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Forty Years of Primary Health Care (PHC) in Iran: Achievements, Lessons and Future Directions

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Abstract

Iran's Primary Health Care (PHC) system was designed and structured in the post-revolution era and rooted in the principles of the Alma-Ata Declaration, over four decades (1985–2025), it has evolved into one of the most resilient and equity-driven primary care platforms in the Global South. Serving a population exceeding 85 million, it illustrates how sustained investment in community-based care can generate population-level impact despite geopolitical pressures, economic sanctions, and shifting epidemiological realities. This review, as a commemoration of 40 years of PHC establishment, expansion, and institutionalization, synthesizes the system's historical evolution, transformative achievements, persistent constraints, and strategic directions for the decades ahead.

Iran's PHC network has achieved near-universal rural coverage, dramatic reductions in maternal, neonatal, and child mortality, and substantial gains in life expectancy. These achievements have been preserved despite war, prolonged sanctions, and the COVID-19 pandemic. The Health Transformation Plan (HTP, 2014) represented a major step toward universal health coverage (UHC), reducing out-of-pocket payments. Yet substantial challenges remain: structural under-resourcing, insufficient community participation in urban settings, limited PHC coverage in large metropolitan areas, the rising burden of noncommunicable diseases, fragmentation, and insufficient inter-sectoral collaboration.

Looking toward 2050, Iran's strategic trajectory depends on modernizing PHC through digital innovation, data-informed decision-making, strengthening self-care capabilities, reinforcing continuity of care for all population groups, revitalizing community engagement, particularly in urban settings, and embedding stronger equity safeguards across the entire system. With deliberate reorganization and sustained political commitment, supported by intersectoral governance, Iran's PHC system can consolidate four decades of progress and offer a compelling, adaptable blueprint for health systems navigating resource constraints and geopolitical adversity.

Keywords: Primary Health Care (PHC), Health System, Iran, Universal Health Coverage (UHC), Sustainable Development Goals (SDGs)

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Introduction

Primary Health Care (PHC) has been the cornerstone of Iran's health system since the early post-revolutionary period, reflecting both the principles of the 1978 Alma-Ata Declaration and the country's broader commitment to equity, social justice, and community-oriented development. Iran's PHC model emerged in the 1980s through pioneering pilots in West Azarbaijan, introducing the Health House and the Behvarz as locally embedded community health workers. Amid the constraints of the Iran–Iraq War (1980–1988), national policy deliberately prioritized prevention over treatment and rural populations, then comprising nearly two-thirds of the population, leading to the establishment of the National Health Network. By 1985, a structured PHC system linking health houses, rural health centres, and

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referral mechanisms was operational, grounded in principles of geographic accessibility, cultural adaptation, intersectoral collaboration, and comprehensive primary care (1-8).

Over the past 40 years, PHC has played a decisive role in advancing Universal Health Coverage (UHC) in Iran, despite prolonged exposure to war, economic shocks, international sanctions, and the recent pandemic. The National Health Network contributed to substantial improvements in population health outcomes, including marked reductions in child mortality and an estimated two million averted deaths between 1979 and 2009 (9). Subsequent reforms, most notably the Health Transformation Plan (HTP) launched in 2014, sought to expand coverage and improve financial protection, reinforcing PHC's role as the entry point to the health system. (4, 10). Nonetheless, persistent challenges, particularly in financing sustainability, governance effectiveness, and service integration, have constrained PHC performance and equity, underscoring the need for renewed reform (10, 11). In line with renewed global commitments under the Astana Declaration on PHC (2018), Iran's experience highlights the continuing relevance of PHC as a dynamic platform that must evolve to address contemporary priorities, including non-communicable diseases, social determinants of health, community participation, and intersectoral action (4, 12, 13). Notably, rehabilitation services, essential for chronic disease management, ageing populations, and post-acute recovery, remain underrepresented in Iran's PHC structure, reflecting a critical omission in both service design and financing priorities.

Against this backdrop, the purpose of this scoping review is to provide a comprehensive assessment of four decades of PHC implementation in Iran, examining achievements, persistent gaps, and future directions toward 2050 in the digital era. Rather than treating PHC as an isolated level of care, this review conceptualizes it as an integrated system-wide platform interacting with governance, financing, workforce, service delivery, information systems, and regulation. By adopting a systems-oriented lens, the review analyses how PHC has adapted, or struggled to adapt, to macro-level transformations, including the epidemiological transition from communicable to non-communicable diseases, demographic change, and technological innovation. This approach aims to generate policy-relevant insights that clarify PHC's strategic role within Iran's health system and inform pathways toward resilient, equitable, and future-ready UHC (1, 14, 15).

Methods

This paper adopts a rapid critical review approach, integrating peer-reviewed literature, authoritative policy documents, and expert analyses to examine the evolution of Iran's Primary Health Care (PHC) system from the late 1960s to 2025. Evidence was drawn from major scientific databases, key WHO reports, and national health policy archives, with purposive selection guided by relevance to PHC governance, equity, financing, and service delivery. The review synthesizes historical phases of PHC development and applies systems-oriented analysis to identify lessons learned and structural challenges. On this basis, it offers a prospective, policy-relevant outlook on PHC adaptation and resilience toward 2050 in the digital era.

Chronological Development of PHC in Iran

Iran's PHC journey predates the Alma-Ata Declaration, with roots in the late 1960s, when early rural health initiatives and community-based service models were planned and piloted to address pronounced urban–rural inequities in access to care. These early efforts positioned PHC as a central instrument of equity by deliberately extending essential health services to rural, remote, and socioeconomically disadvantaged populations. This indigenous, equity-oriented foundation was subsequently consolidated and scaled up in the post-revolutionary period, where it was explicitly reinforced and aligned with the global Health For All movement. Table 1 provides a chronological overview of key developments, reforms, achievements, and challenges.

Conception of PHC (1971–1981)

The early phase of PHC development in Iran (1971–1981) evolved through several pilot initiatives within broader national development efforts. Prior to the landmark West Azerbaijan project, two major rural health interventions shaped service delivery. The Malaria Eradication Organization established a centrally organized cadre of malaria workers deployed nationwide; while effective for disease control, their scope of practice was narrow and skill levels limited. In contrast, the Health Corps mobilized young physicians and other medically trained graduates to serve in rural areas during compulsory military service, achieving substantial short-term impact despite being predominantly curative, medically oriented, and time-limited. Building on these experiences, the WHO-supported West Azerbaijan project (initiated in 1971) introduced a community-based PHC model centered on trained non-physician health workers (Behvarz), emphasizing accessibility, continuity, and task-shifting. Recognized by WHO in the mid-1970s as the most appropriate PHC model for Iran, this approach led to the establishment of health houses and national Behvarz training, forming the structural foundation of Iran's PHC system, which was significantly boosted due to the 1979 Revolution (16).

