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An analysis of levels and trends in childhood mortality in Odisha during 2000-2020

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Abstract
Level of death rate; more importantly, childhood mortality reflects a society's status of well-being. The objective of the study is toanalyzee the levels and trends in infant and child mortality of past two decades in Odisha collected from the various surveys/ sources and make it available in one place. The study used data from the sample registration system collected between 2000 to 2020 and different rounds of the National Family Health Survey (NFHS) in India. The latest round of the National Family Health Survey (fifth round) was conducted in 2019-21. Between 2000 and 2020, there was a downward trend in IMR, CMR, and U5MR in both rural and urban areas in Odisha and India. The decline was more rapid and statistically significant in rural areas but not in urban areas, hence the gap in urban–rural differentials narrowed over time. The significant reduction from 2000 to 2020 (in two decades) are almost 43 and 60 points in India and Odisha respectively. In the first decade, the decline rate of IMR was maximum (34 points) than the second decade (25) in Odisha. To reduce childhood mortality, extra emphasis is needed in the rural areas and disadvantaged districts of Odisha.

Keywords: Trend, infant mortality, neonatal mortality, health inequalities, Odisha

Introduction

Children are a vulnerable group in any society (Goli *et al.* 2013) [1]. The infant mortality rate is a helpful indicator of society's health development as well as economic growth (Reidpath & Allotey, 2003) [2]. Infant Mortality Rate (IMR), which is widely accepted as a crude indicator of the overall health scenario of a country or a region, is defined as the probability of infant deaths (less than one year) per thousand live births in a given time period and for a given region (WHO). Infant and child mortality rates are considered as sensitive indicators of living and socioeconomic conditions of a country. This recognition has made the international organizations as well as National Governments intensify their efforts to reduce infant mortality and improve child survival. As a result, there have been considerable improvements in the infant and child mortality rates for the world as a whole in recent years.

A meeting on "child rights" was conducted by the United Nations in 1959 at the Geneva Conference. 1979 was later designated as the "International Year of the Child" by the UN. As a result, the majority of social scientists concentrate more on the topic of family planning in order to conduct in-depth research on child mortality and potential contributing factors. The announcement prompted a number of academics and demographers to concentrate their efforts on figuring out the nature and causes of child mortality in order to understand how population growth and structural development in various cultures are impacted by it. India continues to have a high new-born and child mortality rate today.

The IMR in India has developed historically and is now a key component of health planning. According to the Office of Registrar General & Census Commissioner (2015), the IMR in India has decreased from 129 per 1000 live births in 1971 to 110 in 1981 and from 80 in 1991 to 34 in 2016. IMR has long been a top concern for both the national Government and international organizations because it is a reliable socioeconomic and health indicator. There have been ongoing initiatives to step up efforts to lower infant mortality. As a result, both internationally and in India, infant and child mortality rates have significantly decreased.

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The infant mortality rate (IMR) in rural areas is higher than the national average (38 infant deaths per 1000 live births), while the IMR in urban areas is much lower (23 infant deaths per 1000 live births) (Office of Registrar General & Census Commissioner, 2015). These statistics unmistakably show that children in urban India have better health, which also serves as the primary factor in bringing the IMR of the nation to lower levels. In a recent news release, the Indian government noted a sharp decline in infant mortality and the birth cohort. However, many larger states were unable to meet the national goal set for the country under the fourth UN Millennium Development Goal (UNMDG) in 2000, which was 29 infant deaths per 1000 live births by 2015. In addition, states like Assam, Bihar, Chhattisgarh, Madhya Pradesh, Uttar Pradesh, Odisha, and Rajasthan have very high child mortality rates, with Chhattisgarh having the highest rate at 50 infant deaths per 1000 live births (Office of Registrar General & Census Commissioner, 2015).

