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Health Status of Under-5 Children in Rural and Urban India: A Comparative Analysis using the Latest NFHS Data

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ABSTRACT This paper tries to investigate the health status of under-5 children in rural and urban India and also tries to find its relationship with different socio-economic-demographic variables. The latest all India NFHS-4 data have been used from this study. The sample size is 192599 in rural areas and 60488 in urban areas. The paper investigates how status of children's heath with respect to Height-for-age, Weight-for-age, Weight-for-height, Hemoglobin level, BMI are related with socio-economic-demographic variables like birth order, family size, mother's education, wealth index etc. About two-fifth of under-5 children are found to be underweight, whereas 57.4 percent children are anemic in India. The logistic regression reveals that wealth and mother's education has positive impact on child's growth in height and weight though it varies in urban and rural areas. Birth order has adverse effect on child's growth.

INTRODUCTION

There are plenty of studies on health and healthcare issues across time and place (Desai et al. 2010; Paine 1978; Park 2011; Bharati et al. 2017). The treatment of status of health varies for different age groups (Short and Mollborn 2015). Study by Meshram et al. (2016) reveals serious undernutrition of under-5 children in rural areas than that of urban setting in Surat region of Gujarat. Based on NFHS-3 data, an epidemiological study of malnutrition among under-five children of rural and urban Haryana by Yadav et al. (2016) reveals about half of under-5 children to be underweight and girls suffer more from malnutrition and thereby reveal serious gender bias in nutritional and child care in the state. The risk of under-nutrition was found to be associated with maternal nutrition, mother's education, household asset, as well as gender and community. Patil et al. (2018) finds prevalence of serious stunting, underweight and wasting among under-5 children in Forest Buffer Zone in Bor Tiger Sanctuary in central India. A considerable number of studies have been conducted on the regional health issues in India (William et al. 2012; Dasgupta et al. 2014; Ramchandran and Gopalan 2011). Very few studies have been made only on urban areas in India (Boregowda et al. 2015) and hardly any study is there relating to the comparison of health status of children in rural and urban in India. The status of health is expected to be better in urban areas because of available healthcare opportunities and better nutritional intake due to higher economic level (Bharati et al. 2020; Yesudian 1988). Anemia is very much prevalent among 6- to 59 -month-old children in India. Iron Deficient Anaemia (IDA) is regarded is one of 'Top Ten Risk Factors contributing to death" (Dubey 1994). IDA is very much common in South Asian countries like India, Bangladesh and Pakistan and it is a very serious problem among pregnant and lactating women, children and adolescents (Lokeshwar et al. 2011). It is seen that among 6-59 months children in India, 70 percent children are anaemic and 20 percent are mildly anaemic, 40 percent are moderately anaemic and 20 percent are mildly anaemic (IIPS 2017). Bharati et al. (2020) shows that in 2015-16, proportion of children in such age-group with anemia was 53.2 percent in urban areas as against 57.2 percent in rural areas.

Metro cities also are in the limelight for reduced under-5 child death and rising life expectancy at birth, which is due to better education of mother in cities than in rural areas. Along with it, various healthcare measures have been administered in a better way in urban areas than in rural areas (Paine 1978). However, some studies have raised doubt about the better status of health of urban children in comparison to rural areas, where a large section of population and children suffer from malnutrition and so is the case for mothers there (Haque et al. 2014; Rodes 2015). It is thus pertinent to examine the status of health of under-5 children in rural and urban areas in India.

Objectives of the Study

In this paper the researchers

1. examined the health status of under-5 children in rural areas in comparison to that of urban areas in India, and
2. found out the set of socio-economic-demographic variables which affect the status of health of under-5 children, so that appropriate policy prescriptions can be made.

METHODOLOGY

This study is based on the latest NFHS 4 data which corresponds to 2015-16. Information related to height, weight, anemia, birth order, age of mother, educational status, wealth and various civic facilities have been used for the purpose of analysis. The sample sizes for (0-59) month children are 253087 at all India level with 192599 in rural areas and 60488 in urban areas respectively. Rural sample size is almost 3 times that of urban sample size to make it representative sample of the population.

The mean levels of HAZ, WAZ, WHZ, hemoglobin and BMIZ at all India urban level are better than that of all India rural areas (Table 2). Also, these indicators of health in urban areas are significantly better than those at all India level.

Distribution of children aged below 5 years have been described in respect of height for age Z-score (HAZ), weight for age Z-score (WAZ), weight for height Z-score (WHZ) and BMI for age Z-score taking the categories below normal, normal and above normal. As per the WHO recommended method, a Z-score of HAZ, WAZ and WHZ less than -2 is considered as stunted, underweight and wasted respectively for under-5 children. On the other hand, a Z-score above 2 in all the above three cases indicate tall, overweight and overweight respectively (Table 1).

Status of anemia based on hemoglobin level has been grouped as anemic if the hemoglobin level is less than 11 g/dl, otherwise the child is non-anemic.

In order to have bivariate relation between various health indicators namely HAZ, WAZ, WHZ, BMIZ and Status of Anemia with the explanatory variables, namely birth order of child, wealth index, HH size, Mother's education and religion; the researchers have grouped the explanatory variables appropriately.

Table 1: WHO-standard criteria for HAZ, WAZ and WHZ to identify growth of under-5 children

	Z<-3	*-3 ≤Z<-2*	*-2≤2<-1*	*-1≤Z<2*	*2≤Z<2*	*2<Z≤3*	*3<Z*
HAZ	*Severely stunted (see note 4)*	*Sunted (See note 4)*					*See note 1*
WAZ	*Severely underweight (see note 5)*	*Underweight*				*See note 2*	
WHZ	*Severely wasted*	*Wasted*			*Possible risk of overweight (See note 3)*	*Overweight*	*Obese*
BMIZ	*Severely Wasted*	*Wasted*			*Possible risk of overweight (See note 3)*	*Overweight*	*Obese*

Note 1. A child in this range is very tall. However, tallness is rarely a problem.
Note 2. A child in this range may have a growth problem, but this is better assessed from weight-for-height or BMI-for-age.
Note 3. A plotted point above 1 shows possible risk.
Note 4. A stunted or severely stunted child may be overweight.
Note 5. A child in this range is very low weight and needs treatment.
Source: WHO (2008).