Development of PHC (1981-1999)

The second phase of primary health care (PHC development in Iran (1981–1991) coincided with the post-revolutionary period and the Iran–Iraq War, yet represented the most transformative expansion of equitable health services in the country's history. Unlike in many contexts, the 1979 Revolution served as a major catalyst for PHC through its strong rural orientation, explicit equity focus, and exceptional community participation, rooted in the high social capital mobilized during the Revolution and the war. Anchored in Article 29 of the Constitution and building on the West Azerbaijan model, Iran rapidly scaled up a nationwide PHC network based on health houses, rural and urban health centers, and the Behvarz workforce, prioritizing maternal and child health, communicable disease control, and

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Table 1. Timeline of Key Milestones in establishment, expansion and reforms in Iranian Primary Health care

Period	Key Events and Reforms	Achievements	Challenges	Adaptation
Conception of PHC (1971–1981)	• The Malaria Eradication Organization established a centrally organized cadre of malaria workers deployed nationwide • the Health Corps mobilized young physicians and other medically trained graduates to serve in rural areas during compulsory military service • The WHO-supported West Azerbaijan project.	• Forming the structural foundation of Iran's PHC system	• Scope of practice was narrow and skill levels limited for malaria Eradication • Scope of practice was narrow and skill levels limited.	• The WHO-supported West Azerbaijan project (1971) introduced a community-based PHC model centered on trained non-physician health workers (Behvarz)
Development of PHC (1981-1999)	• 1980s: Nationwide PHC network rollout, funded by 2.5 billion Rials (1984) via the Headquarters for Health-Treatment Networks; health houses grew from 1,800 (1984) to 7,900 (1989). • 1985: Establishment of the Ministry of Health and Medical Education (MoHME), merging health delivery with medical training for integrated PHC (17). • 1989–1993 (First Plan): Focus on rural expansion, health education, and population control; universal health insurance enacted. • 1995–1999 (Second Plan): Integrated EPI; control of communicable disease and environmental health.	• Reducing rural-urban disparities in service access from. • Reducing neonatal mortality rates; Reducing under-five mortality rate and total fertility rate (TFR). • Increased rural PHC access achieved by late 1990s.	• War disruptions and limited resources delayed full deployment. • Urban-rural disparities in service quality.	• Sustainability through grassroots, preventive ethos (Alma-Ata aligned). • Leveraged the West Azerbaijan pilot • Establishment of rural PHC • Decentralized & tiered PHC system (3). • Establishment of District Health Centers
Expansion of PHC (2000–2010):	• 2000–2004 (Third Plan): surveillance and referral systems strengthened. • 2005: Rural Family Physician (FP) program piloted, covering 21 million by 2009 with 6,600 physicians and 4,600 midwives. • 2005–2009 (Fourth Plan): Rural health insurance expansion; integration of traditional medicine and community participation.	• Life expectancy increased. • TB cases stabilized and leprosy eliminated.	• Incomplete urban FP rollout; rising non-communicable diseases (NCDs) burden (76% of disease load by 2012). • Resource allocation inefficiencies.	• Digital pilots of Rural Family Physician
PHC reforms (2010–2025)	• 2010–2016 (Fifth Plan): FP and referral systems mandated; electronic medical records piloted. • 2014: HTP introduced, with 15 national programs for NCD prevention, cost reduction, and facility upgrades; urban FP piloted in select provinces (18). • 2017–2022 (Sixth Plan): FP extension to urban/suburban areas; public-private partnerships for NCDs like diabetes and mental health. • 2020: 7.5 M confirmed cases with 144 993 deaths from January 3, 2020, to March 16, 2023 (19); COVID-19 response integrated into PHC via emergency preparedness and vaccination drives. • 2024: New administration prioritizes nationwide FP expansion and UHC alignment with WHO/ GPW-13 (extended to 2025).	• Out-of-pocket payments reduced (20). • >90% population insured by 2017; • Life expectancy> 75 years. • Malaria near elimination. • PHC network adapted for pandemic, achieving high vaccination rates. • Infrastructure upgrades within the new FP program.	• Expanded essential services package • Insurance fragmentation: multiple schemes • Sanctions post-2018 strained funding and disrupt equitable access (21). • High burden of COVID Pandemic until 2022 and severe economic pressures (22). • Health expenditures increased due to sanctions, inflation, and COVID; reversed HTP gains with informal payments resurgence (21). • Urban-rural gaps persist; NCDs and aging population strain resources (23).	• Urban FP piloted in select provinces • Digital tools & community mobilization for resilience. • HTP subsidies; targeted use of the PHC network to safeguard essential services. • Expanding use of telehealth especially for COVID-19 response.

prevention. Between 1982 and 1989, parliamentary support enabled nationwide expansion, increasing the number of health houses from fewer than 2,000 to over 7,900 and the number of health centers to more than 4,300. Complementary innovations—including standardized training of community health workers and midwives, introduction of community-based health information systems, and integration

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of the Expanded Program on Immunization—significantly improved coverage, narrowed urban–rural gaps, accelerated gains in life expectancy, and laid the foundation for Iran's later success in reducing maternal and child mortality.

Expansion of PHC (2000–2010)

During the third decade after the Islamic Revolution, Iran's PHC system evolved within the framework of the third and fourth Economic, Social, and Cultural Development Plans (1999–2009). The third development plan (1999–2003) emphasized structural reforms, liberalization, and privatization, while shifting the focus toward service delegation, distributive justice, and rationalization of health care services. Key initiatives included the Family Physician (FP) program and referral system, aimed at improving service quality, reducing costs, and minimizing health inequities. Maternal mortality reduction and targeted social support policies were highlighted.

The fourth development plan (2004–2009) consolidated these reforms, prioritizing health risk reduction, food security, responsiveness to non-medical community needs, and equitable distribution of health services. Legal and policy measures incorporated justice in health care and strategies to reduce catastrophic household health expenditures, integrating PHC with broader health system planning and coordination with national budgeting processes.

