patient arrival rates, service classifications, distribution functions for arrival and service times, sequencing of service delivery, and available resources (e.g., staff expertise and numbers). The current situation was analyzed based on four performance criteria: patients admitted, patients served, waiting times, and employee productivity rates.

4. Scenario Development

Recommendations were provided by 12 experts (Table 1) meeting specific inclusion criteria: two years of experience in the Iranian PHC system and Health Network management, and a relevant educational background in medical or public health sciences. Decision variables were identified from simulation data and incorporated into the software to develop four scenarios.

Table 1: Expertise and number of experts participating in the nominal group

Expertise and experiences	Number
Family physician; Head of Comprehensive Health Center	2
Internist; Head of the Health Network	1
Pediatric specialist; Policy-making in children's health and schools	1
Social medicine; Policy-making in health	1
General practitioner; Management, and supervision of health centers, HPs and HHs	1
Medicine and health economics; Budgeting for health operational units, allocation of resources in health	1
Social medicine; Management and policy-making in health insurance	1
Public health; Management and policy-making in health	1
Industrial engineering/health systems; Design and management of health systems	1
Education and health promotion; Policy-making in health and public health	1
Future research in health; Research and education in public health trends	1

5. Scenario Evaluation and Optimization:

The scenarios were iteratively reviewed with experts using the nominal group technique. Results were scored and prioritized using Expert Choice software, leading to the identification of the optimal scenario for each unit.

Ethical approval

The study was approved by the Ethics Committee of TUMS (IR.TUMS.SPH.REC.1396.4209). Data confidentiality was maintained, and informed consent was obtained from all participants.

Results

At the studied HH, two health workers (one male and one female) operated during specific working hours: weekdays from 8:30 to 14:30 and Thursdays from 8:00 to 13:00. The HH experienced an average of 17 patient arrivals per day (2.4 visitors per hour). The HP, a private facility, was staffed by three health workers, including one midwife and two public health experts, working from 8:00 to 15:00 on weekdays and 8:00 to 13:00 on Thursdays. Patient arrival rates at the HP averaged 16 per day (2.3 visitors per hour). Table 2.

Table 2: The services provided and the average service time (in minutes) at the HH and HP

Services	Children	Teenagers	Youth	Middle-aged	Elderly	Women and mothers,	Health education,	Schools health	Health ambassadors	Diseases control	Environmental health*	Occupational health*
HH	19.1	13.9	16	13.3	14.6	14.4	19	51.4	14	14.2	30	17.9
HP	21.3	30.2	27.4	18.3	24.2	28.2	29.2	51.9	18.8	28.7		

*Environmental and occupational health, which are among the duties of the male health worker (Behvarz) in the HH and are not related to the HP in the cities

The services provided and the average service time (in minutes) at the HH and HP.

Simulation and Workflow Mapping

Data collected on workflows and services enabled the simulation of current conditions for performance evaluation. Four scenarios were developed for each unit based on expert recommendations.

HH scenarios

1. First Scenario: Reduced the number of health workers from two to one due to low productivity.
2. Second Scenario: Increased the number of satellite villages covered by the HH from two to three.
3. Third Scenario: Extended working hours by 30 (8:00–15:00).
4. Fourth Scenario: Combined all previous decisions, leading to increased patient admissions (24) and services (23), improved productivity (95%), and reduced waiting times, albeit with some increases in patient volume-related delays (Table 3, Fig. 2).

Table 3: The results of the fourth scenario compared to the current situation in the HH

The number of patients entered and served in the current situation		The number of patients entered and served in the fourth scenario		The health workers' productivity rate in the current situation	The health workers' productivity rate in the fourth scenario	Waiting time in the current situation (min)	Waiting time in the fourth scenario (min)
Entered 17	served 17	Entered 24	Served 23	45%	95%	Middle-aged care: 0.6	Child: 6.6 Youth: 6 Middle age: 13.2 Elderly 13.8 Women: 4.2 Health education: 2.4 Diseases control: 7.2

