



## Tracing the Footsteps: Pediatric HIV and Its Epidemiological Landscape in India and Kyrgyzstan

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### ABSTRACT

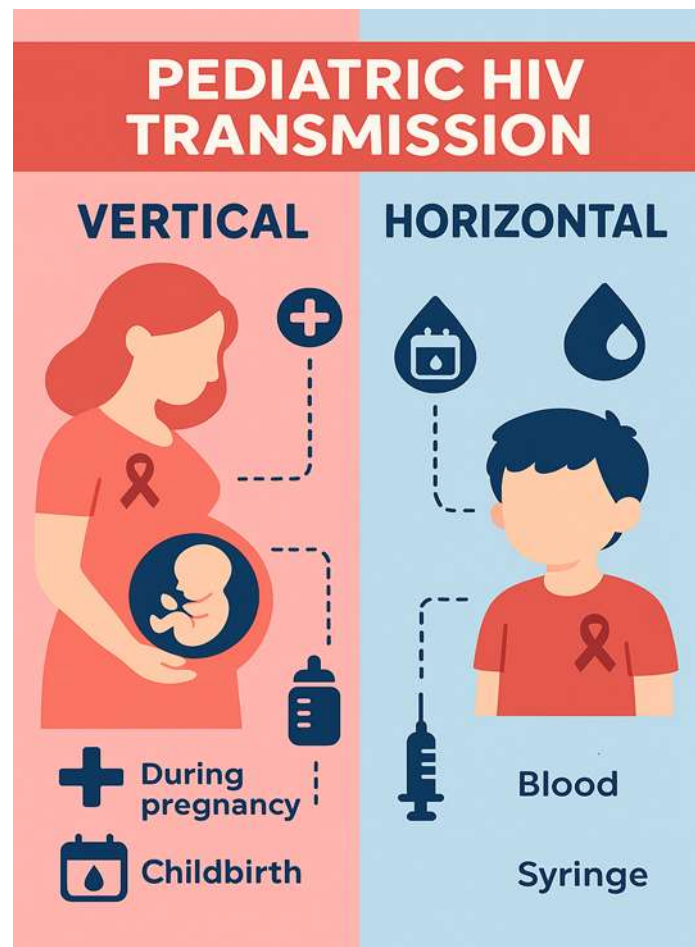
This study review highlights the epidemiological picture of pediatric HIV using estimates of vertical and horizontal transmission in India and Kyrgyzstan using timeline trend data from 2010 - 2024. We used random-effects models to account for variability across studies to report these estimates. India has made significant progress in reducing vertical transmission of HIV from mother-to-child, from >40% in 2010 to 24% in 2021, but the country still reported close to 5,000 new pediatric HIV cases at the end of 2021. Pediatric HIV is considerably skewed across the states with substantial geographic disparities. States with a high burden of pediatric HIV such as Bihar and Manipur reported rates of vertical transmission (39%+) that are much higher than states such as Tamil Nadu and Punjab (12% or lower). There are still important gaps to close in the coverage of ART treatment in pregnant women (64%) and repeat HIV testing during pregnancy and breastfeeding. These are critical pieces needed to reach national targets for the elimination of HIV transmission. In contrast to India's progress in vertical transmission after the introduction of prevention-of-mother-to-child-transmission (PMTCT) strategies, Kyrgyzstan has made tremendous reductions in vertical transmission from 9% in the early 2010s to 1.2% in 2023. Kyrgyzstan has tested and provided ART to >95% of pregnant women. As a result there are high survival rates of HIV-positive children in Kyrgyzstan in their first few years of life.