In Odisha infant and child mortality rates were the highest among the Indian states and it has been criticizing regarding child health. As per the latest available data, the infant mortality rate (IMR) for Odisha was 40 per 1000 live births and varies from rural (41) to urban (31), still much higher than the national level (32 per 1000 live births). Among all the Indian states, Madhya Pradesh (48), Uttar Pradesh (43), Assam (4 anand d 1), Chhattisgarh (41) have higher IMR than Odisha. All the border states of Odisha namely West Bengal (22), Andhra Pradesh (29), Bihar (32), Jharkhand (30) have registered lower IMR than Odisha (Registrar General and Census Commissioner, India 2018). High prevalence of IMR & CMR were more associated with maternal-related, child-related, and household-related factors. The important factors were maternal education, sex of child, place of residence, and wealth index in Odisha according to NFHS 5. (Suvadarsini *et al.* 2022) [8]. The objective of the study is to analyze the levels and trends in infant and child mortality of the past two decades in Odisha collected from the various surveys/ sources and make it available at one place.

Data and Methods
The study used household survey data from three waves of India's National Family Health Survey (NFHS) which was conducted in 2005-06, 2015-16, and 2019-21 for the empirical analysis. Another source of infant mortality data is the Indian Sample Registration System (SRS), whose annual estimates are consistent with those of the NFHS. The SRS was started in a few states of India in 1965, with coverage extended to all states in 1970, and tracks births through the use of continuous enumeration and biannual surveys. Infant mortality rates and child deaths are published annually, but not child mortality rates. STATA 15 and Excel software have been used to analyse the data.

Results

Table 1: Infant mortality rate of India and Odisha, SRS 2000-2020

| Year	Odisha IMR	India IMR
2000	95	68
2001	90	66
2003	83	60
2004	77	58
2005	75	58
2006	73	57
2007	71	55
2008	69	53
2009	65	50
2010	61	47
2011	58	44
2012	53	42
2013	51	40
2014	49	39
2015	46	37
2016	44	34
2017	41	33
2018	40	32
2019	38	30
2020	36	28
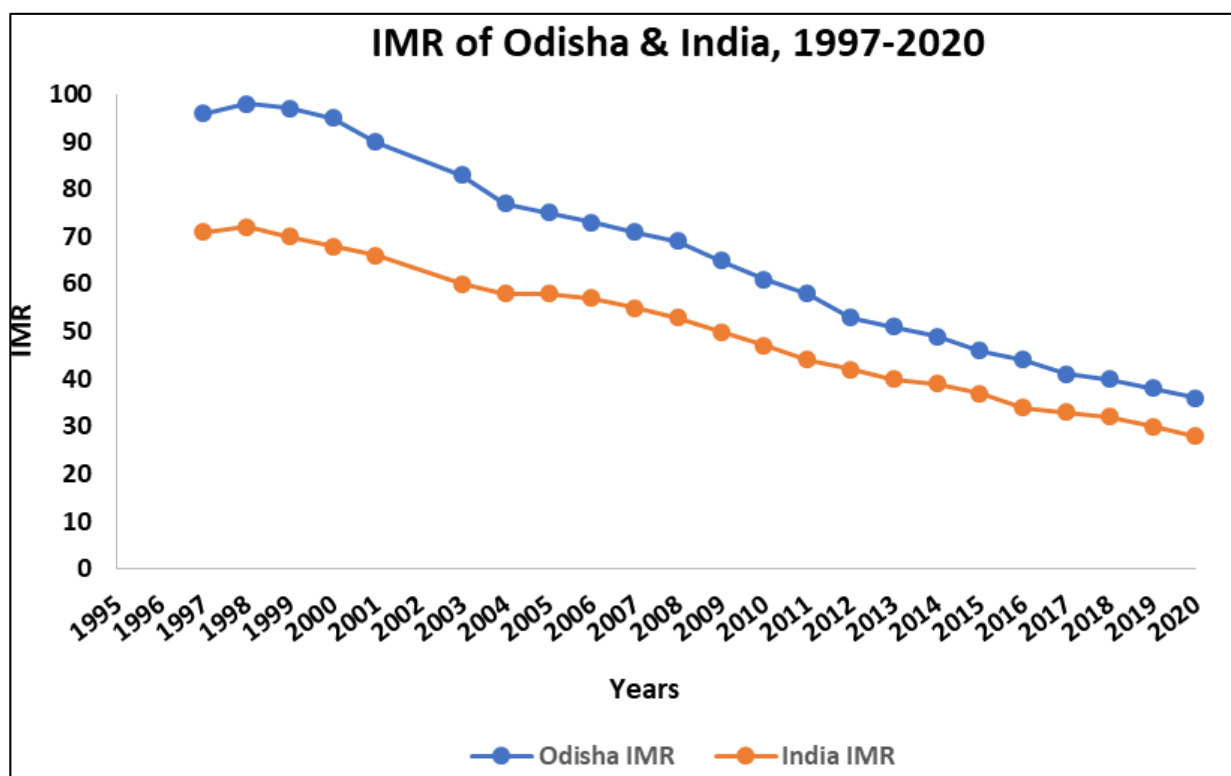
Fig 1: Trend of the Infant mortality rate of India & Odisha during 1997-2020, SRS

