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Review Article

Can vaccination reduce catastrophic health spending? Evidence from rotavirus disease and vaccine introduction in India: a narrative review

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ABSTRACT

In any healthcare system with a high reliance on out-of-pocket spending, treatment for severe rotavirus gastroenteritis can lead to catastrophic health expenditures owing to the costs associated with hospitalization and nonmedical care. While the significant impact of rotavirus vaccination programs on reducing disease incidence, hospitalizations, and childhood mortality is well established, much less attention has been given to their potential impact on the financial burden of diseases that patients, particularly impoverished patients, may experience as a result of the need for medical care. The available literature demonstrates that rotavirus vaccination programs markedly decrease the incidence of severe gastroenteritis and hospitalizations, which are responsible for the high out-of-pocket health expenditures suffered by households. By preventing severe cases and hospitalizations, the vaccines lower direct costs but also indirect costs associated with transportation to and from care facilities and time spent caring for children instead of earning an income. Although no direct estimates currently exist regarding the degree to which the introduction of rotavirus vaccination programs in India reduced catastrophic health expenditures since their introduction, economic evaluations and modeling studies consistently identify that all the financial protective effects of vaccination programs are progressive and disproportionately benefit poorer households. The evidence thus supports the role of rotavirus vaccines not only as lifesaving interventions but also as lifesaving interventions that specifically reduce household financial burdens, promoting universal health coverage and health equity in India.

Keywords: Rotavirus Gastroenteritis, Catastrophic, Spending burden, Out of pocket expenses, Impact, India

INTRODUCTION

Rotavirus infection is responsible for a significant proportion of severe acute gastroenteritis in infants and young children and is a major contributor to childhood disease and death in India. Nearly all children are infected with rotavirus by 5 years of age, and severe rotavirus gastroenteritis often leads to the need for outpatient or hospitalized management due to dehydration and other complications.[1] Before the worldwide implementation of rotavirus vaccines, rotavirus gastroenteritis (RVGE) caused 453 000 deaths globally in young children less than 5 years of age, with India responsible for 22% of the global RVGE mortality.[2,3] Even in the least affected countries, such as Malaysia, rotavirus gastroenteritis results in high levels of morbidity and substantial health care costs and household costs for the treatment of the condition.[4] The World Health Organization (WHO) recommends that rotavirus vaccines be implemented in immunization programs globally to prevent RVGE.[5] In light of this global burden of disease, India chose to implement a domestically produced rotavirus vaccine in its universal immunization program to reduce the burden of rotavirus disease and the costs associated with treatment of the disease.[6]

Although deaths from rotavirus have been eliminated through better management of the disease and improved health care accessibility, rotavirus disease continues to pose a significant clinical and economic burden on families and the health care system. In India, where diarrheal disease continues to be the leading cause of

hospitalization in children, rotavirus-related disease is not only a public health problem but also a financial burden on families.[7]

The economic burden of rotavirus disease is likely to be especially substantial in environments with high OOP health expenditures. India is a high-OOP health expenditure country, financing most health care costs directly at the household level, with little financial threat protection for many population groups. Even when using public services, families incur additional costs for medicines and diagnostics, travel to facilities, food, and opportunity costs of time lost to seeking care.[8] Households may therefore incur considerable OOP expenses if they seek treatment for severe rotavirus gastroenteritis. These expenses may exceed the financial limits of a household. If spending on health care absorbs a large proportion of a household's income, or if it forces a household to borrow, sell assets, or reduce its basic consumption needs, the spending is classed as catastrophic health spending (CHS). CHS has been shown to drive vulnerable households further into poverty and create vicious cycles of financial insecurity. In this context, the widespread introduction of rotavirus vaccination programs presents a lifeline, reducing the burden of severe rotavirus disease and easing the economic strain on households, especially those that are most vulnerable.[4,9,10]