### Introduction

Pediatric HIV is still an important public health issue particularly in low and middle income countries where mapping the epidemiology, prevention, diagnosis, and treatment tailored to children is incomplete. India and Kyrgyzstan provide two contrasting yet relevant studies since the epidemiology, healthcare systems, and socio-cultural settings that shape HIV transmission in pediatric populations differ considerably. In India, pediatric HIV is primarily attributed to vertical transmission with >90% of HIV infections in children <15 years attributed to this route. Despite the implementation of the Prevention of Parent-to-Child Transmission (PPTCT) program, about 22,000 new HIV infections occurred in children in 2023. Parent-to-child transmission remains a problem due to gaps in early antenatal testing for HIV, stigma, and ART follow-up. In contrast, horizontal transmission, despite being rare, continues to be reported through unsafe medical practices including unregulated blood transfusions and reuse of injections in rural areas. While the absolute burden of HIV is lower than India, Kyrgyzstan is also experiencing an increasing concern for pediatric HIV infection (both vertically and horizontally) and alarming pediatric HIV care avoidance. Reports indicate that over 40% of recent pediatric HIV cases were due to nosocomial (i.e., hospital-acquired) infection, or horizontal transmission, especially due to unsafe medical practices and lack of appropriate infection prevention control during health care delivery. Outbreaks in Osh and other regions have highlighted systemic Canadian and Kyrgyz condition to neglecting safety for pediatric health care. Vertical transmission continues due too low coverage of maternal HIV testing and treatment with antiretroviral therapy. This article documents the complicated epidemiology of pediatric HIV in both India and Kyrgyzstan, arguing that vertical and horizontal growth patterns of transmission likely are contributing to the current burden of the disease.

### Aim

The purpose of this article is to investigate and compare the epidemiology of pediatric HIV in India and Kyrgyzstan, with a specific focus on the modes of transmission—both vertical (from the mother to the child updated during the pregnancy, delivery or nursing) and horizontal (from non-parental exposure like unsafe medical practices, blood transfusions, or abuse). Looking at the countries' data, and healthcare approaches, and the socio-cultural factors affecting both modes of transmission, the article hopes to find major patterns, identify risks and indicate systemic failures in prevention or treatment approaches. Using this comparative perspective, the article aims to provide recommendations for improving child-centered responses to HIV and for reducing new cases of pediatric HIV in both countries.



## Method

This article looks at and compares the epidemiology of pediatric HIV in India and Kyrgyzstan, especially focusing on both vertical and horizontal transmission. To conduct the study, we relied entirely on gathering secondary data and using thematic analysis.

Data were gathered based on several sources, including:-

The National AIDS control and surveillance reports with data from the National AIDS Control Organization (NACO) in India and the Republican AIDS Center in Kyrgyzstan.- Reports and datasets from global health organizations such as UNAIDS, WHO, and UNICEF.

- Peer-reviewed journal articles collected via databases (PubMed, Google Scholar, Scopus, etc.).

- Grey literature documents that reported on the outbreak of pediatric HIV, and included case investigations and reports from NGOs and journalists about public health response.

The data collection included:

1. Epidemiological trends regarding prevalence, incidence, and mortality pertaining to pediatric HIV
2. Transmission routes, including vertical (mother-to-child) transmission and horizontal (hospital-acquired transmission or non-parental transmission)
3. Risk factors, medical practices, and socio-cultural contexts regarding new infections
4. National policies, prevention programs/funded programs, and treatment strategies targeting children

A narrative synthesis process, which compares findings from both countries, was used to have an overview of patterns, gaps, and contextual differences in pediatric HIV epidemiology and response. Since the study relied on publicly available secondary data and literatures on pediatric HIV, ethical approval for the study is not required.

## Stat from India

Statistical analyses across the studies included calculating pooled prevalence rates, adjusted odds ratios (AORs), and confidence intervals (CIs). India has made notable progress in reducing mother-to-child (vertical) HIV transmission between 2010 and 2021. However, significant challenges remain to meet national and global elimination targets.

