Analysis of the fairness of child health services in China 2010-2019

Ji Wu

The Fourth Clinical College, Zhejiang Chinese Medical University

Hao-Nan Jin

The Fourth Clinical College, Zhejiang Chinese Medical University

Yi-Lei Lao

The Fourth Clinical College, Zhejiang Chinese Medical University

Xian-Guo Qu (✉ quxianguo@163.com)

Affiliated Hangzhou First People's Hospital, Zhejiang University School of Medicine

Research Article

Keywords: child health service, Concentration index, Equity

Posted Date: May 4th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-468598/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background

The imbalance of child health services caused by the huge income gap between urban and rural residents and uncoordinated regional development has become increasingly prominent. This article analyzes the basic situation and equity of child care services in China from 2010 to 2019.

Methods

Evaluate the equity of child health services by concentration index.

Results

From 2010 to 2019, neonatal visit rate and system management rate of under-three children in Chinese child health service projects showed an upward trend, and the perinatal mortality rate decreased. The perinatal mortality rate is the highest in the western region, and the level of child health services in the central region is lower than the national average, but the gap between regions has gradually decreased. Child health services concentrate in provinces with high economic levels, and the perinatal mortality rate is the most unfair.

Conclusion

The decline in the mortality rate of under-five children is related to the improvement in the child health services. We should improve the health services of perinatal infants and pay attention to the health of children aged 1 to 4 years. The fairness of child health service is affected by the two-child policy. We should rationally allocate resources and strengthen support for the central and western regions.

1 Background

Implementing program of national basic public health services is one of the five major contents of Chinese New Medical Reform. It is of great significance for the transformation of the health service model from disease-centric to health-centric, implementation of the prevention-oriented working policy and "Healthy China" Strategy¹. As an important part of Chinese basic public health services, child health services can reduce children's morbidity and mortality and improve the health level of all society. Since child health services were provided in China, the level of children's health has improved significantly. However, the imbalance caused by the large income gap between urban and rural residents has gradually become prominent.

This article analyzes the basic situation and fairness of China child health services from 2010 to 2019, and its correlation with the under-five mortality rate, and finds problems in comprehensive comparisons and put forward targeted suggestions to provide reference to improve the fairness of child health service.

2 Methods

2.1 Data sources and evaluation indicators

The article collects relevant data on the economic level and child health of 31 provinces (No statistics on Hong Kong, Macao and Taiwan regions) in the *China Statistical Yearbook*, *China Health Statistics Yearbook* and *China Health and Family Planning Statistical Yearbook* from 2011 to 2020. After processing and sorting, the data needed is obtained (see Additional file 1). The article uses per capita GDP as a measure of the economic level of each province, uses neonatal visit rate, perinatal mortality rate, and system management rate of under-three children as indicators to evaluate child health services², and uses the mortality rate of under-five children as a result indicator of child health services.

According to the classification in the *China Health Statistics Yearbook*, the article divides Chinese 31 provinces into three regions—eastern, central and western region, in order to compare the differences of child health services in different regions³.

2.2 Evaluation method

Concentration index (CI), one of measurement methods of the fairness, is often applied to the fairness study of health service utilization in the health field⁴. Wagstaff in The World Bank gave the command in Stata to calculate CI⁵. We calculate the CI of fairness by running the command `conindex` in Stata, which method can be tested to ensure that the CI obtained is not equal to 0 under statistical significance. Edit the collected data in Microsoft Excel Software. The per capita GDP of each province is listed as a column from small to large as standard reference column (Y). Neonatal visit rate, perinatal mortality rate and under-three system management rate are each listed in another column as the column (h) for investigating fairness. Copy the above data to the Stata database and run the command `conindex` to calculate CI:

$$CI = 2/N^2 \cdot \mu_h \cdot \sum [h_i \cdot R_i]$$

Stata command: `conindex h, rankvar(Y) truezero`

The value range of CI is [-1,1]. A positive result indicates that child health services concentrate in provinces with high economic levels with an unfair tendency towards high-income groups. A negative result indicates that child health services concentrate in provinces with low economic levels with an unfair tendency towards low-income groups. The greater CI absolute value, the greater the unfairness of child health services. The closer CI absolute value is to 0, the more equitable child health services are⁶.

The indicators in the eastern, central, and western regions are averaged after weighted by the number of live births in each province.

3 Result

3.1 Correlation analysis between China child health services and mortality rate of under-five children from 2010 to 2019

From **Table 1** and Fig. 1, neonatal visit rate and system management rate of under-three children have increased significantly, but growth slowed or declined from 2015 to 2018. The perinatal mortality rate and mortality rate of under-five children showed a downward trend, with the largest decline from 2011 to 2013. The perinatal mortality rate increased from 2015 to 2016.

