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Strengthening Public Health Systems for Effective Universalism: Governance, Equity, Digital Transformation, Resilience, and Lessons From Indonesia—A Review

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A R T I C L E I N F O

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A B S T R A C T

Public health systems must simultaneously expand access to essential services, protect populations from health threats, reduce inequities, and remain capable of learning and adapting under conditions of fiscal, demographic, epidemiological, and technological change. This qualitative literature review examines how governance, financing, primary health care, health workforce capacity, digital information systems, community participation, social determinants, and public health functions interact to shape system performance, with particular attention to Indonesia. Using a narrative-integrative approach, peer-reviewed literature published primarily from 2020 onward was purposively identified and synthesised thematically around system architecture, universal health coverage, policy implementation, equity, digital transformation, and resilience. The review finds that effective public health performance emerges from coordinated system relationships rather than isolated investments. Universal health coverage is strengthened when financial protection is matched by service availability, quality, workforce distribution, referral capacity, and accountability. Digitalisation can improve surveillance, coordination, and learning, but requires interoperability, governance, privacy protection, and institutional capability. Community participation and intersectoral action are essential for addressing social determinants and improving policy legitimacy

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INTRODUCTION

Public health systems are increasingly required to perform two functions simultaneously: to deliver accessible and high-quality health services and to protect population health through prevention, surveillance, regulation, emergency preparedness, and action on the wider determinants of health. Contemporary health systems therefore cannot be understood only as networks of hospitals and clinical providers; they are complex adaptive arrangements that connect governance, financing, the health workforce, service delivery, information systems, public health functions, communities, and actors beyond the health sector. Recent scholarship has consequently called for health systems to be reconceptualised around their relationships with people, institutions, and social contexts rather than treated as isolated technical structures (Shroff et al., 2021; Haldane et al., 2021).

The urgency of strengthening public health systems is reinforced by persistent gaps in universal health coverage (UHC). UHC requires not merely formal entitlement or insurance enrolment, but effective access to needed services of sufficient quality without financial hardship. Cross-national evidence shows that progress in nominal service coverage can coexist with substantial deficiencies in effective coverage, financial protection, and equitable access. These gaps are particularly important as countries confront the simultaneous pressures of infectious diseases, non-communicable diseases, population ageing, and emerging health threats, all of which increase the demand for coordinated and resilient health-system responses (GBD 2019 Universal Health Coverage Collaborators, 2020; Wagstaff and Neelsen, 2020).

Primary health care (PHC) is central to this agenda because it provides the principal platform through which preventive, promotive, curative, rehabilitative, and essential public health functions can be connected close to communities. However, PHC cannot perform this role without adequate and strategically designed financing, a sufficiently distributed health workforce, reliable referral arrangements, medicines and technologies, and effective local management. The Lancet Global Health Commission on financing PHC emphasised that the way resources are mobilised, pooled, allocated, and used strongly shapes access and quality, while global workforce analyses continue to demonstrate large inequalities in the availability of health workers across countries (Hanson et al., 2022; Cometto, Buchan and Dussault, 2020; Boniol et al., 2022).

Public health policy provides the institutional mechanism through which these system capacities are prioritised, financed, regulated, and translated into practice. Yet the existence of a formally evidence-based policy does not guarantee successful implementation. Implementation depends on the interaction of policy design with institutional capacity, incentives, leadership, inter-organisational relationships, professional behaviour, local context, and the participation of affected populations. Evidence-informed policymaking is therefore most effective when knowledge production is connected with implementation processes and when public and patient participation is incorporated meaningfully rather than symbolically into decision making (Bullock et al., 2021; Baumann, Reinhold and Brütt, 2022; Madon and Krishna, 2022).

Equity must also be treated as a core performance criterion rather than an additional objective. Health outcomes are shaped by income, education, employment, housing, food security, environmental conditions, gender, geography, and other social determinants that often lie outside the direct control of health-care organisations. The COVID-19 pandemic demonstrated how these structural conditions can concentrate exposure, vulnerability, and barriers to care among disadvantaged populations. Public health systems and policies that ignore such determinants may expand services without proportionately reducing avoidable inequalities; conversely, intersectoral and equity-oriented policies can improve both health outcomes and social resilience (Paremoer et al., 2021).

Digital transformation represents another major opportunity and governance challenge. Integrated health information systems, electronic health records, surveillance platforms, telehealth, analytics, and other digital tools can enable more timely planning, continuity of care, and learning across organisations. However, digitalisation can also reproduce inequities when infrastructure, interoperability, digital literacy, cybersecurity, data governance, or public trust are weak. For this reason, digital health should be treated as a health-system capability that requires standards, governance, ethical safeguards, and sustained institutional investment, rather than simply as the adoption of new technologies (Sheikh et al., 2021).

