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A Comparative Study of Infant and Under 5 Mortality Rate and Institutional Births of EAG States with Reference to SDG-3 (Target -2): An Analysis of the NFHS (2019-20)

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Abstract

Children and maternal health are the supreme assets of a nation. Because mothers are reproductive or fertile women and children are the future of the nation. Therefore, both play a vital role for the future of the nation. The increase in economic productivity depends upon the health of the residents of any area. As we know that in 1980s, the social development indicators were included in the development indicators. The social development indicator includes health, education, sanitation, hygiene, etc.; in which health and education play a vital role in economic development. Sustainable Development has 17 goals in which SDG- Goal- 3 is related to Health and Well-being. SDG-3 have 13 targets and 28 indicators defined by United Nations like MMR, U5MR, IMR, HIV, suicide rates, life expectancy, etc. in which Out of 13 target, this study is based on SDG Goal – 3.2 (By 2030, end of preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce IMR to at least as low as 12 per 1000 live births instead of NNMR and Under -5 mortality to at least as low as 25 per 1000 live births) and Institutional birth of EAG States. The EAG states mainly consist of Uttar Pradesh, Uttarakhand, Bihar, Orissa, Jharkhand, Chhattisgarh, Rajasthan and Madhya Pradesh. This study is focused upon the comparative study among EAG states in terms of Infant and child mortality rate and institutional birth with the help of NFHS.

Keywords:IMR, NNMR, U5MR, Institutional Birth, SDG Goals, EAG states

Introduction

Children and maternal health are the supreme assets of a nation. Because mothers are reproductive or fertile women and children are the future of the nation. Therefore, both play a vital role for the future of the nation. Health is the states of a person's mental, social and physical condition. It is very necessary for every human being, if a person's body is healthy, then the mind and brain will be healthy and efficiency will increase, only then by making proper efforts, he will move towards development. That's why, it is very important for a person to be healthy for economic development. The increases in economics productivity dependupon the health of the residents of any area. As we know that in 1980s, the social development indicators are included inthe development indicators. The social development indicator includes health, education, sanitation, hygiene, etc.; in which health and education play a vital role in economic development.

After the end of Cold War (1990s), the whole world was focussed and concerned with social development. Thereafter there was a World Summit on Social Development in 1995 conducted which

resolved Copenhagen Declaration on Social Development that consists of 6 international developmental goals with the aims Shaping The 21st Century. These 6 international developmental goals have been carried forward in the form of "Millennium Development Goals 2000-2015" which is further carried out as "Sustainable Development Goals 2015- 2030". Sustainable Development Goals are 17, in which SDG- Goal- 3 is related Health and Well-being. SDG-3 have 13 targets and 28 indicators defined by United Nations like MMR, U5MR, IMR, HIV, suicide rates, life expectancy, etc. in which this study is based on U5MR,IMR, and INSTITUTIONAL BIRTH for EAG states . EAG states stand for empowered action group states is also known as BIMAROU (backward socioeconomic states) which consist of 8 bigger populated states of India which have a population of 49.5 percent of total India's population. These EAG states mainly consist of Uttar Pradesh, Uttarakhand, Bihar, Orissa, Jharkhand, Chhattisgarh, Rajasthan and Madhya Pradesh.The research problem of this study is to know the status of EAG states in terms of Infant and child mortality rate and institutional birth with the help of NFHS.

Objectives

The objectives of this study are as following:

- To study the comparative analysis of Infant and Under 5 mortality rate of EAG states;
- To analyse the institutional births of EAG states;
- To examine the correlation between NMR and U5MR with institutional births of EAG states;
- To examine whether EAG states achieved the target of SDG-3 by 2030 related to NMR/IMR and U5MR.