Table 2: Mean level of HAZ, WAZ, WHZ, hemoglobin in India by place of residence (rural and urban)

Area	*No. of under-5 children*	*Mean HAZ*	*Mean WAZ*	*Mean WHZ*	*Mean Hb*	*Mean BMIZ*
All India Rural	159687	-1.391	-1.680	-1.048	10.62	-.8553
All India Urban	49783	-1.081	-1.439	-.963	10.68	-.7811
All India	209470	-1.317	-1.623	-1.028	10.63	-.8376

Note: Here the total numbers are excluding system errors.

Households, based on wealth index, are categorized into poorest, poor, middle income, richer and richest as presented in NFHS data. Households, in respect of mothers' education, are grouped into no education, primary, secondary and higher education. Household size has been grouped into household size $\leq$3, 4, 5 and $\geq$6 members. Mother's level of education, wealth index, household size and birth order are thought to influence the status of health of under-5 children in both rural and urban areas in India and also cause significant variation in health status in those two areas.

Each bivariate table is subject to chi-square test to see whether there exists a relation between the health indicator and the corresponding explanatory variable. The researchers had taken some more explanatory variables but did not take these variables into consideration because of lack of sufficient relations between them. In some cases, t-tests have been carried out to compare the significance of mean differences.

In order to see the simultaneous effect of the socio-demographic variables, the researchers have carried out logistic regression of the binary variables of the health indicators on the socio-demographic variables. The stunted/underweight/wasted children are put in one group with value 1 and other children are given the value 0.

RESULTS

Out of 55931 effective sample of under-5 children at all India urban areas, 26.2 percent was found to have stunted growth, 33.3 percent were underweight, and 17.3 percent were wasted, whereas these percentages in rural areas were 34.8, 41.8 and 18.9 respectively (Table 3). The percentages of stunted and underweight children in rural areas were substantially more as compared to urban India. The picture is just opposite when we take proportion of overweight children, which are more in urban India for all the three criteria. It is observed later (Tables 8, 9, 10 and 11) that wealth status and mother's edu-

Table 3: Distribution of under-5 children in urban areas of India with respect to height for age, weight for age and weight for height Z-values

Group	*HAZ_Group*		*WAZ_Group*		*WHZ_Group*	
	N	*Percent*	*N*	*Percent*	*N*	*Percent*
All India Rural						
Below normal	62503	34.8	75061	41.8	34108	18.9
Normal	112433	62.5	103536	57.6	143616	79.6
Above normal	4842	2.7	1181	0.7	2709	1.5
Total	179778	100.0	179778	100.0	180433	100.0
All India Urban						
Below normal	14659	26.2	18635	33.3	9681	17.3
Normal	39455	70.5	36715	65.6	45283	80.8
Above normal	1817	3.3	581	1.1	1090	1.9
Total	55931	100.0	55931	100.0	56054	100.0
All India Total						
Below normal	77162	32.7	93696	39.8	43789	18.5
Normal	151888	64.4	140251	59.5	188899	79.9
Above normal	6659	2.8	1762	0.7	3799	1.6
Total	235709	100.0	235709	100.0	236487	100.0

cation have significant influence on nutritional intake and growth of under-5 children. In general, mother's education raises awareness, while the employment and wealth enhance entitlement for nutritional intake. Further, on an average, educational level, proportion of family heads and mothers in good jobs and wealth index of urban households are much higher than those in rural areas. The lower proportions of stunted, underweight and wasted children in urban areas in comparison to rural areas can thus be attributed to the variation in other's education and wealth status of households in rural and urban areas. Higher obesity in urban areas is also due to the average over-eating or nutritional intake by the affluent urban children.

One can similarly see from Table 4 that the percentages of anemic and undernourished children are comparatively less in urban areas. The cross-tabulations between HAZ, WAZ and WHZ groups have also been found, but are not shown here. They are found to be positively related in all the cross tabulations. This is true for children of both all India rural and urban areas. Thus, they move in the same direction. Moreover, the regression results (Table 15) show that factors influencing HAZ, WAZ and WHZ are more or less same and these are affected by the same variables almost in an identical manner and hence the movements are in similar direction.

Cross tabulation of HAZ, WAZ and WHZ scores with birth order as presented in Table 5 reveals that percentage of stunted, underweight and wasted children increases with the increase of birth order both at all India rural and urban areas. Also, for every birth order, percentages of stunted, underweight and wasted children in rural areas are much higher than that of urban areas. Proportion of above normal height children declines with the order of birth. Chi-square test for each cross-tabulation shows that the relation between birth order and the Z scores are significant, which implies that these variables are not independent in both rural and urban areas as well as at all India level. It reveals that the first child gets better care in terms of nutritional intake than the later born children in the family and it declines more with children of higher birth order in case of the larger family size (with several children) as observed from rural-urban variations in them. Literature suggests that households with poor and uneducated mother backgrounds tend to have more children and the relation with stunted, underweight and wasted growth is thus obvious.

The results of independent variable t-test of the mean Z-scores between the consecutive birth orders (between birth orders 1 vs. 2, 1 vs $\geq$3 and 2 vs. $\geq$3) at all India rural and urban areas are given in Table 6. In all the cases the differences are found to be significant except for WHZ scores. This only means that higher birth orders are not good for children's health. It becomes clearer when we look at parity wise mean scores of HAZ, WAZ and WHZ, which decreases with the increase of parity in all the cases (Table 7).