The COVID-19 pandemic further demonstrated that health-system performance under crisis conditions depends on resilience: the capacity to anticipate, absorb, adapt to, and learn from shocks while maintaining essential services. Comparative evidence from multiple countries identified governance, financing, workforce capacity, public health functions, service delivery, and community engagement as mutually dependent dimensions of resilient responses. Indonesia experienced similar pressures, including limitations in surge capacity and geographic inequalities in health resources, illustrating the need to connect emergency preparedness with long-term system strengthening rather than treating crisis response as a separate policy domain (Haldane et al., 2021; Mahendradhata et al., 2021).

Indonesia provides an especially important setting for analysing the relationship between health-system design and public health policy. The expansion of Jaminan Kesehatan Nasional (JKN) has markedly increased insurance coverage and financial protection for many households, yet effective UHC remains constrained by uneven service availability, geographic inequalities, supply-side limitations, and continued out-of-pocket expenditure. Evidence also shows that the incidence of health financing in Indonesia has important distributional consequences, while vulnerable and rural populations can still face substantial out-of-pocket payments even when insured. These findings indicate that insurance expansion must be accompanied by stronger service capacity, more equitable resource allocation, and policies that address structural differences across regions (Pratiwi et al., 2021; Cheng et al., 2022; Maulana et al., 2022).

Against this background, the article addresses two research questions. RQ1 asks: How do the core components of public health systems—governance, financing, health workforce, service delivery, primary health care, information systems, community participation, and intersectoral action—interact to shape access, quality, equity, resilience, and population health outcomes? RQ2 asks: Which policy and implementation conditions are most important for strengthening public health systems in contemporary settings, particularly in Indonesia, where UHC expansion, geographic disparities, digital transformation, and preparedness for future health shocks must be pursued simultaneously?

The article therefore aims to critically synthesise contemporary literature on public health systems and public health policy; explain the conceptual relationships among system components, governance, financing, equity, digital transformation, resilience, and evidence-informed policymaking; evaluate the principal challenges affecting policy implementation and health-system performance; and identify strategic priorities for building more equitable, resilient, data-enabled, people-centred, and sustainable public health systems. By linking global evidence with Indonesia-specific experience, the review is intended to provide a coherent analytical foundation for the subsequent discussion of system strengthening and policy reform.

LITERATURE REVIEW

Conceptualising Public Health Systems as Complex Adaptive Systems

Contemporary public health systems are best understood not as collections of isolated institutions but as complex adaptive systems in which governance, financing, service delivery, public-health functions, workforce capacity, information, technologies, communities, and wider social institutions interact continuously. This perspective moves beyond a narrow focus on hospitals and clinical care by recognising that population health depends on relationships across levels of government and across sectors, as well as on the ability of systems to learn and adapt. Calls to reconceptualise health systems therefore emphasise people, power, relationships, institutional arrangements, and context alongside conventional building blocks (Shroff et al., 2021; Haldane et al., 2021). This systems perspective is especially important because improvements in one component do not automatically translate into better population outcomes if other components remain weak. Expanded financing, for example, may not improve effective access where health workers, medicines, referral pathways, or service quality are insufficient. Similarly, sophisticated information platforms have limited value if governance structures cannot convert information into timely decisions. Health-system performance is consequently an emergent property of coordinated capacities rather than the simple sum of individual inputs (Shroff et al., 2021; Hanson et al., 2022; Sheikh et al., 2021).

Governance, Stewardship, and Accountability

Governance provides the institutional architecture through which health-system priorities are defined, authority is distributed, resources are allocated, and public and private actors are held accountable. Effective stewardship requires transparent decision-making, regulatory capacity, strategic purchasing, coordination across administrative levels, and mechanisms for monitoring performance. The COVID-19 experience demonstrated that governance quality also shapes the speed with which systems can mobilise resources, coordinate public-health functions, communicate risk, and maintain public trust during shocks (Haldane et al., 2021; Lal et al., 2021). Governance is not purely hierarchical. Contemporary health systems increasingly depend on networked forms of coordination involving ministries, local governments, providers, insurers, civil society, communities, and private organisations. This creates opportunities for innovation but also raises risks of fragmentation, duplication, and unclear accountability. Strong governance therefore requires both vertical coherence—from national policy to local implementation—and horizontal coordination across organisations and sectors. Community governance mechanisms are particularly important in primary health care because they connect policy intent with local knowledge, accountability, and problem-solving (Madon and Krishna, 2022; Baumann et al., 2022).

Health Financing, Financial Protection, and Universal Health Coverage

Health financing is a central determinant of whether policy commitments are translated into accessible and equitable services. Its core functions include revenue mobilisation, pooling, allocation, and purchasing. From a UHC perspective, the objective is not simply to increase total spending or insurance enrolment, but to ensure that people can obtain needed, good-quality services without financial hardship. Cross-country evidence demonstrates substantial variation between nominal coverage and effective coverage, reinforcing the importance of service quality, financial protection, and distributional equity as complementary dimensions of UHC (GBD 2019 Universal Health Coverage. Collaborators, 2020; Wagstaff and Neelsen, 2020; Ridde and Hane, 2021). Primary health care financing is particularly important because PHC is the platform through which many preventive, promotive, curative, and public-health functions reach populations. Financing arrangements influence the availability of staff, medicines, diagnostics, infrastructure, and outreach, while provider-payment mechanisms create incentives that can either support or undermine continuity and quality. The Lancet Global Health Commission on financing PHC argues that people-centred allocation, adequate pooled public funding, and appropriate purchasing arrangements are fundamental to high-performing PHC and UHC (Hanson et al., 2022).

