

Drivers of Stunting among Under Two Years Old Children in Nyabihu District, Rwanda

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Abstract

Childhood stunting is one of the most vital issues on human development that the world faces. The recent global nutrition report 2020 indicates that childhood stunting reduced Worldwide, from 165.8 million in 2012 to 149 billion in 2018, a ten percent drop; 34% of the world stunted children live in South Asia and Sub-Saharan Countries. In Rwanda, stunting affects 33% of children under five years with 35% children under two years affected. The main objective of this study was to assess the drivers of stunting in under two-year children living in Nyabihu District, Rwanda. The study used cross sectional design and a sample of 382 under 2-years children living in Nyabihu District was targeted. The sampling design was two-stage cluster sampling with the first stage being selection of clusters (villages) based on the probability proportional to population size (PPS) approach that utilizes systematic selection of villages. Anthropometrics statuses have been defined under World Health Organization classification: Overall stunting prevalence was classified as (HAZ <-2). This study revealed that 40.6% had stunting while 59.4% were not stunted. Thus, the findings from multivariate analysis revealed that children who didn't taken for deworming in last six months were less likely to be stunted [AOR = 0.497; 95%CI = 0.002 - 0.792; P = 0.003] compared to children took medicine of deworming. The government of Rwanda must keep put into consideration the children under two years old by working hand in hand with different organizations that dealing with children to ensure strong collaboration, communication and partnership for effective fight against stunting.

Keywords: Drivers of Stunting; Under Two Years Old Children; Nyabihu District

Introduction

Stunting is failure of linear growth manifested as height-for-age that is more than two standard deviations below the WHO Child Growth Standards median [1].

Childhood chronic stunting is one of the most vital issues on human development that the world faces. The consequences of malnutrition in young ages result in reduced cognitive and physical development, which exposes children at a difficulty for the entire life [1].

Stunting in early childhood is an indicator of opposing Biological growth are affected. From pregnancy to the age two, the very first 1000 days are critical, the child experiences the rapid physical, sensory, language and cognitive development [2]. Nutritional deficits, poor stimulation and social inattention in the period of first 1000 days affect the development and are associated with further consequences

in adult life [3]. Although according to several reports, the catch-up development may occur the stunted children are more likely to be stunted in adult years with Stunting's potential multigenerational impact on developing nations' progress and expansion [4].

According to UNICEF, in low- and middle-income nations, stunting impacts one-third of kids under the age of five, totaling 178 million children. The recent global nutrition report 2020 indicates that childhood chronic malnutrition reduced Worldwide, from 165.8 million in 2012 to 149 billion in 2018, a ten percent drop; moreover, in many developing countries in South Asia and Sub Saharan including Rwanda still have a rate which is above the WHO threshold of severity.

According to [5], In Rwanda, 33% of kids under the age of five endure from stunting, the rate declined from 38% in 2015. Highest percentage are found in North and west province, moreover District s experience differences with high percentage in Nyabihu District, 53% [6], with 35% among the children under two years' children.

Although chronic malnutrition in Rwanda is still a problem of public health of high importance for decision making, the government is willing and committed to address the issue [7]. The reduction of chronic malnutrition in under 5 years' children is currently considered as a high national priority and it was specifically highlighted in the National Strategy for Transformation. Essentially, from 2009, the interventions initiated by the government include the President Emergency Ingenuity to Eradicate Undernutrition (2009);The elaboration of National multi-sector Strategy to Eradicate Malnutrition, the resolution of three National Nutrition Summits (2009, 2011, 2014); Developing tools for health-care facilities and communities to support and track parental, baby, and young-child feeding; District Plans to Eradicate Malnutrition (DPEM) in every District (2011); a national Joint Action Plan (2012) to Eliminate Malnutrition (JAPEM); the countrywide 1000 days campaign to avoid stunting launched in 2013; The introduction of supplementary feeding Programme targeting children young 6 - 23 months and prenatal and lactating mothers in wealth quintile 1 in all District s and 2 in 11 selected District s which have the high rates (2015) and many projects funded by USAID, World Bank and other donors have been implemented in different Districts nonetheless the reductions are still low as compared to the national target to reach 19% in 2024 thus this study seeks to reveal the drivers of stunting among children under two years living in Nyabihu District which has the high rates to inform the government and non-government actors for interventions alignment to accelerate the lessening process.