Methodology

This study is mainly Analytical and Descriptive research in nature.The study is based upon the secondary data. The secondary data are collected from NFHS and also from various books, journals, articles, magazines and govt publications.NFHS surveys have been conducted under the stewardship of the Ministry of Health and Family Welfare (MoHFW), Government of India. MoHFW designated the International Institute for Population Sciences (IIPS), Mumbai, as the nodal agency for the surveys. Five rounds of NFHS (1993-93, 1998-99, 2005-06, 2015-16 and 2019-20) have been successfully completed in India. Health survey generally includes measures of risk factors, health behaviours, and non health determinants or correlates of health such as socioeconomic status. For analytical study, many statistical tools are used like mean (average), standard deviation, correlation and Linear Regression model etc. All the value for regression analysis are calculated by statistical software SPSS. For the comparative study of EAG states, Status Index is used for IMR, NNMR, U5MR and IB. The methodology for computing the Status Index is as under:

$$\textbf{Status Index (SI)}=\frac{X_i - X_{min}}{X_{max} - X_{min}}$$

Where-

$\mathbf{X}_i$stands for actual value of IMR, U5MR and Institutional Births

$\mathbf{X}_{min}$stands for minimum value of *'i'* variable of EAG states.

$\mathbf{X}_{max}$stands for maximum value of *'i'*variable of EAG states.

It is expressed as the value of status index lies between0 to1. Negativeindicators like IMR and U5MR have indices value near 1 shows worst status and indices value close to 0 shows better status of the EAG states while institutional births (positive indicators) have indices value near 1 shows better status and indices having near 0 shows worst status of EAG states.**On the basis of the indices values, these EAG states can be categorised as per their positive and negative indicator are as follows:**

Indices value	Categorised status of EAG states	
	For Negative Indicators (IMR & U5MR)	For Positive Indicators (IB)
0.75- 1	Worst Status	Better Status
0.25-0.75	Moderate Status	Moderate Status
0- 0.25	Better Status	Worst Status

Abbreviations of used Indicators

1. NNMR –Neonatal Mortality Rate
2. IMR – Infant Mortality Rate
3. U5MR – Under 5 Mortality Rate
4. NFHS –National Family Health Survey
5. IB – Institutional Birth
6. EAG –Empowered Action Group
7. SDG- Sustainable Development Goal

Comparative Status of EAG States in Terms of IMR, U5MR and IB

IMR, U5MR and IB are the most important indicators in the health sector. It is necessary to compare the (Health indicators) IMR, U5MR and IB of EAG states. In EAG states consists of eight states i.e. Rajasthan, U.P, Uttarkhand, Bihar, Jharkhand, M.P, Chhattisgarh and Orissa. With the help of status index, the comparative analysis of IMR, U5MR and IB of these statesis analyzed in Table 1.

Table 1: Comparative analysis of IMR, U5MR and IB of EAG states

EAG states	IMR	STATUS INDEX	U5MR	STATUS INDEX	IB	STATUS INDEX
Madhya Pradesh	41.3	0.5472	49.2	0.5225	90.7	0.7801
Bihar	46.5	0.8059	56.4	0.8468	76.2	0.0209
Uttar Pradesh	50.4	1.000	59.8	1.000	83.4	0.3979
Uttarakhand	39.1	0.4378	45.4	0.3603	83.2	0.3874
Orissa	36.3	0.2985	41.1	0.1576	92.2	0.8586
Chhattisgarh	44.3	0.6965	50.4	0.5765	85.7	0.5183
Rajasthan	30.3	0	37.6	0	94.9	1.000
Jharkhand	37.9	0.3780	45.4	0.3513	75.8	0

Source: NFHS -5 (2019-2021)

Note: Status Indices of this tableare calculated from the Status Index Formula mentioned in the methodology.

Table 2: Comparative status of institutional birth (positive indicators) of EAG states

Indices Value Range	Status	Comparative Status of EAG States for IB
0.75- 1	Better Status	Rajasthan Orissa Madhya Pradesh
0.25 - 0.75	Moderate Status	Chattisgarh Uttar Pradesh Uttarakhand
0 - 0.25	Worst Status	Bihar Jharkhand

Table 2 shows that Rajasthan, Orissa, MP have better status in Indices value range of status index of IB while Bihar and Jharkhand have more worst status in Indices value of range of status index of IB. Chhattisgarh, UP, and Uttarakhand are in moderate status in Indices value of range of status index of IB.