Primary Health Care, Service Delivery, and Integrated Care

Primary health care is conceptually broader than first-contact clinical services. It combines accessible first-contact care, continuity, comprehensiveness, coordination, community orientation, and essential public-health functions. When adequately resourced, PHC can reduce avoidable reliance on hospitals, support earlier detection and management of chronic disease, facilitate vaccination and prevention, and create stronger connections between households, communities, and referral services. Financing and organisation therefore need to position PHC as a system-wide coordinating platform rather than as a low-cost residual service for underserved populations (Hanson et al., 2022; Madon and Krishna, 2022). Integration is equally important because fragmented systems impose transaction costs on patients, providers, and policymakers. Fragmentation can separate disease programmes from general services, public-health functions from clinical delivery, and financial coverage from actual service availability. The COVID-19 pandemic exposed the consequences of such fragmentation and strengthened the case for aligning UHC, health security, and routine service delivery within common governance, financing, and information arrangements (Lal et al., 2021; Haldane et al., 2021).

Health Workforce as a System Capability

The health workforce is not simply an input into service delivery; it is a core system capability that determines whether policies can be implemented in practice. Workforce adequacy depends on numbers, skills, geographic distribution, team composition, working conditions, supervision, and opportunities for continuing professional development. Global analyses indicate that aggregate workforce growth can coexist with severe distributional inequities, leaving rural, remote, and disadvantaged populations without effective access to essential services (Cometto et al., 2020; Boniol et al., 2022). Workforce policy must therefore connect education, labour-market planning, deployment, retention, regulation, and financing. Task sharing, multidisciplinary teams, digital support, and community health workers can extend reach, but their effectiveness depends on supervision, scope-of-practice rules, reliable financing, and referral relationships. In health-system terms, the workforce should be viewed as an adaptive network whose performance depends on institutional support rather than as a fixed stock of professionals (Cometto et al., 2020; Boniol et al., 2022).

Health Information, Digital Transformation, and Learning Health Systems

Health information systems provide the informational infrastructure for surveillance, resource allocation, quality improvement, and policy evaluation. Digitalisation expands these functions through interoperable electronic records, telehealth, real-time dashboards, analytics, and linked population data. However, digital transformation is not a purely technical undertaking. Its value depends on governance, standards, interoperability, privacy and cybersecurity protections, workforce capability, and the ability to translate data into action (Sheikh et al., 2021). The learning health system concept extends this logic by treating routine care and public-health practice as continuous sources of evidence

for improvement. In a learning system, science, informatics, incentives, organisational culture, and stakeholder participation are aligned so that evidence is generated and fed back into practice iteratively. This requires data infrastructure, but also institutional routines for interpretation, experimentation, implementation, and accountability (Friedman, 2022; Foley and Vale, 2023).

Health Equity and the Social Determinants of Health

Equity is a defining criterion of public-health system performance because health outcomes are patterned by the social distribution of resources and opportunities. Income, education, employment, housing, food security, transport, environmental exposures, discrimination, and geographic location influence both health risks and the ability to use health services. The COVID-19 pandemic demonstrated how social disadvantage can amplify exposure, vulnerability, and barriers to care, while simultaneously limiting the capacity to comply with public-health measures (Paremoer et al., 2021). A systems approach to equity therefore requires policies that address both health-care access and upstream determinants. This creates an explicit need for intersectoral action because many drivers of health lie outside ministries of health. Political and institutional incentives can obstruct such coordination, making intersectoral governance, shared objectives, accountability mechanisms, and attention to power relations essential components of health policy (Gopinathan and Buse, 2022; Buse et al., 2022).

Public Health Policy, Evidence, and Implementation

Public health policy translates social priorities into rules, programmes, budgets, incentives, and institutional arrangements. Evidence-informed policymaking is important, but evidence is only one input into decisions that are also shaped by values, political feasibility, fiscal constraints, stakeholder interests, legal authority, and administrative capacity. Consequently, a technically sound policy can still fail if its implementation requirements are poorly understood or if responsibilities and incentives are misaligned (Bullock et al., 2021). Implementation research shows that policy can function simultaneously as context, intervention, enabling mechanism, barrier, and outcome. Successful implementation therefore requires attention to actors, institutions, resources, communication, leadership, and feedback rather than assuming a linear progression from policy formulation to delivery. This is particularly relevant in decentralised systems, where national policy goals must be interpreted and operationalised across diverse local environments (Bullock et al., 2021; Madon and Krishna, 2022).