Although the government has invested a lot in programs and interventions to eradicate stunting through social cluster ministries in partnership with development agencies such as USAID and others, the reduction progress is low and not promising to reach the set target in 2024, considering a 5% reduction from 38% in 2015 to 33% in 2020 as per the DHS 2019 - 2020 [5]. Therefore, there is a high need to study on the persistent drivers of stunting among children aged less than 2 years old to let know the government and non-government actors for interventions alignment to accelerate the lessening process. However, studying on drivers are there but little studies investigated drivers of stunting separately immediate, underlying and basic as these might have different effect on stunting.

In Nyabihu District, from 2015 - 2020 USAID through CRS, SNV and Caritas Rwanda implemented the Integrated Nutrition and WASH activity project in 8/12 sectors while the remaining 4 sectors were covered by EMBRACE project funded by Canada affairs, implemented by ADRA Rwanda, both projects had the common goal "to increase the physical condition of pregnant females and kids under the age of five, with a focus on the 1,000-day period from conception to a child's second birthday". Undoubtedly, those projects contributed to the slight reduction of stunting from 59% in 2015 to 53% in 2018, however the journey is still long since stunting is still a problem of public health of high importance for decision making. The persistence of this issue might be attributed to the high rate of poverty among the population of Nyabihu District and the fact that the District has high altitude.

Methods

Study design

A Cross-sectional study was used to assess the drivers of stunting among children under two years in Nyabihu District, Western province, Rwanda. A cross sectional study was performed once in a stated period of time to assess the situation at that time. Information was gathered once, and the findings are applied to the entire population based on the selection of a random sample.

This study was conducted in Nyabihu District located in the western province of Rwanda. Nyabihu District is one of the seven Districts of the Western Province. It is bordered by Musanze District in the west, Ngororero and Muhanga Districts and Rubavu District. Nyabihu stretches over an area of 581,2 km² with a population of 314,195 distributed into over 69,000 households. Nyabihu District is divided into 12 administrative sectors, it is subdivided into 73 cells and 467 villages.

Nyabihu District was selected because it was among Districts which have high prevalence of stunting, according to NISR, *et al.* 2016 it is ranked first countrywide with 53% of children under five being affected [6]. The previous studies conducted in this domain focused broadly on children under five years thus this study intended to contribute to revealing the persistent determinants of stunting specifically among the children under two years. The period between conception and the child “second birthday” as it offers unique opportunity to prevent and/or reverse stunting [8].

Target population

The study population was children under two years and their mothers or caregivers in Nyabihu District. The total number of children under two years was estimated at 15,548 as per the reports of Shyira District Hospital in August, 2020 [9].

Sample size and sampling procedure

This cross-sectional study was conducted in Nyabihu District to assess the drivers of stunting among children under two years. The sampling design was a two-stage cluster sampling with the first stage being selection of clusters (villages) based on the probability proportional to population size (PPS) approach that utilizes systematic selection of villages from the list of all villages in the District, this list was obtained from the database of the District. The size of the villages was in proportion to the number of children under two years according to the Shyira District hospital report August, 2020. At stage two, 382 children were selected randomly from the list of all eligible subjects which has been provided by Shyira District Hospital. This sample was reflective of the survey’s population (children under two years in Nyabihu) based on the prevalence of stunting assumed at 53%, with precision of 5% and confidence level of 95%. The assumed prevalence of stunting 53% was selected because the proportion takes full advantages of the sample despite lack estimates independent variables under examination.

Data analysis and ethical consideration

All data were entered in MS excel and anthropometric data were imported into WHO Anthro software version to generate HAZ, Anthropometrics statuses were defined under World Health Organization classification: Overall stunting prevalence was classified as (HAZ <-2), for details, check on appendix V. the relationship between variables was analyzed using SPSS (version 21.0): Descriptive statistics was further used classify and explain the features of a family and Pearson chi-square test was used for bivariate analysis of the effects of independent variables on dependent variable. Regression analysis (logistic regression and multivariate analysis) was performed to explore the drivers of stunting which are significantly associated with stunting. Confidence interval of 95% and P-value of less than 5% was considered as level of statistical significance.

Approval for study was sought from the Institutional Review Board of Mount Kenya University Rwanda, upon being surveyed, qualifying participants was introduced about the research for them to participate; participants gave their consent to participate through signing the form. Assurance of voluntarily participation was done to study subjects and if they chose not to engage in the study, there was no detrimental repercussions. To protect the rights of children, permission to execute anthropometric measures of height and weight was obtained from their parents and/or caregivers after explaining to them the whole process of taking measurements and giving assurance that this process will not cause any harm to their children. Information from respondents was stored in computers and accessible only to the researcher, the names were not mentioned in the research project report, all information provided is kept confidential. They were no

risk of participating in this study, mothers and/or caregivers was informed on the nutrition status of their children and given advices and recommendations accordingly.