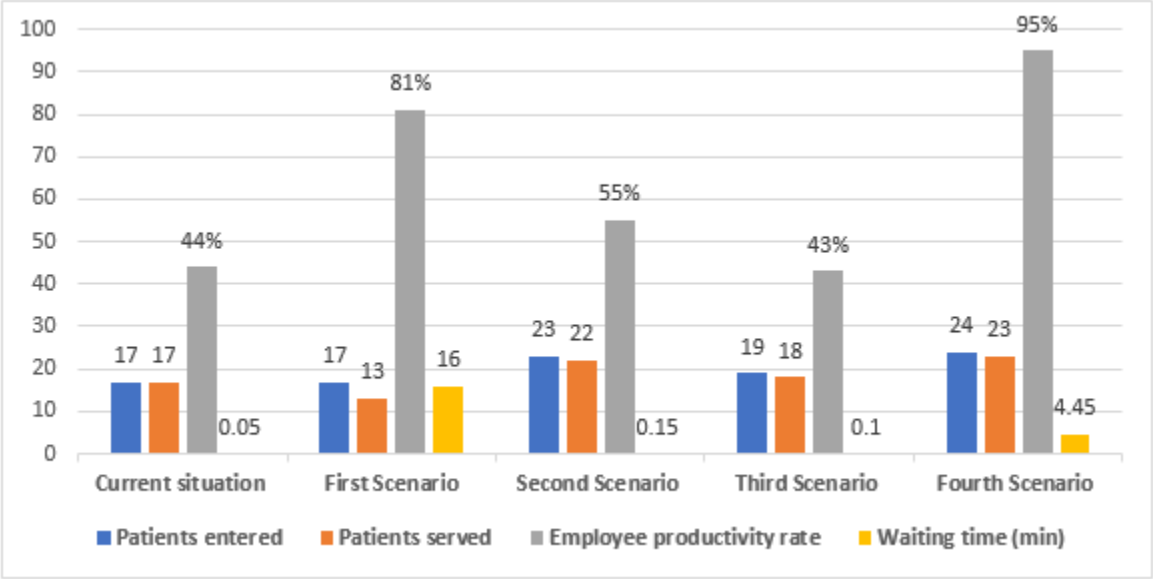

Fig. 2: The results of proposed scenarios in the Health House

HP Scenarios

1. First Scenario: Reduced working hours by one hour (8:00–14:00).
2. Second Scenario: Shifted from a multi-professional to an individual-specialized service delivery model.
3. Third Scenario: Reduced staff from three to one (midwife) due to low productivity.
4. Fourth Scenario: Merged the HP with an adjacent unit, increasing staff to four (two midwives, two public health experts). This doubled patient admissions and services, improved productivity, and maintained zero waiting times (Table 4, Fig. 3).

Table 4: The results of the fourth scenario compared to the current situation in the HP

The number of patients entered and served in the current situation		The number of patients entered and served in the fourth scenario		The health workers' productivity rate in the current situation	The health workers' productivity rate in the fourth scenario	Waiting time in the current situation (min)	Waiting time in the fourth scenario (min)
Entered 16	Exited 15	Entered 33	Exited 31	Health workers (public health): 19% / Health worker (midwife): 56%	Health workers (public health): 32% / Health worker (midwife): 62%	There is no waiting time	There is no waiting time