Table 3: Comparative status of EAG states of IMR and U5MR (Negative Indicators)

Indices Value Range	Status	Comparative Status of EAG States for IMR	Comparative Status of EAG States for U5MR
0.75- 1	Worst Status	Uttar Pradesh Bihar	Uttar Pradesh Bihar
0.25-0.75	Moderate Status	Chattisgarh Madhya Pradesh Uttarakhand Jharkhand Orissa	Chattisgarh Madhya Pradesh Uttarakhand Jharkhand
0 - 0.25	Better Status	Rajasthan	Orissa Rajasthan

From theTable 3, it is clear that Rajasthan is the better status in Indices value range of status index of IMR while Bihar and UP are in more worst status in Indices value of range of status index of IMR. Chhattisgarh, MP, Uttarkhand, Jharkhand and Orissa are in moderate status in Indices value of range of status index of IMR. While Rajasthan and Orissa are the better status in Indices value range of status index of U5MR. While Bihar and UP is in worst status in Indices value of range of status index of U5MR. Chhattisgarh, MP, Uttarakhand and Jharkhand are in moderate status in Indices value of range of status index of U5MR.

Status of SDG Goal – 3 (Target -2) of EAG States

Sustainable Development Goal 3 is regarding **"Good Health and Well-being"** is one of the 17 SDGs established by the united nations in 2015 and is broader including targets related to reduction of maternal mortality, infant and child mortality rate, fight communal diseases and promote mental health, reduce road injuries and deaths, access to sexual and reproductive care, family planning and education, etc. The official wording is: "to ensure healthy lives and promote well-being for all at ages". The UN has defined **13 targets and 28 indicators for SDG 3**. The targets cover a wide range of issues including communal diseases and non-communal diseases. Out of 13 target, this study is based on SDG Goal – 3.2 (By 2030, end of preventable deaths of newborns and children under 5 years of age, with all countries aimingto reduce IMR to at least as low as 12 per 1000 live births instead of NNMR and Under -5 mortality to at least as low as 25 per 1000 live births). Only 5 states out of 8 EAG states data are available related to IMR and U5MR. Due to lack of availability of data we can examine SDG goal 3.2 for only 5states that can be achieved target by 2030 or not.

Table 4: Status of SDG Goal - 3.2 (targeted by 2030) achieved by EAG states with the help of regression model

S. No.	EAG States	Model		SDG– GOAL-3.2 (target by 2030)				Achieved in Year	
		IMR	U5MR	IMR/ NNMR at least as low as 12 per 1000 live births		U5MR at least as low as 25 per live births		IMR	U5MR
				Y_1*	Status	Y_2*	Status		
1	Bihar	Y_1 = 3161.638 - 1.544 X	Y_2 = 5459.357 - 2.679 X	27.32	Not Achieved	20.99	Achieved	2040	--
2	UP	Y_1 = 3466.654 - 1.691 X	Y_2 = 5889.030 - 2.886 X	33.92	Not Achieved	30.45	Not Achieved	2043	2032
3	MP	Y_1 = 3550.365 - 1.737 X	Y_2 = 6781.899 - 3.334 X	24.26	Not Achieved	13.88	Achieved	2038	--
4	Orissa	Y_1 = 5514.424 - 2.716 X	Y_2 = 6797.445 - 3.347 X	0.94	Achieved	3.04	Achieved	--	--
5	Rajasthan	Y_1 = 3596.264 - 1.764 X	Y_2 = 5643.745 - 2.775 X	15.34	Not Achieved	10.50	Achieved	2032	--

Source: NFHS -1, 2, 3, 4 and 5.