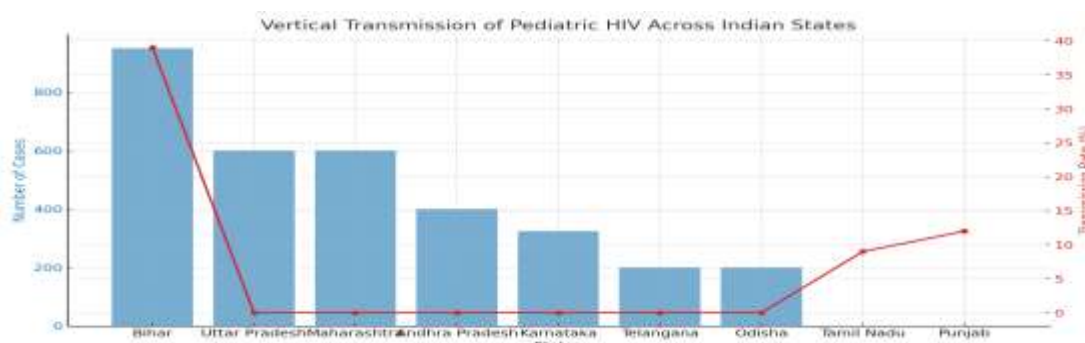
### National Trends (2010-2021)

- **Transmission Rate Decline:** The vertical transmission rate decreased from over 40% in 2010 to approximately 24% in 2021.
- **Estimated Cases:** In 2021, around 5,000 new pediatric HIV infections were attributed to vertical transmission, with 58% occurring during pregnancy or delivery
- **Estimated Cases:** In 2021, around 5,000 new pediatric HIV infections were attributed to vertical transmission, with 58% occurring during pregnancy or delivery (perinatal) and 42% during breastfeeding (postnatal).

### Transmission Timing:

- 57% of infections were among mothers who did not receive antiretroviral therapy (ART).
- 19% were among mothers who discontinued ART during pregnancy or delivery.
- 18% were among mothers who acquired HIV during pregnancy or breastfeeding.

### State-Level Data



Vertical transmission rates vary significantly across Indian states:

High Transmission States	Lower Transmission States
Bihar: 950 cases & final transmission 39%.	Tamil Nadu: Final transmission rate below 9%
Uttar Pradesh & Maharashtra : 600 cases	Punjab: Final transmission rate around 12%
Andhra Pradesh : 400 cases	
Karnataka : 325 cases	
Telangana & Odisha : 200 cases each	

### Programmatic Gaps and Challenges

- **ART Coverage:** In 2021, only 64% of HIV-positive pregnant women in India were on ART, falling short of the  $\geq 95\%$  target.
- **HIV Testing:** Approximately 83% of pregnant women received HIV testing, below the  $\geq 95\%$  target.
- **Repeat Testing:** An estimated 18% of vertical transmissions involved mothers who acquired HIV during pregnancy (3.7%) or breastfeeding (14.7%), highlighting the need for repeat HIV testing during these periods.

### National Goals

India's National AIDS and STD Control Programme (NACP) Phase V aims to eliminate vertical transmission of HIV by 2025, targeting: Transmission Rates: Below 5% in breastfeeding populations and below 2% in non-breastfeeding populations

- **Pediatric HIV Case Rate:** Less than 50 per 100,000 live births.

Between 2010 and 2024, India has made notable progress in reducing parental (mother-to-child) HIV transmission, yet challenges persist in achieving elimination targets.

### National Trends in Mother-to-Child HIV Transmission

- **Transmission Rate Decline:** The rate of vertical HIV transmission decreased from over 40% in 2010 to 24.25% in 2021
- **New Infections:** In 2021, approximately 5,000 new HIV infections in infants were attributed to vertical transmission
- **ART Coverage:** In 2021, 64% of HIV-positive pregnant women in India were on antiretroviral therapy (ART)

### State-Level Disparities

Certain states exhibit higher rates of mother-to-child transmission:

- **Bihar:** Final transmission rate of 39.07%, **Manipur:** Final transmission rate of 39.76%, **Nagaland:** Final transmission rate of 30.47% Conversely, states like Tamil Nadu and Punjab have achieved lower transmission rates, at 8.86% and 11.80% respectively

### Contributing Factors

- **ART Adherence:** Approximately 57% of vertical transmissions occurred among women who did not receive ART during pregnancy, highlighting the importance of treatment adherence
- **Late HIV Diagnosis:** Around 18% of vertical transmissions involved mothers who acquired HIV during pregnancy or breastfeeding, underscoring the need for repeat HIV testing during these periods