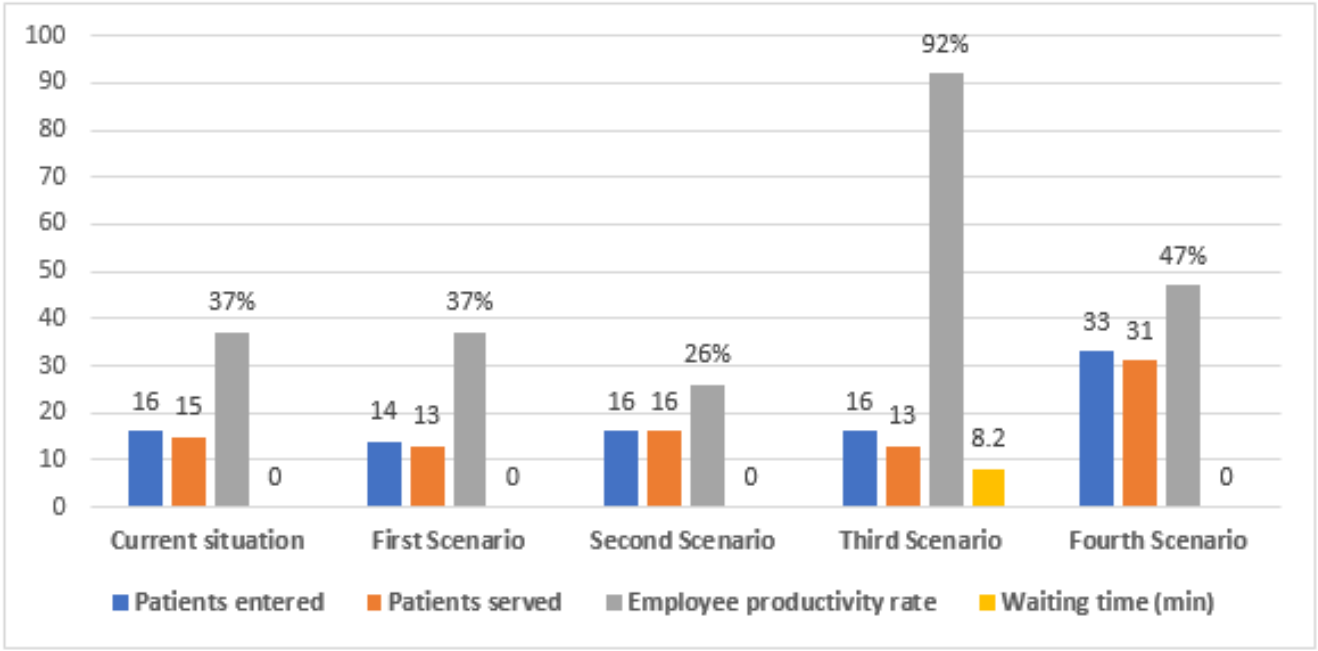

Fig. 3: The results of proposed scenarios in the Health Post

Outcome Evaluation

The scenarios were scored and prioritized using the Analytical Hierarchy Process (AHP) through Expert Choice software. The fourth scenario was identified as the optimal model for both the HH and HP. It demonstrated significant improvements in patient throughput, worker productivity, and service efficiency without compromising waiting times (Figs. 4 and 5).

Fig. 4: Expert Choice scores of the proposed scenarios for the HH

Fig. 5: Expert Choice scores of the proposed scenarios for the HP

Discussion

This study evaluated the performance of a HH and a HP in Iran. Service times varied based on patients' needs and workers' allocated time. For example, in school health services, health workers' time was divided among school visits, health education sessions, and direct services to students. At the HH, health worker productivity was 47%, 12% lower than reported in comparable studies (43). Although patient waiting times were minimal, increasing service delivery and access remains essential. Similarly, at the HP, productivity was only 38%, and while no waiting times were observed, its capacity needs expansion to meet regional demands (23, 29).

The findings underscore the broader necessity to enhance healthcare system performance. Urbanization, rising prevalence of non-communicable diseases (NCDs), and limited primary healthcare (PHC) coverage in suburban areas have exacerbated gaps in service delivery. Concurrent challenges such as re-emerging communicable diseases and inadequate preventive care further emphasize the need for improvements (44).

Human resource management is a critical determinant of healthcare efficiency (45, 46). Effective workload management, task organization, and supervision can significantly enhance worker productivity (47, 48). A studies also highlights the role of optimized workforce management in reducing waiting times and improving service outcomes (28).

Four scenarios were developed to improve HH performance: Scenario 1: Reduced health workers from two to one, addressing low productivity. Scenario 2: Increased satellite villages covered by the HH from two to three, expanding service reach. Scenario 3: Extended working hours by 30 (8:00–15:00). Scenario 4: Combined all prior changes, resulting in a 41% increase in patient admissions, a 31% increase in services delivered, and a rise in worker productivity to 95%.

Scenario 4 aligns with research suggesting that reducing redundant staff can enhance performance in low-traffic facilities (49-51). It also emphasizes aligning service volumes with popula-

tion density, leveraging mobile health units, and reforming organizational structures to improve coverage (52). However, the findings of another study were contradictory; it reported that, despite the number and variety of services rendered by health workers and the referrals to covered villages, the productivity rate exceeded 80% (27).

Similarly, four scenarios were designed to optimize HP performance: Scenario 1: Reduced working hours from 8:00–15:00 to 8:00–14:00. Scenario 2: Shifted service delivery from a multiprofessional, rotating model to an individual-specialized approach. Scenario 3: Reduced the number of staff from three to one (midwife), addressing low productivity. Scenario 4: Merged the HP with an adjacent unit, increasing staff to four (two midwives, two public health experts). This scenario doubled patient admissions and services, improved worker productivity by 10%, and maintained zero waiting times.

Scenario 4 highlights the importance of restructuring workforce arrangements to match patient needs. Consistent with previous research, changes in staffing configurations significantly impacted outcomes (28, 53, 54). Enhanced group performance and supervision further contributed to higher productivity and service quality (46, 47, 55, 56).