Results

Socio-demographic characteristics of the respondents

As indicated in table 1, those are socio-demographic characteristics of 382 respondents all reached and data collected using questionnaire through face-to-face interview.

Variables	Frequency	Percentage
Wealth Category		
A	8	2.1
B	29	7.6
C	173	45.3
D	152	39.8
E	20	5.2
Head of Household		
Mother	313	81.9
Father	51	13.4
Grandmother	5	1.3
Grandfather	13	3.4
Children under five yours		
One	203	53.1
Two	121	31.7
Three	23	6
Education level of the head of household		
None	69	18.1
Primary	255	66.8
Secondary	26	6.8
university and above	32	8.4
Education level of the caregiver		
None	100	26.2
Primary	231	60.5
Secondary	21	5.5
University and above	30	7.9
Marital status of the parents		
Married	199	52.1
Cohabiting	137	35.9
Never been married	28	7.3
Divorced	14	3.7
Widowed	4	1

Table 1: Demographic characteristics of respondents.

The table 1 of socio-demographic shows that 173 (47.3%) of parents with children under two years old belonged in C wealth category and 313 (81.9%) of mothers were the head of the family. More than a half 203 (53.1%) of respondents had only one under-two years' child while 121 (31.7%) had two under-two children. 100 (26.2%) of care givers were illiterate, 231 (60.5%) had primary level of education and 199 (52.1%) of the parents were married.

Socio-economic factors

The table 2 below presents the socio-economics of parents or caregivers of under-two years old children located in Nyabihu District.

Variables	Frequency	Percentage
Source of drinking water		
piped water available at home	26	6.8
public tap	265	69.4
River stream	35	9.2
Rainwater	39	10.2
Other	17	4.5
Methods of cleaning drinking water		
Boil	275	72
Water filter	18	4.7
Chemical product	1	0.3
Let it stand and settle	28	7.3
Not at all	60	15.7
Availability of latrine at household		
Yes	350	91.6
No	32	8.4
Hand washing methods		
Nothing	6	1.6
Water and soap	346	90.6
Soil	2	0.5
Plain water	28	7.3
Availability of lands		
Yes	261	68.3
No	121	31.7
Availability of livestock		
Yes	210	55
No	172	45
Availability of kitchen garden with varied vegetables		
Yes	351	91.9
No	31	8.1

Table 2: Socio-economic factors of respondent.

The most parent parents or caregiver of children under-two years old 265 (69.4%) drunk water from public tap and 39 (10.2%) drunk rainwater but, 275 (72%) of them boiled water as a method of water cleaning. 350 (91.6%) had latrine at household and 346 (90.6%) used water and soap as hand washing method. 261 (63.3%) had availability of land for crop production, 210 (55%) had livestock and 351 (91.9%) had available kitchen garden with varied vegetables.

Presentation of findings

The findings of this study are presented according to their research objectives which are to determine the prevalence of stunting, to identify the immediate drivers of stunting, to determine the underlying drivers of stunting and to determine the basic drivers of stunting among under two-years children in Nyabihu district.

Prevalence of stunting among under two-years children in Nyabihu district

The objective one was to determine the prevalence of stunting among under two-years children in Nyabihu District and was determined by considering height-for-age is -2 degrees of separation underneath the WHO child development standard median.

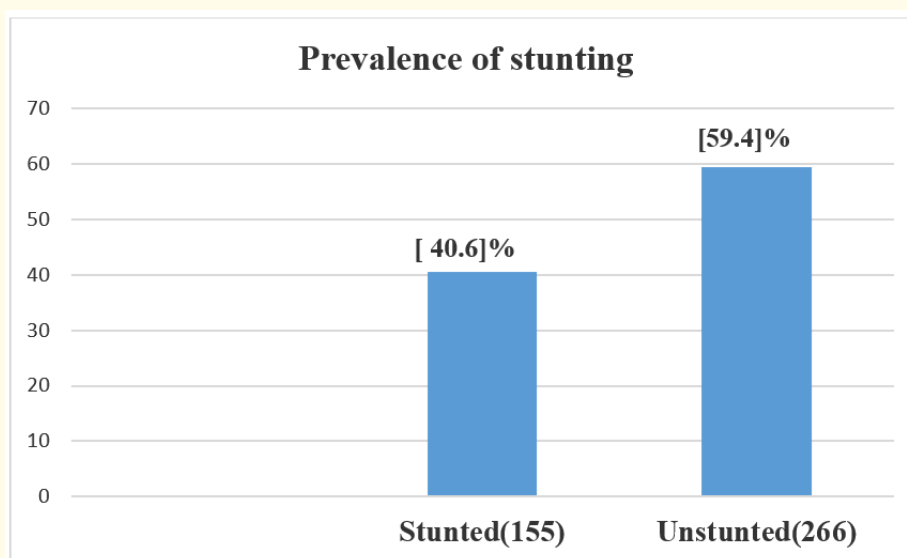


Figure 1: Prevalence of stunting.