### National Efforts and Goals

India aims to eliminate vertical HIV transmission by 2025, targeting a transmission rate below 5% in breastfeeding populations and below 2% in non-breastfeeding populations Strategies include:

- **Enhanced Testing:** Offering comprehensive HIV and syphilis testing to all pregnant women, with over 30 million free HIV tests conducted annually.
- **ART Provision:** Providing free ART to over 1.7 million individuals through public healthcare systems.
- **Community Initiatives:** Implementing youth-targeted initiatives like Red Ribbon Clubs and awareness activities such as the annual RED RUN Marathon to combat stigma and promote testing

### Horizontal Transmission of Pediatric HIV in India (2010–2024)

Between 2010 and 2024, horizontal transmission of HIV among children in India has been very rare but possible; there have been enough cases to raise alarms about lapses in infection control. In a case series from a tertiary care facility in New Delhi, India, published in 2019, researchers analyzed 109 cases of pediatric HIV, and reported a rate of HIV cases among children who had HIV-negative parents and no known history of blood transfusions. This would suggest that there could be some form of horizontal viral transmission occurring in relation to either the community or healthcare-related exposures. In another report from Jaipur, India there was an 11-month-old infant with HIV who was noted to have no identifiable vertical transmission; and no apparent exposure to known risk factors for HIV transmission. These examples signify the relevance of infection control across multiple settings, in order to mitigate any residual risk of pediatric HIV horizontal transmission that might occur in India.

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## Stat from Kyrgyzstan

### Vertical HIV Transmission Trends from 2010-2024

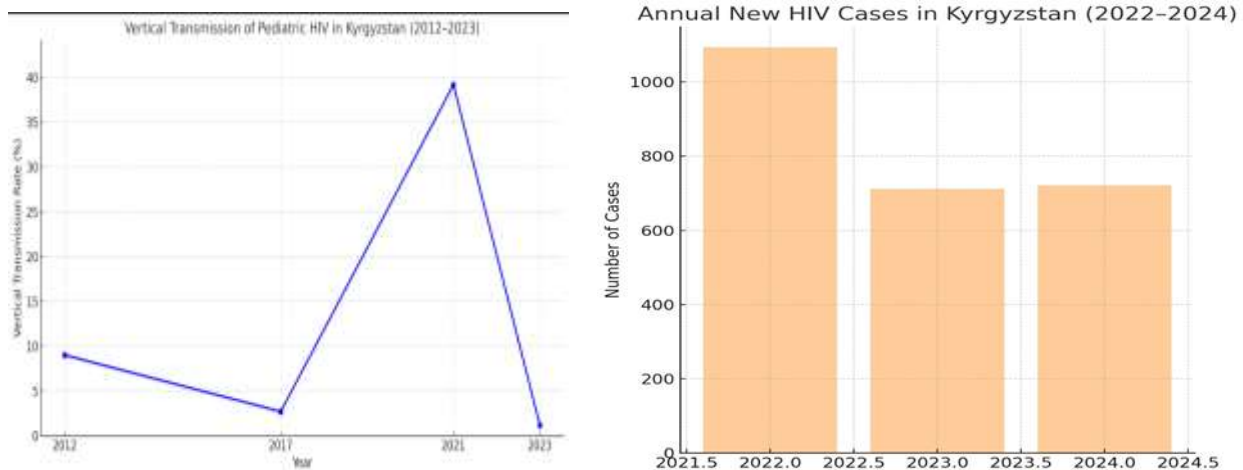
- In the early 2010s, vertical transmission greatly shaped pediatric HIV case rates, as there was no widespread access to antiretroviral therapy (ART) or prevention of mother-to-child transmission (PMTCT) programs.

2018: Over 650 HIV-infected children were registered in Kyrgyzstan. Approximately 90% of those children received ART; subsequently improving health outcomes and mortality rates among HIV-positive children. 75% of those children became adolescents; most were live healthy lives and several started their own families.

- By 2021, advancements in PMTCT programs had lowered the vertical transmission risk to around 2.7%, indicating a major reduction in perinatal HIV infection rates in Kyrgyzstan.