Community Participation and People-Centred Governance

Public and patient participation can improve the legitimacy, responsiveness, and contextual relevance of health policy when involvement is meaningful rather than symbolic. Participation may occur through consultation, co-design, advisory structures, community monitoring, or shared decision-making. Evidence indicates that the effectiveness of these mechanisms depends

strongly on how participants are selected, what authority they possess, the policy issue under consideration, and whether decision-makers are prepared to act on public input (Baumann et al., 2022; Pedersen et al., 2022). Participation is also central to innovation and service redesign. Involving patients, families, and communities across stages of innovation can reveal unmet needs, implementation barriers, and equity concerns that are less visible to institutional actors. However, participation requires resources, facilitation, transparency, and explicit attention to unequal power. Without these conditions, participatory structures can reproduce rather than reduce existing inequalities (Cluley et al., 2022; Madon and Krishna, 2022).

Resilience, Health Security, and Essential Public Health Functions

Health-system resilience refers to the capacity to prepare for, absorb, adapt to, recover from, and learn from shocks while preserving essential services. Contemporary resilience frameworks emphasise that this capacity emerges from governance, financing, workforce flexibility, supply systems, public-health functions, service-delivery networks, information, and community engagement. Comparative evidence from the COVID-19 pandemic indicates that highly resilient responses combined adaptive capacity with coordinated decision-making and measures to protect vulnerable populations (Haldane et al., 2021; Arsenault et al., 2022). Resilience should not be interpreted as a narrow emergency-preparedness function. A system that performs poorly during routine periods is unlikely to become resilient during crisis. Preparedness therefore needs to be built on strong PHC, equitable financing, trusted institutions, adequate workforce, integrated surveillance, and the capacity to maintain essential services under stress. Aligning health security with UHC and equity avoids the creation of parallel systems that compete for attention and resources (Lal et al., 2021; Haldane et al., 2021).

Indonesia: UHC Expansion, Supply-Side Constraints, and Equity

Indonesia illustrates the distinction between coverage expansion and effective universalism. Jaminan Kesehatan Nasional has substantially expanded financial coverage, but access and financial protection remain influenced by service availability, regional resource distribution, provider capacity, and household vulnerability. National analyses indicate that insurance coverage alone does not eliminate inequity when geographic differences in health spending and service supply remain large (Pratiwi et al., 2021; Pradhan and Sparrow, 2021; Cheng et al., 2022). The Indonesian experience also highlights the importance of aligning financing reform with service-delivery strengthening. JKN can reduce out-of-pocket expenditure for vulnerable groups, yet benefits depend on whether accessible facilities and qualified providers are available. COVID-19 further exposed constraints in hospital capacity, public-health preparedness, workforce distribution, and coordination, reinforcing the need to connect UHC reform with stronger PHC, surveillance, digital infrastructure, and local implementation capacity (Mahendradhata et al., 2021; Maulana et al., 2022).

Integrative Conceptual Framework for the Article

The literature supports an integrated conceptual framework in which public health system performance is produced through interactions among governance, financing, PHC and service delivery, workforce capability, information and digital infrastructure, community participation, and intersectoral action. These interacting capacities shape intermediate system properties—access, quality, responsiveness, financial protection, equity, learning capacity, and resilience—which in turn influence population health outcomes. No single component can substitute for weakness in the others; policy coherence and implementation capacity are therefore central analytical concerns (Shroff et al., 2021; Hanson et al., 2022; Haldane et al., 2021). This framework provides the theoretical bridge to the research questions. RQ1 is addressed by examining how system components interact rather than assessing each component in isolation. RQ2 is addressed by analysing the policy and implementation conditions that determine whether reforms—particularly UHC expansion, digitalisation, PHC strengthening, and preparedness—produce equitable and sustainable improvements. The framework also justifies particular attention to Indonesia, where financing reform, geographic diversity, decentralised implementation, and digital transformation make system interactions especially visible (Pratiwi et al., 2021; Cheng et al., 2022; Sheikh et al., 2021).

METHODOLOGY

This article employed a qualitative literature review (QLR) with a narrative-integrative orientation to interpret and synthesise contemporary evidence on public health systems and public health policy. This approach was selected because the research questions concern how multiple system components—governance, financing, primary health care, workforce capacity, information and digital infrastructure, community participation, equity, resilience, and policy implementation—interact across heterogeneous institutional and national contexts, rather than seeking a pooled effect estimate for a narrowly defined intervention. The review is therefore explicitly not a systematic literature review: it did not use PRISMA-based exhaustive screening, protocol registration, formal risk-of-bias scoring, or meta-analysis. Methodological rigour was instead pursued through a clearly bounded topic, research-question-led selection, critical comparison of perspectives, and integrative synthesis, consistent with contemporary guidance on narrative and integrative reviews (Elsbach and van Knippenberg, 2020; Sukhera, 2022).