PHC reforms (2010–2025)

From 2010 onward, Iran's PHC confronted major challenges from economic sanctions, the COVID-19 pandemic, and a rising burden of noncommunicable diseases. The Health Transformation Plan (HTP), launched in 2014 with an initial investment of around US$3 billion, was a flagship reform aiming to strengthen health infrastructure, to expand the health workforce, and to achieve near-universal health insurance coverage (~98% of the population). HTP improved access to primary and specialized care, reduced out-of-pocket expenditures, and enhanced financial protection, particularly for vulnerable populations. However, reimposed U.S. sanctions in 2018 and fiscal constraints eroded these gains, limiting sustainability and exposing inequities. These fiscal constraints were not limited to external shocks. As noted in the 2017 WHO mission report, Iran's fiscal space for health has been structurally narrow, characterized by reliance on unstable revenue streams, political contestation over earmarked funds (such as VAT allocations), and weak linkages between high-level policy commitments and actual budgetary execution. Even during periods of increased health spending, such as under the HTP, funding channels remained fragmented and often vulnerable to reallocation and delayed disbursement. Without a predictable and protected financial base, large-scale reforms like the HTP struggled to maintain momentum, particularly in scaling up PHC. Sustainable progress in UHC therefore depends not only on headline investments, but on embedding those investments within a resilient fiscal architecture that ensures continuity, equity, and strategic purchasing.

PHC adapted through community mobilization, task shifting, and digital health tools, leveraging a network of over 18,000 rural health houses and 2,300 urban centers staffed by Behvarzes to maintain preventive services, manage COVID-19 cases, and reduce hospital overload. Initiatives like "Each Home, One Health Post" engaged households through health ambassadors, strengthening resilience, especially in low-resource settings. Despite these achievements—many of which were realized under the guidance, vision, and supervision of distinguished figures (Image 1) whose names and contributions will remain in the memory of Iranians and as part of the legacy of Iran's PHC—significant challenges remain. These include sustaining financial protection, ensuring equitable access, and maintaining high-quality service delivery, underscoring that broad insurance coverage alone does not guarantee full Universal Health Coverage.

Table 1 shows timeline of key milestones in establishment, expansion and reforms in Iranian Primary Healthcare.

Sanctions and economic vulnerability

International sanctions impose a multifaceted toll on the Iranian health ecosystem, from procurement barriers to broader economic erosion. Access to vital medicines, medical equipment, and advanced technologies is severely restricted, resulting in shortages of life-saving medications, vaccines, preventive medicines, and diagnostics that disproportionately affect vulnerable populations. In addition, banking constraints and over-compliance disrupt global supply chains and partnerships. At the macroeconomic level, these measures fuel currency devaluation, rampant inflation, and diminished public revenues, reducing total welfare by 15% and exacerbating poverty and food insecurity, thereby curtailing investments in PHC expansion and maintenance. Politically, sanctions exacerbate Iran's exclusion from international health networks, stifling innovation and knowledge-sharing (24). To counter these headwinds, Iran has pivoted toward self-sufficiency, scaling up domestic pharmaceutical manufacturing and pioneering local digital health tools, while advocating for humanitarian exemptions in sanction regimes. These adaptive strategies are essential for preserving PHC's core functions and fostering greater regional and global engagement (24, 25).

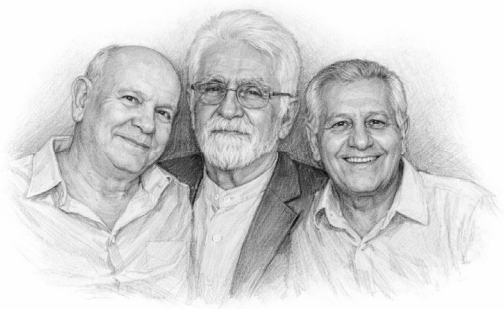

Image 1. From left to right: the late Dr. Sirous Pileroudi, Professor Hossein Malek-Afzali, and the late Dr. Kamel Shadpour, distinguished Iranian visionaries whose intellectual courage, enduring dedication to the health of the Iranian people, and profound patriotism established the foundations of Iran's PHC system.

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Notably, despite years of sanctions, available mortality data from Iran until 2020 do not show system-wide increases in general mortality of the magnitude reported in some other sanctioned settings (26), although excess deaths have been documented among specific patient groups such as those with haemophilia and thalassaemia (27) or for specific groups of diseases such as NCDs (28). Beyond the methodological challenges of isolating the effect of sanctions in the presence of multiple confounders and the absence of a clean natural experiment, one line of interpretation emphasizes Iran's adaptive capacity in the face of long-standing sanctions. At the same time, another highlights the role of a relatively strong PHC network in preventing a rise in leading causes of death. This indicates that deliberate strengthening of the PHC network is not only desirable from an equity perspective but also a key instrument for building health system resilience under prolonged sanctions and other external shocks (29). This matters for equity because shocks tend to concentrate harm on people with limited savings, unstable income, and chronic health needs, groups that rely most on accessible and continuous PHC.

Lessons Learned from 40 Years of PHC in Iran

Structural and systemic weaknesses

Despite its historic success, the Iran's PHC network has accumulated deep structural problems that are now widely seen as the main barriers to further progress toward sustainable UHC. It also reflects the erosion of one of the founding principles of Iran's PHC: "meaningful community participation". In particular, the voices of socially disadvantaged groups, whose distance from the health system often translates into poorer access to care, are no longer systematically heard in shaping how PHC is organized and governed.

Taken together, the evidence suggests that weakening community participation in Iran's PHC system reflects not only a decline in active volunteers, but also the ways in which participatory forums have been designed and used over time. A wide array of mechanisms, including NGOs and community-based organizations, municipal health houses and clubs, people's participation houses, and local, provincial, and national health assemblies has emerged incrementally, but with overlapping roles and only limited, formalized pathways for their discussions to inform provincial or national priority-setting (30, 31). In practice, many of these initiatives have remained politically contingent and discontinuous, which has limited their ability to influence priority-setting and accountability rather than primarily supporting programme implementation In particular, effective participation must account for intersectional inequalities, such as those based on ethnicity, income decile, disability, or living with rare and chronic conditions, that shape how different groups experience and access PHC. Representation of these groups in priority-setting mechanisms remains limited, undermining both equity and responsiveness.