In Table 1, the Infant mortality rate of India and Odisha has been mentioned from the year 2000 to 2020. The trend has given for twenty years for both the nation and state of Odisha where we can see a significant massive decline rate within 20 years. Many years ago, there were the highest number of infant and child deaths due to the paucity of health facility, education, and nutrition for mother and child. The significant reduction from 2000 to 2020 (in two decades) are almost 43 and 60 points in India and Odisha respectively. In the first decade, the decline rate of IMR was maximum (34 points) than the second decade (25) in Odisha where it was almost the same in India in two decades. Hence Odisha has progressed more in reducing child mortality which is the best achievement for our state. Even though Odisha has made significant progress in reducing IMR over the last few decades, the number is still high, according to SRS 2020, Odisha's IMR was higher than the national average and it is ranked fourth among the all states in India. Figure 1 shows the trend of IMR in Odisha and India by using sample registration system data from 2000 to 2020. Here it can be identified that the Odisha IMR has always been higher than the national average during the last two decades.

Table 2: Three years moving averages of IMR by place of residence in Odisha, SRS 2000-2020

Year	Odisha IMR			3 years moving average		
	Total	Rural	Urban	Total	Rural	Urban
2000	95	99	66			
2001	90	94	60	89.33	93.00	60.33
2003	83	86	55	83.33	86.67	57.67
2004	77	80	58	78.33	81.33	56.00
2005	75	78	55	75.00	78.00	55.33
2006	73	76	53	73.00	75.67	53.33
2007	71	73	52	71.00	73.33	51.33
2008	69	71	49	68.33	70.67	49.00
2009	65	68	46	65.00	67.33	46.00
2010	61	63	43	61.33	63.00	43.00
2011	58	58	40	57.33	58.67	40.67
2012	53	55	39	54.00	55.33	39.00
2013	51	53	38	51.00	53.00	37.67
2014	49	51	36	48.67	50.67	36.33
2015	46	48	35	46.33	48.33	35.00
2016	44	46	34	43.67	45.33	33.67
2017	41	42	32	41.67	43.00	32.33
2018	40	41	31	39.67	40.67	31.00
2019	38	39	30	38.00	39.00	29.67
2020	36	37	28			
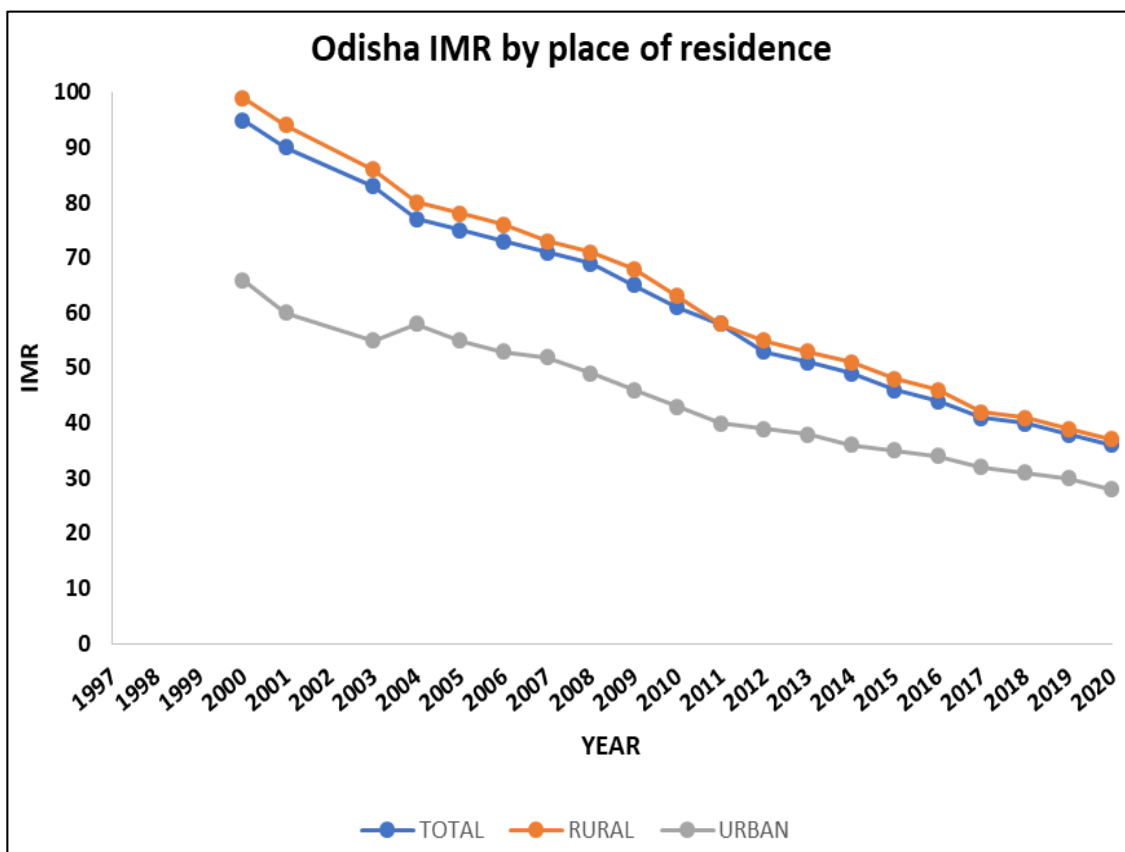
**Fig 2:** Trend of Infant mortality rate in Odisha by place of residence, SRS 2000-2020

