

Determinants of Child Health-Care Utilisation and Health Outcomes in Salem District, Tamil Nadu: A Health-Economic Analysis

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Abstract

The study uses district-level secondary data and recent Indian literature. First-trimester antenatal care (ANC) rose from 69.7% to 74.7%, and four or more ANC visits from 78.7% to 85.0%. Iron-folic acid (IFA) consumption for at least 100 days climbed from 63.9% to 82.2%, and full vaccination of children aged 12-23 months from 73.6% to 77.0%. Nutrition improved as well, but in NFHS-5 23.6% of children under five were still stunted, 20.8% underweight and 10.1% wasted. Services have grown faster than nutrition has improved. Read through Grossman's health-capital model and a household health-production framework, this pattern is not surprising: medical care is only one input, and household income, maternal education, food security and sanitation decide how far it turns into health. The paper argues that policy in Salem should now focus on the quality and continuity of care, complete immunisation, nutrition security and support for poorer households. Because the data are district averages, the study makes no causal claims. It ends by proposing a household-level econometric framework for future work.

Keywords: child health; health-care utilisation; health economics; maternal health; child nutrition; immunisation; NFHS; Salem District; Tamil Nadu; human capital

1. Introduction

The health a child has in the womb, in infancy and in the early years shapes growth, learning and later earning power. Poor health at that stage costs families, and it costs the wider economy too.

India has made real progress on maternal and child health. Institutional deliveries, antenatal care, immunisation and nutrition programmes have all widened, and Tamil Nadu is among the better-

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performing states. But a state average does not mean every district, community or household enjoys the same health security.

Salem is a useful place to ask the question. It has urban centres, peri-urban settlements and rural communities, and a fairly developed network of government hospitals, primary health centres, sub-centres and private facilities. Households, however, differ a great deal in income, schooling, occupation, food security and distance from care.

The economics matters here. A household splits limited income and time between food, schooling, housing, transport and health. Even where treatment is free or cheap, there are indirect costs: the bus fare, the hours in a queue, a day's wage lost to take a child to the facility. Maternal education shapes the decision too. A mother who knows why antenatal care, vaccination and proper feeding matter is more likely to use them, though whether she can act on that knowledge depends on the household's resources. Child nutrition shows how these pieces interact. A child can be fully immunised and still be undernourished because of a poor diet, repeated infections, bad sanitation or poverty. Child health therefore cannot be reduced to the use of health services. This paper compares NFHS-4 and NFHS-5 indicators for Salem and interprets them within a framework of household health production and health capital.

2. Theoretical framework

2.1 Grossman's health-capital model

Grossman (1972) treats health as a stock of capital that wears down over time and can be added to through investment. Medical care is one form of investment; education and healthy habits raise the efficiency with which health is produced. For children, parents and caregivers make the investments, through food, preventive care, treatment, schooling and a healthy home. The returns are fewer illnesses, better physical and cognitive development, more time in school, lower future health spending and higher productivity. Spending on child health is therefore partly an investment in human capital and not only consumption.

2.2 Household health production

The household health-production approach adds that families combine economic and non-economic resources to produce health. Child health can be written as a function of several inputs:

$$CH = f(MH, HC, NUT, SES, ENV, B)$$

Here CH is the child health outcome, MH maternal health and characteristics, HC health-care utilisation, NUT nutrition, SES socioeconomic status, ENV environmental conditions and B behavioural and household practices. The point of the formula is that medical care is one input among several. If one input stays weak, gains in another may not show up in the final outcome. That fits Salem, where better service use sits alongside persistent undernutrition.

2.3 Conceptual framework

The framework below links socioeconomic and health-system conditions to service use, health inputs, outcomes and long-term human capital. Socioeconomic factors can act on child health directly and also through the use of services.