Note:

* Coefficient and constant value of the regression model are calculated with the help of statistical software SPSS (See Annexure 1 & 3).
* Y_1 = Estimated Value of IMR, Y_2 = Estimated Value of U5MR, Y_1^* = Estimated Value of IMR by 2030, Y_2^* = Estimated Value of U5MR by 2030, X= Year

Table 4 expresses that in case of IMR, out of 5 EAG states only Orissa can achieve the SDG target goal 3.2 by 2030. While other states Bihar, UP, MP, andRajasthan are lagging behind in achieving the target SDG goal 3.2 by 2030. As per regression analysis these states can achieve the target by 2040, 2043, 2038 and 2032 respectively. While onthe other hand, in case of U5MR out of 5 EAG states Bihar, MP, Orissa and Rajasthan can achieve the target of SDG goal 3.2 by 2030. Only UP is lagging behind in achieving the target of SDG goal 3.2 by 2030. As per regression analysis UP can likely to be achieve by 2032.

Correlation between NNMR, IMR, and U5MR withInstitutional Birth of EAG States

It is known from many national and international level studies that NNMR, IMR and U5MR are found to be correlated with IB. Generally negative correlation found between NNMR, IMR and U5MR with IB. In the light of these studies, correlation status between NNMR, IMR and U5MR with IB of EAG states is analysed in this study. Correlation status between these health indicators is depicted by Table 5.

Table 5: Correlation between NNMR, IMR, and U5MR with Institutional birth of EAG states

S.N.	EAG States	NNMR (Per 1000 live births)	IMR (Per 1000 live births)	U5MR (Per 1000 live births)	IB (Percent)
1	Madhya Pradesh	29	41.3	49.2	90.7
2	Bihar	34.5	46.8	56.4	76.2
3	Uttar Pradesh	35.7	50.4	59.8	83.4
4	Uttarakhand	32.4	39.1	45.6	82.2
5	Orissa	27	36.3	41.1	92.2
6	Chattisgarh	32.4	44.3	50.4	85.7
7	Rajasthan	20.2	30.3	37.6	94.9
8	Jharkhand	28.2	37.9	45.4	75.8

Source: NFHS 5 (2019 - 20)

Table 5.1: Analysis Result

Variables	IB	
	r	r^2
NNMR	-0.645	0.416
IMR	-0.539	0.291
U5MR	-0.569	0.324

- ❖ Where :
  r = Coefficient of Correlation
  r^2 = Coefficient of Determination (Goodness of fit)

On the basis of table 5.1, the correlation status is as follows:

- The correlation between NNMR and Institutional Births is negatively moderate degree of correlation (r = - 0.645) and having goodness of fit (r^2) is 0.416 which show that if delivery care is taken under health institutes then 41.6% of NNMR will be reduced while 58.4% of NNMR are affected from other factors rather than institutional births.
- The correlation between IMR and Institutional Births is negatively moderate degree of correlation (r = - 0.539) and having goodness of fit (r^2) is 0.291 which show that if delivery care is taken under health institutes then 29.1% of IMR will be reduced while 70.9% of IMR are affected from other factors rather than institutional births.
- The correlation between U5MR and Institutional Births is negatively moderate degree of correlation (r = - 0.569) and having goodness of fit (r^2) is 0.324 which show that if delivery care is taken under health institutes then 32.4% of U5MR will be reduced while 67.6% of U5MR are affected from other factors rather than institutional births.

Suggestions

For the improvement of health sector in EAG States, some suggestions for government, policy makers, researchers etc. are as follows:

- ❖ Need to aware about policy regarding newborns baby at ground level (especially in rural area) as well as better implementation of policy (child development program) at ground level for preventable and reduce deaths of newborns and children less than 5 year of age.
- ❖ According to Economic survey 2021-22, trends in social service expenditure by the government (combined centre and states) are 8.6 percent of GDP in which expenditure of health sector is only 2.1 percent of GDP. So, there is need for increases percentage share of GDP expenditure on health sector. The Government should be increases the expenditure on health sector for increasing Research and Development centre, labs, hospitals, doctors, midwives etc.
- ❖ In present scenario, private sector has more contribution in health sector in India. So, below poverty line of people are not able to get proper treatments due to higher cost in private sector. So, here the government should be gives treatment at minimum cost /free for basis treatment.