Table 8 reveals that percentage of stunted and underweight children of under-5 age group decreases with the value of wealth index for both all India rural and urban areas. But the rate of decline in proportion in rural areas is more than in urban areas, which is clear from the fact that percentage of under-5 stunted or underweight

Table 4: Distribution of under-5 children according to the level of anemia and BMI in rural, urban and All India level

	All India Rural		*All India Urban*		*All India Total*	
	Anemia					
	N	*%*	*N*	*%*	*N*	*%*
Anemic	97806	58.2	28787	55.0	126593	57.4
Not anemic	70346	41.8	23538	45.0	93884	42.6
Total	168152	100.0	52325	100.0	220477	100.0
	BMI					
Below normal	33812	18.8	9868	17.6	43680	18.5
Normal	141883	78.8	44511	79.4	186394	78.9
Above normal	4401	2.4	1701	3.0	6102	2.6
Total	180096	100.0	56080	100.0	236176	100.0

Table 5: HAZ, WAZ and WHZ groups vs. birth order group cross-tabulation for rural, urban and All India level

	All India Rural				*All IndiaUrban*				*All India*			
Birth Order	*1*	*2*	*≥3*	*Total*	*1*	*2*	*≥3*	*Total*	*1*	*2*	*≥3*	*Total*
HAZ												
Under	18258	17297	24039	59594	5091	4568	4338	13997	23349	21865	28377	73591
	(30.2)	(33.4)	(40.8)	(34.8)	(22.8)	(25.6)	(32.8)	(26.2)	(28.2)	(31.4)	(39.4)	(32.8)
Normal	40680	33099	33338	107117	16454	12673	8527	37654	57134	45772	41865	144771
	(67.2)	(63.9)	(56.6)	(62.6)	(73.8)	(71.1)	(64.5)	(70.6)	(69)	(65.7)	(58.1)	(64.5)
Above	1604	1442	1480	4526	764	581	355	1700	2368	2023	1835	6226
	(2.6)	(2.8)	(2.5)	(2.6)	(3.4)	(3.3)	(2.7)	(3.2)	(2.9)	(2.9)	(2.5)	(2.8)
Total	60542	51838	58857	171237	22309	17822	13220	53351	82851	69660	72077	224588
	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)
χ^2 value	1581.58, (p<0.01)				436.21, (p<0.01)				2282.74, (p<0.01)			
WAZ												
Under	22771	21272	27565	71608	6655	5991	5201	17847	29426	27263	32766	89455
	(37.6)	(41)	(46.8)	(41.8)	(29.8)	(33.6)	(39.3)	(33.5)	(35.5)	(39.1)	(45.5)	(39.8)
Normal	37345	30211	30977	98533	15391	11637	7930	34958	52736	41848	38907	133491
	(61.7)	(58.3)	(52.6)	(57.5)	(69)	(65.3)	(60)	(65.5)	(63.7)	(60.1)	(54)	(59.4)
Above	426	355	315	1096	263	194	89	546	689	549	404	1642
	(0.7)	(0.7)	(0.5)	(0.6)	(1.2)	(1.1)	(0.7)	(1)	(0.8)	(0.8)	(0.6)	(0.7)
Total	60542	51838	58857	171237	22309	17822	13220	53351	82851	69660	72077	224588
	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)
χ^2 value	1065.52, (p<0.01)				349.48, (p<0.01)				1625.63, (p<0.01)			
WHZ												
Under	11100	9815	11452	32367	3726	3121	2387	9234	14826	12936	13839	41601
	(18.3)	(18.9)	(19.4)	(18.8)	(16.7)	(17.5)	(18)	(17.3)	(17.9)	(18.5)	(19.1)	(18.5)
Normal	48569	41372	46914	136855	18112	14371	10720	43203	66681	55743	57634	180058
	(80.1)	(79.6)	(79.3)	(79.7)	(81.1)	(80.5)	(80.7)	(80.8)	(80.4)	(79.8)	(79.6)	(79.9)
Above	970	792	793	2555	497	359	171	1027	1467	1151	964	3582
	(1.6	(1.5)	(1.3	(1.5)	(2.2)	(2)	(1.3)	(1.9)	(1.8)	(1.6)	(1.3)	(1.6)
Total	60639	51979	59159	171777	22335	17851	13278	53464	82974	69830	72437	225241
	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)
χ^2 value	34.29, (p<0.01)				48.44, (p<0.01)				84.07, (p<0.01)			

Note: Figures in the parentheses represent percentage to total.

Table 6: Values of independent t-test along with significance levels between HAZ/WAZ/WHZ scores and birth order at rural, urban and all India level

	All India			*For stunted/underweight/wasted*		
Birth Order Group	*1 vs. 2*	*1 vs. ≥3*	*2 vs. ≥3*	*1 vs. 2*	*1 vs. ≥3*	*2 vs. ≥3*
All India Rural						
HAZ Score	9.93 (.000)	21.46) (.000)	12.58 (.000)	4.16 (.000)	8.18 (.000)	4.44 (.000)
WAZ Score	11.76 (.000)	22.49 (.000)	12.24 (.000)	5.49 (.000)	10.7 (.000)	5.82 (.000)
WHZ Score	6.35 (.000)	9.36 (.000)	4.00 (.000)	1.21 (0.227)	0.87 (0.385)	1.85 (0.065)
All India Urban						
HAZ Score	6.59 (.000)	13.31 (.000)	8.03 (.000)	0.282 (0.778)	2.95 (0.003)	2.73 (0.006)
WAZ Score	7.82 (.000)	14.10 (.000)	7.93 (.000)	0.475 (0.635)	4.57 (.000)	4.11 (.000)
WHZ Score	4.11 (.000)	6.16 (.000)	2.99 (.003)	-2.09 (0.036)	-1.68 (0.093)	-0.07 (0.944)
All India						
HAZ Score	12.34 (.000)	26.86 (.000)	16.06 (.000)	3.94 (.000)	9.02 (.000)	5.52 (.000)
WAZ Score	14.57 (.000)	28.22 (.000)	15.78 (.000)	5.15 (.000)	11.97 (.000)	7.41 (.000)
WHZ Score	7.75 (.000)	11.84 (.000)	5.42 (.000)	-2.11 (0.035)	-0.083 (0.934)	1.62 (0.104)

Note: Figures in the parentheses are the corresponding p-values.