Table 1
China child health services and mortality rate of under-five children (2010–2019)

Years	Neonatal visit rate %	Perinatal mortality rate‰	System Management Rate of Under-three children %	Mortality Rate of Under-five children‰
2010	89.60	7.02	81.50	16.40
2011	90.60	6.32	84.60	15.60
2012	91.80	5.89	87.00	13.20
2013	93.20	5.53	89.00	12.00
2014	93.60	5.37	89.80	11.70
2015	94.30	4.99	90.70	10.70
2016	94.60	5.05	91.10	10.20
2017	93.90	4.58	91.10	9.10
2018	93.70	4.26	91.20	8.40
2019	94.10	4.02	91.90	7.80

3.2 Basic situation analysis of child health services from 2010 to 2019

From Table 2, Fig. 2, Fig. 3 and Fig. 4, the neonatal visit rate and system management rate of under-three children showed an upward trend, and the perinatal mortality rate decreased. The neonatal visit rate and system management rate of under-three children in the central and western region increased significantly. The perinatal mortality rates in the three regions all have decreased significantly. The perinatal mortality rate of the western region and the eastern region is at a low level, while that of the central region is at a high level in the country. The other two indicators of the central region are below the national level, while

those of the western region and the eastern region are above the national level. The gap between regions has been narrowing and gradually approaching the national level, but there is still a certain gap between the central and western regions and the eastern region.

Table 2
National and regional child health services (2010–2019)

Years	Location	Neonatal visit rate %	Perinatal mortality rate‰	System Management Rate of Under-three children %
2010	Entire country	89.60	7.02	81.50
	Eastern region	95.28	6.14	92.04
	Central region	83.03	6.24	73.13
	Western region	90.12	8.96	78.96
2011	Entire country	90.60	6.32	84.60
	Eastern region	95.27	5.59	92.47
	Central region	84.44	5.53	77.09
	Western region	92.61	8.19	84.63
2012	Entire country	91.80	5.89	87.00
	Eastern region	94.88	5.29	93.19
	Central region	86.64	5.19	81.10
	Western region	94.37	7.53	86.85
2013	Entire country	93.20	5.53	89.00
	Eastern region	95.37	4.84	93.16
	Central region	89.34	4.91	84.48
	Western region	95.15	7.18	89.14
2014	Entire country	93.60	5.37	89.80

Years	Location	Neonatal visit rate %	Perinatal mortality rate‰	System Management Rate of Under-three children %
2015	Eastern region	94.99	4.68	92.92
	Central region	90.44	4.75	86.28
	Western region	95.60	7.00	89.98
	Entire country	94.30	4.99	90.70
	Eastern region	95.44	4.22	93.00
	Central region	91.90	4.43	87.83
	Western region	95.72	6.68	90.98
	Entire country	94.60	5.05	91.10
	Eastern region	95.15	4.43	92.98
2016	Central region	92.85	4.54	88.92
	Western region	95.90	6.45	91.52
	Entire country	93.90	4.58	91.10
	Eastern region	95.15	4.04	92.79
	Central region	92.50	4.10	88.96
	Western region	93.90	5.86	91.59
2017	Entire country	93.70	4.26	91.20
	Eastern region	94.04	3.81	92.33
	Central region	92.65	3.85	89.36

Years	Location	Neonatal visit rate %	Perinatal mortality rate‰	System Management Rate of Under-three children %
2019	Western region	94.42	5.26	91.47
	Entire country	94.10	4.02	91.90
	Eastern region	94.79	3.70	93.07
	Central region	93.13	3.69	90.31
	Western region	94.32	4.74	92.23

3.3 Fairness of children health services from 2010 to 2019

From Table 3 and Fig. 5, it can be seen that CI of neonatal visit rate in China from 2010 to 2019 is 0.007 ~ 0.04, and CI of system management rate of under-three children is 0.01 ~ 0.07, indicating that neonatal visit and system management rate of under-three children concentrated in provinces with high economic level. CI of perinatal mortality rate was - 0.07 ~ -0.13, which was negative, indicating that perinatal mortality concentrated in provinces with low economic level. From the perspective of vertical development trend, CI of neonatal visit rate and system management rate of under-three children generally decreased, but slightly increased from 2016 to 2018. The absolute value of CI of perinatal mortality rate showed a fluctuating downward trend from 2010 to 2014, but it increased significantly from 2014 to 2015, and then decreased slightly. In addition, through the horizontal comparison of the absolute values of these three indicators, it is found that CI of perinatal mortality rate is the highest, and CI of neonatal visit rate is the lowest, indicating that health services for perinatal infants are the most unfair, and the fairness of neonatal visit rate is the best.