Recommendations

The study recommends regular supervisory visits and progress reporting to enhance productivity at HHs and HPs. For units with low referrals and productivity, integrating and restructuring personnel is crucial. Additionally, the PHC Directorate under the Ministry of Health and Medical Education (MoHME) should consider revising service packages to better align with local needs and resources.

While quantitative criteria informed scenario evaluations, future studies should incorporate qualitative assessments for a more comprehensive analysis. Simulation tools, Nominal Group Technique (NGT), and Expert Choice methods provided effective frameworks for developing evidence-based scenarios, but qualitative inputs could enhance these methodologies.

Strengths and Limitations

The study offers a benchmarking methodology applicable to LMICs and countries within the WHO EMRO. It addresses gaps in research on PHC optimization, especially in underserved areas. However, limitations include reliance on expert consensus for scoring, potential variability in results across contexts, and limited generalizability due to the study's experimental nature.

Conclusion

Optimal performance at HHs and HPs requires increasing worker productivity and patient referrals. Implementing the proposed scenarios with managerial oversight can enhance service delivery and efficiency. The findings provide practical benchmarks for similar units in Iran and other LMICs. Simulation tools, NGT, and expert evaluation methods represent valuable tools for healthcare performance optimization and decision-making.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Acknowledgements

This research is part of a Ph.D. thesis in Healthcare Services Management (SHH), supported by TUMS. We would like to thank the Deputy for Research and Technology and deputy for public health-TUMS for their support, the staff of selected HH and HP and the expert panel who generously contributed their time to the study.

Conflicts of interest

The authors declare that there is no conflict of interest.

References

1. Jalali Khan Abadi T, Alvani SM, et al (2020). Designing a network governance model in Iran's health care system. *Iran J Manag Sci*, 15(58): 1-30.
2. Tghvaei Yazdi M (2016). The Relationship between Organizational Health and Organizational Trust to Social Responsibility of Teachers in Sari Education District. *J New Approaches Educ Adm*, 7(27): 95-116.
3. Negarandeh R, Kamran A, Heydari H (2022). Iran's health system performance in achieving goals based on the World Health Organization's framework: a scoping review. *J Research Health*, 12(2): 65-74.
4. Askarzade E, Nabizade Z, Goharinezhad S, et al (2023). Universal health coverage in Iran: a review of strengths, weaknesses, opportunities, and threats. *Med J Islam Repub Iran*, 37: 6.
5. Yanful B, Kirubarajan A, Bhatia D, et al (2023). Quality of care in the context of universal health coverage: a scoping review. *Health Res Policy Syst*, 21(1): 21.
6. Obubu M, Chuku N, Ananaba A, et al (2023). Evaluation of healthcare facilities and personnel distribution in Lagos State: implications on universal health coverage. *Hosp Pract(1995)*, 51(2): 64-75.
7. Gharaee H, Azami Aghdash S, Farahbakhsh M, et al (2023). Public–private partnership in primary health care: an experience from Iran. *Prim Health Care Res Dev*, 24: e5.
8. Chen M,Huang X,Cheng J, et al. (2023). Urbanization and vulnerable employment: Empirical evidence from 163 countries in 1991–2019. *Cities*, 135: 104208.
9. Khoshchashm K (2016). *Rapid urbanization and healthy cities and healthy villages programs in the Eastern Mediterranean.* In: *Transforming Distressed Global Communities.* 1st ed, Routledge, London, pp.277–302.
10. Razavi Fard H (2018). Urbanization and informal settlement challenges: Case study Tehran metropolitan city. *Open House Int*, 3(2): 77-82.
11. World Health Organization (2022). Regional review: role of the private health sector in the provision of essential health services in the Eastern Mediterranean Region. Available from: https://apps.who.int/iris/handle/10665/366798
12. Moore M, Gould P, Keary B (2003). Global urbanization and impact on health. *Int J Hyg Environ Health*, 206(4): 269–78.
13. Li X, Song J, Lin T, et al (2016). Urbanization and health in China: thinking at the national, local and individual levels. *Environ Health*, 15: 113-123.
14. Asghar Pilehvar A (2021). Spatial-geographical analysis of urbanization in Iran. *Humanit Soc Sci Commun*, 8(1): 1-12.
15. Marvi A, Kokabisaghi F, Tabatabaee SS, et al (2024). Evaluation of the primary health care expansion program with public-private partnership in slum areas from the perspective of stakeholders: a qualitative study. *BMC Prim Care*, 25(1): 67.
16. Shafiee A, Kazemian S, Jalili A, et al (2024). Epidemiology and Prevalence of Dyslipidemia Among Adult Population of Tehran: The Tehran Cohort Study. *Arch Iran Med*, 27(2): 51-61.
17. Najarkolaei F, Rakhshbani F, Tavafian S, et al (2018). Health Education Performance in Health Houses: A Descriptive study from Iran during April-September 2011. *Shiraz E Med J*, 19(4): 1-6.
18. Hosseini SH, Takian AH, Sepehri MM, et al (2020). Effects and challenges of Health Transformation Plan in public health: views of public health providers. *Dilemas Contemp Educ Polit Valores*, 7(2): 1-22.
19. Rahbar A, Rahi L, Ebraze A, et al (2016). Compare Client Satisfaction in the Public Health Posts and Outsourced Health Posts Affiliated to Qom University of Medical Sciences in 2014. *J Arak Univ Med Sci*, 19(9): 67-77.
20. Tabrizi J, Pourasghar F, Gholamzadeh Nikjoo R (2019). Governance of Iranian Primary Health Care System: Perceptions of Experts. *Iran J Public Health*, 48(3): 541-548.
21. Damari B (2019). Road Map of Health Area in Iran Health System. *refahj*, 18(70): 9-30.
22. Cooper WW, Seiford LM, Zhu J (2011). Handbook on data envelopment analysis. 2nd ed. Springer Science & Business Media, pp. 1-39.