Table 7: Birth order wise mean values of the HAZ, WAZ and WHZ scores of under-5 children at rural, urban and all India total

Birth order	*1st child*		*2nd child*		*3rd or higher order child*	
	N	*Mean*	*N*	*Mean*	*N*	*Mean*
All India Rural						
HAZ Score	60542	-1.315	51838	-1.343	58857	-1.589
WAZ Score	60542	-1.629	51838	-1.657	58857	-1.817
WHZ Score	60639	-1.037	51979	-1.053	59159	-1.086
All India Urban						
HAZ Score	22309	-0.960	17822	-1.061	13220	-1.334
WAZ Score	22309	-1.338	17822	-1.433	13220	-1.635
WHZ Score	22335	-0.918	17851	-0.968	13278	-1.036
All India Total						
HAZ Score	82851	-1.172	69660	-1.271	72077	-1.542
WAZ Score	82851	-1.511	69660	-1.600	72077	-1.784
WHZ Score	82974	-0.984	69830	-1.031	72437	-1.077

children for poorest category is more in rural area than that in urban area, while the proportion of such under-5 children in richer and richest category in rural area is lower than that in urban area. Similar is the case for wasted categories of under-5 children. In all cases at all India level, and rural as well as urban areas, the Chi-Square statistics are found to be significant at one percent level of significance by two-tailed tests. So, there is a significant negative impact of wealth on stunted, underweight and wasted percentages. Hence, the impact of wealth, which is significant both in rural and urban areas, is more pronounced in rural area than in urban area.

The picture becomes clearer when we take the mean Z scores (Table 9). The mean scores

Table 8: Cross-tabulation of HAZ, WAZ and WHZ groups vs. wealth index for rural, urban and all India level

Wealth group		*Poorest*	*Poorer*	*Middle*	*Richer*	*Richest*	*Total*	*Poorest*	*Poorer*	*Middle*	*Richer*	*Richest*	*Total*
		All India Rural						*All India Urban*					
HAZ	Under	26231 (44.8)	18273 (36.6)	10738 (29.4)	5181 (23.0)	2080 (17.0)	62503 (34.8)	1205 (44.3)	2224 (37.8)	3377 (31.8)	4324 (25.5)	3672 (18.6)	14802 (26.4)
	Normal	30889 (52.8)	30377 (60.9)	24777 (67.7)	16661 (73.8)	9729 (79.4)	112433 (62.5)	1449 (53.3)	3525 (60.0)	6952 (65.5)	12127 (71.0)	15242 (77.2)	39295 (70.3)
	Above	1378 (2.4)	1229 (2.5)	1067 (2.9)	727 (3.2)	441 (3.6)	4842 (2.7)	65 (2.4)	130 (2.2)	290 (2.7)	509 (3.0)	840 (4.2)	1834 (3.4)
	Total	58498 (100.0)	49879 (100.0)	36582 (100.0)	22569 (100.0)	12250 (100.0)	179778 (100.0)	2719 (100.0)	5879 (100.0)	10619 (100.0)	16960 (100.0)	19754 (100.0)	55931 (100.0)
χ^2 value		6271.54, (p<0.01)						1668.0, (p<0.01)					
		All India Rural						*All India Urban*					
WAZ	Under	31084 (53.1)	21554 (43.2)	13109 (35.8)	6641 (29.4)	2673 (21.8)	75061 (41.8)	1459 (53.7)	2639 (44.9)	4167 (39.2)	5629 (33.2)	4939 (25.0)	18833 (33.7)
	Normal	27143 (46.4)	28048 (56.2)	23193 (63.4)	15731 (69.7)	9421 (76.9)	1181 (57.6)	1248 (45.9)	3210 (54.6)	6379 (60.1)	11155 (65.8)	14518 (73.5)	36510 (65.3)
	Above	271 (0.5)	277 (0.6)	280 (0.8)	197 (0.9)	156 (1.3)	179778 (0.7)	12 (0.4)	30 (0.5)	73 (0.7)	176 (1.0)	297 (1.5)	588 (1.0)
	Total	58498 (100.0)	49879 (100.0)	36582 (100.0)	22569 (100.0)	12250 (100.0)	103536 (100.0)	2719 (100.0)	5879 (100.0)	10619 (100.0)	16960 (100.0)	19754 (100.0)	55931 (100.0)
χ^2 value		7140.73, (p<0.01)						1668.1, (p<0.01)					
		All India Rural						*All India Urban*					
WHZ	Under	13189 (22.4)	9351 (18.7)	6292 (17.2)	3589 (15.9)	1687 (13.8)	34108 (18.9)	586 (21.4)	1191 (20.2)	1948 (18.3)	2917 (17.2)	3162 (16.0)	9804 (17.5)
	Normal	44916 (76.4)	40079 (80.0)	29736 (81.1)	18588 (82.2)	10297 (84.0)	143616 (79.6)	2119 (77.4)	4637 (78.6)	8541 (80.1)	13736 (80.9)	16115 (81.5)	45148 (80.5)
	Above	701 (1.2)	648 (1.3)	656 (1.8)	429 (1.9)	275 (2.2)	2709 (1.5)	33 (1.2)	73 (1.2)	167 (1.6)	333 (1.9)	496 (2.5)	1102 (2.0)
	Total	58806 (100.0)	50078 (100.0)	36684 (100.0)	22606 (100.0)	12259 (100.0)	180433 (100.0)	2738 (100.0)	5901 (100.0)	10656 (100.0)	16986 (100.0)	19773 (100.0)	56054 (100.0)
χ^2 value		1005.92, (p<0.01)						149.7, (p<0.01)					

Note: Numbers in the parentheses represent percentage to total.

clearly decrease as wealth index rises at all India rural and urban level. The mean scores are clearly much less among richer and the richest children than in other children. ANOVA gives significant result in all cases including HAZ, WAZ and WHZ.

From Table 10 the researchers found that, as mother's education increases, the percentage of stunted, underweight and wasted children decrease, and the percentages of normal and overweight children increase. The Chi-square test statistic is significant for all the cases. The trends are clearer if we look at their mean scores (Table 11). The mean scores have distinct increasing pattern as mother's education increases, which means that the level of health of children has a positive relation with mother's level of education. Mother's education has thus pronounced effect on the status of health of under-5 children. Further, like wealth index, impact of mother's education on reduction in percentage of stunted, underweighted and wasted children appeared to be more in rural areas than in urban areas.

