



Review article

Role transformation of Chinese obstetricians and improvement of obstetric service systems amid declining birth rates: Challenges and strategies

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ABSTRACT

Problem: China's declining birth rate presents significant challenges to obstetricians, impacting workload, career prospects, and the obstetric service system.

Background: The reduction in birth rates alters the landscape for obstetricians, necessitating adaptation to new medical demands and technological environments.

Aim: This paper aims to explore the future development and role transformations of Chinese obstetricians amidst declining birth rates.

Key questions include: What is the impact of declining birth rates on China's obstetric services? What are the future development directions for obstetricians in this scenario? How will their roles evolve to meet new medical demands and technological environments? What international experiences can be drawn upon, and how applicable are they to China?

Methods: A literature review method is employed, analyzing research papers, statistical data, and policy reports from domestic and international sources.

Findings: The paper systematically summarizes and evaluates current and future trends in Chinese obstetrics in the context of declining birth rates.

Discussion: It discusses practical implications for sustainable development, including optimizing medical resources, leveraging technological innovations, and enhancing talent development.

Conclusion: This paper contributes a comprehensive analysis and practical recommendations for navigating the challenges posed by declining birth rates to Chinese obstetricians.

1. Analysis of the current situation of obstetrics in China

In recent years, China's birth rate has significantly declined due to factors such as economic development, urbanization, higher female education levels, and changes in birth policies [5]. Since the 1990s, China's total fertility rate has remained below the replacement level of 2.1, and by 2023, the number of births further dropped to 9.02 million, a decrease of 8.84 million compared to the 17.86 million births in 2016. This reflects the fading of the fertility accumulation effect and the continued decline in the fertility rate [1–3]. This decline has not only altered the population structure but also profoundly impacted the obstetric service system.

With the decreasing birth rate, the demand for obstetric services has also diminished. Data from the China Health Statistical

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Yearbook shows that the national delivery volume in 2023 decreased by 10 % compared to 2022 [3], with urban areas experiencing a more significant drop. In urban hospitals, the occupancy rate of delivery wards fell by 15 % [4], and some obstetric hospitals even faced bed vacancies. In contrast, rural and remote areas, where medical resources are already scarce, continue to experience a stark mismatch between supply and demand. Despite a smaller decline in obstetric ward usage in these areas, resource shortages remain severe [5].

The decline in birth rates has significantly impacted the workload of obstetricians. On one hand, fewer delivery cases reduce clinical practice opportunities, potentially affecting the accumulation of clinical experience and skill enhancement for new doctors [6, 7]. For example, in a large general hospital, the number of delivery cases has been decreasing year by year [8], noticeably reducing internship and training opportunities for new doctors. On the other hand, advances in medical technology and the increasing demand for high-quality obstetric services from expectant mothers require obstetricians to continually update their knowledge and skills to manage complex high-risk pregnancies and deliveries. Surveys show that over 70 % [6,7] of obstetricians believe they need more training and education opportunities to meet these new challenges.

The decline in birth rates has also influenced hospital resource allocation. Hospitals may adjust their resources, reducing investments in obstetrics and redirecting them to departments with higher demand. Data from a tertiary hospital indicated an 8 % [9] reduction in the obstetrics budget in 2023 compared to the previous year, while budgets for pediatrics and geriatrics increased [7]. Such adjustments could delay the update of obstetric equipment and technology, affecting the quality and efficiency of obstetric services. Some hospitals are considering merging obstetric wards or sharing resources with other departments to cope with the decreased demand for obstetric services. A city-level hospital has already implemented this strategy, using shared resources to improve overall efficiency [6,12].

Despite the reduced demand for services due to the declining birth rate, there is an opportunity to enhance the quality of obstetric services. Hospitals can use this period to optimize obstetric service processes, improve staff training, and upgrade facilities and equipment to provide more efficient and high-quality obstetric services. For example, a maternity hospital invested special funds in updating obstetric equipment and training healthcare staff during the period of declining birth rates, achieving significant results [10]. Particularly in managing high-risk pregnancies and deliveries, the hospital utilized advanced medical technologies and equipment to offer more precise and personalized care, increasing the success rate of high-risk pregnancy management by 15 % [11,13].