Table 2 shows three years of moving average of IMR in Odisha and IMR by place of residence. IMR has decreased considerably from 95 in 2000 to 61 in 2010 and to 36 in 2020. Analysis of the Infant mortality rates by place of residence, that is, in urban and rural areas also shows a decreasing trend in both urban and rural areas. The infant mortality rate was 99 and 66 in in the rural and urban areas of Odisha respectively which was a stark difference in IMR in the urban and rural areas is indicative of the difference in health facilities, education, and other socio-economic factors but after two decades this gap was dropped to 9 points in Odisha. So, the Government of Odisha giving more effort to reduce the regional inequality of IMR. From Figure 2, it can be identified that urban IMR was significantly lower than the total and rural IMR but it was not decreasing rapidly as like total and rural IMR.

Table 3: Trend in different childhood mortality rates of Odisha by place of residence, NFHS.

MR	NFHS 3	NFHS 4	NFHS 5	Decline Rate
NMR	45	28	27	18
PMR	19	11	9	10
IMR	65	40	36	29
CMR	28	9	5	23
U5MR	91	48	41	50
RURAL				
NMR	48	30	27	21
PMR	21	13	10	11
IMR	69	43	37	32
CMR	30	10	6	24
U5MR	97	52	43	54
URBAN				
NMR	31	16	25	6
PMR	9	4	7	2
IMR	40	20	31	9
CMR	10	4	1	9
U5MR	50	24	32	18