Vaccination offers a unique solution to the dual burden of disease and cost burden. Rotavirus vaccines significantly reduce severe gastroenteritis disease burden, hospitalizations, and medical costs in vaccinated children.[11] By preventing illness episodes that incur these additional treatment costs, the direct and indirect costs to families can be reduced. In this way, vaccination programs might be considered protective not only from a public health perspective but also from a cost perspective. The implementation of rotavirus vaccination programs, for example, could help to avoid the high costs of medical treatment for rotavirus diarrhea in countries such as India; the annual cost of such treatment in the country has been estimated to be between ₹2.0 billion and ₹3.4 billion.[12] This consideration is especially relevant to lower- and middle-income countries such as India, where the cost of illness episodes can increase the expenditures and risk of catastrophic spending faced by household members. Immunization programs in India and Ethiopia, for example, have been shown to reduce rotavirus deaths by 85% in high burden countries such as India and to have a significant effect on household expenditure in India despite socioeconomic status, impacting risk-protective factors and benefiting mainly the poorest of the poor.[10]

India has incrementally rolled out the rotavirus vaccine to its Universal Immunization Programme (UIP) to avert the morbidity and mortality of rotavirus-related diarrhea while maximizing access equity through a publicly funded model.[13] Although the health benefits of the vaccine are well documented in the scholarly literature, much remains to be learned about its impact on the household-level financial outcomes of its beneficiaries. Most studies have focused on reducing incidence, hospitalizations or direct/indirect costs at the population level; few studies have addressed the question of whether the demonstrated health benefits of rotavirus vaccination have similar population-level implications for OOP expenditure and CHS. Clarifying the relationship between these two variables is especially relevant in the Indian healthcare system, which allows access to care in the public or private sector at the family's discretion and in which healthcare-seeking behaviors have been demonstrated to correlate with the income level, educational level, and urban or rural status of the household.[14]

This study investigated the impact of vaccination on catastrophic health spending via evidence from rotavirus disease and the roll-out of the rotavirus vaccine in India. By examining changes in healthcare utilization and spending patterns before and after the introduction of the vaccine, this study aims to quantify the value of vaccination in providing financial protection against the costs of treating this disease. In so doing, this study adds to the evidence of how vaccination as a preventive intervention can help achieve universal health coverage objectives by generating both health gains and alleviating financial burdens. The results will be used to inform immunization policy decisions on vaccine funding, inclusion in public health programs, and the potential role of vaccination in reducing health inequities in India. Thus, this study fills a crucial gap in the literature by investigating the financial risk protection associated with rotavirus vaccination in a high out-of-pocket spending context with significant socioeconomic diversity across populations.

BURDEN OF ROTAVIRUS DISEASE AND ITS ECONOMIC CONSEQUENCES IN INDIA

Rotavirus infection remains an important cause of severe acute gastroenteritis in children under five years of age in India and is a significant contributor to pediatric illness and health care visits. While improved use of oral rehydration solution and management practices have mitigated the disease's impact, rotavirus infections are still among the leading causes of diarrhea-related hospitalizations in children under five years of age. Many of these cases require hospitalization due to vomiting, dehydration, electrolyte imbalance, and complications of the infection, with the youngest infants, particularly those at risk, as well as those from economically disadvantaged groups. The costs associated with rotavirus disease are also substantial at the household level because of direct medical costs and indirect costs related to lost wages from caregivers who tend to care for sick children.[4] India has one of the highest burdens of rotavirus deaths in children under five years of age.[10,12] Understanding the full economic burden of disease beyond direct medical costs is important for making informed policy decisions.