The decline in birth rates has also profoundly affected the career development of obstetricians. As the demand for traditional delivery services decreases, obstetricians need to adjust their career paths, exploring new roles and development directions. A survey from a university-affiliated hospital showed that a large proportion of obstetricians expressed interest in transitioning to fields such as prenatal diagnosis and postpartum care [14]. Additionally, participating in reproductive health and women's healthcare has become a new career development direction. Data from a renowned reproductive health center indicated an increasing involvement of obstetricians in reproductive health and infertility treatments over recent years [11,13].

This analysis of the current state of obstetrics in China against the backdrop of declining birth rates reveals that, despite the challenges posed to the obstetric service system, there are also new opportunities for service optimization and quality improvement. Understanding how to achieve role transformation and career development for obstetricians in this context is a crucial topic for further exploration.

2. Future development directions

Amid declining birth rates, China's obstetric service system needs to enhance service quality and efficiency by optimizing medical resources, innovating technology and equipment, and focusing on talent development and team building. First, improving the obstetric capabilities of primary healthcare institutions is essential. This can be achieved through facility upgrades, professional training for primary healthcare staff, and the use of telemedicine [15,16]. Telemedicine provides expert consultations and diagnostic support, bridging the gap between primary healthcare and major hospitals. Additionally, hospitals can integrate and share resources to form regional obstetric alliances, promoting cooperation and resource efficiency [15,17].

Second, technological and equipment innovation is crucial for improving obstetric service quality. The application of telemedicine and artificial intelligence (AI) can significantly enhance efficiency and quality [16]. Real-time monitoring devices can track the health of pregnant women and fetuses, and AI can assist in accurate and efficient diagnoses. Furthermore, developing and using advanced obstetric equipment, such as high-resolution ultrasound devices and smart delivery beds, can improve fetal examination accuracy and enhance the childbirth experience. Smart delivery beds can monitor the mother's condition in real time, providing a more comfortable and safe delivery environment [16].

Talent development and team building are also crucial. Multidisciplinary collaboration enables obstetricians to provide comprehensive and efficient care. Cross-disciplinary training and regular multidisciplinary teamwork are beneficial for managing high-risk pregnancies and complex cases. Improving professional development through ongoing education and clear career paths encourages continuous self-improvement [18,19]. Additionally, attractive policies like housing subsidies and educational grants can attract top talent to primary healthcare settings [20]. Enhancing the work environment and offering good career opportunities and work-life balance can boost job satisfaction and loyalty [21].

Addressing regional disparities is essential, particularly the uneven distribution of medical resources between urban and rural areas. Strengthening obstetric services in rural and remote areas through increased government investment [22], subsidies, and infrastructure development is crucial. Mobile medical teams can provide high-quality care and health guidance in these areas.

In summary, by optimizing medical resources, innovating technology and equipment, and focusing on talent development and team building, China's obstetric service system can improve service quality and efficiency amid declining birth rates. Implementing

practical policies and measures can further enhance maternal and neonatal health.

3. Transformation of obstetricians' roles

With declining birth rates, the roles and work modes of obstetricians in China are undergoing significant changes to address new challenges and opportunities. These changes are seen in role diversification, shifts in work modes, and innovative career development paths. In recent years, many studies have started to focus on the relationship between the professional transformation of obstetricians and the demand for obstetric services [23]. Although technological upgrades and policy support are widely regarded as important means for obstetricians to cope with declining birth rates [24,25], these studies have certain limitations. For instance, most of these studies concentrate on the healthcare environments of developed countries, lacking in-depth exploration of developing countries, particularly those with complex conditions like China. The differences in technological levels and policy backgrounds across countries are significant, and the applicability of technological upgrades in underdeveloped regions remains contentious. Moreover, while policy support helps alleviate the short-term imbalance between the supply and demand for healthcare services, its long-term effects, especially on the career development paths of obstetricians, require more empirical research. Therefore, this paper not only analyzes the potential application of existing technologies and policies in the Chinese context but also discusses in detail the limitations of these technologies in underdeveloped areas, proposing specific measures to address these shortcomings.

