

# A Study on the Fluctuation of Birth Rate in Guangzhou Based on PEST Analysis——Influencing Factors and Policy Optimization Strategies

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**Abstract:** In recent years, the birth rate in the Guangzhou region has experienced a trend of change, first increasing and then decreasing. By 2023, although the birth rate of the household population in the area is higher than the national average, it still shows a decreasing trend overall, and there are significant differences among different administrative districts. Taking Guangzhou City as the core research object, this study first conducts an in-depth analysis of the current birth rate situation to reveal its characteristics and trends. Subsequently, based on the PEST analysis framework, this study comprehensively analyzes the multiple factors affecting the birth rate in Guangzhou and reveals its internal mechanism at the macro level. Based on the above analysis, this study puts forward a series of optimization policy recommendations, aiming to provide a scientific basis for coping with demographic changes. It is expected that this study can provide useful references for solving the demographic problems facing the Guangzhou region.

**Keywords:** Guangzhou area; birth rate; PEST analysis method

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## 1 Introduction

As an early demonstration area of China's reform and opening up, Guangzhou has experienced significant demographic changes along with its rapid economic growth. Since the reform and opening up, a large number of outsiders have entered Guangzhou, which has led to the continuous expansion of its resident population. According to the seventh national census, the resident population of Guangzhou reached 18,676,600, an increase of 5,975,800 in ten years compared with 12,708,000 in the sixth national census, an increase of 47.05%, with an average annual growth rate of 3.93%. As a super first-tier city, Guangzhou's population dynamics have always been a key factor of concern in the process of urban development. The birth rate, as a key indicator of the urban population growth trend, its fluctuation not only concerns the sustainable development of the urban population but also has far-reaching impacts on various aspects of the economy and society. By scrutinizing Guangzhou's birth rate data over the years, it can be observed that the city's birth rate has shown a fluctuating downward trend after reaching a peak of 22.7 per thousand in 2017. For example, the birth rate in Guangzhou fell to 16.31‰ in 2018, 15.92‰ in 2019, and further declined to 13.32‰ in 2020 due to a variety of factors such as COVID-19. And there are significant differences between different administrative districts, for example, in 2023, the birth rate in Huangpu District was 16‰, while the birth rate in Yuexiu District is only 6.64‰. An in-depth discussion of the evolution of the birth rate in Guangzhou is of great theoretical and practical significance for grasping the challenges and opportunities facing China's population governance. This study adopts PEST analysis to comprehensively analyze the current situation, development trend, influencing factors, and their impact on the economic future of the birth rate in Guangzhou and puts forward corresponding policy recommendations on this basis.

## 2 Analysis of the Current Situation of the Birth Rate in Guangzhou

### 2.1 Unique Overall Posture

The overall trend of Guangzhou's birth rate is unique and markedly different from that of most regions and some cities of the same type in China. Although Guangzhou has not been able to completely escape from this downward trend against the backdrop of a general decline in the national birth rate, it has shown a special development trend of first increasing and then decreasing during certain specific periods.

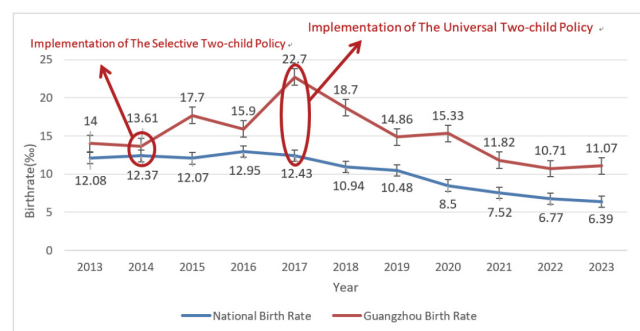


Figure 1 Trend of Birth Rate in China and Guangzhou

At the beginning of the twenty-first century, Guangdong's rapid economic development drove the demand for labour by enterprises, while the leapfrog development of the private economy also provided a large number of jobs. Against this backdrop, Guangzhou, as the capital city of the province, attracted a large influx of outsiders, while the standard of living of residents improved. The dual factors contributed to an upward trend in fertility intentions and a subsequent rise in the birth rate, a phase that stands out when the overall birth

rate in the country continues to be stable or declining.