Health system stewardship

The weaknesses described above highlight that the challenge is not only technical and financial but also concerns social groups that can influence PHC priorities and design. They also reflect an implementation gap: high-level health policies have not consistently translated into enforceable PHC priorities, stable financing commitments, and accountability mechanisms at the local level (Table 2).

Iran proved that a publicly financed, community-based PHC system can deliver gains in mortality and equity in just one generation. Without continuous political priority, adequate financing, especially for prevention, structural integration, workforce renewal, and adaptation to demographic/epidemiological transition, even a widely recognised PHC network will gradually lose relevance and efficiency. Iran's health stewardship must urgently recommit to

Table 2. Lessons learned from Iran's PHC.

Lesson	Key Insight from Iran's Experience
Strong political commitment can achieve rapid gains even under sanctions	Post-1979 revolutionary ideology of equity and rural focus produced one of the fastest declines in maternal/child mortality ever recorded in a large country. The development of rural PHC coincided with improvements in water, sanitation, schools, and roads, all of which contributed to better health outcomes.
Community health workers (Behvarz model) are highly cost-effective	Locally recruited, modestly paid, and trusted by the community, this approach achieves vaccination rates over 99%, with huge mortality reductions on a very low budget.
Evidence-informed, continuous health needs assessment is essential	Early success came from systematic population surveys and death certification improvement (1984–2000). When this stopped, the system lost direction.
Surveillance and burden-of-disease studies must be institutionalised	Iran built sustainable vital registration systems providing reliable data that enables better planning.
Without sustained financing and adaptation, even the best PHC networks stagnate	After 2010, relative neglect + hospital bias in HTP → efficiency scores fluctuated or declined.
Referral system and integration with hospitals are make-or-break for UHC	Despite 90–95% nominal insurance coverage, Iran still lacks a functioning gatekeeping mechanism, resulting in persistently high catastrophic expenditures.
Urban PHC requires different design and stronger political will	Repeated failure of urban family physician programme shows that simply copying the rural model does not work.
Community participation and intersectoral collaboration must be continuously nurtured	Early rural success relied heavily on village health volunteers and councils; renewed mechanisms should now include representatives of disadvantaged ethnic, low-income and disabled/chronically ill groups in decision-making process

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the principles that made the country a global PHC success in the 1980s and 1990s, but with updated designs, adequate resources, and future-oriented technology. It should also renew community participation in ways that explicitly recognize how diverse groups, across income deciles, disabilities, or chronic conditions, experience PHC differently. This approach ensures fairer priority-setting, broader benefits in practice, and fewer overlooked risks for vulnerable populations (32, 33).

Integrative governance

Iran's PHC governance is among the most comprehensive in the EMR (34), characterized by integration of medical education with service delivery through universities, which directly participate in PHC operations (25). This university-based stewardship model distinguishes Iran from countries with centralized ministry-led control and has contributed to high global rankings for impact on health and SDG 3 (35). Challenges include high managerial turnover, policy inconsistency, and fragmentation between insurance schemes and service networks (36). Iran's inclusive refugee-health policies and strong pharmaceutical and vaccine production capacities enhance its regional relevance (9, 25, 34, 37, 38).

Health Workforce

Iran's Behvarz program, established in the early 1980s, is one of the world's longest-standing CHW initiatives, providing essential PHC services in rural areas and reducing maternal and child mortality (9, 39). Key features include local recruitment, comprehensive training, supervision, task-shifting, and strong referral linkages. Compared to regional programs like Pakistan's Lady Health Workers or Egypt's Raeda Rifya, the Behvarz system demonstrates superior sustainability, cost-effectiveness, and community orientation (9). Contemporary challenges include an aging workforce, expanding workloads, limited adaptability to urban settings, and insufficient upskilling for NCDs and digital health demands (40).

Digital transformation levels

Iran has advanced in digital PHC infrastructure, particularly through university-led initiatives, with integrated data systems, ICD-10 coding, chronic disease modules, and real-time infectious disease reporting (38, 40, 41). However, nationwide digital integration remains incomplete, with limited interoperability, gaps in electronic personal health records, urban–rural disparities, and insufficient internet infrastructure, which constrain the scalability and effectiveness of digital PHC services.

Alignment with global commitments

Sustainable Development Goals (SDGs): Iran's PHC system has contributed substantially to progress toward health-related SDGs, particularly SDG 3 (Good Health and Well-being) (Table 3).

UHC Progress and Gaps

During the Health Transformation Plan (HTP), Iran achieved near-universal insurance coverage (~96–98% of the population), advancing the coverage dimension of UHC (44). However, fiscal constraints from declining revenues and international sanctions have undermined financial protection, with out-of-pocket (OOP) spending remaining high (~40% of total health expenditure in 2024), particularly for hospital and specialized care (36, 44). At the PHC level,

Table 3. Sustainable Development Goals (SDGs) and Iran's PHC system

SDG Target	Description	Status	Key Details
SDG 3.1 (Maternal mortality)	Reduction in maternal mortality ratio.	Achievement	From approximately 140 per 100,000 live births in 2000 to 16 per 100,000 in 2023, representing an 88.6% reduction (42).
SDG 3.2 (Child mortality)	Decline in under-five mortality.	Achievement	From 72 per 1,000 live births in 1990 to 12 per 1,000 in 2025, with PHC interventions (immunization, nutrition programs, diarrheal disease management) playing central roles (43).
SDG 3.3 (Communicable diseases)	Elimination and control of diseases.	Achievement	Achieved elimination status for malaria in endemic areas; maintained high immunization coverage (>95% for most antigens); controlled tuberculosis incidence (39).
SDG 3.8 (Universal Health Coverage)	Framing and positioning of UHC.	Achievement	The Health Transformation Plan (2014) explicitly framed UHC as a national goal, with PHC positioned as the foundation for achieving universal coverage by 2025 (44).
SDG 3.4 (NCDs)	Rising prevalence of non-communicable diseases.	Gap	Requires PHC reorientation from acute/infectious disease management to chronic care for diabetes, cardiovascular disease, and mental health disorders (23, 40).
SDG 10 (Health equity)	Persistent disparities in access and protection.	Gap	Urban-rural disparities have narrowed but persist; insurance fragmentation creates inequities in financial protection; vulnerable populations (migrants, urban poor) face access barriers (36, 44, 45).
SDG Partnerships (Multisectoral determinants)	Insufficient intersectoral collaboration	Gap	Limits PHC capacity to address social determinants of health, environmental risks, and structural drivers of health inequities (36, 40).