Note: IMR: Infant mortality rate, NMR: Neonatal mortality rate, PMR: Post neonatal mortality rate, CMR: Child mortality rate, U5MR: Under-five mortality rates, NFHS: National Family Health Survey.
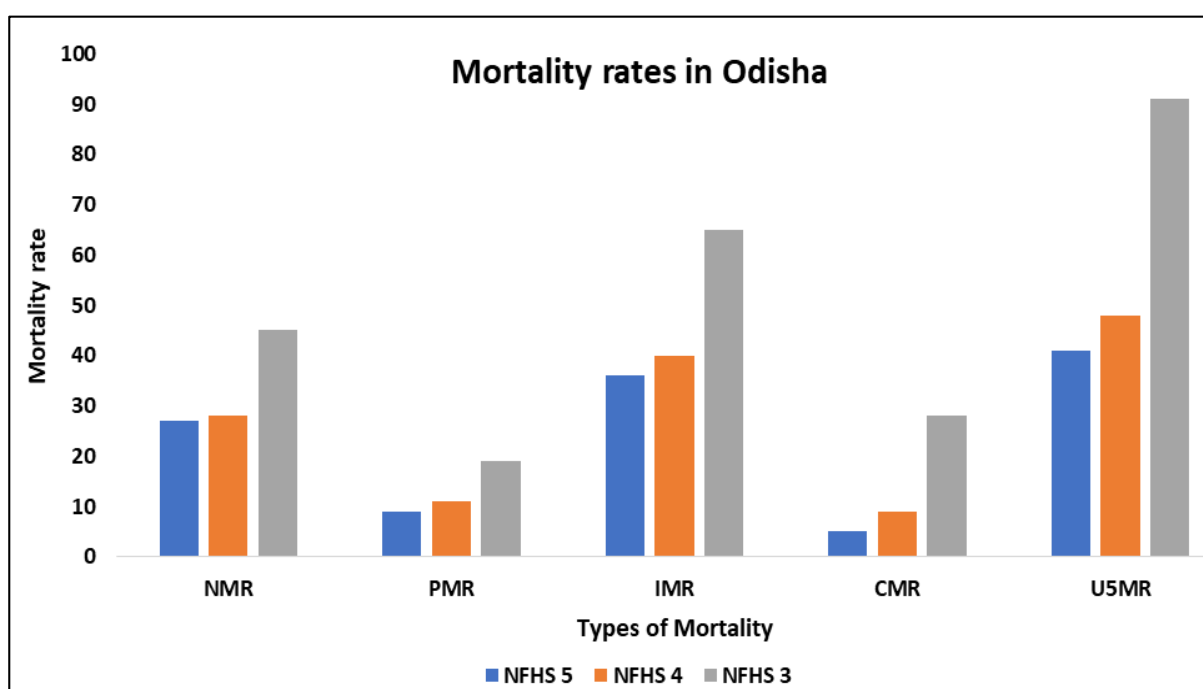
Fig 3: Trend in NMR, PMR, IMR, CMR & U5MR of Odisha, NFHS.

Table 3 shows the different childhood mortality rates such as neonatal, post-neonatal, infant, child, and under-five mortality rates in three rounds of the National Family Health Survey in Odisha. It was conducted in different periods in India, UT, and states. NFHS 3 was conducted in 2005-06, NFHS 4 was conducted in 2015-16 and NFHS 5 was conducted in 2019-2021. According to NFHS, childhood mortality rates across the state of Odisha have declined. The infant mortality rate has declined from 65 in 2005 to 36 in 2019 and the child mortality rate has declined from 28 in 2005 to 5 in 2020. As per the NFHS, the reduction rate of under-five mortality rate was 50 within almost fifteen years so Odisha is a best performer as it witnessed a step reduction in neonatal mortality rate (NMR), infant mortality rate (IMR), child mortality rate (CMR) and under-five mortality rates (U5MR). Infant and child mortality rates were 37 and 6 in rural Odisha and in urban areas and these were 31 and 1 in 2019-21 respectively. The table shows the childhood decline rate was maximum for urban areas than the rural areas in the past of Odisha.

Discussions and Conclusion
The Indian states are well known to differ significantly from each other concerning demographic, social, cultural, and environmental conditions and the availability of health infrastructure. Such differences have led to a varying pace in the infant and child mortality transition in these states. The demographically less advanced northern states of Bihar, Madhya Pradesh, Uttar Pradesh, Rajasthan, and Orissa have the highest levels of infant and child mortality, with Orissa having the highest IMR of all (the IMR was 95 per 1000 live births and the child mortality rate (CMR) was 27 per 1000 in 2000. From this finding, this is something of a surprise, given that Orissa has reached an advanced stage in the child mortality transition with a significant tremendous decline rate and took a position after the Madhya Pradesh, Uttar Pradesh, and Chhattisgarh. This could be possible for the implementation of different schemes and programs of the national and Odisha Governments.
The Government of Odisha has implemented several programs and initiatives to reduce child mortality and