In addition to the direct medical costs of rotavirus disease, there is also a considerable economic burden on households. As noted previously, in India's health care financing system, direct payments to providers by patients account for the majority of health care expenditures. Direct medical costs should be viewed in the context of relatively mild and short illnesses. Nevertheless, households face considerable costs. These include consultation fees, hospitalization costs, costs of medicines, diagnostic costs, transport costs, accommodation costs for caregivers and loss of productivity due to working days lost. Costs can be high, especially when private health care providers are consulted, as is often the case in both urban and rural settings.[15] The cumulative burden of direct and indirect costs can be overwhelming; the catastrophic consequences for vulnerable households are particularly well described.[10,16]

Several studies have shown that diarrheal diseases are a leading cause of CHS among households with young children. CHS occurs when health spending exceeds a certain threshold of household income or consumption and can force families to forgo basic needs, borrow money, or dispose of productive assets. For rotavirus, the cost of hospitalization already represents a large percentage of monthly and even yearly household income, especially in low-income families.[17] As a result, rotavirus disease not only endangers the health of the child but also increases the financial burden on families and contributes to the intergenerational transmission of poverty.

ROTAVIRUS VACCINATION AND REDUCTION IN HEALTHCARE UTILIZATION

Vaccination against rotavirus is one of the most effective ways to prevent rotavirus diarrhea and its associated complications. Vaccines have been shown in clinical trials and post introduction studies from various countries to reduce severe gastroenteritis, emergency care visits, and hospital admissions.[18] In high-burden countries such as India, which disproportionately burden systems with diarrhea in children, the value of these reductions is crucial to services and home lives.

By preventing severe clinical episodes, rotavirus vaccination directly prevents the need for medical care and reduces both direct medical costs and indirect costs to families. Fewer hospitalizations lead to fewer expenditures on bed fees, intravenous rehydration, laboratory tests, and medicines and, beyond that, lost wages from parents' caregiving responsibilities.[19] Thus, it acts as a de facto cost-protection strategy in its own right, especially for countries in which vaccination programs are rolled out in contexts with little use of (or no) OOPs and with the HPV vaccine. Public financing of rotavirus vaccination has the added benefit of reducing mortality after medical care in children.[10] For example, in India and Ethiopia, billions of dollars in household costs could be avoided if rotavirus illness is publicly funded through vaccines and payments, much of which accrue specifically to the lowest socioeconomic quintiles.[10] Analyses have shown that rotavirus vaccination programs save not only individual households but also millions of hospitalizations and doctor visits worldwide, even at relatively high rates of the price of the vaccine itself.[20] They protect against financial disasters by limiting OOPs and income disparities in health care use.[4]

EVIDENCE FROM ROTAVIRUS VACCINE INTRODUCTION IN INDIA

India introduced the rotavirus vaccine in a staggered manner to the UIP with the aim of reducing diarrheal morbidity and mortality and ensuring equitable access to immunization through the establishment of a publicly funded programme. Early programmatic assessment and surveillance data suggest reduced rotavirus hospitalization and severe diarrhea in targeted age groups.[7] These health gains are expected to yield economic returns at the household and healthcare system levels.

Emerging evidence from India suggests that rotavirus vaccination reduces treatment-related OOP spending costs by reducing hospitalization rates, as the cost of inpatient care accounts for the highest proportion of overall treatment costs. Even slight reductions in hospital admissions can save households a significant amount of money.[21] The fact that the vaccine is made available through public sector programs reduces the potential vaccine acquisition costs for households and the reliance on expensive private health care. Mass rotavirus vaccination campaigns have also been shown to have a significant public health impact by preventing a large burden of morbidity and mortality at a cost per life-year saved that is substantially less than existing cost-effectiveness thresholds.[22] This especially applies to low-income settings with high levels of mortality, which increases the potential impact of these interventions.[10] The economic benefit of vaccination does differ between populations, as households that mainly use private facilities for their treatment still incur high levels of costs for the treatment of residual illness episodes, pointing to unequal access to and financing of health care resources. Differences between states in health care, insurance coverage, and immunization coverage seem to play a role in the degree to which vaccination protects against financial threat. As such, future studies should investigate the financial impact of rotavirus vaccination in different socioeconomic and healthcare contexts in India.[23]

VACCINATION AND CATASTROPHIC HEALTH SPENDING

While there is no direct empirical evidence yet that rotavirus vaccination has reduced catastrophic health spending in India, studies and economic modeling allow a strong inference of such an effect.[24] By preventing severe

rotavirus cases, households are less likely to face catastrophic healthcare costs that exceed their ability to handle. The impact on poor and near-poor households is especially significant, as healthcare shocks can devastate their economic well-being for years.