23. Dargahi H, Darrudi AR (2019). Performance Assessment of Health Care Centers in South Tehran Health Network. *Manag Strateg Health Syst*, 3(4): 264-275.
24. Scotellaro M, Cornio AR, Borgini A, et al (2024). Standardizing Primary Health Care in Italy: Operational Guidelines for Community Health Houses. *Eur J Public Health*, 34(3).
25. Al-Ashbal MA, Lami F (2023). Performance evaluation of health houses in Iraq 2021–2022: A descriptive study. *J Family Community Med*, 30(2): 116-122.
26. Aghahasani M, Saghafipoor A, Farshid Moghadam M, et al (2019). Time measurement and workload of primary health care services in Qom's comprehensive health centers based on Iran Health Transformation Plan. *Iran Occup Health*, 16(4): 83-95.
27. Zanganeh Bagigh M, Khammarnia M, Peavand M, et al (2019). A Review of the Timing and Performance Calibration of Health Care Workers' Activities of Health Homes. *Sadra Med Sci J*, 7(1): 11-22.
28. Bahadori M, Teymourzade E, Hosseini SH, et al (2017). Optimizing the Performance of Magnetic Resonance Imaging Department Using Queuing Theory and Simulation. *Shiraz E Med J*, 18(1): 1-9.
29. Delavari A, Vosoogh-Moghadam A, Kazemi Esfa Z, et al (2022). Comparison of the Level of Satisfaction of Service Recipients Between Government and Outsourced Health Posts Under Coverage of South Tehran Health Center. *sjsph*, 20(1): 1-12.
30. Aeenparast A, Tabibi SJ, Shahanaghi K, et al (2009). Estimating outpatient waiting time: a simulation approach. *Payesh*, 8(4): 327-333.
31. El Khatib M, Alhosani A, Alhosani E, et al (2022). Simulation in Project and Program Management: Utilization, Challenges and Opportunities. *Am J Ind Bus Manag*, 12(4): 731-749.
32. Atalan A (2022). A cost analysis with the discrete-event simulation application in nurse and doctor employment management. *J Nurs Manag*, 30(3): 733-741.
33. Castanheira-Pinto A, Gonçalves B, Lima R, et al (2021). Modeling, assessment and design of an emergency department of a public hospital through discrete-event simulation. *Appl Sci*, 11(2): 805.
34. Wang Z, Hu Z (2024). A discrete-event simulation study for pre-hospital emergency systems. *J Simul*, 19(3): 1-21.
35. Lin W, Zhang L, Wu S, et al (2024). Optimizing the management of electrophysiology labs in Chinese hospitals using a discrete event simulation tool. *BMC Health Services Research volume*, 24(1): 67.
36. Gorelova A, Meliá S, Gadzhimusieva D (2024). A Discrete Event Simulation of patient flow in an Assisted Reproduction Clinic with the integration of a smart health monitoring system. *IEEE Access*, 12(99): 1-1.
37. Forbus J, Berleant D (2024). Using Discrete-Event Simulation to Balance Staff Allocation and Patient Flow Between Clinic and Surgery in a Pediatric Hospital Setting. *Modelling*, 4(4): 567-584.
38. Lin Y, Hoyt A, Manuel V, et al (2024). Using Discrete Event Simulation to Design and Assess an AI-aided Workflow for Same-day Diagnostic Testing of Women Undergoing Breast Screening. *AMIA Jt Summits Transl Sci Proc,* 314-323.
39. Rodríguez A.V.B, Alfaro G.N.T, Gutiérrez J.A.T (2023). Simulation of Clinical Laboratory Process Improvement based on ISO 15189 Standard. In 2nd Australian International Conference on Industrial Engineering and Operations Management.
40. Vázquez-Serrano JI, Cárdenas-Barrón LE, Vicencio-Ortiz JC, et al (2024). Hybrid optimization and discrete-event simulation model to reduce waiting times in a primary health center. Expert Systems with Applications, 238: 121920.
41. Shoaib M, Ramamohan V (2022). Simulation modeling and analysis of primary health center operations. *Simul*, 98(3): 183-208.
42. Aboutorabi A, Darvishi B, Rezapoor A, et al (2023). History of primary health care in Iran. *J Prev Med Hyg*, 64(3):E367–E374.
43. Chaman R, Amiri M, Bagheri H (2012). Calculation of per capita performance of employees working in health care centers and health homes in Shahrood city. *Knowl Health*, 18(1): 75-81.

