Perspectives

Improving Equitable Access to Antenatal Care in China: Challenges and Potential Innovative Approaches

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ABSTRACT

Achieving equitable antenatal care (ANC) is fundamental to China's 'Healthy China 2030' agenda and its universal health coverage (UHC) commitments. Despite measurable national progress, substantial urban-rural and regional disparities in ANC access persist, driven by a complex interplay of financial, geographic, institutional, and digital barriers that disproportionately affect rural, low-income, and migrant populations. This analysis examines the current landscape of ANC in China, identifying core structural challenges including the enduring legacy of the *hukou* (household registration) system, a widening digital divide, and the maldistribution of healthcare resources. We contend that piecemeal interventions are insufficient to address these deeply rooted inequities. Instead, this Viewpoint advances an integrated 'spatial-technology-institutional' strategy that synergizes innovations across three mutually reinforcing domains: optimizing tiered healthcare delivery through smart payment reforms, deploying geospatial tools for evidence-based resource allocation, constructing an inclusive digital ANC ecosystem, and establishing sustainable talent incentive mechanisms for grassroots healthcare workers. By implementing this coordinated, multi-pronged approach, China can systematically dismantle geographic inequities in maternal health and ensure equitable ANC access for all women.

Equitable access to maternal health services is a cornerstone of universal health coverage (UHC) and a key indicator of a nation's commitment to health as a fundamental human right (*1*–*3*). Although China has made remarkable strides in improving maternal health outcomes over recent decades, national averages obscure deep-seated and persistent inequities. The maternal mortality ratio (MMR) in rural China (17.0 per 100,000 live births) remained 1.36 times that of urban areas (12.5 per 100,000 live births) in 2023, a stark reminder that geographic location continues to be a critical determinant of survival for pregnant women (*4*–*5*).

Antenatal care (ANC) represents the primary and most essential mechanism for safeguarding maternal and fetal well-being. Disparities in ANC utilisation extend well beyond service statistics, reflecting a complex interplay of structural barriers that include spatial inaccessibility, socioeconomic stratification, inefficiencies in healthcare delivery, and a rapidly widening digital divide (*6*–*7*). This Viewpoint argues that addressing these interconnected challenges requires a paradigm shift from fragmented, project-based interventions to a systems-thinking approach. We leverage integrated innovations across infrastructure, digital technology, and institutional policy to examine how China can bridge the equity gap, with particular focus on its most vulnerable populations: those residing in remote regions and internally migrated communities.

The Challenge: Multifaceted Barriers to Equitable ANC

Geographic and socioeconomic disparities At the national level in 2023, aggregate ANC indicators appear encouraging: the prenatal examination rate (the proportion of women who received one or more antenatal checkups relative to the number of live births during the year) stood at 98.2%, the maternal system management rate at 94.5%, and the health record establishment rate (the proportion of women who had a health record account relative to the number of women who gave birth during the year) at 95.6% (*5*,*8*). However, a regional breakdown reveals a markedly different picture. The eastern region consistently outperforms the national average, whereas the western region lags considerably, with Xizang Autonomous Region representing a particularly pronounced outlier. In Xizang, the prenatal examination rate was only 92.1% and the system

management rate only 81.9% (*5*). These disparities reflect not merely differences in service uptake, but fundamental gaps in resource capacity. Although the western region has a greater number of maternal and child health institutions, these facilities have fewer beds per institution and are substantially more dependent on government financial allocation — accounting for 21.7% of total income in the west compared with 15.2% in the east — indicating a structurally weaker capacity to generate revenue and sustain high-quality services (*8*). This financial allocation refers to fiscal utility funds (including flat-rate subsidies) provided directly to the healthcare institutions by the competent authorities, rather than direct financial assistance to patients. This dynamic perpetuates a cycle of chronic underinvestment and poorer health outcomes that aggregate national statistics consistently obscure.

Double burden of demographic shift and migration China's demographic landscape is undergoing profound transformation. The shift from the one-child policy to a three-child policy has driven a marked rise in advanced maternal age (≥35 years) pregnancies, which reached 15.8% nationally in 2019 (*9*). This trend, observed consistently across both urban and rural settings, substantially elevates the risk of obstetric complications such as preeclampsia and placental abnormalities — conditions that typically necessitate specialised, higher-level ANC (*10*–*11*). Compounding this challenge, China's internal migrant population now numbers approximately 380 million (*12*). The household registration (*hukou*) system remains a significant structural impediment to equitable service utilization, as it ties access to social services — including urban health insurance — to one's place of origin rather than current residence (*13*–*14*). As a consequence, many migrant women are compelled to return to their rural hometowns for childbirth in order to access insurance reimbursement, a phenomenon commonly referred to as 'medical return'. This return journey imposes considerable unsubsidised expenses — including long-distance transportation, accommodation, and lost income — that serve as a powerful financial deterrent to receiving continuous and timely ANC in their cities of residence (*13*).