In order to have bi-variate cross-tabulation of different health indicators with household size, households are divided into 4 groups with number of members 3, 4, 5 and 6 or more (largest). Table 12 reveals that the proportions of stunted, underweight and wasted children under-5 increase and the proportion of normal children declines as family size moves from 3 to 6 and above at all India urban level. Proportion of overweight children also declines. The Chi-square value is also significant at one percent level of significance for all cases.

Table 13 reveals that percentage of stunted under-5 children in Muslim category is more than the other religion in both rural and urban areas. However, percentage of underweight and wasted under-5 children in Muslim community is lower than those in Hindu community but more than those of other religious community. Chi-square values are all found to be significant that indicates significant relation of religion with healthcare.

The researchers have further reduced the explanatory variables namely, Sex, Birth Order, Wealth, Household Size and Mother's Education into two groups in order to see the simultaneous effect of these variables on the status of health of children. The status of health in terms of BMIZ, HAZ, WAZ and WHZ are also divided into two groups to get a clear-cut picture of the regression results. The first group is underweight/stunted/wasted children taking value '0' and the second group consists of rest of the children, who are normal or overweight taking value '1'.

Table 9: HAZ, WAZ and WHZ mean scores of under-5 children by family income groups for rural, urban and all India level

	Poorest	*Poorer*	*Middle*	*Richer*	*Richest*	*Overall*	*ANOVA-F, (Sig.)*
All India Rural							
HAZ	-1.73	-1.46	-1.22	-0.99	-0.75	-1.39	1684.8
	(58498)	(49879)	(36582)	(22569)	(12250)	(179778)	(.000)
WAZ	-1.98	-1.7269	-1.53	-1.35	-1.11	-1.68	2398.5
	(58498)	(49879)	(36582)	(22569)	(12250)	(179778)	(.000)
WHZ	-1.19	-1.0543	-0.98	-0.91	-0.78	-1.05	505.6
	(58806)	(50078)	(36684)	(22606)	(12259)	(180433)	(.000)
All India Urban							
HAZ	-1.74	-1.48	-1.28	-1.08	-.76	-1.08	501.8
	(2719)	(5879)	(10619)	(16960)	(19754)	(55931)	(.000)
WAZ	-1.97	-1.78	-1.62	1.43	-1.17	1.44	569.7
	(2719)	(5879)	(10619)	(16960)	(19754)	(55931)	(.000)
WHZ	-1.17	-1.12	-1.04	-.95	-.85	-.96	98.8
	(2738)	(5901)	(10656)	(16986)	(19773)	(56054)	(.000)
All India Total							
HAZ	-1.73	-1.46	-1.2	-1.03	-0.75	-1.32	2597.53
	(61217)	(55758)	(47201)	(39529)	(32004)	(235709)	.000)
WAZ	-1.98	-1.73	-1.55	-1.38	-1.15	-1.62	3384.95
	(61217)	(55758)	(47201)	(39529)	(32004)	(235709)	(.000)
WHZ	-1.19	-1.06	-1.00	-0.93	-0.83	-1.03	636.56
	(61544)	(55979)	(47340)	(39592)	(32032)	(236487)	(.000)

Table 10: Cross-tabulation of HAZ, WAZ and WHZ groups vs. education level of mothers for children of rural, urban and all India level

Education		*No education*	*Primary*	*Secondary*	*Higher*	*Total*	*No education*	*Primary*	*Secondary*	*Higher*	*Total*
		All India Rural					*All India Urban*				
HAZ	Under	27424 (44.5)	10393 (37.6)	21532 (28.3)	1927 (17.9)	61276 (34.8)	3682 (39.4)	2137 (34.7)	6855 (24.1)	1694 (15.7)	14368 (26.2)
	Normal	32767 (53.1)	16587 (60.1)	52388 (68.8)	84301 (78.3)	10172 (62.5)	5431 (58.2)	3888 (63.2)	20682 (72.6)	8629 (79.9)	38630 (70.5)
	Above	1476 (2.4)	631 (2.3)	2205 (2.9)	405 (3.8)	4717 (2.7)	226 (2.4)	130 (3.3)	935 (4.5)	481 (4.5)	1772 (3.2)
	Total	61667 (100.0)	27611 (100.0)	76125 (100.0)	10762 (100.0)	176165 (100.0)	9339 (100.0)	6155 (100.0)	28472 (100.0)	10804 (100.0)	54470 (100.0)
χ^2 value				5437.6, (p<0.01)					1792.3, (p<0.01)		
		All India Rural					*lAll India Urban*				
WAZ	Under	31728 (51.5)	12314 (44.6)	27053 (35.5)	2533 (23.5)	73628 (41.8)	4345 (46.5)	2609 (42.4)	9067 (31.8)	2299 (21.3)	18320 (33.4)
	Normal	29620 (48.0)	15161 (54.9)	48510 (63.7)	8091 (75.2)	101382 (57.5)	4940 (52.9)	3499 (56.8)	19125 (67.2)	8316(77.0) (77.0)	35880 (65.5)
	Above	319 (0.5)	136 (0.5)	562 (0.7)	138 (1.3)	1155 (1.3)	54 (0.6)	47 (0.8)	280 (1.0)	189 (1.7)	570 (1.0)
	Total	61667 (100.0)	27611 (100.0)	76125 (100.0)	10762 (100.0)	176165 (100.0)	9339 (100.0)	6155 (100.0)	28472 (100.0)	10804 (100.0)	54770 (100.0)
χ^2 value				5190.4, (p<0.01)					1727.4, (p<0.01)		
		All India Rural					*All India Urban*				
WHZ	Under	13045 (21.0)	5308 (19.2)	13537 (17.8)	15843 (14.7)	3474 (18.9)	1844 (19.6)	1179 (19.1)	4838 (17.0)	1664 (15.4)	9525 (17.4)
	Normal	48220 (77.7)	22034 (79.5)	61451 (80.6)	8926 (82.9)	140631 (79.6)	7449 (79.2)	4902 (79.4)	23111 (81.1)	8829 (81.7)	44291 (80.7)
	Above	787 (1.3)	361 (1.3)	1252 (1.6)	255 (2.4)	2655 (1.5)	110 (1.2)	92 (1.5)	553 (1.9)	314 (2.9)	1069 (1.9)
	Total	62052 (100.0)	27703 (100.0)	76240 (100.0)	10765 (100.0)	176760 (100.0)	9403 (100.0)	6173 (100.0)	28502 (100.0)	10807 (100.0)	54885 (100.0)
χ^2 value				446.9, (p<0.01)					157.1, (p<0.01)		