After entering the new development stage, although the national birth rate is rapidly decreasing, the birth rate of Guangzhou's 2023 Guangzhou household population is still higher than the national average, thus showing its comparative advantage in improving the fertility vitality of the population. The main reason for this is the importance that the Guangzhou government places on public service satisfaction. Studies have shown that comprehensive satisfaction with public services of youth groups has a significant positive impact on their fertility intentions (Zou Yuchun, 2024). As a typical city characterized by demographic dividend, the government of Guangzhou has actively introduced public health care, public education and public security in the birth of health care, childcare education and policy subsidies and other policies, construction, etc. effectively alleviate the worries of families in childbirth, further enhance the willingness to give birth, so that Guangzhou can still maintain a relatively high level of birth rate in the environment of the national birth rate continues to decline.

### 2.2 Significant Differences in Administrative Districts

Further comparing the birth rates of different regions in Guangzhou through the latest data released by the Guangzhou Municipal Bureau of Statistics, Guangzhou Statistical Yearbook 2024, we find that the results are significantly different. Taking the data of 2023 as an example, the birth rate of the household population in Huangpu District is 16.00 per thousand, Tianhe District is 11.45 per thousand, while Yuexiu District is only 6.64 per thousand.

**Table 1 Birth rate of the Total Household Population in Each Administrative District of Guangzhou**

Administrative District	Birth Rate
Total	11.07‰
Liwan	8‰
Yuexiu	6.64‰
Haizhu	7.83‰
Tianhe	11.45‰
Baiyun	11.81‰
Huangpu	16‰
Panyu	12.59‰
Huadu	11.82‰
Nansha	13.75‰
Conghua	10.99‰
Zengcheng	13.49‰

The birth rate of the total household population in each administrative district of Guangzhou. In recent years, Huangpu District has successfully attracted a large number of high-tech enterprises to the district, relying on its unique geographical location, abundant resources, and policy support. Starting from optimizing the allocation of medical resources, improving the level of maternal and child healthcare services, and reinforcing the protection of children's education, Huangpu District has created an environment conducive to the fertility of residents. In March 2024, the China Family Planning Association (CFPA) Eugenics Guidance Centre's project site in Guangzhou's Huangpu District was officially launched, which marked a new development in the area of fertility support and eugenics in Huangpu District. This environment strengthens the fertility intentions of residents while improving the quality of births

and contributing to a higher birth rate. Tianhe District, although still maintaining its position as the economic, technological, and cultural centre of Guangzhou, has seen some young people becoming more cautious about having children in the face of increasing competition in the workplace and the pressures of life. Although the district still has a large pool of high-calibre talent, the declining fertility rate may reflect the challenges of work-life balance for this population. Older urban areas, represented by Yuexiu District, are rich in educational resources and cultural heritage, but high property prices and tight housing resources put considerable pressure on young families. These factors have a dampening effect on fertility intentions, keeping the birth rate in Yuexiu District at a low level. The more pronounced reduction in the birth rate in Yuexiu District relative to Tianhe District may reflect the difficulties encountered in attracting and retaining young talent in the older urban areas.

## 3 Analysis of factors Affecting the Birth Rate in Guangzhou Based on PEST Analysis Method

### 3.1 Political Environment Analysis

#### 3.1.1 Maternity Policy Adjustment

By analysing the time series of the birth rate data of Guangzhou in the past ten years, it is possible to gain a clear insight into its long-term trend. As seen in Figure 1, during the period 2014-2016, with the implementation of The Selective Two-child Policy, the birth rate of Guangzhou city has been steadily improving, from 13.61 per thousand in 2014 to 15.9 per thousand in 2016. This growth trend shows that the policy adjustment has positively stimulated fertility intentions, with many eligible families choosing to have a second child, leading to an increase in the number of births. Between 2016 and 2020, Guangzhou's birth rate fluctuated to a certain extent. Although The Universal Two-child Policy was formally implemented in 2016, the birth rate did not continue to rise, but reached a peak of 22.7 per thousand in 2017, and then fluctuated down in 2018-2023. It can be seen that the birth rate with the gradual weakening of the effect of the policy, as well as the change in people's concept of fertility, the policy's stimulus to the birth rate gradually diminished. At present, the introduction of The Three-child policy and accompanying support measures aims to further boost fertility levels, but the effect of the policy's implementation remains to be seen.