First, obstetricians are transitioning from traditional single-role medical service providers to multifaceted roles, including health managers, educators, and researchers. As health managers, they not only handle pregnancy and delivery but also take on health management duties, offering pre-pregnancy consultations, prenatal guidance, and postpartum recovery plans to help women manage their health and prevent potential issues [28]. As educators, their role in public health education is becoming more prominent, providing knowledge about pregnancy, childbirth, and parenting to expectant mothers and their families, and participating in community health education to raise public health awareness [26]. In research, obstetricians are increasingly involved in projects to advance obstetric medicine, discover, and promote new diagnostic and treatment methods to improve service quality and safety [27].

Second, the work modes of obstetricians are evolving. The development of telemedicine is transforming their work, enabling them to provide timely medical services to remote areas, thus overcoming barriers like difficult access to healthcare due to transportation issues. Modern obstetric services rely heavily on multidisciplinary collaboration, with obstetricians working with pediatricians, anesthesiologists, geneticists, and other specialists to create comprehensive treatment plans for the health of mothers and newborns [29]. Additionally, obstetricians are extending their work beyond hospitals to communities and homes [30], offering personalized and attentive services through community obstetric care and home visits, which improve the accessibility and quality of medical services and foster better doctor-patient relationships [31].

Lastly, career development paths for obstetricians are innovating. To meet evolving medical needs and technological advancements, they must continually update and enhance their professional knowledge and skills. Continuing education and professional training are crucial, achieved by attending domestic and international conferences, receiving new technology training, and engaging in research projects to stay at the forefront of their field [25]. Obstetricians are no longer limited to clinical roles; they can pursue careers in academic research, medical management, and public health, becoming hospital administrators or public health experts to serve a broader range of maternal and child health needs [32,34]. International exchanges and cooperation offer expansive development platforms [33], enabling obstetricians to learn the latest medical technologies and management practices globally, enhancing their professional competence and international perspective [35,36].

By diversifying roles, shifting work modes, and innovating career development paths, Chinese obstetricians can achieve sustainable development amid declining birth rates and continue to provide high-quality medical services to mothers and newborns. This transformation not only addresses current challenges but also drives the continuous advancement of obstetric medicine.

4. International experience and comprehensive recommendations

Amid declining birth rates, the roles and work modes of Chinese obstetricians are undergoing significant changes to address new challenges and opportunities. By learning from the successful experiences of Japan, South Korea, and Sweden, China can implement comprehensive measures to optimize its obstetric service system, improve the childcare environment, and promote the career development of obstetricians. However, to ensure these international practices are suitable for China, they must be thoroughly analyzed and localized.

China should implement family-friendly policies to increase birth rates. Japan offers childcare subsidies, parental leave, and flexible work schedules, reducing the burden on families [37,38]. Sweden provides world-leading childcare benefits, including paid parental leave and allowances. China can adopt similar measures, such as paid parental leave and childcare allowances, and promote flexible work schedules to help parents balance work and family responsibilities. These policies must be tailored to China's economic capacity and social conditions to ensure feasibility and sustainability [39,40].

Japan and South Korea have extensive community support networks, including mother-child health centers and family support centers that offer childcare guidance and services [41,42]. China can establish and improve such centers to provide comprehensive childcare guidance and support. Promoting home and community care ensures that pregnant women receive high-quality medical and care services at home, enhancing service coverage and accessibility. Given the urban-rural disparity in China, community support initiatives must be adapted to local conditions [42]. In economically developed areas, rapid establishment and improvement of community support networks can be achieved through government and community collaboration. In less developed areas, successful pilot projects can be gradually expanded, with funding and resources supplemented by government subsidies and social donations

[43].