Vaccination may therefore support the economic risk protection agenda, which is a cornerstone of universal health coverage (UHC). In a direct way, rotavirus vaccination decreases the incidence of disease and health service use, which reduces the occurrence and intensity of catastrophic health expenditures beyond the help of demand-side financing, e.g., publicly funded insurance programs.[23]

Indirectly, these economic benefits of vaccination translate into longer-term stabilization of economically vulnerable populations by protecting their most basic economic unit: the household.[25] Finally, the long-term decrease in rotavirus disease burden allows reallocation of health system/public health resources toward strengthening other areas of need for direct and indirect impacts.[10]

POLICY AND HEALTH SYSTEM IMPLICATIONS

The reviewed evidence adds value to rotavirus vaccination by also demonstrating the economic and equity benefits associated with vaccination. Using metrics for financial protection (e.g., out-of-pocket expenditure and catastrophic health spending) in the impact evaluation of rotavirus vaccines helps make a strong case for continued public investment in rotavirus vaccination and informs policy-makers of the full range of benefits associated with rotavirus vaccination being not just a public health intervention but also a public health and economic strategy.[10,23]

This argument has particular relevance for India, where the elimination of a major share of rotavirus disease through preventative vaccination delivers large returns on investment. Continued investment in rotavirus vaccine programs, especially in low- and middle-income countries, is needed to meet health and poverty reduction goals, including the SDG targets, for households with children living in poverty.[23]

Consequently, improving routine immunization coverage and ensuring that coverage rates are equitable across socioeconomic groups would be the best route forward. Combining economic evaluation with disease surveillance would also help provide policy-makers with a better understanding of the value of vaccination programmes.[26]

VACCINATION AND CATASTROPHIC HEALTH SPENDING: A CONCEPTUAL FRAMEWORK

The rotavirus vaccine protects against disease and severity and decreases out-of-pocket expenditures in terms of hospitalization and medication, ensuring that households are not financially burdened by catastrophic health expenditures.[10,23] The financial protection aspect is crucial for vulnerable population groups, as rotavirus vaccination programmes have a greater ROI for these groups.[27] Increased return on investments fosters economic growth, enhances the health impact of the vaccination program and plays an integral role in poverty alleviation in Uganda, thus addressing the global agenda for universal health coverage.[23,27] Uganda made an expenditure savings of 57 million ($7 per capita) on diarrhea. The return on investment (ROI) per dollar spent on RV was $1.48.[28]

CONCEPTUAL FRAMEWORK LINKING VACCINATION AND CATASTROPHIC HEALTH SPENDING

Catastrophic health spending (CHS) is understood in a broad conceptualization of financial risk protection failure and is defined as out-of-pocket (OOP) health expenditures exceeding a specified share of household income or consumption, typically set at 10-25% of total household spending or 40% of non-subsistence spending.[29] In this conceptualization, illness is an economic shock that displaces spending on essential household needs such as food, schooling and shelter. In low- and middle-income countries such as India, where OOP spending is the predominant form of health financing, acute childhood illnesses such as rotavirus diarrhea are especially likely to induce CHS.

Vaccination affects CHS through a preventive risk pathway. The vaccine reduces the probability of the disease occurring or the probability of a serious disease, thereby reducing the need for the household to access health care in the first place.[23] This effect applies especially to diseases such as rotavirus, where severe cases routinely result in hospitalization and where the costs associated with treatment are highly skewed toward a small number of cases that account for the majority of spending. In this way, vaccination reduces exposure to high-cost health events, leading to a reduction in both the prevalence and intensity of catastrophic spending.