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OOP is relatively low, but fragmentation across care levels, incomplete implementation of the family physician and referral system, and misaligned insurance benefits contribute to coverage gaps. One practical implication is the need for a clearly defined essential PHC service package, explicitly linked to purchasing decisions and referral protocols, ensuring that core entitlements are coherent across financing schemes and levels of care. WHO assessments show mixed PHC performance: accessibility is strong due to the rural network and Behvarz workforce, but continuity, coordination, and quality, especially in NCD management, preventive care, and patient-centered practices, remain weak. Lessons from equity-focused health reforms elsewhere (e.g., England's NHS) highlight that Iran's PHC 2050 roadmap should prioritize investment in high-need areas, strengthen neighbourhood PHC teams, digital innovations, and prevention programmes, and maintain low-barrier, face-to-face access to ensure equity rather than exacerbating disparities (37).

The Future of PHC in Iran (2025–2050)

Epidemiological and demographic transitions

Iran's PHC system faces profound transformations driven by demographic aging, epidemiologic shifts toward NCDs, growing mental health burdens, and climate-related health threats. These transitions require fundamental reorientation of PHC priorities, financing, and workforce capabilities.

Ageing: Iran is experiencing rapid population ageing, with the proportion aged 60+ projected to rise from 9% in 2020 to 21% by 2050 (54, 55). This shift increases demand for integrated chronic care, geriatric competencies, polypharmacy management, home-based services, caregiver support, and social care integration (23, 36, 46, 47). Without PHC reorientation toward prevention and efficient chronic care, health costs are expected to escalate.

NCDs: Non-communicable diseases account for ~76% of deaths and 70% of the disease burden in Iran (23, 48, 49). High prevalence of diabetes (11–14%), hypertension (25–30%), cardiovascular disease, and mental disorders poses significant challenges. PHC gaps include limited prevention infrastructure, weak chronic care models, inadequate workforce training in behavioural health and chronic care, and perverse financial incentives favouring acute over preventive care (23, 39, 40).

Mental Health: Mental disorders now represent 10.3% of Iran's disease burden, up from 4.6% in 1990 (50). Depression, anxiety, and substance use affect vulnerable groups, particularly women and youth. Mental and Social Health (MaSH) Units in urban areas provide psychologist-led teams supporting PHC providers, but meaningful improvement requires addressing social determinants beyond clinical care.

Climate Change: Iran faces severe climate-related health threats, including water scarcity, heatwaves, air pollution, vector-borne disease expansion, and rural-to-urban migration (51-53). PHC adaptation strategies include strengthening system resilience, early warning systems, workforce training on climate-related risks, public awareness, and integration of environmental health into service packages.

Immigration: Migration of PHC providers is driven by high workloads, staff shortages, limited career advancement, weak incentives, job insecurity, and rural living conditions. Addressing this requires strategic, intersectoral policies focusing on workforce development, retention, career pathways, and quality-of-life improvements.

Public Trust: Public confidence in PHC is critical for UHC, affecting social participation, preventive intervention uptake, adherence, and service utilization. Iran's success in infectious disease control and COVID-19 response shows that transparent, trust-based communication strengthens social capital and health outcomes. PHC must identify local needs and effectively communicate them to policymakers, leveraging networks, community health workers, and service providers to sustain system resilience.

Structural challenges

Financing sustainability: Iran's health financing is fragmented and inefficient, with multiple insurance schemes (Social Security Organization, Iran Health Insurance Organization, Armed Forces Insurance, private funds) offering disparate benefits and payment methods, leading to waste and unequal access (36, 44, 49). Public spending favors hospitals over PHC, while high out-of-pocket costs (35–40% of total expenditures) reduce financial protection. Sanctions further strain revenues, restrict medical imports, and weaken purchasing power (54). Reforms should align insurance schemes, secure dedicated PHC budgets, implement innovative payment models, expand public funding, and link strategic purchasing to PHC outcomes to enhance equity, efficiency, and resilience (8, 34).

Urbanization pressures: Rapid urbanization, from 31% in 1955 to 78% in 2023, projected 85% by 2050, stresses the PHC infrastructure originally designed for rural areas (55, 56). Urban, suburban, and informal settlements require adaptable PHC models to address dense, transient, and diverse populations (57). Urban health challenges include air pollution, road accidents, mental health burdens, and NCDs, necessitating upstream interventions in housing, sanitation, poverty reduction, and unemployment (25, 58). Current urban PHC delivery remains fragmented across public centres, private practices, and hospitals, with weak referral pathways (25, 59).

Intersectoral collaboration: Iran's PHC struggles with cross-sectoral engagement on social determinants of health (SDH) due to weak coordination, siloed funding, and limited data on SDH impacts. Educational policies exemplify broader social challenges that, together with wider socioeconomic factors, have exacerbated inequalities in early childhood development (ECD) and schooling, leading to uneven access to quality learning opportunities across regions and social groups. These disparities have produced uneven educational resources, higher dropout rates in disadvantaged areas, and a growing class divide, which in turn constrain PHC's capacity to advance equity and achieve its population health goals amid widening social and educational inequalities. Effective intersectoral action, therefore, requires high-level political support through a Health in All Policies (HiAP) approach, joint planning and budgeting, systematic monitoring of SDH, and meaningful community

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involvement aligned with grassroots needs (38).

Governance Challenges: PHC governance is undermined by political volatility, leadership turnover, fragmented authority among the Ministry, insurers, universities, and private actors, and weak accountability (25, 34, 36, 49, 60). The "policy implementation gap" limits translation of national strategies into coherent local action. Governance reforms should include multi-stakeholder planning, long-term strategies insulated from politics, outcome-linked performance metrics, transparent reporting, and streamlined authority, thereby embedding PHC-centred resilience to withstand shocks such as sanctions and epidemics better.

Role of Medical Universities in PHC: Iran's integration of medical universities with service delivery fosters innovation, research, workforce development, and guideline adherence (38). However, curative and academic priorities can divert PHC funds, regional disparities persist, and redundant oversight outside MOHME complicates and hinders accountability. Strengthening this model requires explicit PHC benchmarks, guaranteed funding, innovation-sharing protocols, and curricula emphasizing PHC skills (36, 61).