Conclusion

This study concludes that Rajasthan has better status and UP and Bihar have worst status in terms of IMR. In terms of U5MR, Orissa and Rajasthan have a better status while UP and Bihar have worst status in EAG States. Therefore, it is a need to imply an effective policy the betterment of UP and Bihar especially among the EAG States. In the context of SDG Goal 3.2 determined by the UN only Orissa of EAG States will achieve this target by 2030 while other EAG states are lacked behind achieving the Goal by 2030. For achieving SDG Goal 3.2 for EAG states especially UP & Bihar, Government should taken initiatives for awareness among the people (especially for rural areas) about policies, projects and programme i.e. Child Development Programme etc. conducted by the government to reduce and preventable of infant and child death as well as better implantation for the poor people of EAG States.

Since, previous budget expenditure on health sector is very low as per its requirement in EAG States, so the government allocate increases more funds in budget for health sector. Since, human development and economic development have positive correlation and human development increases the pace of economic development so it is necessary to take care of health variables to increase productivity, efficiency and well- being.

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Annexure 1:Coefficient(IMR)

Coefficients for EAG States						
EAG States		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
UP	(Constant)	3466.654	312.148		11.106	0.002
	YEAR	-1.691	0.156	-0.988	-10.867	0.002
Bihar	(Constant)	3161.638	356.075		8.879	0.003
	Year	-1.544	0.178	-0.981	-8.700	0.003
Orissa	(Constant)	5514.424	646.601		8.528	0.003

	YEAR	-2.716	0.322	-0.980	-8.425	0.004
MP	(Constant)	3550.365	441.190		8.047	0.004
	YEAR	-1.737	0.220	-0.977	-7.896	0.004
Rajasthan	(Constant)	3596.264	760.892		4.726	0.018
	YEAR	-1.764	0.379	-0.937	-4.650	0.019
a. Dependent Variable: IMR						

Annexure 2: Model Summary (IMR)

Model Summary for EAG States				
EAG States	R	R Square	Adjusted R Square	Std. Error of the Estimate
UP	0.988 [a]	0.975	0.967	3.51716
Bihar	0.981 [a]	0.962	0.949	4.01212
Orissa	0.980 [a]	0.959	0.946	7.28565
MP	0.977 [a]	0.954	0.939	4.97117
Rajasthan	0.937 [a]	0.878	0.838	8.57345
a. Predictors: (Constant), YEAR				

Annexure 3: Coefficient (U5MR)

Coefficients for EAG States						
EAG States		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
UP	(Constant)	5889.030	419.344		14.043	0.001
	YEAR	-2.886	0.209	-0.992	-13.806	0.001
Bihar	(Constant)	5459.357	448.271		12.179	0.001
	Year	-2.679	0.223	-0.990	-11.986	0.001
Orissa	(Constant)	6797.445	445.997		15.241	0.001
	YEAR	-3.347	0.222	-0.993	-15.055	0.001

MP	(Constant)	6781.899	1033.352		6.563	0.007
	YEAR	-3.334	0.515	-0.966	-6.471	0.007
Rajasthan	(Constant)	5643.745	1099.370		5.134	0.014
	YEAR	-2.775	0.548	-0.946	-5.063	0.015
a. Dependent Variable: U5MR						

Annexure: 4 Model Summaries (U5MR)

Model Summary for EAG States				
EAG States	R	R Square	Adjusted R Square	Std. Error of the Estimate
UP	0.992[a]	0.985	0.979	4.72501
Bihar	0.990[a]	0.980	0.973	5.05095
Orissa	0.993[a]	0.987	0.983	5.02533
MP	0.966[a]	0.933	0.911	11.64342
Rajasthan	0.946[a]	0.895	0.860	12.38728
a. Predictors: (Constant), YEAR				