Stage	Elements
1. Socioeconomic determinants	Maternal education, household wealth, maternal employment, residence, family size, food security
2. Health-system determinants	Availability of services, distance, affordability,

Stage	Elements
	quality of care, health insurance, outreach
3. Maternal health-care utilisation	Early ANC, four or more ANC visits, IFA supplementation, institutional delivery, postnatal care
4. Child health-care utilisation	Immunisation, growth monitoring, treatment-seeking, nutrition services
5. Intermediate health inputs	Breastfeeding, complementary feeding, dietary diversity, disease prevention, sanitation
6. Child health outcomes	Stunting, wasting, underweight, morbidity, healthy growth
7. Long-term human capital	School readiness, educational attainment, productivity, economic participation

3. Review of literature

Indian evidence on child health points to the same set of influences. Studies using NFHS data find that children from poorer households face much higher risks of stunting and underweight, and that maternal education and maternal nutrition matter as well. The link between poverty and nutrition is not only about the quantity of food. Poor households often cannot afford varied, nutrient-rich diets, and insecurity of income makes it harder to seek care on time, keep the home sanitary and look after a sick child.

Maternal education works through knowledge, decision-making and the ability to deal with health workers. Research on India's nutritional transition finds that it continues to protect children against undernutrition, especially when combined with household wealth. NFHS-5 studies also tie child nutrition to women's schooling, financial inclusion, mobile-phone access and household wealth.

On antenatal care, recent work draws a line between the number of visits and the quality of what is delivered. Many women attend four or more visits, yet the content of care is often incomplete, and education, wealth and residence are linked to inadequate use. This matters in Salem, where reported ANC use is already high and the question is increasingly about quality and continuity.

Immunisation is among the most cost-effective public health measures, because it prevents disease and the household and system costs of treating it. Studies across several NFHS rounds find that wealth, maternal education, health-card availability and antenatal care all influence full immunisation, so incomplete coverage cannot be explained by vaccine supply alone.

On malnutrition, stunting has fallen in India but unevenly. Wealth, maternal education and sanitation explain a large part of the socioeconomic inequality in stunting, and NFHS-5 analyses show that mothers and children in the same household can suffer from malnutrition together.

4. Research gap, objectives and hypotheses

National evidence is plentiful, but three gaps remain. National averages hide differences between districts, where health-system capacity and living conditions vary. Maternal care and child nutrition are usually studied separately, though a health-economic framework can connect them. And descriptive district indicators suit policy monitoring but cannot explain household-level differences. This paper addresses the first two gaps within one district-level framework and sets up the ground for the third.

The objectives are to:

1. Examine changes in selected maternal health-care indicators in Salem between NFHS-4 and NFHS-5.
2. Assess changes in childhood immunisation.
3. Examine selected child nutritional outcomes.
4. Interpret these indicators from a health-economic perspective and identify socioeconomic and health-system factors likely to influence child health.
5. Develop a conceptual framework for household-level analysis and propose policies for child health equity in Salem.

The research questions are: how maternal health-care use has changed in Salem; whether childhood immunisation has improved; what the nutritional profile of children under five now looks like; why high service use can coexist with continuing undernutrition; which socioeconomic factors are likely to matter; and which policy interventions could give the best health and economic returns.

The following hypotheses are proposed for future household-level testing. They are not tested in this district-level analysis.

- **H1:** Maternal education is positively associated with child health-care utilisation.
- **H2:** Household socioeconomic status is positively associated with the use of preventive child health services.
- **H3:** Greater antenatal-care use is positively associated with complete childhood immunisation.
- **H4:** Complete immunisation is associated with better child health outcomes.
- **H5:** Maternal education and household economic status are negatively associated with the probability of stunting and underweight.
- **H6:** The effect of health-care use on child health is partly mediated by nutrition-related practices.

5. Methodology

The study follows a descriptive and analytical secondary-data design. It compares NFHS-4 (2015-16) and NFHS-5 (2019-21) for Salem District, a mixed urban-rural district with government hospitals, primary health centres, sub-centres and private facilities. Sources are the NFHS-4 and NFHS-5 district fact sheets, the NFHS-5 India report, Government of India health and nutrition reports, and peer-reviewed and recent NFHS-based literature. Individual-level microdata are not used, so the study does not estimate causal regression coefficients.