improve child health outcomes. These programs aim to address various factors contributing to child mortality, including access to healthcare, nutrition, immunization, and overall maternal and child well-being. Some of the key Odisha government programs are Biju Swasthya Kalyan Yojana, Balaram Yojana, Immunization Programs, Nutritional Interventions, and Village Health and Nutrition Days (VHND). Balaram Yojana program aims to enhance nutrition among children in tribal areas of Odisha. It focuses on providing nutritional support, including eggs and bananas, to children aged 3 to 6 years to address malnutrition. VHND is a monthly community-based program that offers essential health and nutrition services to mothers and children in rural areas. It includes health check-ups, immunization, growth monitoring, and awareness sessions. Due to the implementation of different programs and schemes to provide health care to pregnant & lactating women and children, child mortality reduced significantly in Odisha.

References
1. Goli S, Doshi R, Perianayagam A. Pathways of economic inequalities in maternal and child health in urban India: A decomposition analysis. PloS One. 2013;8(3):e58573.
2. Reidpath DD, Allotey P. Infant mortality rate as an indicator of population health. Journal of Epidemiology & Community Health. 2003;57(5):344-346.
3. International Institute for Population Sciences (IIPS), Macro International. National Family Health Survey (NHFS-3), 2005-06: India. 2007; Mumbai, India: IIPS; c2007.
4. International Institute for Population Sciences (IIPS) and ICF. National Family Health Survey (NFHS-4), 2015-16: India. Mumbai: IIPS; c2017.
5. UN IGME. Levels and Trends in Child Mortality Report 2018. United Nations Children's Fund, World Bank Group, World Health Organization, and United Nations Population Division; c2018. https://www.unicef.org/media/47626/file/UN-IGME-Child-Mortality-Report-2018.
6. UN. Department of Economic and Social Affairs. The Sustainable development goals report 2019. United Nations; c2019. https://digitallibrary.un.org/record/3812145
7. WHO. United Nations Sustainable Development Summit 2015. World Health Organization; c2015. https://sustainabledevelopment.un.org/post2015/summit
8. Suvadarsini S, Sahoo RK, Munda S. Socio-Demographic Predictors of Infant Mortality in Odisha: Statistical Analysis of National Family Health Survey (2019-21) Findings. Entomologica-Bari. 2022;53:126-135.
9. UNICEF. Levels and Trends in Child Mortality Report; c2021. https://data.unicef.org/resources/levels-and-trends-in-child-mortality-2021
10. Razzaque A, Chowdhury R, Mustafa AG, Begum F, Shafique S, Lawton A, *et al.* Levels, trends and socio-demographic determinants of infant and under-five mortalities in and around slum areas of Dhaka city, Bangladesh. SSM-Population Health. 2022;17:101033.
11. Bhatia M, Ranjan M, Dixit P, Dwivedi LK. Mind the gap: Temporal trends in inequalities in infant and child mortality in India (1992-2016). SSM-population Health. 2018;5:201.
12. M Kabir, Rafiquel, Islam, Chowdhury, Ruhul, Amin. Infant and child mortality levels and trends in Bangladesh. Journal of Biosocial Science. 1995;27(2):179-192. DOI: 10.1017/S0021932000022689
13. Arokiasamy P, Gautam A. Neonatal mortality in the empowered action group states of India: Trends and determinants. Journal of Biosocial Science. 2008;40(2):183-201.
14. Hong R, Ayad M, Rutstein S, Ren R. Childhood mortality in Rwanda: Levels, trends, and differentials; Further analysis of the Rwanda demographic and health surveys, 1992-2007/08. DHS Further Analysis Reports No. 66. Calverton, Maryland, USA: ICF Macro; c2009.
15. Ghosh S. Trends in infant and child mortality in India during 1992-2012: A district-level analysis. Journal of Biosocial Science. 2016;48(1):1-19. DOI: 10.1017/S0021932015000031.
16. Rajeshwari K, Gupta P. Trends and Patterns of Infant Mortality in India: An Analysis of NFHS Data. In Routledge Handbook of Demographic Methods; c2020. p. 405-422.
17. Nguyen KH. Jimenez-Soto E, Dayal P, Hodge A. Disparities in child mortality trends: What is the evidence from disadvantaged states in India? The case of Orissa and Madhya Pradesh. International Journal for Equity in Health. 2020;12(1):1-14.