Literature was identified purposively and iteratively, with priority given to peer-reviewed journal articles published from 2020 to 2026 in English or Indonesian and to sources that could be verified through a DOI or a stable publisher/indexing record. Searches were organised around combinations of concepts including public health systems, health policy, governance, universal health coverage, health financing, primary health care, health workforce, digital health, health equity, social determinants of health, community participation, health-system resilience, implementation, Indonesia, and Jaminan Kesehatan Nasional (JKN). Seminal pre-2020 sources were considered only when necessary

to clarify a foundational concept, while the analytical narrative was anchored primarily in contemporary literature. Sources were retained on the basis of topical relevance, methodological or conceptual contribution, credibility of the publication outlet, contextual fit, and bibliographic traceability; this purposive and bounded strategy is consistent with state-of-the-art and integrative review methodologies that emphasise a representative and analytically useful corpus rather than exhaustive retrieval (Barry, Merkebu and Varpio, 2022; Lubbe, ten Ham-Baloyi and Smit, 2020).

The selected literature was analysed through iterative thematic comparison and integrative synthesis. Evidence was organised into interconnected analytical domains covering governance and accountability; financing and financial protection; primary health care and service delivery; workforce capability; information systems and digital transformation; equity and social determinants; community participation; resilience and health security; and policy formulation, implementation, and evaluation. Within each domain, the review compared proposed mechanisms, institutional dependencies, implementation barriers and facilitators, equity implications, and reported system-level outcomes, and then examined cross-domain interactions to construct an explanatory framework linking system capacities to access, quality, responsiveness, financial protection, learning capacity, resilience, and population health. Indonesian evidence was interpreted as a context-specific application rather than assumed to represent all low- and middle-income countries, and conflicting findings or implementation constraints were retained in the synthesis rather than being forced into a single causal narrative. This interpretive procedure was used directly to address RQ1 and RQ2 and to generate the policy and research implications developed in the Results and Discussion section (Elsbach and van Knippenberg, 2020; Barry, Merkebu and Varpio, 2022; Sukhera, 2022).

RESULTS AND DISCUSSION

1. Public Health System Performance as an Interaction of Core System Functions

The synthesis shows that public health system performance is best understood as an emergent property of interactions among governance, financing, service delivery, the health workforce, information systems, public health functions, community participation, and the social determinants of health. No component operates independently. Financing determines whether services and personnel can be deployed; governance shapes accountability and resource allocation; workforce availability influences whether nominal entitlements can be converted into effective access; data systems determine how quickly problems are detected and corrected; and community participation influences trust, uptake, and responsiveness. This systems perspective is consistent with contemporary efforts to reconceptualise health systems as dynamic arrangements of institutions, people, relationships, power, and resources rather than as a checklist of technical building blocks (Shroff et al., 2021; Haldane et al., 2021; Debie, Khatri and Assefa, 2022). The interaction among these functions is particularly important for equity. Expanding one dimension, such as insurance coverage, does not automatically compensate for weak service availability,

workforce shortages, low quality, or geographic exclusion. Likewise, strong hospitals cannot substitute for weak disease surveillance, fragmented primary care, or inadequate public health capacity. Effective universalism therefore requires coordinated investments across financial protection, service capacity, quality, and population-level prevention. Studies of UHC consistently emphasise that meaningful progress must combine service coverage with quality and financial protection rather than measuring entitlement alone (GBD 2019 Universal Health Coverage Collaborators, 2020; Wagstaff and Neelsen, 2020; Endalamaw et al., 2022). Figure 1 summarises this systems interpretation by positioning population health, equity, and resilience as the joint product of eight mutually dependent public health system capabilities.



Figure 1. Integrated Architecture of a Resilient and Equitable Public Health System.

As Figure 1 illustrates, a high-performing public health system requires more than the presence of individual programmes. Governance must align financing, primary care, workforce policy, digital information, community participation, intersectoral action, and public health functions around shared population-health objectives. The model also highlights feedback: data, community experience, and implementation evidence should continually inform financing and policy decisions. This is the logic of a learning system rather than a static administrative structure (Sheikh et al., 2021; Friedman, 2022; De Bruin et al., 2023).