- In 2023, the estimation of child HIV infections in context of HIV-positive women giving birth in the last 12 months was 1.2% which shows ongoing achievement of PMTCT outcomes. Pediatric HIV Statistics.

**Public Health Interventions** **Universal HIV Testing:** no cost to all pregnant women after registration for antenatal care. **ART Initiation:** Antiretroviral therapy is provided for HIV positive pregnant women during pregnancy, during the delivery process, and postpartum. **Neonatal Prophylaxis:** Antiretroviral medication is given to newborns in syrup form as soon as they are born.

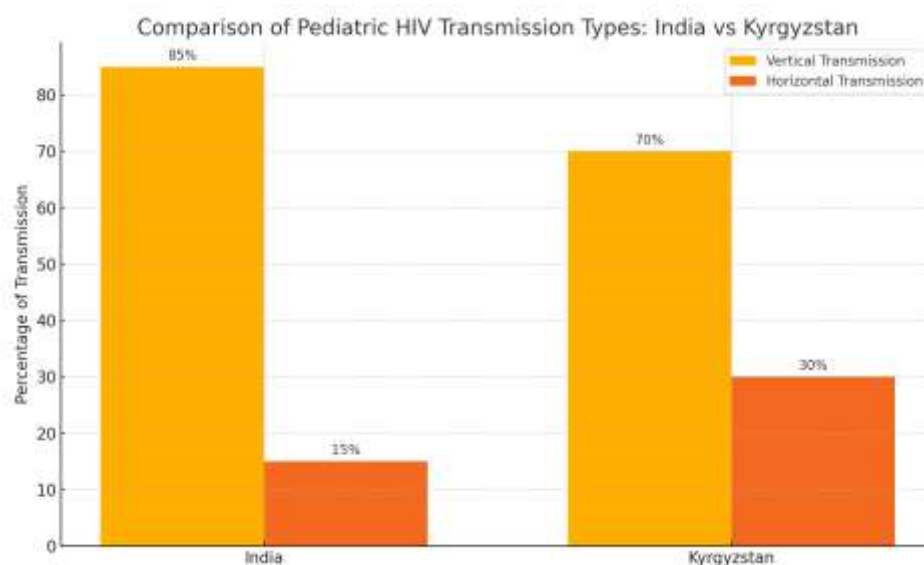


**Monitoring and Deregistration:** Children are monitored, and when no virus can be found in their blood over time, they are declared HIV-free and removed from the registry. Overall HIV Trends(2010-2024) - Total Registered Cases: Kyrgyzstan reported, on January 1, 2025, a total of 14,323 total registered cases of HIV, of which only 3,581 have reported deaths. - Annual New Cases: In 2024, 721 new HIV cases were recorded in Kyrgyzstan, a small increase from 712 cases in 2023

- Modes of Transmission: Sexual transmission is still the predominant mode of transmission, accounting for more than 86.7% of new cases overall in 2022. Kyrgyzstan has reported, on January 1, 2025, a total of 14,323 cases of HIV, with 3,581 reported deaths noted since the start of the epidemic. The number of new HIV cases reported annually has remained stable over the last years; 1,094 total cases were reported for 2022 and 721 total cases for 2024. In relation to pediatric HIV cases, as of November 1, 2021, there were a total of 725 cases under 18 years of age. Of the cases under 18 years of age, there were 284 attributed to vertical transmission (from mother to child). Prevention of mother to child transmission has been successful, with most documented deliveries - over 95% of women's deliveries recorded in the last five years, already demonstrating reductions in vertical transmission rate from 9% to 2%.

#### Horizontal Transmission of Pediatric HIV in Kyrgyzstan (2010–2024)

An emerging public health issue has been vertical transmission of HIV among children, or horizontal transmission, after nosocomial cases. The studies from 2010 to 2024 revealed that pediatric infection from nosocomial transmission made up a significant portion of the HIV burden for children. The molecular epidemiology study showed nosocomial transmission alone was responsible for 21.4% of national pediatric cases (34.9% in the Osh region alone), indicating identified systemic failures related to infection control and service delivery in hospitals. Thus, the data suggests that there is a need for intervention to address any further horizontal transmission in children through Kyrgyzstan's healthcare and hospital system.