Table 3
Concentration Index of Child Health Service (2010–2019)

Years	Neonatal visit rate %	Perinatal mortality rate‰	Mortality Rate of Under-five children %
2010	0.0325	-0.1208	0.0617
2011	0.0260	-0.0895	0.0463
2012	0.0167	-0.0960	0.0351
2013	0.0141	-0.0891	0.0253
2014	0.0143	-0.0825	0.0212
2015	0.0099	-0.1174	0.0145
2016	0.0082	-0.1142	0.0142
2017	0.0107	-0.1243	0.0130
2018	0.0113	-0.1107	0.0140
2019	0.0072	-0.1099	0.0101

4 Discussions

From 2010 to 2019, neonatal visit rate and system management rate of under-three children increase generally, and perinatal mortality rate decreases generally, indicating that child health services are gradually improving. Neonatal visit is the regular health check of the newborns by community medical staff, early detection of abnormalities and diseases, and popularization of scientific parenting knowledge to the mothers and their families during the visits. According to the case of each newborn and parturient, individualized guidance is given to the parturient to do well in newborn feeding, nursing and disease prevention, which has a positive effect on reducing the morbidity and mortality of the newborn and promoting the healthy growth of the newborn^{7,8}. System management of under-three children is that under-three children receive growth testing or physical examination, common disease prevention and other health management systems, which promotes the early intelligent physical development and reduce common diseases⁹. Perinatal death refers to stillbirths and neonatal deaths from 28 weeks of pregnancy to the 7th day after birth¹⁰. According to Fig. 1, it can be found that the mortality rate of under-five children declines slower than that of the perinatal infants. This suggests that the reduction in the deaths of children under 5 in China is more due to the decrease in children aged 1 to 4, and there is still a large room for perinatal deaths to decline. Therefore, vigorously conduct neonatal visit and child system management services to reduce perinatal mortality can reduce the mortality rate of under-five children.

Previous studies¹¹ have found that the death of perinatal infants is closely related to perinatal health care, the quality of obstetrics and pediatric diagnosis and treatment services, regional economic levels, social and cultural background, and geographical transportation. The perinatal health care system in the

western region is imperfect, and the economic level has affected the accessibility of maternal health services, resulting in a low proportion of pregnant women receiving prenatal education and prenatal examinations. Pregnant women in these areas have higher pregnancy risks and lack of health care awareness, which affects the safety of mothers and babies. The reduction of perinatal mortality is closely related to the development of maternal health services, which requires relevant departments to improve maternal health care, and strengthen the screening and management of high-risk pregnant women and birth defects¹². The neonatal visit rate and the system management rate of under-three children in the central region are lower than the eastern and western regions. The eastern region has richer material foundation and talent advantages than the central region, and western region have more policy support compared with the central region. And it is difficult to implement projects with a large population base in the central region. The gap between the three regions has gradually narrowed which is related to the change of national policies. The government has provided support in the medical and economic development of the central and western regions, such as *National Child Development Plan for Poor Areas* promulgated by the State Council in 2014.

From CI, there is an unfair phenomenon that child health services concentrate in provinces with high economic levels. The absolute value of CI of their three indicators are all showing a downward trend, indicating that the fairness of child health services continues to improve. This is related to policy of increasing capital and human input and promoting the equalization of basic public health services. However, the index increased slightly from 2014 to 2019, and the absolute value of CI of perinatal mortality rate in 2017 even reached the highest value in a decade, indicating that the fairness of child health services from 2014 to 2019 has not been further improved. This is related to the implementation of the separate two-child policy in 2013 and the implementation of the comprehensive two-child policy in 2015¹³. The two-child policy has increased the number of children the demand for child health services. However, nowadays resources of child care health are insufficient and high-quality resources are inclined to developed areas, resulting in inequality¹⁴. After the implementation of the two-child policy, the incidence of high-risk pregnant women has increased significantly in both developed areas and undeveloped areas¹⁵, which puts forward higher requirements for child health services. Developed areas have abundant medical service resources, which can still cushion the impact of the two-child policy, but undeveloped areas lack medical resources, and the contradiction between supply and demand brought about by the two-child policy is more prominent, which lead to increased unfairness of child health services between regions. Therefore, government should allocate health resources based on the needs of maternal and child health care, and appropriately tilt to the central and western regions. It is also found that the unfairness of perinatal mortality is the highest. The reason is that the perinatal mortality rate will be affected by the quality of maternal health care services, and the influencing factors are difficult to control, such as birth defects and preterm birth factors, will lead to death of the perinatal infant. One of the keys to preventing perinatal death lies in the level of diagnosis and treatment technology in obstetrics and pediatrics. Areas with high economic levels have high medical standards and effective prevention and treatment, which keeps the perinatal mortality rate at a low level, while areas with low economic levels are just the opposite, which further highlights the unfairness of perinatal mortality.