#### 3.1.2 Public Service Policy Adjustments

The results of the 2023 China General Social Conditions Survey found that an increase in overall satisfaction with public services among the youth group boosts the fertility intentions of youth, and this positive effect is most pronounced among middle-aged youth. Among them, social security service satisfaction has the strongest facilitating effect (Zou Yuchun, 2024). Therefore, to improve public service satisfaction to enhance young people's fertility intentions, the relevant policies should take middle-aged youth as the primary target population, and improve the social security service satisfaction of the youth group as the preferred path. Among them, the issue of whether the public service policies are implemented or not should not be ignored. On the one hand, there are deficiencies in the publicity of some of the policies, leading to a lack of understanding of the details of the policies, the application process and the conditions by some families that are in line with the birth policy, thus affecting

the effective implementation of the policies. In the case of the subsidy policy that accompanies The Universal Two-child Policy, for example, due to limited publicity channels, some communities and grassroots units have not been able to fully disseminate the information, resulting in many fertile families knowing little about the details of the subsidy, the application requirements and the ways to receive it, and thus not being able to enjoy the benefits of the policy to which they are entitled. On the other hand, there are problems with the synergy of policy implementation. The implementation of fertility policies involves several departments, such as health, education and finance, but there is a lack of effective communication and collaboration between these departments in the process of policy implementation. In the case of the implementation of the childcare subsidy policy, for example, the education department is responsible for setting the criteria for the subsidy, while the finance department is responsible for disbursing the funds. If there is poor information exchange between departments, problems such as untimely subsidy payments and inconsistent standards may arise, which not only reduces families' trust in and sense of access to the policy but also weakens the incentive effect of the birth policy.

### 3.2 Economic Environment Analysis

#### 3.2.1 The Level of Economic Growth

As an economically developed city, Guangzhou has a high standard of living for its residents, but at the same time, the cost of living is also relatively high. As the economy develops and prices rise, especially housing prices, education costs and prices of daily necessities continue to climb, the cost of raising children for families has increased significantly. According to the research data of the China Childbirth Cost Report (2024 Edition), the average cost of raising a child aged 0-17 in Guangdong is as high as 705,720 yuan, the fifth highest in the country, and the cost of raising a child in Guangzhou, the city with the highest consumption dynamics in Guangdong, is even higher, which has led to many families being deterred from having children. In addition, due to the increasingly fierce competition for jobs as a result of economic development, people are more inclined to choose to delay childbearing or reduce the number of children to get better development in the workplace.

**Table 2 The Average Cost of Raising a Child Aged 0-17 in a First-tier City**

No.	Area	Cost of raising ( ¥ )
0	Average	538312
1	Shanghai	1010130
2	Beijing	936375
3	Zhejiang	854942
4	Jiangsu	720616
5	Guangdong	705720

Different income groups are affected differently by economic factors. Although high-income groups face higher parenting costs, they are financially strong and parenting costs have relatively less impact on their fertility decisions. They pay more attention to the quality of childbearing, pursue quality education and medical resources, and are willing to provide a better environment for their children to grow up. The middle-income group, on the other hand, is in a more awkward position, with the cost of child-rearing exerting greater financial pressure on them. To maintain their current living standards and ensure the quality of their children's education, they

are more cautious in making decisions on childbearing, often taking into account their financial capacity, and some families may give up having two or three children due to financial pressure. The low-income group faces even greater economic pressure, with basic living expenses taking up most of their income, and the cost of raising a child is beyond their affordability, so their willingness to give birth is lower. Even with the support of the fertility policy, economic hardship still limits their reproductive choices. As economic development leads to increased competition for jobs, people are more inclined to delay childbearing or reduce the number of children they have to have a better chance of getting ahead in the workplace.

#### 3.2.2 Industrial Restructuring

Guangzhou is in a critical period of industrial restructuring and upgrading, with the total deviation of the industrial structure of the Greater Bay Area gradually approaching 0. With the emergence of a labour surplus in traditional labour-intensive industries, Guangzhou is actively transforming itself into a high-end manufacturing industry in the secondary sector, as well as modern service industries and science and technology innovation industries. This change in industrial structure has brought about a shift in the employment structure and an increase in the quality of the labour force. To meet the needs of industrial upgrading, people need to spend more time and energy on learning and training, which also makes the impact of childbearing on one's career development more significant, and the willingness to have children is further weakened. For example, in the science and technology industry, the fast pace of work and frequent overtime work make it difficult for workers to reconcile family and childbearing.