2. Financing, Universal Health Coverage, and Equity: From Nominal Coverage to Effective Access

Health financing is central to public health system performance because it affects revenue mobilisation, risk pooling, purchasing, provider incentives, and financial protection. The evidence reviewed here indicates that UHC should not be reduced to insurance enrolment. Effective UHC requires that people can obtain needed services of adequate quality without financial hardship, including preventive and primary care. Public financing for primary health care is particularly important because PHC is the platform through which many cost-effective interventions, chronic-disease services, and public health functions are delivered (Hanson et al., 2022; Brundtland, 2022; Endalamaw et al., 2022). Indonesia illustrates the difference between nominal coverage and effective access. JKN has expanded financial protection and has reduced out-of-pocket expenditure for many service users, especially among poorer and rural populations, yet supply-side constraints remain decisive. National analyses show that districts with lower service availability may also have lower utilisation and lower claims, meaning insurance status alone can overstate actual access. Financing incidence and benefit incidence analyses further indicate that geographic and socioeconomic patterns of service use continue to shape who benefits from public spending (Pratiwi et al., 2021; Maulana et al., 2022; Cheng et al., 2022; Asante et al., 2023).The policy implication is that Indonesia's next phase of UHC should emphasise effective service coverage: adequate primary-care capacity, referral connectivity, medicines and diagnostics, quality assurance, and targeted investment in underserved districts. Geographic spending variation can reinforce benefit inequality when resources do not follow population need, while disease-management programmes can show substantial regional differences in uptake, quality, and outcomes. These findings support a shift from measuring enrolment toward assessing who receives effective, high-quality services and who remains excluded despite formal coverage (Pradhan and Sparrow, 2021; Mulyanto et al., 2023; Putri, Laksono and Rohmah, 2023).

3. Primary Health Care, Workforce, and Service Delivery Capacity

Primary health care is the operational interface between population needs and the health system. Strong PHC can integrate prevention, early detection, routine treatment, chronic-disease management, referral, and community-oriented services. However, PHC cannot perform these functions without sufficient public financing, functional supply chains, adequate diagnostics, and trained personnel. The Lancet Global Health Commission on PHC financing emphasises that people-centred primary care is both a UHC strategy and a health-security investment because it reduces avoidable demand on hospitals while maintaining essential services during crises (Hanson et al., 2022; Brundtland, 2022). Workforce capacity is a particularly important constraint. Globally, health-worker shortages and maldistribution threaten the universality of UHC, and the problem is more acute when rural and remote areas depend on a limited pool of trained personnel. Indonesia faces both quantity and distribution challenges, with specialists and other cadres remaining concentrated in urban areas and provincial centres. These patterns imply that workforce policy

should combine education and recruitment with retention incentives, task-sharing, supportive supervision, safe working conditions, and location-specific planning rather than relying on aggregate national headcounts (Cometto, Buchan and Dussault, 2020; Boniol et al., 2022; Muharram et al., 2024). The service-delivery implications are substantial. Where workforce and infrastructure are uneven, referral pathways become fragile and insurance benefits cannot be fully realised. Community-oriented primary care and local governance mechanisms can partly reduce this gap by linking facilities to community actors, improving problem identification, and supporting accountability. Nevertheless, community mechanisms are not substitutes for sufficient professional capacity; they work best when embedded within adequately financed and technically capable PHC systems (Madon and Krishna, 2022; Jain et al., 2022).

4. Digital Transformation, Information Systems, and Learning Health Systems

Digital transformation creates opportunities to improve surveillance, care coordination, claims administration, telehealth, and policy intelligence, but technology contributes to system performance only when supported by interoperable standards, data governance, privacy safeguards, and organisational capability. National learning health systems require data to flow from routine service delivery into analysis, decision making, implementation, and re-evaluation. This makes interoperability and institutional learning more important than the mere accumulation of digital applications (Sheikh et al., 2021; Foley and Vale, 2023; De Bruin et al., 2023). For Indonesia, digital reform must address the practical conditions of adoption. Studies of personal health records identify technological, organisational, environmental, and individual barriers, including regulation, vendor support, infrastructure, and availability of IT-skilled personnel. Experience from resource-limited settings also shows that digital interventions scale more effectively when they are designed around users, delivered through multiple channels, and linked to measurable health-seeking or service outcomes rather than treated as stand-alone apps. The digital divide therefore remains a public health equity issue as much as a technical one (Harahap, Handayani and Hidayanto, 2022; Hazra-Ganju et al., 2023; Mitgang, Blaya and Chopra, 2021).

5. Evidence-Informed Policy, Implementation, Evaluation, and Adaptive Learning

A recurring finding across the literature is the gap between policy formulation and policy performance. Evidence can inform the definition of problems and selection of interventions, but implementation depends on institutions, incentives, leadership, administrative capacity, communication, stakeholder alignment, and local feasibility. Policy itself can function as an intervention, an enabling context, or a barrier. Consequently, effective public health policy should be analysed through the entire sequence from problem definition to implementation, monitoring, evaluation, and redesign rather than being judged only by whether a regulation or programme has formally been adopted (Bullock et al., 2021; Debie, Khatri and Assefa, 2022). Figure 2 presents

this process as an iterative policy-learning cycle rather than a linear sequence. The framework is especially relevant for complex reforms such as UHC, digital transformation, workforce redistribution, and NCD prevention, where implementation conditions change over time and policy learning must be continuous.