Financial barriers and health insurance gaps Despite the dramatic expansion of health insurance coverage in China, financial barriers remain a primary obstacle to equitable ANC access. While direct medical costs for hospital delivery are heavily subsidised, the indirect costs associated with seeking care are not. For rural and migrant women, expenses related to transportation, accommodation, and lost income from informal or agricultural work can add 15%–20% to their total out-of-pocket (OOP) expenditure (*15*). The 2016 integration of rural and urban resident insurance schemes represented a meaningful policy advance; however, reimbursement rates for outpatient ANC services have not fully offset longstanding OOP gaps, particularly for advanced prenatal screenings (*16*). As a result, low-income rural households (annual income <30,000 Chinese Yuan) are 1.7 times more likely to forgo recommended ANC visits under the weight of these cumulative financial pressures (*15*).

Digital divide The rapid digitisation of healthcare holds considerable promise for bridging geographic gaps in service access, yet it simultaneously risks generating new forms of exclusion. Western and rural regions face a compounding triple burden: inadequate infrastructure, limited device access, and low digital literacy. In 2020, optical fiber density in western provinces was 42% lower than in eastern provinces, and rural internet users represented only 30.2% of the national total (*17*–*18*). Device ownership presents an additional structural constraint, with smart device ownership in rural low-income households standing at only 57% — 33 percentage points below that of urban households (*19*). Most critically, digital literacy gaps further compound these disparities. Rural women with an education level below senior high school have a 42% lower probability of effectively using online ANC services [odds ratio (*OR*)=0.58, 95% confidence interval (*CI*): 0.46–0.72, $P<0.001$] (*19*–*20*). Without systematically addressing these foundational barriers, telemedicine and digital health platforms will remain inaccessible to the populations who stand to benefit most.

Cultural and linguistic obstacles In ethnic minority regions such as Xizang, Xinjiang, and Inner Mongolia provincial-level administrative divisions (PLADs), cultural and linguistic barriers constitute a significant impediment to ANC service uptake (*21*). Traditional beliefs — including a preference for home delivery, reported by 39% of ethnic minority rural women — alongside skepticism toward modern medicine substantially reduce engagement with formal ANC (*22*).

Linguistic isolation further compounds this exclusion. Critically, 88% of telemedicine platforms operating in western ethnic regions lack multilingual support (e.g., in Tibetan or Uyghur), effectively excluding non-Mandarin-speaking women from digital health initiatives and the essential clinical information

these platforms provide (*23*).

The path forward: integrated innovative solutions

Addressing these deeply interconnected challenges requires China to move decisively beyond isolated, piecemeal interventions. We propose an integrated 'spatial-technology-institutional' (STI) framework (Figure 1) designed to generate synergistic, system-wide improvements in ANC equity.

Reinforcing the tiered system with targeted financial levers China has advanced a tiered service delivery model to decentralise care, establishing integrated one-stop ANC centres at the township level. By 2022, coverage of such centres in western rural areas had reached 78.3% (*24*). This structural reform is being reinforced by complementary financial innovations. The diagnosis-Intervention Packet (DIP) payment reform establishes clear reimbursement standards for basic ANC packages, incentivising primary facilities to deliver these services proactively (*25*–*26*). In addition, reimbursement rates for ANC provided at primary facilities are set 15%–20% higher than those at tertiary hospitals, creating a deliberate financial gradient to encourage care-seeking at the appropriate level.

To further advance equity, these financial mechanisms must be strengthened and more precisely targeted. Basic medical insurance could be expanded to cover high-cost ANC items — such as non-invasive prenatal DNA testing — in designated low-income counties in western China, accompanied by a firm cap on OOP expenditure for pregnant women living below the poverty line. Furthermore, the DIP reimbursement rate could be dynamically linked to a primary healthcare centre's (PHC) technical capacity — for instance, by tying higher payment levels to the proportion of staff holding certified ANC qualifications — thereby creating a direct financial incentive for quality improvement and sustained workforce investment (*27*). From a governance perspective, the draft outline of China's 15th Five-Year Plan, released in October 2025, proposed optimising fertility support policies and incentive measures, including reducing or exempting expenses associated with childbirth, reforms that may meaningfully facilitate ANC service utilisation (*28*).