### 3.3 Social Environment Analysis

#### 3.3.1 Impact of Traditional Attitudes

In the social environment, traditional attitudes have a significant impact on the birth rate in Guangzhou. To quantify the influence of traditional attitudes, we refer to the '2021 Guangzhou Fertility Intention Survey Report', which shows that there is a significant correlation between the generational structure of family households and fertility intention. The highest proportion of those who chose 'having one child' was among first-generation households, at 32.74 per cent; the highest proportion of those who chose 'having two children' was among third-generation households, at 60.35 per cent; and the highest proportion of those who chose 'having three children' and 'the more children' was among third-generation households, at 60.35 per cent. The highest proportions of those who chose '3 children' and 'the more the better' were from households with 4 generations and above, at 11.18% and 5.74% respectively. This shows that in Guangzhou, there is a big difference in fertility intentions depending on the generational structure of the family. Three-generation households and four-generation and above family households are more obviously influenced by traditional attitudes, and the traditional attitudes of the elders in such households often play an important role in family fertility decisions. Traditional concepts such as 'passing on the family line' and 'more children, more happiness' are deeply rooted in people's minds, which makes them more inclined to have more children in the hope that a thriving family will perpetuate the family, add to the family's good fortune, and enhance the family's social status. On the other hand, a generation of households are mostly young couples or single youths, who are more influenced by modern lifestyles and concepts, pay more attention

to personal development and quality of life, and tend to have fewer children as their pursuit of the number of children is relatively low. These data strongly prove the important role of traditional attitudes in the fertility decisions of families in the Guangzhou area, which has had an inescapable impact on the birth rate.

### 3.3.2 Impact of the Internet on the Dissemination of Modern Ideas

Research says that Internet use inhibits women's fertility intentions (Pu Yanping, 2024). It provides broader career development space for women, which makes women pay more attention to their personal career growth; at the same time, online negative information and social media also increase women's worry and anxiety about childbirth; in addition, the Internet also changes women's lifestyle and values, making them more in pursuit of a free and relaxed life; and information about contraception and reproductive health is also popularised on the Internet, which The Internet has also made information on contraception and reproductive health more widely available, which makes it easier for women to control their reproductive behaviour. The combination of these factors has led to a decline in women's willingness to have children.

### 3.4 Technical Environment Analysis

#### 3.4.1 Artificial Intelligence to Improve Service Technology

At a time when AI technology is advancing by leaps and bounds, it is indirectly affecting family reproductive choices by improving the effectiveness of social services. AI-assisted reproduction technologies in the healthcare sector have significantly improved the success rate of infertility treatments. For example, AI systems have achieved up to 90 per cent accuracy in screening high-quality embryos, which has dramatically improved IVF success rates. Intelligent baby care robots and AI nappy monitors in the childcare sector have significantly reduced the labour costs of childcare. For example, Nanit released a smart baby safety monitoring product - intelligent and multi-functional management of baby sleep patterns, which enables parents to reduce night care time and ensure a good night's sleep. The continuous improvement of AI technology has provided a more favourable environment and conditions for family childbearing. However, the application of AI in fertility and parenting is not all rosy, and there are potential risks and challenges behind it. Firstly, in terms of thinking, AI does not have human thinking and emotions, cannot communicate emotionally with patients and their families, and lacks flexibility in diagnosis and treatment strategies to differentiate on a case-by-case basis. Secondly, in terms of cognitive concepts, the commercial application of AI in the medical industry involves multiple fields such as medical ethics, laws and regulations, and issues such as the definition of responsibility for diagnostic results and the protection of patients' privacy have yet to be clarified. Meanwhile, in terms of virtual parenting, long-term immersion in the virtual parenting experience may cause a cognitive bias towards the reality of childbearing and parenting, leading to the weakening of the emotional bond of parent-child relationships and affecting the healthy development of family relationships.