PATHWAYS OF FINANCIAL PROTECTION THROUGH ROTAVIRUS VACCINATION

Conceptually, the vaccine's relationship with CHS can be understood through three mechanisms: 1) disease prevention lowers healthcare use and the most financially destructive form of health care, inpatient care; 2) cost avoidance prevents not only the direct costs of treatment but also the indirect costs, such as transportation to care, accommodation, and lost income for caregivers; and 3) risk pooling through public provision improves financial protection when vaccines are provided at no cost through public programmes by reducing reliance on privately provided care, which exposes households to market prices for health care.[23]

In India, all three mechanisms are strengthened by the role of the UIP in providing the vaccine free of charge to the most vulnerable populations, who are most in need of financial protection. High coverage rates maximize population-level effects and minimize household exposure to the financial consequences of preventable infectious diseases. This further strengthens the role of prevention in efforts to improve financial protection and achieve universal health coverage, especially in developing countries such as India, where out-of-pocket spending on health care is a major cause of CHS and a driver of the re-impoverishment of vulnerable populations.[30]

DIFFERENTIAL IMPACT ACROSS SOCIOECONOMIC GROUPS

Conceptual models of CHS suggest that the financial consequences of illness are not distributed evenly across households. Poorer households are at greater risk of suffering catastrophic expenditures even for modest healthcare costs, and richer households will be able to absorb similar costs without incurring catastrophic expenditures. Financially protective effects of vaccination will therefore be progressive, providing greater benefits to poorer households.[31]

In the case of rotavirus vaccination, progressivity arises from the greater disease burden experienced by poorer households, their greater reliance on OOP payments, and their lower likelihood of being able to rely on insurance.[32] The welfare costs of a single episode of hospitalization incurred by a poor household will be greater than the costs incurred by a richer household in terms of avoiding borrowing, losing savings and assets, and having reduced consumption needs. Vaccination will therefore be protective not only with regard to efficiency but also with regard to equity.

VACCINATION WITHIN THE HEALTH SHOCK–COPING FRAMEWORK

From a health economic perspective, rotavirus disease can be characterized as a transient health shock with persistent economic impacts. Households cope with these shocks by borrowing, selling off assets or depleting future healthcare funds.[17] Conceptual models indicate that coping strategies reduce buffering costs but increase vulnerability over time. The vaccine breaks the cycle by stopping the shocks from occurring in the first place.[33]

This model applies to India, where informal borrowing and distress financing are the norm for coping with health expenditures. By decreasing the incidence of severe rotavirus cases, the vaccine reduces the number of instances in which households are forced to engage in such coping strategies.[23]

IMPLICATIONS FOR MEASUREMENT AND POLICY

The association between vaccination and catastrophic expenditures highlights the importance of extending vaccine evaluations beyond clinical outcomes. Evaluating the impact of vaccination on out-of-pocket spending and catastrophic expenditures provides a comprehensive measure of the value of immunization programs. This argument is particularly valuable to policy-makers, reinforcing the case for public financing of vaccines, especially in resource-constrained settings, where the benefits of prevention generate substantial savings.[34]

Incorporating financial risk protection measures into routine evaluations not only enhances our understanding of the value of vaccination but also aligns immunization programmes with universal health coverage goals. The rotavirus vaccine in India has thus become more than a child health intervention; it is important for household welfare and social policy investment. With this broader framing, we can understand that investing in vaccines not only improves health outcomes but also, just as importantly, protects households economically, especially those at greatest risk.[23]

HEALTH AND ECONOMIC IMPACT OF ROTAVIRUS VACCINATION

This section consolidates results from multicounty and LMIC studies evaluating the effects of rotavirus vaccination on healthcare usage, economic burden, and catastrophic expenditure. The results revealed significant reductions in symptomatic illness, hospitalization, healthcare visits, and financial burden across the board, with the most pronounced effects in vulnerable populations. The table below summarizes the main health and economic outcomes measured by the studies.