China can leverage telemedicine and digital health technologies to ensure that pregnant women in remote areas receive high-quality obstetric care [44]. South Korea has significantly improved medical service quality in remote areas through telemonitoring and consultations [45]. China can further promote telemedicine, especially in rural and remote areas with transportation and medical resource challenges. Measures include establishing telemedicine platforms, training primary healthcare staff in telemedicine use, and providing policy and financial support to ensure sustainability [46,47]. Although the introduction of smart delivery beds and high-resolution ultrasound equipment has enhanced the technological level of hospitals, these devices cannot fully compensate for the reduction in clinical practice opportunities. Especially in the context of limited clinical experience, obstetricians need other methods to maintain and improve their skills. Virtual reality technology and simulation training have proven effective in many developed countries, providing highly realistic training environments that help doctors maintain proficiency despite fewer clinical opportunities [48]. At the same time, the promotion of telemedicine technology has provided more opportunities for multidisciplinary collaboration, allowing doctors to participate in a broader range of case analyses and treatment decisions through online consultations and expert discussions. Additionally, enhancing obstetric equipment and technology in hospitals and clinics, such as high-resolution ultrasound machines and smart delivery beds, requires government investment and incentives for companies to develop and produce advanced medical equipment. Promoting equipment upgrades through favorable policies and financial subsidies is essential to further improving the quality of obstetric care [46,49].

High-quality medical services in Sweden rely on multidisciplinary teamwork, with obstetricians collaborating with pediatricians, anesthesiologists, and geneticists to ensure maternal and newborn health [49,50]. China can enhance healthcare services by promoting interdisciplinary training and establishing cooperation mechanisms [51]. Specific measures include setting up multidisciplinary teams within medical institutions, conducting regular interdisciplinary training and simulations, and fostering collaboration between healthcare institutions and research institutes through policy guidance and incentives [50].

Strengthening continuing education and career development for obstetricians is vital for sustainable career growth. Japan and Sweden offer regular continuing education and professional training to help doctors stay updated with the latest medical knowledge and techniques [52,53]. China should provide diverse career development paths, allowing obstetricians to expand their careers in academic research, medical management, and public health. Measures include establishing dedicated training funds, supporting participation in high-level academic exchanges and training, creating clear career advancement pathways, and implementing policies and incentives to attract and retain top obstetric talent [54].

Gender equality and social support are also crucial. Sweden encourages equal participation in childcare through legislation ensuring men's right to parental leave [55]. China can implement similar gender equality policies, guaranteeing men's right to parental leave and enhancing social support for childcare. Specific measures include revising laws to clearly define men's parental leave rights and responsibilities, conducting widespread education to raise awareness and acceptance of gender equality and shared parenting, and encouraging employers to implement gender equality policies through policy guidance and incentives.

By implementing family-friendly policies, enhancing community support, optimizing medical services, promoting multidisciplinary collaboration, strengthening continuing education and career development, and promoting gender equality and social support, China's obstetric service system can achieve optimization and improvement in the context of low birth rates. This ensures sustainable development for obstetricians in the new medical environment, addressing current and future challenges. By thoroughly analyzing and localizing international experiences, China can formulate and implement practical policies and measures to further enhance its obstetric service system and improve maternal and newborn health.

5. Policies and recommendations

In the context of low birth rates, a series of innovative policy measures are needed to promote the development of obstetrics in China, improve service quality, optimize the childcare environment, and ensure the sustainable career development of obstetricians. First, China should establish a national maternal and child health research center focused on research and technological development in this field. By providing dedicated research funding and strengthening international cooperation, scientific progress and technological innovation can be advanced. Drawing on the model of research centers in Europe and the United States, consolidating resources for fundamental and clinical research will enhance China's research capabilities in maternal and child health.

Second, promoting smart hospitals and intelligent obstetric services by utilizing IoT, cloud computing, and big data technologies is essential for achieving intelligent hospital management and medical services, thereby improving service efficiency and patient experience. Specific measures include piloting smart hospital projects in major city hospitals [56], applying intelligent equipment and information systems to improve hospital management efficiency and service quality, and then gradually expanding these projects to second- and third-tier cities as well as rural areas. However, although smart delivery beds and other equipment have been widely adopted in developed regions, hospitals in underdeveloped areas often struggle to afford such high-cost devices. These hospitals typically face funding shortages and outdated equipment. To address this challenge, the government could provide special subsidies, and social organizations could initiate donation campaigns to help these hospitals acquire advanced medical equipment. Additionally, partnerships between companies and hospitals could offer long-term equipment leasing or technical support at lower costs, alleviating the financial burden on hospitals in underdeveloped areas. At the same time, promoting precision medicine in obstetrics is also an important avenue for improving medical quality. By promoting genetic testing technologies for prenatal screening and diagnosis, hospitals can offer personalized treatment plans based on the genomic information of pregnant women, improving the effectiveness and safety of treatments. For example, in the fields of genetic testing and personalized medicine, China can adopt the advanced practices of the United States and Europe by establishing relevant technical standards and guidelines, ensuring the standardization and