Table 11: Mean scores of under-5 children of different categories of mother's education for rural, urban and all India level

	No education	*Primary*	*Secondary*	*Higher*	*Total*	*ANOVA (F value, Sig.)*
All India Rural						
HAZ	-1.71	-1.51	-1.18	-0.76	-1.39	1939.7
	-1.71	(27611)	(76125)	(10762)	(179778)	(.000)
WAZ	-1.93	-1.77	-1.52	-1.14	-1.68	2315.5
	(61667)	(27611)	(76125)	(10762)	(179778)	(.000)
WHZ	-1.15	-1.08	-0.99	-0.81	-1.05	367.5
	(62052)	(27703)	(76240)	(10765)	(180433)	(.000)
All India Urban						
HAZ	-1.56	-1.41	-1.03)	-.62	-1.08	573.9
	(9339)	(6155)	(28472)	(10804)	(55931)	(.000)
WAZ	-1.83	-1.71	-1.40)	-1.0554	-1.44	587.3
	(9339)	- (6155)	(28472)	(10804)	(55931)	(.000)
WHZ	-1.13	-1.09	-.95	-.7980	-.96	41.9)
	(9403)	6173)	(28502)	(10807)	- (56054)	(.000)
All India						
HAZ	-1.69)	-1.49	-1.14)	-0.69)	-1.32	3112.0
	(71006)	(33766)	(104597)	- (21566)	- (235709)	(.000)
WAZ	-1.92	-1.76	-1.49)	-1.10	-1.62)	3637.9
	(71006)	(33766)	(104597)	(21566)	(235709)	(.000)
WHZ	-1.15	-1.08	-0.98	-0.81	-1.03	581.3
	(71455)	(33876)	(104742)	- (21572)	(236487)	(.000)

In order to reduce the set of explanatory variables, the researchers have found the bivariate contingency table for each combination of heath indices and the explanatory variables and carried out the χ^2 test to see whether the explanatory variable should be included in the logistic regression. Table 14 shows the significance (p-values) of Pearson's χ^2 tests of bivariate contingency table of health indices with the explanatory variables sex, birth order, wealth, household size and mother's education. It is clear from the table that mother's education and wealth index have significant relation with all the health indices, whereas sex, birth order and household size have significant effect on some of the health indices for all India urban children. Thus, mother's education and wealth index are the two most important factors for the health status of under-5 children.

The researchers have carried out the logistic regression of the health indices on the explanatory variables, namely, Sex, Birth Order, Wealth Index, Household Size, Mother's Education, sex of head and religion (Table 15). In order to make the four equations comparable, the researchers have included all these seven variables in each of the four regressions. Though indicators of health are considered as binary and the sex, the other explanatory variables are considered as continuous, as available in NFHS-4 data. The summary result of the contingency tables as shown in Table 13 is more or less reflected in the results of the logistic regressions (Table 15). In case of both all India rural and urban children, mother's education and wealth index have been found to have significant influence on the health status of the children in all the four regressions. More specifically the effect is negative, implying that as level of wealth or mother's education rise, then the chance of becoming underweight/wasted/stunted become less. All the significant coefficients, except the coefficient associated with sex, have expected signs. But the positive sign of coefficient of sex of child in case of BMIZ and WHZ indicates better nutritional care for the boy than that of girls. Height for age may be a genetic factor but weight for height would be taken care through nutrition and thus it reflects some gender bias in the care of child in favour of boy. Note that positive coefficients imply that status of health decreases, that is, the risk of underweight/wasted/stunted increase due to increase of the value of the variable and opposite is the case when the value of the coefficient becomes negative. Thus, wealth index and mother's education are beneficial for health of children, whereas birth order and household size are not so. Negative sign in case of birth order

Table 12: HAZ, WAZ and WHZ groups Vs. HH size cross-tabulation for all India rural and urban areas

		HH Size (All India Rural)					*HH Size (All India Urban)*				
		3	*4*	*5*	*≥6*	*Total*	*3*	*4*	*5*	*≥6*	*Total*
HAZ	Under	3810	9391	11636	37666	62503	1096	2738	2867	7958	14659
		(32.1)	(33.4)	(35.0)	(35.4)	(34.8)	(23.2)	(25.9)	(27.1)	(26.5)	(26.2)
	Normal	7698	17963	20738	66034	112433	3459	7502	7360	21134	39455
		(64.8)	(63.8)	(62.3)	(62.0)	(62.5)	(73.1)	(71.0)	(69.6)	(70.3)	(70.5)
	Above	366	801	904	2771	4842	174	332	346	965	1817
		(3.1)	(2.8)	(2.7)	(2.6)	(2.7)	(3.7)	(3.1)	(3.3)	(3.2)	(3.2)
	Total	11874	28155	33278	106471	179778	4729	10572	10573	30057	55931
		(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
χ^2 value				86.8, (p<0.01)					30.7, (p<0.01)		
WAZ	*Under*	4773	11626	14000	44662	75061	1448	3482	3656	10049	18635
		(40.2)	(41.3)	(42.1)	(41.9)	(41.8)	(30.6)	(32.9)	(34.6)	(33.4)	(33.3)
	Normal	6984	16349	19055	61148	103536	3230	6973	6795	19717	36715
		(58.8)	(58.1)	(57.3)	(57.4)	(57.6)	(68.3)	(66.0)	(64.3)	(65.6)	(65.6)
	Above	117	180	223	661	1181	51	117	122	291	581
		(1.0)	(0.6)	(0.7)	(0.6)	(0.7)	(1.1)	(1.1)	(1.2)	(1.0)	(1.0)
	Total	11874	28155	33278	106471	179778	4729	10572	10573	30057	55931
		(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
χ^2 value				37.2, (p<0.01)					27.6, (p<0.01)		
WHZ	Under	2383	5466	6528	19731	34108	820	1813	1855	5193	9681
		(20.0)	(19.4)	(19.6)	(18.5)	(18.9)	(17.3)	(17.1)	(17.5)	(17.2)	(17.3)
	Normal	9313	22370	26317	85616	143616	3810	8575	8508	24390	45283
		(78.2)	(79.2)	(78.8)	(80.1)	(79.6)	(80.5)	(80.9)	(80.3)	(80.9)	(80.8)
	Above	212	402	545	1550	2709	104	208	228	550	1090
		(1.8)	(1.4)	(1.6)	(1.4)	(1.5)	(2.2)	(2.0)	(2.2)	(1.8)	(1.9)
	Total	11908	28238	33390	106897	180433	4734	10596	10591	30133	56054
		(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
χ^2 value				51.7, (p<0.01)					7.1, (p<0.10)		