44. Moradi-Lakeh M, Vosoogh-Moghaddam A (2015). Health Sector Evolution Plan in Iran; Equity and Sustainability Concerns. *Int J Health Policy Manag*, 4(10): 637-640.
45. Yazdanpanah M, Jafarzadeh S, Nkhaee N, et al (2018). Evaluation of human resources proportion to the volume of services provided in hospitals affiliated to Kerman University of Medical Sciences. *Health_Based Research*, 4(1): 95-108.
46. Alinejad R, Yousefi M, Ebrahimpoor H, et al (2020). Workload of Disease Control (Prevention) Section in Health Care Centers: Application of Work And Time Study Model. *payavard*, 14(2): 176-188.
47. Jaskiewicz W, Tulenko K (2012). Increasing community health worker productivity and effectiveness: a review of the influence of the work environment. *Hum Resour Health*, 10: 38.
48. Yousefi M, Ahmadi M, Fazaeli S (2014). Staff Management Based On Performance: Application Of A Work Measurement Model In Hospital. *Payavard Salamat*, 8(1): 79-89.
49. Ajami S, Ketabi S, Bagherian MahmoodAbadi H (2013). Reducing waiting time in emergency department at Ayatollah-Kashani Hospital using simulation. *jha*, 16(51): 84-94.
50. Shoja N, Gholamabri A, Khalili N (2014). Performance Evaluation Health Houses of Firouzkouh City by Using Data Envelopment Analysis. *Journal of Economic Modelling*, 8(27): 53-69.
51. Hadipour H, Kavousi Kelashomi M, Salari A, et al (2017). Applications of Data Envelope Analysis Using Efficient or Inefficient Frontiers in Evaluating the Efficiency of Rural Healthcare Centers (Case Study: Langroud County). *J Res Rural Plan*, 6(3): 203-216.
52. Nanakar R, Bagh Sheikhi Z, Soltanifar A (2008). Investigating the cost of health care services for the population covered by health centers in Kashan city. *Homa Salamat*, 6(2): 23-29.
53. Amiri M, Chamani R, Bagheri H, et al (2012). Cost Analysis and Per capita Performance of the Staff Working in Hygiene Sectors of Shahroud University of Medical Sciences. *Intern Med Today*, 18(1): 75-81.
54. Stewart J (2022). Why was US labour productivity growth so high during the COVID-19 pandemic? The role of labour composition. *Int Prod Monit*, (42): 87-103.
55. Zeng Z, Ma X, Hu Y, et al (2012). A simulation study to improve quality of care in the emergency department of a community hospital. *J Emerg Nurs*, 38(4): 322-8.
56. Noorizadeh Dehkordi S, Dadashzadeh L, Dadgoo M, et al (2014). Experience of Physiotherapists of Teamwork Results: A Qualitative Study. *Phys Treat Spec Phys Ther J*, 4(3): 161-168.