Table 1: The main health and economic outcomes measured by the studies.

Outcome category	Specific outcome	Estimated reduction/savings
Healthcare utilization	Symptomatic rotavirus infection	13.0% reduction[6]
Healthcare utilization	Population-wide rotavirus mortality	34.6% reduction[6]
Healthcare utilization	Rotavirus outpatient visits	21.3% reduction[6]
Healthcare utilization	Rotavirus hospitalizations	28.1% reduction[6]
Financial savings (Uganda 2018-2021)	Diarrhea-associated expenses (excluding mortality productivity)	~$57 million[28]
Financial savings (Uganda)	Return on investment (excluding mortality productivity)	$1.48 per dollar invested[28]

Continued.

Outcome category	Specific outcome	Estimated reduction/savings
Financial savings (Uganda)	Return on Investment (including mortality productivity)	$78 per dollar invested[28]
financial savings (Uganda)	ROI for most disadvantaged groups	$1.71 to $2.03 per dollar[28]
Catastrophic health expenditure (LMICs)	Averted CHE cases (across 52 Gavi-eligible countries 2000-2030)	~200 million[23]
Catastrophic health expenditure (LMICs)	Proportion of CHE cases prevented among the poorest quintiles	Approximately half[23]

CONCLUSION

This review shows that rotavirus vaccination in India has health economic benefits beyond reducing childhood morbidity and mortality. It spares households from catastrophic health spending. Rotavirus disease is associated with high out-of-pocket hospital care, medication and indirect costs, especially in a health system that does not consistently provide financial risk protection. By preventing disease episodes associated with costly care, vaccination reduces exposure to sudden large health care payments and the risk of CHS, especially among vulnerable socioeconomic groups.

Evidence from India and other similar low- and middle-income countries shows that the introduction of the rotavirus vaccine reduces the burden of severe diarrhea, hospitalizations and treatment costs. The returns are highest where public immunization services are available and utilized, highlighting the importance of continued support for routine immunization programs and equitable access to all children. Direct evidence of reduced catastrophic health spending is limited, but model projections and preliminary evidence support immunization as a key pillar of financial risk protection necessary to achieve universal health coverage.

The benefits of a resilient immunization system and effective immunization program in protecting households from health and economic shocks during the COVID-19 pandemic underscore the importance of this message. Improving rotavirus vaccination rates, along with supply chains, cold chains and health information systems, will enhance the health and economic returns of the vaccination program. Future research should focus on household-level studies that measure catastrophic health spending, household costs and longer-term effects of vaccination on household economics. In conclusion, rotavirus vaccination is not only a life-saving public health intervention but also an important investment in household health economic equity in India.