#### 3.4.2 Artificial Intelligence Replaces the Satisfaction of the Child's Bring

In this study, a questionnaire on fertility intention was widely distributed in Guangzhou, with an effective response rate of 87.68 per cent. In the question 'What do you think are the most

important factors influencing fertility behaviour?' in the question 'What do you think are the most important factors influencing childbearing behaviour?', the data shows that the overall score of 'the satisfaction brought by children' is only 1.4, which indicates that its substitutability is relatively high. With the rise of artificial intelligence technology, it seems that new alternatives to the satisfaction traditionally provided by children have been found. The holographic AI companion 'Azuma Hikari' launched by Japan's Gatebox, with its emotional interaction algorithms, provides users with round-the-clock companionship and meets the emotional needs of some people. According to user research, 23 per cent of single men believe that 'Azuma Hikari' is a sufficient substitute for their need for marriage. In addition, meta-universe platforms (such as Decentraland) have also launched a 'virtual parenting' module, allowing users to adopt digital people with growth attributes through NFT. Just six months after its launch, the feature has attracted 1.5 million users, 41 per cent of whom say the virtual experience has reduced their desire to have children in reality. These phenomena suggest that as AI and virtual technologies continue to evolve, they are replacing, to some extent, the satisfaction associated with the traditional act of procreation.

## 4 Policy Recommendations on the Birth Rate

### 4.1 Economic Support Aspects

Increasing the income level of the population is important for strengthening fertility intentions. When the relative income ratio of husband and wife continues to increase, it will have a 'U' shaped effect on fertility, which is negative first and then positive (Zhong Qiongyao, 2024).

The government should introduce proactive employment policies to promote economic growth, increase employment opportunities, and provide residents with a stable economic source. Among them, the Guangzhou Municipal Development and Reform Commission undertakes the task of formulating macro-policy planning for promoting economic growth and employment within one month of the launch of the national policy; the Guangzhou Municipal Finance Bureau cooperates in budgetary arrangements, allocation and supervision of funds; and the Guangzhou Municipal Bureau of Human Resources and Social Security is specifically responsible for the implementation and enforcement of the employment policy, and for providing good employment services and protection for the residents in three months.

Increasing the childbirth subsidy is not a bad idea in terms of cost-effectiveness. Taking into account the fact that raising children in Guangzhou is expensive, the Government should appropriately increase the childbirth subsidy. For low- and middle-income families in particular, subsidies for pregnancy check-ups, delivery costs, infant care and education can significantly reduce the financial burden on families. Calculated comparisons between the cost of these subsidies and the potential growth in fertility indicate that the long-term socio-economic benefits of a larger labour force and higher consumption capacity in the future are likely to outweigh the current fiscal inputs.

Optimising tax incentives is again a practical option. Tax breaks or deductions for families with a desire to have children, such as increasing the amount of pre-tax deductions for children's education, can effectively reduce the tax burden on families. This policy measure, which is relatively inexpensive to implement, would encourage families to take care of more children, which would in turn increase fertility and have a positive effect on demographic and

economic development in the long term.

#### 4.2 Industrial and Employment Support

From the perspective of cost-benefit analysis, it is of practical significance to promote the coordinated development of industrial structure and employment structure. The Guangzhou Municipal Bureau of Human Resources and Social Security should continue to promote industrial restructuring and upgrading, and at the same time strengthen vocational training and skills enhancement for the labour force to help workers adapt to the development of new industries. The benefits it brings are also significant, both in terms of raising labour productivity and attracting more high-tech industries on the premise of increasing tax revenue and promoting economic prosperity.

Enterprises are encouraged to provide flexible arrangements in balancing work and family responsibilities, such as telecommuting, flexible working hours, and so on. Its benefits reflect on indicators such as employee satisfaction and retention rates, enhancing work-life balance, boosting efficiency and contributing to the long-term development of enterprises.

Strengthening the management of mother-baby friendly enterprises, and the Guangzhou Municipal Health Commission should introduce relevant policies to incentivize enterprises to set up mother-baby rooms, provide parental leave, and flexibly arrange work, etc., which can facilitate working parents, reduce the impact of childbearing on career development, and increase the willingness to give birth. In the long term, increasing fertility rates can provide the future market with sufficient labour to support sustainable economic growth and reduce the pressure that population ageing may put on social security development.

#### 4.3 The Social Attitude Guidance Aspect

From the perspective of social conceptual guidance, the task of cost-benefit analysis has been given to us. The Government has to pay a certain price for the promotion of the concept of gender equality and the change of traditional concepts of reproduction.

As far as media channels are concerned, the Publicity Department of the Guangzhou Municipal Party Committee produces and places advertisements and programmes promoting gender equality and modern concepts of childbearing, and so on, all of which involve the cost of producing advertisements and placing them in the media. In the field of education, the Guangzhou Municipal Bureau of Education has included the relevant content in the school curriculum, requiring the preparation of special teaching materials and the training of teachers, etc., all of which also entail human and material costs. The GZ Municipal Women's Federation's community activities also involve the cost of organising manpower, renting venues and purchasing materials.