The indicators are grouped as follows:

- **Maternal care:** first-trimester ANC, four or more ANC visits, IFA consumption, institutional delivery.
- **Child health-care use:** full immunisation, child health visits, preventive services.
- **Child outcomes:** stunting, wasting, underweight.
- **Socioeconomic determinants (for the framework, not measured here):** maternal education, household wealth, residence, employment, food security, access to facilities.

6. Results and discussion

6.1 Maternal care and immunisation

Table 1. Maternal and child health-care indicators, Salem District

Indicator	NFHS-4	NFHS-5	Change
First-trimester ANC	69.7	74.7	+5.0 pp

Indicator	NFHS-4	NFHS-5	Change
(%)			
At least 4 ANC visits (%)	78.7	85.0	+6.3 pp
IFA for at least 100 days (%)	63.9	82.2	+18.3 pp
Fully vaccinated, 12-23 months (%)	73.6	77.0	+3.4 pp

Source: NFHS-4 and NFHS-5 Salem district fact sheets.

Maternal care improved clearly. More women are entering the system early: first-trimester ANC rose by five percentage points. Repeated contact now creates more chances for screening, counselling, supplementation and referral, with four or more visits up by 6.3 points. The biggest gain was IFA, up 18.3 points to 82.2%. In economic terms these are signs of greater investment in preventive health during pregnancy. But the number of visits does not measure the quality of care, and national research shows the content of ANC is often incomplete even when the recommended visits are made.

Full vaccination among children aged 12-23 months rose from 73.6% to 77.0%. That is encouraging, but it leaves nearly a quarter of children outside the full-vaccination category. This gap is economically important because preventable illness costs households both directly and indirectly. National studies link incomplete immunisation to maternal education, wealth, ANC use and health-system factors, so the aim in Salem should go beyond making vaccines available. It should be to find the children who miss doses and understand why.

6.2 Child nutrition

Table 2. Nutritional status of children under five, Salem District

Indicator	NFHS-4	NFHS-5	Change
Stunting (%)	27.0	23.6	-3.4 pp
Wasting (%)	22.5	10.1	-12.4 pp
Severe wasting (%)	8.4	4.3	-4.1 pp
Underweight (%)	22.2	20.8	-1.4 pp

Source: NFHS-4 and NFHS-5 Salem district fact sheets.

Nutrition improved, most of all for wasting, which fell from 22.5% to 10.1%. Stunting dropped from 27.0% to 23.6%, yet nearly one child in four was still stunted in NFHS-5, and underweight moved only from 22.2% to 20.8%. The persistence of stunting is the most telling number, because it reflects long-run nutritional and developmental conditions and not a short-term food shortage.

6.3 A health-economic reading

The results contain an apparent puzzle: maternal care improved sharply while undernutrition stayed common. There is no contradiction. A mother can receive good antenatal care and her child can be fully immunised, yet the household may still struggle to provide an adequate diet. Health is produced from access, use, nutrition, household resources and environment together, and a weak link in any of them limits what the others deliver. A narrow medical model is not enough.

Maternal education deserves special mention. It improves knowledge of services and vaccination schedules, recognition of danger signs, feeding decisions, conversations with health workers, household budgeting and a woman's say in family decisions. Indian evidence consistently identifies it as a determinant of both nutrition and service use. Its benefits therefore reach beyond the labour market: it raises the efficiency with which a household converts its resources into health.

Household wealth works in a similar way. Poorer households tend to have less varied diets, unstable work, higher transport barriers, less ability to absorb indirect costs, less access to private care and worse housing and sanitation. NFHS-based research shows that wealth, maternal education and sanitation explain much of the inequality in stunting. Universal services may lower financial barriers, but households facing several disadvantages at once still need targeted help.

Food security belongs in the same picture. Local research on urban slum households in Salem has linked food insecurity to the nutritional status of under-five children. A child needs health services, enough food, a safe environment and good care together, which is why health departments, nutrition programmes, local government and social protection have to work as one.