Regional challenges in EMR: Iran's PHC is affected by broader EMR dynamics, including political instability, humanitarian crises, and economic pressures.

- ***Political instabilities***: crisis zones: Conflicts in Syria, Yemen, Iraq, Afghanistan, Palestine, and Libya generate refugees, workforce shortages, and infrastructure damage, while hindering regional cooperation and knowledge exchange (25).
- ***Refugee health:*** Iran hosts millions of Afghan refugees, increasing demand for essential PHC services and straining budgets amid inconsistent international support. Despite these challenges, Iran's Universal Public Health Insurance policies provide inclusive coverage, funded by UNHCR for vulnerable groups, though sustainability remains difficult (25, 62, 63).
- ***Cross-border diseases:*** Porous borders increase transboundary health threats, including polio (Afghanistan, Pakistan, 2025), cholera (Yemen, 2025), COVID-19, and antimicrobial resistance, necessitating synchronized surveillance, rapid response, and climate-adaptive vector control (64).

Digital Transformation of PHC in Iran

Digital Health Houses

The Digital Health House strategy reframes Iran's PHC network as a family-centered, community-enabled health ecosystem, in which every household serves as an active node for health promotion and disease prevention. Through universal access to mobile-based self-care platforms, supported by national standards for digital health literacy, individuals can monitor vital health indicators, receive personalized health coaching, and engage in behaviour-change programs grounded in comprehensive health promotion principles. Families are positioned as both beneficiaries and providers of care: parents track child growth and immunization milestones; youth access mental-health supports; and older adults receive chronic-disease management guidance. At the neighbourhood scale, aggregated, anonymized data from households feed into community dashboards that help CHWs (Behvarz), local councils, and health houses detect emerging needs and mobilize tailored interventions. In this policy model, community participation is not optional, it is structurally built into the digital architecture, reinforcing Iran's long-standing emphasis on social mobilization within PHC.

Real-Time Referral System

A central policy pillar of the Digital Health House is the creation of a real-time, risk-stratified referral system that ensures rapid support for the most vulnerable populations. Mobile applications enable families to initiate referrals directly from home, while AI-assisted triage tools classify urgency and automatically notify the appropriate level of care, such as health house, rural health centre, district hospital, or specialist teleconsultation. High-risk groups (elderly, pregnant women, patients with chronic or multi-morbidity conditions) can be flagged for proactive digital follow-up, scheduled tele-visits, or home-based outreach by CHWs. The system is strengthened by policy mandates on interoperability, equity safeguards, and data protection, making sure that digital tools reduce existing disparities. By closing the loop between households, neighbourhoods, and formal health services, the Digital Health House becomes the operational backbone of a responsive, people-powered PHC system that integrates self-care, community vigilance, and professional services into a single continuum of care (65-67).

Mobile Health Applications for PHC Delivery and Public Engagement

Mobile health (mHealth) platforms proffer scalable avenues for broadening PHC ambit, bolstering self-care, and galvanizing civic involvement in health governance.

- ***Maternal Health Interventions:*** Iranian mHealth pilots in maternal care encompass pregnancy-monitoring applications furnishing gestational milestones, scheduling cues, and peril-sign education; SMS/app-driven immunization prompts; and postpartum advisories incorporating mental health appraisals. Nascent evidence from controlled trials evinces heightened compliance and approbation, albeit comprehensive efficacy appraisals remain nascent (68, 69).
- ***Chronic Disease Self-Management Platforms:*** Amid escalating NCD prevalence, mHealth enabled self-management and rehabilitation tools for diabetes and hypertension self-governance integrate glucose logging with trend analytics, pharmacotherapy reminders, nutritional heuristics, activity trackers, and didactic modules. A substantial share of long-term rehabilitation and functional follow-up, particularly for NCD-related complications, can be delivered through these digital platforms, reducing the need for in-person visits. Analogous hypertension suites feature pressure chronologies, adherence nudges, and lifestyle directives that interface with ambulatory monitors. Feasibility trials affirm acceptability in Iran, yet seamless integration into provider workflows and sustained engagement remain unresolved challenges (70-72).

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• ***Immunization Monitoring Systems:*** Digital registries supplanting paper immunization ledgers, coupled with parental alert mechanisms, potentiate coverage augmentation. Electronic repositories enable provider-wide record retrieval, automated notifications expedite due dates, and geospatial analytics pinpoint immunization laggards for outreach. Provincial prototypes herald national expansion, contingent upon interoperability with collateral health informatics (73).

• ***Impediments to mHealth Dissemination:*** mHealth proliferation confronts multifaceted barriers: paucity of context-specific randomized evaluations; ephemeral donor financing imperiling continuity; siloed architectures decoupled from EHR ecosystems; regulatory lacunae in app vetting, data stewardship, and assurance; heterogeneous digital proficiencies curbing adoption; and pervasive privacy trepidations (65, 74, 75).

Blueprint for Electronic Personal Health Records

Iran's envisioned PHC information architecture is centered on universal electronic personal health records (ePHRs) linked to a single national health identifier, integrating data across PHC, hospital, and specialist care. Standardized data elements and interoperability frameworks (HL7 FHIR, ICD, SNOMED CT) are intended to support continuity of care, patient access, surveillance, quality improvement, and research (38, 76).

Prevailing Landscape and Lacunae: Despite incremental progress, Iran's digital health ecosystem remains fragmented across university-based EHRs, vertical program databases, insurers, and hospitals, resulting in duplication and data silos. Urban areas show greater EHR penetration, while rural regions lag behind. Gaps persist in national data standards and governance regarding data ownership, access rights, and secondary use (38, 76).

Interoperability Hurdles: Achieving interoperability requires addressing technical, organizational, and legal barriers, including standards harmonization, workflow alignment, and consent and liability frameworks. International experience highlights the need for centralized stewardship, mandatory standards, financial incentives, strong data protection, and sustained political commitment (38).

Stewardship and Confidentiality Protocols: Effective PHC digitalization depends on robust privacy, security, and data quality safeguards, including encryption, access controls, audit mechanisms, cybersecurity protocols, continuous quality assurance, and transparent rules for secondary data use supported by ethical oversight and participatory governance (38, 66).