Nonetheless, the return on these financial investments is quite significant. Vigorously promoting the concept of gender equality can gradually reduce social pressure and prejudice against women giving birth. Respecting women's reproductive rights and treating childbirth as an important personal choice is conducive to improving women's status in the family and society, and increasing their sense of autonomy and well-being, thereby promoting more harmonious and stable family relations. In the long run, harmonious family relations will contribute to the stable development of society and reduce the cost of managing the social problems caused by family conflicts.

In the modern concept of the family, which advocates fewer and better births and emphasises the education and growth of children, the quality of births can be significantly improved despite the higher costs

of publicity, education and community activities. Families will devote more resources and energy to the education and growth of their children, to create a next generation with higher quality. These high-quality talents will be able to provide stronger intellectual support and increase social wealth for economic development, promote scientific and technological innovation and industrial upgrading in the future, and the economic benefits generated will be higher than ever before. At the same time, guiding families to focus on quality of life and personal development will help to improve the quality of life of society as a whole, create a positive social atmosphere and strengthen social cohesion, and this social benefit is also incalculable.

#### 4.4 Scientific and Technological Applications and Innovations

In order to encourage the application of AI in the field of fertility and parenting, the government has increased its support for scientific and technological research and development of AI-assisted reproduction technology and smart parenting tools, which also means that more financial investment is required.

The injection of research funds, the purchase of R&D sites and equipment, and the training and introduction of research talents all require huge financial support. But once the result is available, its benefits cannot be underestimated. On the one hand, AI-assisted reproduction technology is expected to reduce the cost of infertility treatment, increase the fertility success rate, and bring hope to the vast number of families longing for children. This not only enhances family happiness but also helps to maintain reasonable population growth, reduce the pressure of population ageing, ensure a stable supply of labour in society and achieve sustainable economic development on a macro level. On the other hand, smart childcare devices can play a key role in reducing the burden of childcare, freeing parents from tedious childcare matters giving them more energy to devote to their work and personal development, and indirectly promoting economic growth.

At the same time, the GZCHK's efforts to strengthen the regulation of AI, virtual technology and other related industries, and to guide the healthy development of these industries will come at a cost in terms of regulatory manpower and the formulation and implementation of regulatory policies. Emphasising real family and emotional relationships in public education, and avoiding over-reliance on technological products as a substitute for real human interaction and emotional needs, can maintain family stability and harmony. A stable and harmonious family environment forms the basis of social stability, which can mitigate social problems arising from imbalanced family relationships and reduce the cost of social governance; at the same time, a positive and healthy family atmosphere also contributes to a physically and mentally healthy nurturing, socially adaptable new generation that prepares high-quality human resources for social development.

## 5 Conclusion

This study focuses on the fluctuation of the birth rate in Guangzhou, analyses the influencing factors with the help of PEST analysis, and proposes optimisation strategies with remarkable results.

The study finds that the birth rate in Guangzhou rises and then falls, with obvious differences among administrative districts, which is closely related to political, economic, social and technological factors. The multi-dimensional policy recommendations based on this provide a scientific basis for coping with demographic changes.

In recent years, China's birth rate has declined, and Guangdong, as a major fertility province, has attracted much attention to its fertility situation, especially in economically developed provincial capital cities and administrative districts. The results of this study are of great significance to the adjustment and optimisation of the population policy in Guangzhou and the whole country, which can provide an important reference for policy formulation, help alleviate the pressure of population ageing and promote sustainable socio-economic development.

However, there are still limitations in this study, and the subsequent research can go deeper in two aspects. The first is to build a perfect evaluation system for the effect of policy implementation,

using a combination of quantitative and qualitative methods to dynamically monitor the changes in the birth rate, family fertility intentions, and socio-economic indicators after the implementation of the policy, to accurately assess the effectiveness of the policy and make timely adjustments and optimizations. The second is to pay attention to the impact of emerging factors on fertility behavior, such as digital lifestyles, new socio-cultural trends, population mobility and synergistic regional development, to provide forward-looking theoretical support for the formulation of population policies and the development of society, and to deepen the study of demographic and fertility issues, to better respond to the challenges posed by changes in the demographic structure of the population.

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