Figure 2. From Evidence to Public Health Policy Impact

The figure emphasises that monitoring and evaluation should not be treated as end-stage auditing. Instead, evaluation generates evidence for policy adaptation, scaling, or redesign. This orientation is consistent with implementation science, which highlights the need to understand context, mechanisms, feasibility, and unintended consequences. It also aligns with learning-health-system approaches in which data and stakeholder feedback create recurrent cycles of improvement (Bullock et al., 2021; Friedman, 2022; Foley and Vale, 2023). Indonesia's COVID-19 experience demonstrates why this feedback loop matters. Analyses of early pandemic policy identified problems of coordination, transparency, fragmented authority, and inconsistent communication, while ecological evidence showed that healthcare availability was associated with variation in outcomes across provinces. These findings suggest that policy capacity includes not only technical expertise but also institutional coordination, trusted communication, and the ability to revise decisions when new evidence emerges (Ayuningtyas et al., 2021; Wirawan and Januraga, 2021; Mahendradhata et al., 2021).

6. Social Determinants, Community Participation, and Intersectoral Action

Public health outcomes are strongly shaped by conditions outside formal healthcare, including income, education, housing, employment, food security, environmental exposure, and social protection. The COVID-19 pandemic demonstrated how these determinants influence exposure, vulnerability, and the ability to comply with public health measures. For this reason, health policy that focuses solely on healthcare delivery risks reproducing existing inequalities. Intersectoral action is required, but its effectiveness depends on political incentives, institutional ownership, and mechanisms for accountability across

sectors (Paremoer et al., 2021; Buse et al., 2022; Marmot, 2020). Community participation is another cross-cutting determinant of implementation quality. Evidence suggests that involvement can improve relevance, legitimacy, and service responsiveness, but outcomes depend on who participates, whether decision authority is meaningful, how vulnerable groups are represented, and whether institutions are prepared to act on public input. Community engagement has also been associated with improved uptake of specific public health interventions, including routine immunisation, although effectiveness varies by design and context (Baumann, Reinhold and Brütt, 2022; Pedersen et al., 2022; Jain et al., 2022; Bergholtz et al., 2024). Importantly, participation can generate unintended effects when consultation is tokenistic, power differences are ignored, or participants carry burdens without influencing decisions. Realist and thematic syntheses therefore support moving from participation as a symbolic requirement toward structured co-design, feedback, transparency, and social accountability. This is particularly relevant for community health services and WASH programmes, where local ownership and institutional support jointly affect sustainability (Nelson et al., 2021; Pedersen et al., 2022).

7. Indonesia: From Coverage Expansion to Effective Universalism

Indonesia has made major progress toward UHC, but the literature indicates that the next stage of reform must focus on effective universalism. This means aligning JKN financing with service availability, workforce distribution, quality, continuity, digital interoperability, and public health capacity. Financial protection has improved for many households, yet significant out-of-pocket spending persists, while benefit incidence and access vary by geography and socioeconomic position. The policy challenge is therefore not only to sustain enrolment but to ensure that formal coverage is matched by real capacity to deliver care when and where people need it (Pratiwi et al., 2021; Cheng et al., 2022; Maulana et al., 2022; Asante et al., 2023). Figure 3 translates these findings into a system-strengthening pathway for Indonesia, moving from coverage expansion to service availability, quality and equity, and ultimately to a resilient learning system.



Figure 3. Public Health System Strengthening in Indonesia: From Coverage to Effective Universalism

The pathway identifies geographic inequality, supply-side constraints, and workforce maldistribution as central barriers. These constraints are mutually reinforcing: limited local infrastructure reduces service use; low service volume can weaken provider incentives; and specialist concentration in urban centres deepens referral inequities. Indonesia's future reforms should therefore strengthen PHC, workforce planning, digital interoperability, public-health surveillance, and community accountability as connected elements of the same system rather than as isolated programmes (Pradhan and Sparrow, 2021; Mahendradhata et al., 2021; Muharram et al., 2024; Harahap, Handayani and Hidayanto, 2022). Quality should also be made explicit in the UHC agenda. International reviews show that UHC becomes genuinely universal only when financial protection is accompanied by accessible, comprehensive, and good-quality services. Indonesian evidence on diabetes management and provider incentives indicates that formal coverage can coexist with variation in service quality and potential behavioural responses within payment systems, underscoring the need for quality measurement, purchasing reform, and accountability (Endalamaw et al., 2022; Mulyanto et al., 2023; Syafrawati et al., 2023).

8. Health-System Resilience and Essential Public Health Functions

The reviewed evidence indicates that resilience should be understood as a continuous system capability rather than an emergency-only attribute. Resilient systems prepare for shocks, absorb acute pressure, adapt service delivery, recover essential functions, and institutionalise learning. Comparative analyses of COVID-19 responses demonstrate that resilience depends on governance and financing, workforce protection, public health functions, service delivery, supply systems, and community engagement operating together. Fragmentation between public health security and UHC can therefore weaken both routine care and crisis response (Alfaro et al., 2021; Haldane et al., 2021; Lal et al., 2021; Arsenault et al., 2022). Figure 4 synthesises the main determinants of resilience identified across the reviewed literature, highlighting governance, sustainable financing, workforce capability, public health functions, service delivery, data systems, and community trust.