regulation of these technologies, and thus promoting the widespread adoption of precision medicine in the country.

At the same time, the government's idea of establishing an Obstetrician Career Development Fund can draw on the successful experiences of countries like Japan and South Korea. For example, in South Korea, the government supports doctors' continuing education and professional development through special funds, ensuring that they receive the latest medical technology training. China can establish a similar career development fund to help obstetricians access remote learning and online courses, particularly for doctors in underdeveloped areas. The government and private enterprises can jointly contribute to the fund to ensure its sustainability. The fund can also provide opportunities for doctors to attend international academic conferences, allowing them to stay updated on the latest global medical developments. Additionally, the fund will offer continuing education opportunities for doctors, covering emerging fields such as telemedicine technology training and AI-assisted diagnostic skills, especially supporting obstetricians in remote areas to enhance their professional capabilities. Specific implementation plans include offering online learning courses and offline workshops annually, with the government partially subsidizing tuition fees to ensure broad participation in the training programs.

The promotion of international standardization of obstetric services is also essential. Developing and promoting guidelines that meet international standards will enhance service standardization and quality. Introducing internationally recognized certification systems like ISO or JCI can improve service quality and management. Additionally, integrating mental health support into obstetric services will provide psychological counseling and treatment for pregnant women, with specialized training for obstetric psychologists and the establishment of mental health support teams.

Lastly, developing public health and preventive medicine by implementing a national maternal and child public health plan is necessary. Strengthening prenatal care and preventive medicine, expanding community health service networks, and providing accessible public health services will reduce disease risks for mothers and newborns. Training primary healthcare workers to enhance their service capabilities and establishing maternal and child health consultation centers in communities for comprehensive prenatal care and health education are also important steps.

To ensure the effectiveness of these policies across different regions and levels of economic development, it is recommended that policy formulation and implementation be accompanied by in-depth analysis of specific case studies. For example, in economically developed regions, policies can be rapidly implemented through joint investment from both the government and society, with pilot projects used to gather experience that can be gradually expanded to other regions. However, hospitals in underdeveloped areas often face funding shortages and outdated equipment, making it difficult to afford high-cost devices such as smart delivery beds. To address this challenge, the government can provide special subsidies, and social organizations can initiate donation campaigns to help these areas acquire advanced medical equipment. Additionally, partnerships between companies and hospitals could offer long-term equipment leasing or low-cost technical support to alleviate the financial pressure on these regions. Based on these measures, pilot projects can explore implementation paths suitable for local conditions and gradually expand the effective implementation of policies.

Through these innovative policies and measures, China's obstetric service system can achieve higher levels of optimization and improvement in the context of low birth rates. This ensures sustainable development for obstetricians in the new medical environment, effectively addressing current and future challenges, and providing new opportunities and directions for the professional growth of Chinese obstetricians.

6. Discussion

6.1. Main findings

The decline in China's birth rate has profoundly impacted the obstetric service system and the roles of obstetricians. Current trends show a reduction in demand for traditional obstetric services, affecting clinical practice opportunities and hospital resource allocation. However, this situation also offers valuable opportunities to improve service quality and efficiency through optimization and technological innovation.

Firstly, the significant decrease in delivery cases, especially in urban areas, has led to lower utilization of delivery wards and fewer training opportunities for new doctors. Many hospitals are reallocating resources, cutting obstetric budgets, and considering merging obstetric wards with other departments to improve resource utilization efficiency. Despite the reduced demand, hospitals can use this period to update equipment, optimize service processes, and enhance care quality. The application of telemedicine and artificial intelligence, particularly in managing high-risk pregnancies and personalized care, shows great potential for significantly improving service quality and efficiency.