Artificial Intelligence and Big Data for UHC Advancement

Artificial intelligence and big data offer transformative potential for PHC by enhancing prediction, efficiency, and population health management. AI-driven analysis of EHR data can identify high-risk populations for targeted prevention, forecast NCD progression, predict acute deterioration, and anticipate non-adherence. In Iran, such tools could support vulnerability mapping, proactive care, and risk-adjusted resource allocation (77, 78).

AI applications can strengthen Behvarz-led triage, support diagnostics in resource-limited settings, align treatments with clinical guidelines, and improve referral decisions, particularly where specialist access is constrained (77, 78). Big data analytics enable real-time syndromic surveillance, outbreak forecasting, and integration of multiple data sources, strengthening early warning and response capacities (77). In addition, AI facilitates near–real-time monitoring of disease prevalence and incidence, geospatial inequities, demographic disparities, and intervention impact, complementing traditional Global Burden of Disease assessments and positioning Iran as a regional leader in real-time health intelligence (77). Responsible AI deployment requires safeguards against bias, transparency and explainability, strong consent and privacy protections, human oversight, context-specific regulation, inclusive design to avoid digital divides, and workforce training to support evolving roles (65, 77).

Strategic Roadmap Towards PHC 2050 in Iran

The synthesis of identified challenges and opportunities in Iran's PHC system informs a strategic roadmap spanning 2025 to 2050. This roadmap is structured around four interconnected pillars: policy reforms, workforce transformation, technology and infrastructure enhancement, and robust monitoring and evaluation frameworks. These elements aim to foster a resilient, equitable, and sustainable PHC system aligned with UHC principles and Iran's evolving epidemiological profile.

Policy Reforms

Strengthening PHC Governance: Iran requires a long-term national PHC strategy (2025–2035; 2035–2050) with explicit targets, accountability mechanisms, and insulation from political turnover, developed through a multi-stakeholder process and anchored in parliamentary approval. A high-level coordinating body (e.g., a National PHC Council) should align actors and close the persistent implementation gap between upstream policy documents and frontline PHC practice by translating goals into costed, time-bound plans informed by local epidemiological, service-use, and financial data (5, 34, 36, 60, 79). Clear role delineation across the Ministry of Health, medical universities, insurers, and provincial authorities, coupled with outcome-linked performance management and transparent reporting, is essential to ensure delivery of the PHC essential service package and system-wide accountability (5, 34, 36, 80).

Despite strong and adaptable PHC implementation at the service delivery level, persistent underfunding at higher tiers of government decision-making, beyond the direct control of the Ministry of Health, reveals a clear disconnect between national policy commitments and fiscal priorities. At the same time, PHC is consistently emphasized in policy statements, limited and unstable budgetary support for initiatives such as the family physician programme has constrained their scale and sustainability. This disconnect has been compounded by the insufficient strategic translation of research evidence into budgetary and policy processes, underscoring the need for stronger policy engagement and

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more effective use of evidence to influence high-level resource allocation decisions.

Reforming PHC Financing Mechanisms: PHC financing reforms should be grounded in a clearly defined essential PHC service package and increased public investment, raising PHC's share of total health expenditure toward 35–40%. Priority investments should emphasize prevention, NCD and mental health care, digital infrastructure, and workforce capacity (36, 44). Fragmented insurance arrangements require harmonization, standardized benefits, coordinated purchasing, and interoperable data systems. Payment reforms should shift away from fee-for-service toward capitation, pay-for-performance, bundled payments, and global budgets that incentivize continuity of care and population health outcomes. Reducing out-of-pocket payments—particularly for chronic, preventive, and mental health services—and protecting ring-fenced, multi-year PHC budgets would enhance equity and fiscal sustainability (34, 36, 44).

Integrating PHC and Hospital Services: Effective gatekeeping requires enforced referral systems, standardized clinical pathways, specialist feedback, shared care models, and financial disincentives for bypassing PHC. Integrated care models for NCDs should link PHC, specialty, and inpatient services through multidisciplinary teams, unified protocols, interoperable information systems, and care coordinators for complex patients. Vertical programs should be embedded within a comprehensive PHC to reduce fragmentation (5, 22, 34, 36, 44).

Workforce Transformation for the Digital Era

Behvarz Workforce Renewal and Upskilling: Sustaining the Behvarz workforce requires recruiting younger cohorts, offering competitive remuneration, establishing career ladders, and providing incentives for rural retention, all aligned with a digitally enabled PHC. Continuous upskilling should cover NCD management, mental health screening, health coaching, digital competencies, and population health approaches, supported by modular, accredited training linked to progression. Task-shifting under supervision and structured advancement pathways can improve retention and performance in underserved areas (40, 81).

Family Physician Program Strengthening: Medical education and professional development must prioritize PHC, prevention, chronic care, and population health. Addressing remuneration disparities, workload pressures, and limited career prospects is critical to attract physicians to PHC. Multidisciplinary teams should function with clear scopes, shared accountability, and defined responsibilities for digital tools, teleconsultations, and decision support to reinforce continuity of care (82). Expanded PHC roles for nurses and allied professionals, including chronic care, patient navigation, community interventions, nutrition, social work, and digital health support, are essential to address complex health and social needs (1, 83).

Workforce Distribution and Retention: Reducing geographic inequities requires rural service obligations, financial incentives, telemedicine-enabled professional support, and context-sensitive retention packages that address compensation, working conditions, training, and staff well-being. Co-design with frontline workers is critical to ensure effectiveness and sustainability (61).

Technology and Infrastructure Priorities

National ePHR and Interoperability: A national electronic personal health record (ePHR) system with universal identifiers, standardized terminologies, HL7 FHIR interoperability, and patient portals is foundational. Regulatory mandates, incentives, and phased implementation should enforce interoperability across PHC, hospitals, and insurers, supported by a governed national health information exchange with robust privacy protections (38).

Digital Health House Scale-Up: Health houses require investments in connectivity, hardware, power resilience, and Behvarz-friendly EHR interfaces with offline functionality and telemedicine integration. Phased pilots with structured frontline feedback can enhance usability and acceptance prior to national scale-up (38).

Mobile Health and Citizen Engagement Platforms: A national mHealth framework should prioritize high-impact applications, ensure EHR integration, regulate quality, and safeguard equity. Citizen portals for access, scheduling, refills, results, and education should be paired with digital literacy initiatives and routine monitoring to prevent exclusion of vulnerable groups.