Leveraging geospatial tools for resource optimization

China has made meaningful progress in leveraging geospatial analysis and telemedicine to address macro-level resource gaps. Eastern-western pairing assistance

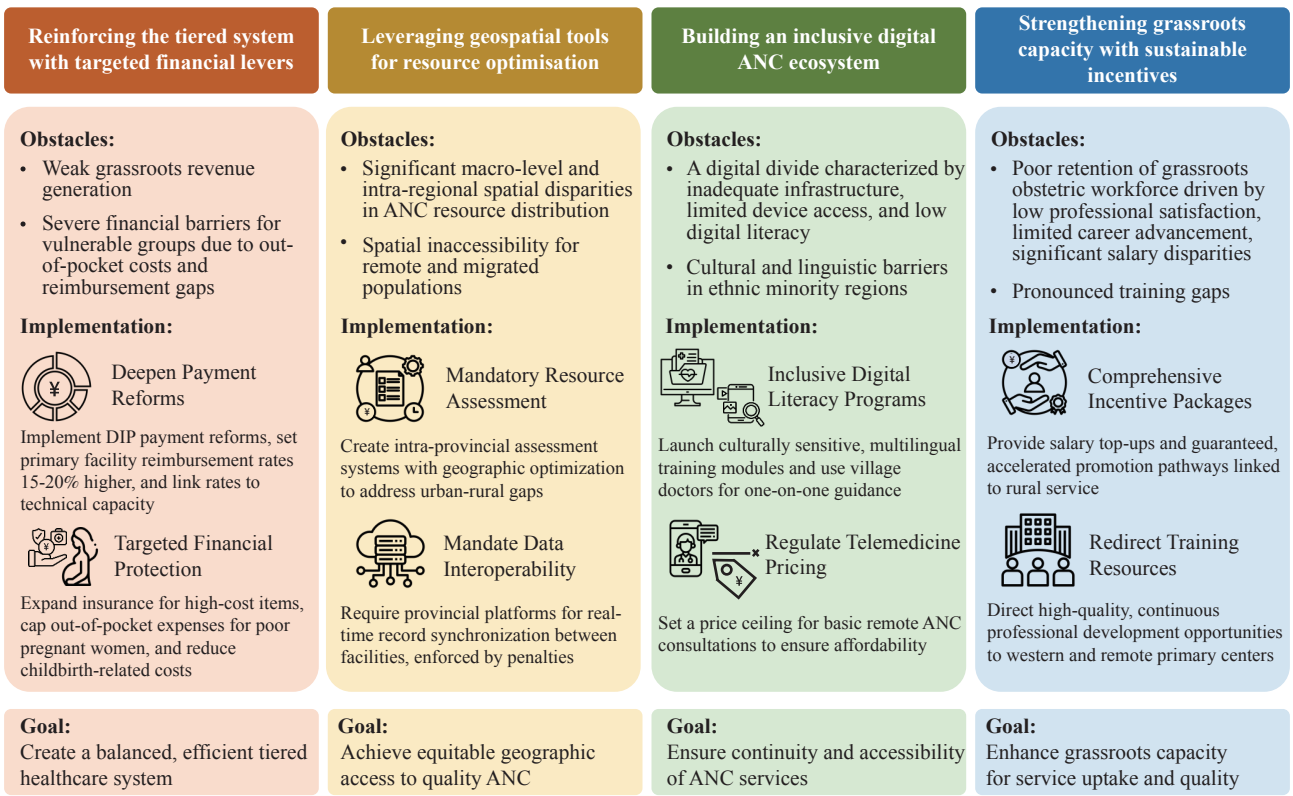

FIGURE 1. An integrated 'spatial-technology-institutional' framework.
Abbreviation: ANC=antenatal care.

programs and the construction of 'provincial-municipal-county' teleconsultation networks have demonstrated considerable success, completing over 120,000 remote ANC consultations in western counties in 2022 and reducing cross-province healthcare-seeking by 34% (*24*). National policies now mandate the application of spatial analysis to identify underserved areas for targeted resource deployment (*29*).

Attention must now shift toward intra-regional disparities, which account for over 60% of overall service gaps (*30*). We recommend establishing mandatory intra-provincial ANC resource balance assessment systems with geographic optimization capability, designed to continuously monitor and address inequities between centrally located urban areas and remote counties. This structural reform must be coupled with a requirement for provincially unified ANC data platforms that ensure real-time synchronization of prenatal examination records between PHC facilities and tertiary hospitals. To guarantee seamless care coordination and data-driven management, financial or performance-based penalties should be enforced for non-compliance (*31*).