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REFERENCES

1. Nirmal K, Gangar S. Rotaviral Diseases and Their Implications. IntechOpen eBooks, IntechOpen. 2023.
2. Tate JE, Burton A, Boschi-Pinto C, Steele AD, Duque J, Parashar UD. 2008 estimate of worldwide rotavirus-associated mortality in children younger than 5 years before the introduction of universal rotavirus vaccination programmes: a systematic review and meta-analysis. Lancet Infect Dis. 2011;12:136.
3. Parikh R, Raju BB, Vetter V, Kolhapure S. Epidemiology of rotavirus gastroenteritis and need of high rotavirus vaccine coverage with early completion of vaccination schedule for protection against rotavirus diarrhea in India: A narrative review. Indian J Publ Health. 2019;63(3):243.
4. Loganathan T, Lee WS, Lee K-F, Jit M, Ng C. Household Catastrophic Healthcare Expenditure and Impoverishment Due to Rotavirus Gastroenteritis Requiring Hospitalization in Malaysia. PLoS ONE. 2015;10(5):e0125878.
5. Amit LN, Mori D, John JL, Chin AZ, Mosiun AK, Jeffree MS, Ahmed K. Emergence of equine-like G3 strains as the dominant rotavirus among children under five with diarrhea in Sabah, Malaysia during 2018-2019. PLoS ONE. 2021;16(7):e0254784.
6. Rose J, Homa L, Meropol SB, Debanne SM, Bielefeld R, Hoyen CK, Singer ME. Health impact and cost-effectiveness of a domestically-produced rotavirus vaccine in India: A model based analysis. PLoS ONE 2017;12(11):e0187446.
7. Nair NP, N SR, Giri S, Thiyagarajan V, Muliyil J, Hemavathy P, et al. Impact of the indigenous rotavirus vaccine Rotavac in the Universal Immunization Program in India during 2016-2020. Nature Med. 2025;31:3871.
8. Mori AT, Mudenda M, Robberstad B, Johansson KA, Kampata L, Musonda P, et al. Impact of cash transfer programs on healthcare utilization and catastrophic health expenditures in rural Zambia: a cluster randomized controlled trial. Front Health Serv. 2024;4:1254195.
9. Riumalló-Herl C, Chang AY, Clark S, Constenla D, Clark A, Brenzel L, et al. Poverty reduction and equity benefits of introducing or scaling up measles, rotavirus and pneumococcal vaccines in low-income and middle-income countries: a modelling study. BMJ Global Healt.h 2018;3(2):e000613.
10. Verguet S, Murphy S, Anderson B, Johansson KA, Glass RI, Rheingans R. Public finance of rotavirus vaccination in India and Ethiopia: An extended cost-effectiveness analysis. Vaccine. 2013;31:4902.