Figure 4. Determinants of Public Health System Resilience

The figure reinforces two conclusions. First, resilient public health systems require investment before crises, especially in PHC, surveillance, workforce capacity, and trusted institutions. Second, resilience requires integration: surveillance must connect with service delivery, emergency funding must protect essential care, and risk communication must be linked to community engagement. The renewed essential public health functions framework similarly argues that public health functions can bridge UHC, health security, and wider system strengthening (Zhang et al., 2023; Haldane et al., 2021).

9. Synthesis and Explicit Answers to the Research Questions

RQ1 asked how the core components of public health systems interact to shape access, quality, equity, resilience, and population health outcomes. The evidence indicates that these outcomes arise from system interactions rather than isolated inputs. Governance establishes priorities and accountability; financing determines what can be purchased; PHC and service delivery translate resources into care; workforce capacity sets practical delivery limits; information systems enable surveillance and learning; community participation shapes legitimacy and uptake; and intersectoral action addresses the wider determinants of health. Weakness in any one component can reduce the effectiveness of the others, which explains why insurance expansion, digitalisation, or infrastructure investment alone rarely produces equitable system-wide improvement (Shroff et al., 2021; Haldane et al., 2021; Hanson et al., 2022; Sheikh et al., 2021). RQ2 asked which policy and implementation conditions are most important for strengthening public health systems, particularly in Indonesia. The synthesis identifies seven recurring conditions: coherent governance and accountability; sustainable and equitable financing; strong PHC and referral systems; adequate and fairly distributed workforce capacity; interoperable data and digital infrastructure; meaningful community participation; and institutionalised monitoring, evaluation, and adaptive learning. In Indonesia, these conditions must be pursued together with explicit attention to geographic inequality, supply-side limitations, and quality variation if JKN is to progress from broad coverage toward effective universalism (Pratiwi et al., 2021; Cheng et al., 2022; Asante et al., 2023; Muharram et al., 2024). The overall analytical conclusion is therefore that public health policy should be designed as system change rather than as a collection of programmes. Effective reforms connect financing with service capacity, policy design with implementation institutions, data with learning, and national priorities with local adaptation. They also incorporate equity and resilience as design criteria from the outset, rather than treating them as secondary outcomes. This orientation is consistent with governance and implementation literature emphasising the need to integrate UHC, health security, quality, and social accountability within adaptive institutions (Debie, Khatri and Assefa, 2022; Bullock et al., 2021; Zhang et al., 2023).

CONCLUSIONS AND RECOMMENDATIONS

Public health systems are complex institutional arrangements in which governance, financing, primary health care, workforce capacity, information systems, public health functions, community participation, and the social determinants of health operate interdependently. The central implication of this review is that population health performance cannot be explained by any one component in isolation. Sustainable improvement requires coordinated system strengthening in which resources, institutions, data, and communities are aligned around equity, quality, and population need.

Universal health coverage remains a critical organising goal, but the evidence reviewed here shows that insurance enrolment and formal entitlement are insufficient measures of success. Effective universalism requires available services, competent personnel, functional referral systems, good-quality care, and protection against financial hardship. Indonesia's JKN has created an important foundation, yet geographic inequality, supply-side constraints, workforce maldistribution, and differences in service quality continue to limit the translation of nominal coverage into equitable access.

The review also shows that contemporary public health systems must be able to learn and adapt. Digital health, interoperable information systems, monitoring, evaluation, and implementation science can help convert routine data and experience into policy improvement. However, digitalisation should be approached as institutional transformation rather than technology procurement. Data governance, privacy, workforce capability, organisational readiness, and equitable access to digital tools are essential to prevent digital innovation from reproducing existing inequalities.

Resilience should similarly be embedded in routine system design rather than activated only during emergencies. Strong primary care, sustainable financing, adequate workforce capacity, surveillance, trusted communication, community engagement, and intersectoral coordination strengthen both day-to-day health services and the ability to respond to shocks. The COVID-19 experience demonstrated that fragmented systems struggle to protect essential services during crises, whereas integrated systems can adapt more effectively while preserving public trust and continuity of care.

Future research should move beyond descriptive comparisons of health-system components toward implementation-oriented studies that examine how combinations of governance, financing, workforce policy, digital infrastructure, and community participation produce different outcomes across contexts. For Indonesia, priority areas include district-level analyses of effective service coverage, longitudinal evaluation of workforce redistribution, quality-adjusted assessment of JKN benefits, implementation studies of integrated digital health systems, and comparative evaluation of community accountability mechanisms. Such research would provide a stronger empirical basis for building a public health system that is equitable, resilient, people-centred, and capable of continuous learning.

FURTHER STUDY

This study still has some limitations, so further research on the topic Strengthening Public Health Systems for Effective Universalism: Governance, Equity, Digital Transformation, Resilience, and Lessons From Indonesia—A Review is needed to improve this study and provide more insights for both the authors and the readers

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