AI and Big Data Infrastructure: Centralized analytics platforms integrating PHC, hospital, and insurer data can support surveillance, planning, and management. AI deployment must be context-validated, ethically governed, and problem-driven, targeting defined PHC performance gaps while ensuring transparency, bias mitigation, and human oversight.

Equitable Digital Access: Universal broadband, device subsidies, inclusive design, and hybrid digital–analogue service models are essential to prevent widening inequities. Community co-design and partnerships with local institutions can extend reach to digitally excluded populations (11, 45, 84). If implemented with targeted investment in high-need areas and protected non-digital routes into care, digital "front doors" can reduce friction and improve continuity; if rolled out without such safeguards, they risk creating two-tier access that mirrors existing social and geographic inequalities (37).

Monitoring, Evaluation, and Accountability

Achieving UHC through a strong PHC system requires a WHO-aligned national performance framework that is supported by an AI-enabled, real-time monitoring and learning system spanning the full continuum of care—from self-care and community-based services to primary, secondary, and tertiary levels (Table 4). This overarching system should integrate EHRs, patient-generated data, and service-use information into interoperable platforms with real-time analytics and decision dashboards. Importantly, service recipients and their families should play an active role by contributing data, feedback, and self-management information, thereby strengthening transparency, responsiveness, and co-production of care. Continuous evaluation, drawing on

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Table 4. Monitoring, Evaluation, and National Accountability of Iran's PHC system

Component	Key Elements and Details
PHC Performance Measurement and Indicators Framework (85)	Objectives: Develop a unified PHC monitoring framework aligned with UHC/SDG tracking; provide adaptable indicators for national/subnational use; reduce reporting duplication; drive PHC improvements through data-informed actions. Scope: Covers the three PHC components: (1) integrated health services (primary care and public health functions), (2) multisectoral policies/actions, and (3) empowered people/communities. Focuses on health system levers (e.g., governance, workforce, financing). Added Value: Tailorable indicator menu; links to PHC levers; addresses gaps in PHC measurement (e.g., community engagement, quality systems). Target Audience: National/subnational policymakers, health planners, program managers, international partners, and civil society
Data Systems and Reporting (86)	EHR automation would streamline indicator derivation, obviating manual efforts. Real-time dashboards would democratize insights for stakeholders. Reporting cadences -monthly for operations, quarterly for oversight, annual for synthesis- should integrate with health accounts and UHC tracking. Public portals, scorecards, and media amplification would foster transparency and choice.
Evaluation of Innovations and Reforms (87)	Emphasizes creating new approaches to monitoring and evaluation as a core aim of reforms (e.g., improving effectiveness of monitoring/evaluation systems). Prioritizing evidence-based monitoring and stakeholder coordination for better reform outcomes. Key Focus: Building Adaptive Learning: Investing in structured evaluation to ensure reforms are evidence-based, scalable, and equitable, turning provincial experiences into national knowledge.
Accountability Mechanisms (88)	Focusing on the design and implementation of accountability mechanisms. The establishment of clear and measurable indicators, targets, and benchmarks. Outlining the accountability mechanisms, responsibilities, reporting structures, and consequences for performance. Fostering a culture of transparency and continuous improvement to drive tangible health outcomes. Involving the community via governance boards, using feedback channels, and scorecards for enhancing local oversight.

embedded trials, cost-effectiveness analyses, and learning health system approaches, should inform adaptive policy and service redesign. Accountability mechanisms, including AI-supported performance tracking, performance-linked financing, community oversight, and professional audits, are essential to reduce inequities, enhance system trust, and sustain improvement across regions.

Conclusion

The study concludes that long-term sustainability and effectiveness of Iran's PHC system depend fundamentally on preserving its agility, vitality, and system-wide centrality. PHC must not be treated as a standalone or peripheral sector, but rather as the core organizing platform of the health system, shaping governance, financing, workforce development, service delivery, information systems, and regulation in an integrated manner. This systems-oriented perspective aligns with the foundational philosophy of PHC articulated in the Alma-Ata Declaration (1978) and reaffirmed in the Astana Declaration (2018), which emphasizes equity, community participation, and intersectoral action as prerequisites for achieving UHC.

Over 40 years, Iran's PHC system has demonstrated its value as the beating heart of the national health system, repeatedly proving its resilience under conditions of war, prolonged economic sanctions, and public health emergencies. Its achievements including substantial reductions in mortality, near-universal rural coverage, and strong international recognition underscore the strategic importance of PHC as the engine of population health gains. Beyond service delivery, Iran's PHC system has functioned, and holds strong potential, as a critical pillar of national health security, disease surveillance, and public trust, particularly during periods of crisis and uncertainty. However, persistent structural weaknesses, including fragmented financing, insufficient preventive spending, urban coverage gaps, workforce aging, and weak linkages across primary, secondary, and tertiary levels of care, have constrained its full potential.

The future trajectory of Iran's PHC system, therefore, requires reinvigoration through deliberate system reconfiguration, ensuring seamless connections across all levels of service delivery and positioning PHC as the central hub of care coordination. Strengthening referral and counter-referral mechanisms, reinforcing continuity of care, and embedding PHC more deeply within hospital and specialized services are essential to restoring its system-wide effectiveness.

In the context of rapid population aging and a growing burden of non-communicable diseases, a strengthened and integrated PHC system will be essential for managing multimorbidity, long-term care needs, and continuity of care. Looking ahead to 2050, sustaining PHC's transformative role will depend on modernizing its operational foundations through digital health innovation, integrated information systems, and data-driven decision-making, while simultaneously investing in workforce renewal, upskilling, and incentive alignment. Prioritizing prevention, addressing the growing burden of non-communicable diseases, and safeguarding equity, particularly in urban and marginalized populations, will be critical to maintaining PHC's responsiveness to evolving demographic, epidemiological, and environmental pressures.

Recommitting to the principles of Alma-Ata through a

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renewed, agile, and integrated PHC model offers Iran a realistic and credible pathway toward a more equitable, resilient, and sustainable health system. By addressing its structural weaknesses while building on its proven strengths, Iran's PHC system can once again serve as the driving force of national health development and provide valuable lessons for health systems pursuing UHC under conditions of resource constraints and geopolitical adversity.

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Conflict of Interests

The authors declare that they have no competing interests.

Authors' Contributions

RM, EA, AR and MAL: Conceptualization, Investigation, Writing original draft, Writing - review and editing.

MA, RM, EA, LD, and MAL: Writing – review and editing.

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