

Title: Cost-Benefit Analysis for Universal Cataract Coverage in India

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Conflicts of Interest:

None

Background:

Cataract is the most significant cause of curable blindness necessitating universal coverage. Here, we have estimated the scale-up costs for universal cataract coverage and the benefits of averting the economic burden of disease in India.

Methods:

We conducted retrospective analysis for 2018. We used data for cataract prevalence and disability-adjusted life-years (DALYs) from the Global Burden of Diseases (GBD) study and surgeries conducted under the government-sponsored program from the National Health Profile (2020). We used 10 per capita surgical costs: National Sample Survey on health consumption, six cataract surgical packages under the national health insurance, and direct, indirect, and societal costs from Aravind Eye Care Model, Madurai. For the cataract scale-up costs, we calculated the total need by multiplying cataract prevalence with per capita costs and the unmet need by multiplying the difference between the prevalence and surgeries achieved with the same costs. For economic benefits of averted cataract burden in 2018, we multiplied DALYs with non-health gross domestic product (i.e., GDP - Government Health Expenditure) derived from the National Health Accounts (2021). For net benefits, we subtracted the scale-up costs for meeting total and unmet needs from economic benefits. All monetary values were adjusted for inflation and converted to USD 2020.

Findings:

Annual scale-up costs for meeting total cataract needs were 921,852,056-4,898,629,084 USD in 2018. Costs for covering unmet needs were 718,584,854-3,818,487,619 USD. The economic benefit by averting the cataract disease burden was

12,429,100,755 [8,878,449,077, 16,662,568,954] USD. Annual net benefits for covering total needs are 7,530,471,671 to 11,507,248,698 USD. While those for covering unmet needs are 8,610,613,136 to 12,429,100,755 USD. All Indian states would benefit from cataract scale-up, i.e., positive net benefit values.

Interpretation:

We found that universal cataract coverage would be cost beneficial for India. Scale-up of cataract surgeries to cover unmet needs makes up a small percentage of the country's GDP. This study looked at annual net benefits. Future studies should investigate projected benefits for the future.

Source of Funding:

None

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INTRODUCTION

- Cataract is the most common cause of curable blindness necessitating universal coverage in India¹.
- What we know:** According to the **Global Burden of Disease Study (GBD)**², India had a cataract burden of **30.34 million** in 2017-18. According to the **National Health Profile**, the number of cataract surgeries achieved during that time were only **6.66 million**. India has subsidized cataract surgery packages under national program and government-funded health insurance- **Pradhan Mantri Jan Arogya Yojana (PMJAY)**.
- What we don't know:** The amount of money government needs to invest for universal cataract coverage. Would the money spent by the government be beneficial?
- Our three main aims:**
 - To calculate scale-up costs for meeting total and unmet cataract coverage needs.
 - To calculate the economic benefits of disease burden averted by cataract surgeries.
 - The net benefits for cataract coverage scale-up.

METHODS

We conducted a retrospective analysis for India and its 30 states for 2018.

Variables	Date Sources
Cataract prevalence and disability-adjusted life-years (DALYs)	GBD 2019
No. of free/subsidized cataract surgeries in a year conducted under national program	National Health Profile 2020
Cost of cataract surgeries	PMJAY Benefits Package List 2.0, National Sample Survey 2017-18, Aravind Eye Care Model
Gross State Domestic Product per Capita (GSDP), Total Health Expenditure per Capita (THE), Government Health Expenditure (GHE), and Gross Domestic Product (GDP)	National Health Accounts (NHA) 2021

Scale-Up Costs Analysis

We used ten cataract surgical package costs in two cataract needs scenarios.

Scale-up costs for total needs = (cataract prevalence) * (cataract surgical package cost)

Scale-up costs for unmet needs = (cataract prevalence - cataract surgeries conducted) * (cataract surgical package cost)

Analysis of Economic Benefits of Averted Disease Burden³

Economic Benefits (Value of Life-Year or VLY) = ((GSDP - THE) * 2.8) * DALY

For states, we consider GSDP and THE. For India, we consider GDP and GHE.