Taken together, Salem has seen real improvement in maternal and child health-care use between NFHS-4 and NFHS-5, matching the wider Indian literature. The results also reinforce a distinction between coverage and quality: a high count of ANC visits does not mean every recommended service was received, and vaccines can be available while some children are still missed because of missed appointments or household barriers. The next stage of policy should concern the effectiveness of use, not only the availability of services.

7. Policy implications

Priority	What to do
Move from coverage to quality	Monitor the content of ANC as well as the number of visits: IFA supplementation, blood-pressure checks, anaemia screening, counselling, nutrition advice, risk identification and referral.
Find children missing vaccines	Track children who have missed doses through frontline workers and follow up at the household.
Join nutrition and health services	Use every vaccination or health visit to check growth, feeding practices, dietary diversity, illness, sanitation and household food insecurity.
Target vulnerable households	Add targeted support to universal programmes for households facing several disadvantages.
Build maternal health literacy	Give practical, usable information instead of general awareness messages.
Reach rural and peri-urban areas	Focus outreach where distance, transport or lost wages hold down use.
Link health with social protection	Connect child health programmes with nutrition schemes, food security, women's empowerment, sanitation, financial protection and livelihood support.

8. A district model for child health in Salem

The paper proposes a six-level model that links public health with health economics.

Level	Content
1. Household capacity	Income, education, food security, women's empowerment
2. Health-system access	Primary health centres, hospitals, outreach, health workers, insurance
3. Service utilisation	ANC, IFA, immunisation, growth monitoring, treatment-seeking
4. Child health inputs	Nutrition, breastfeeding, complementary feeding, sanitation, disease prevention
5. Outcomes	Lower stunting, wasting, underweight and morbidity
6. Economic returns	Better school readiness and attainment, higher productivity, lower future health spending

Model 4 uses concentration indices and decomposition methods to estimate how much household wealth, maternal education, sanitation, residence, maternal BMI and health-care use contribute to health inequality. A primary survey should collect the following:

Domain	Suggested variables
Household economy	Income, expenditure, wealth
Maternal characteristics	Education, employment, BMI
Health access	Distance, travel time, transport
Health utilisation	ANC, postnatal care, immunisation
Nutrition	Dietary diversity, food security
Child health	Height, weight, morbidity
Health expenditure	Direct and indirect costs
Environment	Water, sanitation, housing
Women's agency	Financial control, decision-making
Information	Media and mobile health information

Such a study would allow the economic determinants of health-care use to be estimated, along with the cost-effectiveness of different interventions.

10. Limitations

The study relies on secondary data, so it depends on the indicators that NFHS provides. It uses district-level estimates and cannot establish causal relationships at the individual level. NFHS-5 refers to 2019-21 and should not be read as a measure of Salem's health in 2026. District averages can hide wide differences between rural, urban, tribal and poorer communities. Finally, the study does not estimate household health spending or the direct economic cost of childhood illness.

11. Conclusion

Salem District improved on most maternal and child health indicators between NFHS-4 and NFHS-5.

First-trimester ANC rose from 69.7% to 74.7%, four or more visits from 78.7% to 85.0%, IFA use for 100 days from 63.9% to 82.2% and full vaccination from 73.6% to 77.0%. Stunting fell from 27.0% to 23.6%, wasting from 22.5% to 10.1% and underweight from 22.2% to 20.8%.

Still, the remaining burden of undernutrition shows that better service use alone cannot guarantee good child health. Families need both services and the socioeconomic conditions that let them benefit from those services. For Salem, that means an integrated approach that joins maternal health, immunisation, nutrition, food security, women's education and empowerment, sanitation and targeted support for poorer households. These measures are best seen as investment in human capital: healthier children today mean lower health costs, better schooling and a more productive population later. Future household-level research should test the proposed relationships and estimate the relative weight of socioeconomic, maternal, nutritional and health-system factors.

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