5 Conclusions

5.1 The decline in the mortality rate of under-five children is related to the improvement of child health services

5.2 The perinatal mortality rate in the western region is the highest, and the level of child health services in the central region is lower than the national average, but the gap between regions has gradually decreased

5.3 Child health services concentrate in provinces with high economic levels, and fairness is affected by the two-child policy. Among them, the unfairness of perinatal mortality is the highest

Abbreviations

Concentration index -CI

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Availability of data and materials

All data generated or analyzed during this study are included in this published article and its supplementary information files.

Competing interests

The authors declare that they have no competing interests

Funding

No

Authors' contributions

QXG conducted the design and screening data. WJ extracted and interpreted data and was a major contributor in writing the manuscript. JHN collected and sorted the data, and helped draft the manuscript. LYL conducted the searches of the literature, and was responsible for chart production. All authors read and approved the final manuscript.

Acknowledgements

Not applicable

References

1. Liu Z, Xiao Y, Zhao K, Liu AZ. Implementation progress and effect of National Essential Public Health Services Program in China. *Chinese Journal of Public Health*. 2019;35(06):657-664. Chinese
2. Ju L, Lu Y, Zhang H, et al. Current situation and quality evaluation of maternal and child health care services in China. *Maternal and Child Health Care of China*. 2019;34(04):726-730. Chinese
3. Zhang T, Sun LQ, Li ST, Zhu YY, Ren JP. Studying on the Equity of Maternal and Child Health Services in China From 2010 to 2014. *Chinese Health Service Management*. 2017;34(04):268-270. Chinese
4. He LP, Li XM, Meng Q, Chen Y, Zhang XP. Comparison of different calculation methods of concentration index. *Chinese Journal of Health Statistics*. 2015;32(04):699-701. Chinese
5. Wagstaff A. Inequality aversion, health inequalities, and health achievement. *J Health Economics*. 2002;21(04):627-641.
6. Wang YN, Wang BY, Liu XL, Zhao L, Jia XP. Equity Analysis of Health Resource Allocation in County-level Public Hospitals in Liaoning Province. *Chinese Hospital Management*. 2020;40(07):31-34. Chinese
7. Li JX, Wang L. Effects of increased community postpartum visits on parturient and newborns. *Psychologies*. 2020;15(14):14-15+18. Chinese
8. Li YW. The effect of postpartum visit nursing on the parturient and newborn during the puerperium. *Chinese Journal of Clinical Rational Drug Use*. 2020;13(32):150-152. Chinese
9. Yang YX. Evaluation of the role of child care system management in the early growth and development of children. *Modern Diagnosis and Treatment*. 2020;31(13):2164-2165. Chinese
10. Chen SZ. Surveillance Analysis of Perinatal mortality in Shaoxing city, from 2009 to 2019. *Chinese Journal of Birth Health & Heredity*. 2020;28(07):866-869. Chinese
11. Zhao ZL, Jiang LY, He LK, Jiang YJ. Research on the Relationship between Neonatal Mortality, Infant Mortality and Mortality of Children Under 5 Years Old at Home and Abroad. *Maternal and Child Health Care of China*. 2016;31(13):2585-2588. Chinese
12. Zhang YY, Liu CX. Analysis of perinatal mortality rate of different areas in China and the obstetric management measures. *Chinese Journal of Practical Gynecology and Obstetrics*. 2015;31(12):1088-1090. Chinese

13. Zhang XR, Jin LM, Zhang Q, Zhang YL, Cui W. Analysis on the Changes of High-Risk Factors of Key Pregnant Women before and after the Two-Child Policy. *Chinese Primary Health Care*. 2020;34(10):60-62+65. Chinese

14. Gu W, Wang DH, Hang SM, Ge AC, LI L, Tao JX. The influence of regional pediatric medical resources distribution on infant mortality and mortality of children under 5 years old. *Jiangsu Health System Management*. 2020;31(10):1381-1386. Chinese

15. Peng XY, Zeng L. Study on the Level and Equity of Pediatric Medical Resources Allocation in Hubei Province. *Medicine and Society*. 2020;33(11):15-19. Chinese

Supplementary Materials

Additional file 1.xls is not available with this version

Figures

Figure 1

Correlation Curve between National Child Health Services and Mortality Rate of Under-five children (2010-2019)

● Entire Country ◆ Eastern Region ■ Central Region ▲ Western Region

Figure 2

National and Regional Neonatal Visit Rate (2010-2019)

●Entire Country ◆Eastern Region ■Central Region ▲ Western Region

Figure 3

National and Regional Perinatal Mortality Rate (2010-2019)

●Entire Country ◆Eastern Region ■Central Region ▲Western Region

Figure 4

National and Regional System Management Rate of Under-three children (2010-2019)

● Neonatal Visit Rate

■ Perinatal Mortality Rate

◇ System Management Rate of under-three Children

Figure 5

Concentration Index of Child Health Services (2010-2019)