Building an inclusive digital ANC ecosystem Initiatives to create cloud-based ANC ecosystems and distribute smart devices (e.g., fetal heart monitors) to pregnant women in remote areas show considerable promise. However, as noted above, their effectiveness is substantially undermined by persistent digital literacy gaps. Evidence indicates that even when devices are provided, only 41% of rural pregnant women in western China can operate them independently, and the effective usage rate of ANC applications plateaus at approximately 61% even following structured training (*32*).

A national commitment to 'digital inclusion' in maternal health is therefore urgently required. This entails the development and rollout of tiered, culturally sensitive digital literacy training programmes tailored to local contexts. Such programmes should employ accessible, simplified instructional formats — including short video modules delivered in local dialects, community health broadcasts, and social media content designed for low-literacy audiences — while leveraging village clinic staff to provide individualised, one-on-one guidance. This approach would simultaneously promote multilingual service delivery and help reorient traditional health-seeking behaviours. To incentivise participation, modest financial bonuses could be linked to the attainment of digital skills certification. Furthermore, given that private telemedicine platforms often demonstrate higher diagnostic accuracy (*OR*=3.85) but charge 40% more than their public counterparts, targeted regulatory measures are needed to establish a maximum price ceiling for basic remote ANC consultations, thereby ensuring that high-quality digital care remains financially accessible to low-income populations (*33*).

Strengthening grassroots capacity with sustainable incentives Initiatives such as the 'Eastern Medical Talent Pairing Assistance' programme and 'rural-oriented' medical education with compulsory service commitments play a vital role in stabilising the grassroots obstetric workforce (*34*–*35*). Nevertheless, retention remains a critical challenge, driven by persistent issues of low professional satisfaction, limited career advancement opportunities, and substantial salary disparities relative to urban hospitals. A pronounced training gap further deepens this quality divide: only 49% of western PHC staff receive annual ANC-related training, compared with 82% in the eastern region (*32*).

Incentive mechanisms must therefore be substantially strengthened and broadened in scope. Rather than relying on one-time subsidies, a comprehensive and sustained support package is required — one that encompasses salary supplements, guaranteed and accelerated promotion pathways explicitly tied to rural service tenure, and access to continuous, high-quality professional development. Targeted efforts must be made to channel training resources and opportunities toward western and remote PHCs, thereby establishing a virtuous cycle in which a well-trained workforce remains both motivated and equipped to deliver high-quality care (*36*).

Recommendations

In conclusion, achieving equitable ANC access in China requires a paradigm shift from piecemeal interventions to a systems-level, integrated approach. The proposed 'STI' framework provides a coherent logic for this transition. Its core lies in the synergistic interaction of three pillars: spatial optimization, which uses geospatial tools to identify and bridge physical access gaps; technological empowerment, which deploys inclusive digital solutions to transcend geographic distance; and institutional innovation, which crafts financial, talent, and data policies that incentivize equitable service delivery. These

components are not sequential but iterative, forming a reinforcing loop in which data from one pillar informs and strengthens the others, ultimately producing a resilient system capable of adapting to diverse local needs.

Translating this framework into practice, however, presents substantial implementation challenges. First, execution fatigue and capacity gaps at the grassroots level may leave overburdened health workers without the resources or motivation to adopt new technologies and protocols. Second, high coordination and data integration costs across disparate government departments — spanning health, finance, and telecommunications — require sustained political will and investment to align objectives and systems. Third, bridging the digital divide is a long-term undertaking that involves not only infrastructure rollout but also fundamental changes in user behavior and institutional trust, with measurable returns that are often considerably delayed.

A phased, adaptive implementation strategy offers a structured pathway to address these challenges and ensure tangible progress. An initial phase (1–2 years) would establish 3–5 demonstration zones in provinces with pronounced internal disparities, such as Sichuan and Yunnan, to pilot a unified resource monitoring platform, quality-linked bundled payment reforms, and digital literacy programs, with the explicit goal of validating the approach and refining implementation toolkits. This would be followed by a scale-up phase (3–5 years) to expand successful models across western China and migrant-receiving regions, mandating equity assessments, achieving full health record interoperability, and embedding digital inclusion metrics into local government performance evaluations. In a final consolidation phase (6–10 years), these practices would be integrated nationally, establishing equitable ANC access as a core system output and normalizing digital health options in remote areas. Throughout this process, the framework itself should be continuously refined through predictive analytics and the incorporation of broader social determinants of health. Sustained commitment to this coordinated, multi-pronged strategy would enable China to move beyond documenting disparities toward systematically eliminating them, securing maternal health rights for vulnerable populations and establishing a replicable model for achieving health equity through integrated innovation.

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