Note: Figures in the parentheses represent percentage to total.

Table 13: HAZ, WAZ and WHZ groups vs. birth order group cross-tabulation for rural, urban and all India level

	All India rural				*All India urban*				*All India*			
Religion	*Hindu*	*Muslim*	*Others*	*Total*	*Hindu*	*Muslim*	*Others*	*Total*	*Hindu*	*Muslim*	*Others*	*Total*
HAZ												
Under	47263	8890	5543	61696	9565	3803	1194	14562	56828	12693	6737	76258
	(35.4)	(36.2)	(28.6)	(34.8)	(26.2)	(29.3)	(19.8)	(26.3)	(33.4)	(33.8)	(26.5)	(32.7)
Normal	82946	14951	13105	111002	25710	8798	4590	39098	108656	23749	17695	150100
	(62.1)	(60.9)	(67.7)	(62.6)	(70.5)	(67.8)	(76.1)	(70.5)	(63.9)	(63.3)	(69.7)	(64.4)
Above	3334	697	720)	4751	1178	374	249	18014	512	1071	969	6552
	(2.5)	(2.8)	(3.7)	(2.7)	(3.2)	(2.9)	(4.1)	(3.2)	(2.7)	(2.9)	(3.8)	(2.8)
Total	133543	24538	19368	177449	36453	12975	6033	55461	169996	37513	25401	232910
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
χ^2 value			433.0, (p<0.01)				201.9, (p<0.01)				566.6, (p<0.01)	
WAZ												
Under	58939	9889	5269	74097	12568	4684	1273	18525	71507	14573	6542	92622
	(44.1)	(40.3)	(27.2)	(41.8)	(34.5)	(36.1)	(21.1)	(33.4)	(42.1)	(38.8)	(25.8)	(39.8)
Normal	73877	14473	13844	102194	23506	8193	4661(77.3)	(65.6)	(57.3)	(60.4)	(72.9)	(59.5)
Above	727	176	255	1158	379	98	99	576	1106	274	354	1734
	(0.5)	(0.7)	(1.3)	(0.7)	(1.0)	(0.8)	(1.6)	(1.0)	(0.7)	(0.7)	(1.4)	(0.7)
Total	133543	24538	19368	177449	36453	12975	6033	55461	169996	37513	25401	232910
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
χ^2 value			2108.3, (p<0.01)				489.3, (p<0.01)				2558.3, (p<0.01)	
WHZ												
Under	26982	3952	2657	33591	6706	2229	698	9633	33688	6181	3355	43224
	(20.1)	(16.0)	(13.6)	(18.9)	(18.4)	(17.1)	(11.6)	(17.3)	(19.8)	(16.4)	(13.2)	(18.5)
Normal	105221	20288	16333	141842	29090	10602	5178	44870	134311	30890	21511	186712
	(78.5)	(82.3)	(83.9)	(79.6)	(79.6)(81.4)		(85.7)	(80.7)	(78.8)	(82.0)	(84.3)	(79.9)
Above	1784	397	479	2660	730	187	164	1081	2514	584	643	3741
	(1.3)	(1.6)	(2.5)	(1.5)	(2.0)	(1.4)	(2.7)	(1.9)	(1.5)	(1.6)	(2.5)	(1.6)
Total	133987	24637	19469	178093	36526	13018	6040	55584	170513	37655	25509	233677
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
χ^2 value			735.5, (p<0.01)				200.0, (p<0.01				)892.3, (p<0.01)	

Note: Figures in the parentheses represent percentage to total.

Table 14: Significance (p-values) of Pearson's χ^2 tests of bivariate contingency table of health indices with sex, birth order, wealth, household size and mother's education

	Sex	*Birth order 2-Group*	*Wealth index 2-Group*	*HH size 2-Group*	*Mother's education 2-Group*
All India Rural					
BMIZ2Grp	0.000	0.051	0.000	0.128	0.000
HAZ2Grp	0.033	0.000	0.000	0.000	0.000
WAZ2Grp	0.000	0.000	0.000	0.000	0.000
WHZ2Grp	0.000	0.000	0.000	0.000	0.000
All India Urban					
BMIZ2Grp	0.002	0.345	0.000	0.593	0.000
HAZ2Grp	0.160	0.000	0.000	0.000	0.000
WAZ2Grp	0.520	0.000	0.000	0.001	0.000
WHZ2Grp	0.000	0.013	0.000	0.714	0.000

Table 15: Results of logistic regression of the health indices on sex, birth order, wealth index, household size and mother's education