11. Ssebagereka A, Broucker GD, Aloysius M, Kiracho EE, Patenaude B, Constenla D. Costs and Economic Burden of Childhood Diarrhea in Uganda. Research Square. 2023.
12. Tate JE, Chitambar SD, Esposito DH, Sarkar R, Gladstone BP, Ramani S, et al. Disease and economic burden of rotavirus diarrhoea in India. Vaccine. 2009;5:27.
13. Kumar P, Ray A, Kumari A, Kaur A, Hora R, Singh K, et al. Post-introduction evaluation (PIE) of rotavirus vaccine in India. Vaccine X. 2024;19:100526.
14. Fattah RA, Cheng Q, Thabrany H, Susilo D, Satrya A, Haemmerli M, et al. Incidence of catastrophic health spending in Indonesia: insights from a Household Panel Study 2018-2019. Int J Equity Heal. 2023;22(1):185.
15. Naznin B, Kabir MdA, Xie W, Quayyum Z, Sarker T, Ahsan A, et al. Cost of Diabetes and Hypertension Care among Patients in Rural Bangladesh: A Cross-Sectional Study. 2025;26(1):806.
16. Jacob J, Joseph TK, Srinivasan R, Kompithra RZ, Simon A, Kang G. Direct and indirect costs of pediatric gastroenteritis in Vellore, India. Indian Pediat. 2016;53:642.
17. Neyra J, Kambhampati A, Calderwood LE, Romero C, Soto G, Campbell W, Tinoco Y, Hall AJ, Ortega-Sanchez IR, Mirza SA. Household economic costs of norovirus gastroenteritis in two community cohorts in Peru, 2012-2019. PLOS Global Public Health. 2024;4.
18. Soares-Weiser K, Bergman H, Henschke N, Pitan F, Cunliffe NA. Vaccines for preventing rotavirus diarrhoea: vaccines in use. Cochrane Library. 2019;2019(10):CD008521.
19. Shoji A, Kudo K, Murashita K, Nakaji S, Igarashi A. Reduction in all-cause medical and caregiving costs through innovative health awareness projects in a rural area in Japan: a retrospective cohort study. BMC Health Services Res. 2024;24(1):370.
20. Kim S, Sweet SMM, Slichter D, Goldie SJ. Health and economic impact of rotavirus vaccination in GAVI-eligible countries. BMC Public Health. 2010;10:253.
21. Debellut F, Clark A, Pecenka C, Tate JE, Baral R, Sanderson C, et al. Re-evaluating the potential impact and cost-effectiveness of rotavirus vaccination in 73 Gavi countries: a modelling study. Lancet Global Health 2019;7(12):e1664-z4.
22. Rose J, Hawthorn RL, Watts B, Singer ME. Public health impact and cost effectiveness of mass vaccination with live attenuated human rotavirus vaccine (RIX4414) in India: model based analysis. BMJ. 2009;339:b3653.
23. Jiao B, Sato R, Mak J, Patenaude B, Villiers MJ de, Deshpande A, et al. Financial risk protection from vaccines in 52 Gavi-eligible low- and middle-income countries: A modeling study. PLoS Med. 2025;22(11):e1004764.
24. Panda HS, Rout HS, Jakovljević M. Catastrophic health expenditure of inpatients in emerging economies: evidence from the Indian subcontinent. Health Res Policy Systems. 2024;22(1):104.
25. Esposito DH, Tate JE, Kang G, Parashar UD. Projected Impact and Cost-Effectiveness of a Rotavirus Vaccination Program in India, 2008. Clin Infect Dis. 2010;52:171.
26. Torre GL, Chiaradia G, Waure C de, Mannocci A, Capri S, Bruno S, et al. Health Technology Assessment and vaccine: new needs and opportunities? Deleted J. 2024;4.
27. Kananura RM, Broucker GD, Ssebagereka A, Aloysius M, Kiracho EE, Patenaude B. Coverage and distributional benefit-cost of rotavirus vaccine in Uganda: an analysis of routine health facility aggregated data. Research Square. 2023.
28. Kananura RM, Broucker GD, Ssebagereka A, Aloysius M, Kiracho EE, Patenaude B. Coverage and distributional benefit–cost of rotavirus vaccine in Uganda: an analysis of routine health facility aggregated data. Cost Effectiveness Resource Allocat. 2024;22(1):85.
29. Alwan A, Siddiqi S, Safi MM, Zaidi R, Khalid M, Baltussen R, Gudumac I, Huda M, Jansen M, Raza W, Torres-Rueda S, Zulfiqar W, Vassall A. Addressing the UHC Challenge Using the Disease Control Priorities 3 Approach: Lessons Learned and an Overview of the Pakistan Experience. Int J Health Policy Manag. 2023;12:8003.
30. Srivastava S, Kumar P, Chauhan S, Banerjee A. Household expenditure for immunization among children in India: a two-part model approach. BMC Health Services Res. 2021;21.
31. Wang Q, Leung K, Jit M, Wu T-SJ, Lin L. Global socioeconomic inequalities in vaccination coverage, supply, and confidence. Npj Vaccines. 2025;10:91.
32. Virachith S, Lao M, Inthepphavong M, Inthalath S, Hübschen JM, Kounnavong S, et al. Susceptibility to Vaccine-Preventable Diseases in Four Districts of Xaysomboun Province, Lao People's Democratic Republic. Vaccines. 2022;10:463.
33. Memirie ST, Tolla MT, Rumpler É, Sato R, Bolongaita S, Tefera YL, et al. Out-of-pocket expenditures and financial risks associated with treatment of vaccine-preventable diseases in Ethiopia: A cross-sectional costing analysis. PLoS Med. 2023;20(3):e1004198.
34. Zhou F, Jatlaoui TC, Leidner AJ, Carter RJ, Dong X, Santoli JM, et al. Health and Economic Benefits of Routine Childhood Immunizations in the Era of the Vaccines for Children Program-United States, 1994–2023. MMWR Morbid Mortal Weekly Rep. 2024;73(31):682.

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