Benefits Analysis

Mean net benefits for total needs = Mean VLY - scale-up costs for total needs

Mean net benefits for unmet needs = Mean VLY - scale-up costs for unmet needs

All costs were adjusted from INR to USD as per USD value in year 2020. 95% uncertainty intervals were propagated from DALYs to VLYs.

FINDINGS

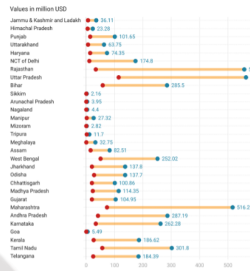
Minimum & maximum scale-up costs for meeting total needs for India are 922 & 4899 million USD.

Minimum & Maximum Scale-Up Costs for Meeting Total Needs



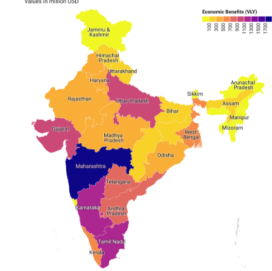
Minimum & maximum scale-up costs for meeting unmet needs are 719 & 3824 million USD.

Minimum & Maximum Scale-Up Costs for Meeting Unmet Needs



Economic benefits of averted burden for India are 12.4 (95%UI: 8.9 - 16.7) billion USD.

Economic Benefits (VLYs) of Universal Cataract Coverage in India



Net Benefits for Meeting Total Needs for Universal Cataract Coverage in India

State	Mean Cost (USD)	95% UI (Lower)	95% UI (Upper)
Andhra Pradesh	156.02	156.02	156.02
Assam	156.02	156.02	156.02
Bihar	156.02	156.02	156.02
Chhattisgarh	156.02	156.02	156.02
Goa	156.02	156.02	156.02
Gujarat	156.02	156.02	156.02
Haryana	156.02	156.02	156.02
Himachal Pradesh	156.02	156.02	156.02
Jharkhand	156.02	156.02	156.02
Karnataka	156.02	156.02	156.02
Kerala	156.02	156.02	156.02
Madhya Pradesh	156.02	156.02	156.02
Madhesh	156.02	156.02	156.02
Maharashtra	156.02	156.02	156.02
Manipur	156.02	156.02	156.02
Mizoram	156.02	156.02	156.02
NCT of Delhi	156.02	156.02	156.02
NCT of Jammu & Kashmir	156.02	156.02	156.02
NCT of Chandigarh	156.02	156.02	156.02
Odisha	156.02	156.02	156.02
Punjab	156.02	156.02	156.02
Rajasthan	156.02	156.02	156.02
Tamil Nadu	156.02	156.02	156.02
Telangana	156.02	156.02	156.02
Uttar Pradesh	156.02	156.02	156.02
West Bengal	156.02	156.02	156.02
Yudh-Kashmir	156.02	156.02	156.02

Except Bihar, Manipur & Meghalaya, all other states would see net benefits for meeting total needs. Maharashtra would have had the largest net benefit.

Except Manipur & Meghalaya, all other states would see net benefits for meeting unmet needs. Maharashtra would have had the largest net benefit.

Minimum & maximum net benefits for meeting total needs for coverage in India are 7.5 & 11.5 billion USD.

Minimum & maximum net benefits for meeting unmet needs for coverage in India are 8.6 & 11.7 billion USD.

CONCLUSIONS

- Universal cataract coverage would be cost-beneficial for India as the scale-up costs of covering unmet needs make up only a small percentage of India's GDP.
- Caveats: The study assumes that all cataract surgeries would prevent blindness. Moreover, it doesn't account for all causes of cataract, like congenital cataract and cataract due to metabolic reasons.
- This study looked at annual net benefits. Future studies should investigate projected benefits over years extending beyond 2030.

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