	All India Rural							
Explanatory variables	*BMIZ*		*HAZ*		*WAZ*		*WHZ*	
	B	*Sig.*	*B*	*Sig.*	*B*	*Sig.*	*B*	*Sig.*
Sex of child	**.048**	.000	-.016	.116	**-.047**	.000	**.078**	.000
Birth order	**-.011**	.016	**.048**	.000	**.029**	.000	**-.009**	.047
Wealth index	**-.106**	.000	**-.244**	.000	**-.249**	.000	**-.115**	.000
HH size	**-.008**	.001	**.014**	.000	**.005**	.003	**-.013**	.000
Mothers education	**-.015**	.051	**-.205**	.000	**-.186**	.000	**-.048**	.000
Sex of head	**.099**	.000	**-.051**	.001	.018	.260	**.103**	.000
Religion	**-.202**	.000	**-.080**	.000	**-.300**	.000	**-.228**	.000
	All India Urban							
Explanatory variables	*BMIZ*		*HAZ*		*WAZ*		*WHZ*	
	B	*Sig.*	*B*	*Sig.*	*B*	*Sig.*	*B*	*Sig.*
Sex of child	**.054**	.019	.032	.118	-.022	.248	**.065**	.005
Birth order	.007	.468	**.054**	.000	**.040**	.000	.006	.548
Wealth index	**-.039**	.001	**-.206**	.000	**-.194**	.000	**-.059**	.000
HH size	-.006	.149	**.010**	.005	**.007**	.042	-.003	.405
Mothers education	**-.023**	.116	**-.262**	.000	**-.248**	.000	**-.062**	.000
Sex of head	.037	.306	-.010	.762	.033	.258	.025	.492
Religion	**-.185**	.000	**-.101**	.000	**-.232**	.000	**-.203**	.000

Note: The constant term is not shown. Sex: M=1 & F=0, Health Indices: Underweight/Wasted/ Stunted= 1 & Else = 0, Religion: 1 = Hindu, 2 = Muslim, 3 = Other.

indicates the better care is received by first or second born baby than the later born baby. It is further observed that, sex of head has significant positive coefficient in rural area in case of BMIZ and WHZ but it is insignificant in urban areas. Negative coefficient of religion is an indication of better healthcare in case of Hindu families in comparison to the Muslim households in both rural and urban areas.

DISCUSSION

The studies on the status of under-5 children in the rural and urban areas in India are

scanty. Agarwal et al. (2008) assessed child health in metropolitan cities of India. But their study was limited to only slum areas of the metro cities. Rastogi and Dwivedi (2014) found the prevalence of stunted, underweight and wasted under-5 children in non-slum Delhi as 38.6 percent, 25.0 percent and 16.5 percent and in slum areas as 50.7 percent, 35.2 percent and 14.8 percent respectively. Haque et al. (2014), Rodes (2015) raised serious doubts about the better healthcare in urban areas as compared to that of rural areas. Roy et al. (2018a) observes that about 36.1 percent rural children in West Bengal have composite index of anthropometric failure (CIAF) (wasting only 2.1%, wasting and underweight 14.5 %, wasting, stunting and underweight 5.5 %, stunting and underweight 6.3 %, stunting only 4.9 %, underweight only 2.8%). Education of mother, birth order and exclusive breast-feeding practice are found to be the significant correlates when adjusted with other variables in the multivariable analysis.

Dual burden of malnutrition is becoming a major concern even among the children now a days (Roy et al. 2018b). Since status of health of children in urban India is better, there is a shift in the percentages in each group. Naturally, for urban children the undernutrition is less but overnutrition or obesity is more compared to rural India. Even then, there are some states which show high percentages of underweight along with overweight or obese children in urban India. The researchers have, however, not done any state wise analysis in this paper.

In this study the researchers observed average levels of healthcare indicators to be better in urban India than in rural India in case of under-5 children by all five criteria. Mother's education and wealth index of the families are very significant but the impacts of these two variables are more pronounced in rural areas for stunted/underweight/wasted children. However, the impacts are more towards overweight and above normal height children in urban areas than in rural areas.

When we look at the anemic condition of children, we see that about 55 percent of under-5 children in urban India are anemic, which is much higher in rural India (58.2%). As per BMIZ also 18.8 percent of the rural under-5 children are in below normal category, which is 17.6 percent at all India urban level. Bharati et al. (2019) computed state wise percentages of underweight (WAZ), stunted (HAZ) and anemic children along with all India percentages, in which they got 32.4 percent underweight, 35.6 percent stunted and 56.0 percent anemic children. The differences, though not much, are due to leaving out many observations by them. They wanted to relate morbidity status with socio-demographic variables and took observations which were present for all the variables.

The logistic regression result reveals significant positive impact of wealth and mother's education on the child's growth in terms of height and weight though there are some variations in the values of the coefficients at all India urban and rural areas. The family size and birth order do not show much significant influence on the growth of children in the logistic regression though the contingency tables of birth order with the status of health showed significant negative influence.

CONCLUSION

Rural children and girls are lagging urban children and boys respectively, so far as status of health is concerned. However, there is not much difference of status of anemia between rural and urban India. It is seen that there is significant effect of sex on health status of children. Wealth and mother's education have positive effect on the status of health of children. Household size and birth order have negative effect on health of the children. Higher birth order implies larger household size. So, these two variables are interrelated. Larger family size is also another reason for poor nutritional status and the children of higher birth order relatively suffer more and record stunting, underweight and wasted.

RECOMMENDATIONS

Health status of rural children needs to be improved so that they can come at par with urban children. Rural-urban disparity in education and income needs to be addressed in order to address capability inequalities and deprivations.

Besides there are some other clear-cut messages which come out from the results of the analysis made in this paper. So far as differences of status of health between male and female children is concerned, we cannot change the sex of the children, but at least we can treat the male and female children equally. It is necessary to make proper plans to improve the educational levels of the girls. There should be efforts to minimize the dropout rates of the children, especially the girl children. After all, girls are the future mothers. Government of India and non-government organizations (NGOs) should launch awareness programs, so that families do not opt for many children and male and female children are treated equally.

If these recommendations are carried out successfully, the rural-urban differences will automatically vanish, because rural households are poorer, rural mothers are less educated, and rural family sizes are larger on the average, compared to their urban counterparts.

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