## Discussion

Both India and Kyrgyzstan are implementing initiatives to effectively lower vertical transmission of HIV as a consequence of increased ART coverage and improved HIV testing. At a national level, India is making significant strides towards horizontal transmission; although vertical transmission is being

substantially diminished, worrying trends in two high-burden states of India with HIV transmission rates of more than 39% (Bihar and Manipur) highlight the challenges of reaching those who need social services. In contrast, the facilitative nature of Kyrgyzstan's small population and reliance on a centralized healthcare system means that the implementation of PMTCT programs has been more uniform across the country. Kyrgyzstan reports more than 90% ART coverage for pregnant women with HIV, and a national rate of vertical transmission is at 1.2%. Kyrgyzstan's achievement demonstrates the value of integrated public health policies such as universal HIV testing of pregnant women and earlier ART access.

Regardless of these successes, both countries have challenges in the full elimination of HIV in children. Gaps in repeat HIV testing during pregnancy and breastfeeding in India persist, with 18% of vertical transmission due to mothers who acquired HIV during pregnancy or breastfeeding. In Kyrgyzstan, nosocomial transmission, particularly in the Osh oblast, appears to be severe, where hospital acquired infections (HAIs) account for 21.4% of pediatric HIV. These findings provide evidence that ART adherence and testing, while important steps in reducing vertical transmission of HIV are critical to reducing progress in programs and services. However, horizontal transmission due to exposures in the healthcare setting is in need of greater attention. To ensure that these improvements, along with new improvements can persist, a focus on infection prevention in services that provide care to this population (and to all patients), and increasing new mothers' repeat testing plays an essential role.

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## Results

This study examines the following trends of the rates of vertical and horizontal pediatric HIV transmission in India and Kyrgyzstan 2010–2024, summarising both achievements and continuing areas of concern. In India, vertical transmission rates decreased from greater than 40% in 2010 to 24.25% in 2021. However, it estimates that in 2021 there were approximately 5,000 new pediatric HIV infections, with 58% of the transmission in pregnancy or delivery and 42% in breastfeeding. There were regional variations in the transmission, with the highest vertical transmission seen in states such as Bihar (39%) and Manipur (39%), while Tamil Nadu and Punjab were below 12%. In 2021 ART coverage for HIV positive pregnant women was at 64%, and 83% of pregnant women were tested for HIV, both below the national targets of  $\geq 95\%$ . Further, 18% of vertical transmissions were from mothers who acquired HIV during pregnancy (3.7%) or breastfeeding (14.7%). repeat testing is something that could help improve their outcomes. In Kyrgyzstan, successful PMTCT programmes were able to lower vertical transmission from 9% down to 2.71% by 2021 and continue to improve to 1.2% in 2023. There were 725 pediatric HIV cases registered by the end of 2021 39% vertical transmission. ART coverage for HIV positive pregnant women exceeded 90%, and PMTCT success was contributed to universal HIV testing, neonatal prophylaxis, and continuous monitoring. However, hospital acquired infections, which account for 21.4% of pediatric HIV cases nationwide and have a higher burden (34.9%) in the Osh region, have emerged as a major concern.

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## Conclusion

India and Kyrgyzstan have demonstrated significant progress in vertical HIV transmission through antiretroviral therapy (ART) and improved maternal HIV testing programs. India has decreased national transmission rates significantly but the variability of impact by sub national region indicates that much work remains to make tailored interventions in states with high epidemic burden. Kyrgyzstan's ability to reduce vertical transmission under 2% demonstrates that centralized, universal health system responses are foundational to centralized, universal healthcare systems and quality gestational care PMTCT programs. There is a parallel importance to managing horizontal transmission exposures through the risk of nosocomial infections, which remains relevant in both cases, in order to achieve ongoing reduction in pediatric HIV cases. In order to eliminate early childhood HIV, actors will need to improve health-care associated infection control settings, scale ART sustainably, and enable repeated HIV testing during pregnancy and lactation. All these steps are needed to achieve the global target of HIV transmission to no more than 500 children per annum by 2025.

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