Secondly, the roles of obstetricians are undergoing significant transformation. They are exploring new career paths in prenatal diagnosis, postpartum care, and reproductive health. The shift from being single-role medical service providers to multifaceted roles in health management, public health education, and research marks a positive development. Additionally, learning from countries like Japan, South Korea, and Sweden, China can implement family-friendly policies, establish community support networks, and promote telemedicine to improve the obstetric service system and support the sustainable career development of obstetricians.

6.2. Strengths and limitations

This study's strengths lie in its comprehensiveness and international perspective. It provides a detailed analysis of the current situation of obstetrics in China, future development directions, and the transformation of obstetricians' roles amid declining birth rates. The study offers practical recommendations tailored to China's socio-economic context and emphasizes the importance of

technological innovation and service optimization.

However, the study has limitations. The broad overview may not fully capture the specific challenges faced by different regions within China, particularly the urban-rural divide. Additionally, the analysis relies heavily on existing statistical data and literature, which may not entirely reflect the dynamic and rapidly changing landscape of obstetric services. While the recommendations are practical, their implementation requires substantial policy support, funding, and coordination among various stakeholders, posing significant real-world challenges.

6.3. Interpretation

The findings highlight the dual impact of declining birth rates on China's obstetric service system. While the reduced demand presents challenges in resource allocation and clinical opportunities, it also offers opportunities to enhance service quality through technological and service innovation. The transition of obstetricians from traditional delivery-focused roles to multifaceted roles in health management, education, and research is a positive development.

International experiences provide valuable lessons for China. Family-friendly policies, comprehensive community support, and the adoption of telemedicine are practical measures that can help mitigate the impact of declining birth rates and promote sustainable development for obstetricians. However, these measures must be carefully tailored to China's unique socio-economic context to ensure their effectiveness and sustainability.

Overall, the study underscores the importance of a proactive and scientific approach in policy-making and the adoption of innovative technologies to address the challenges posed by declining birth rates. By optimizing medical resources, promoting technological innovation, and enhancing talent development, China's obstetric service system can achieve sustainable development and continue to provide high-quality care to mothers and newborns.

6.4. Conclusion

The decline in China's birth rate presents significant challenges to the obstetric service system, but it also offers opportunities to improve service quality and efficiency. The transformation of obstetricians' roles and the adoption of international best practices can address these challenges and promote sustainable development. In the future, policy formulation and implementation must be grounded in scientific research and tailored to the country's specific conditions to create more precise and effective measures. At the same time, strengthening international cooperation and exchanges, learning from successful global experiences, and continuously innovating and optimizing China's obstetric service system will provide higher-quality services to both obstetricians and pregnant women, promoting the sustainable and healthy development of China's obstetric sector. Future research should further focus on the long-term impact of the integration of technology and policy on the professional transformation of obstetricians, particularly in underdeveloped areas. Moreover, the government needs to build on existing policies by adopting regionalized and customized approaches to ensure equitable resource distribution, thus achieving balanced healthcare services across the country. The widespread adoption of smart medical technologies and the improvement of career support systems for obstetricians will be key strategies in addressing the challenges posed by declining birth rates in the future.

CRedit authorship contribution statement

Xu Mingming: Writing – original draft, Investigation, Formal analysis. **Xu Youdi:** Writing – review & editing.

Statement of significance

Problem or Issue: China's declining birth rate significantly impacts obstetricians' workload, career prospects, and the overall obstetric service system.

What is Already Known: Previous studies have highlighted the challenges posed by declining birth rates, such as reduced clinical opportunities and resource allocation issues in obstetrics.

What this Paper Adds: This paper offers a comprehensive analysis of the current and future trends in Chinese obstetrics, practical recommendations for sustainable development, and international insights tailored to China's context.

Consent for publication

All authors consent to publication.

Ethics approval and consent to participate

This article is a review, does not involve ethics, and does not require ethical approval.

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Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Xu Mingming reports a relationship with Nanjing Medical University that includes: employment. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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