The figure 1 above presented the prevalence of stunting where 227 (59.4%) were not stunted and 155 (40.6%) had stunting.

Immediate drivers of stunting among under two-year children in Nyabihu district

Objective two was to identify the immediate drivers of stunting among under two-year children in Nyabihu District and those were comprised by inadequate dietary intake and the occurrence of infections and diseases.

Variables Stunted		Stunting		Chi-Square Value	P-Value
		Not Stunted			
Feeding food to a child at birth	Yes	7 (50.0)	7 (50.0)	0.535	0.464
	No	148 (40.2)	220 (59.8)		
Initiation of breastfeeding at birth	0 - 1 Hours	149 (40.1)	223 (59.9)	1.607	0.205
	> 1 hour	6 (60.0)	4 (40.0)		
Age at complementary feeding	< 6 months	11 (33.3)	22 (66.7)	0.786	0.375
	> = 6 months	114 (41.3)	205 (58.7)		
Did the child eat yesterday	Yes	136 (43.5)	177 (56.5)	5.938	0.015
	No	19 (27.5)	50 (72.5)		
Feeding frequency	3 - 6 times	21 (43.8)	27 (56.2)	5.523	0.063
	6 - 10 times	102 (42.9)	136 (57.1)		
	Over 10 times	16 (26.7)	44 (73.3)		
Breastfeeding frequency	3 - 6 times	43 (47.8)	47 (52.2)	2.827	0.243
	6 - 10 times	86 (38.6)	137 (61.4)		
	Over 10 times	14 (35.0)	26 (25.0)		
Eating grains, roots and tubers yesterday	Yes	135 (43.8)	173 (56.2)	10.027	0.007
	No	15 (35.7)	27 (64.3)		
Eating legumes and nuts yesterday	Yes	115 (42.8)	154 (57.2)	5.445	0.066
	No	35 (23.0)	52 (25.)		
Eating fresh foods yesterday	Yes	73 (44.8)	90 (55.2)	2.089	0.148
	No	82 (37.4)	137 (62.6)		
Eating dairy products yesterday	Yes	55 (42.0)	76 (58.0)	0.164	0.685
	No	100 (39.8)	151 (60.2)		
Eating eggs yesterday	Yes	72 (42.6)	97 (57.4)	0.517	0.472
	No	83 (39.0)	130 (61.0)		
Eating vitamin A rich food yesterday	Yes	86 (45.5)	103 (54.5)	6.553	0.038
	No	59 (38.8)	93 (61.2)		
Child drunk water	Yes	79 (40.5)	116 (59.5)	0.098	0.755
	No	47 (42.3)	64 (57.7)		
Sickness in last two weeks	Yes	34 (35.4)	62 (64.6)	1.416	0.234
	No	121 (42.3)	165 (57.7)		
Deworming in last six months	Yes	123 (46.4)	142 (53.6)	12.235	< 0.001
	No	32 (27.4)	85 (72.6)		
Vaccination in last six months	Yes	108 (42.9)	144 (57.1)	1.598	0.206
	No	47 (36.2)	83 (63.8)		

Table 3: Immediate drivers of stunting among under two-year children in Nyabihu District (Bivariate analysis).

The findings from bivariate analysis revealed that among the children feed food at the birth 7 (50%) of them stunted, Children whose parents initiated breast feeding within 0 - 1 hour after birth, 149 (40.1%) of them stunted and parents performed breastfeeding frequently between 3 - 6 times 21 (43.8%) of their children stunted. Among children used to eat grains, roots and tubers 173 (56.2%) did not stunted and those who used to eat legumes and nuts 154 (57.2%) didn't stunted. Children who were sick in last two weeks 34 (35.4%) of them stunted and among those who were sick and suffered from diarrhea 20 (50%) of them stunted. Then after falling in sickness, the children who didn't have access to medical treatment 26 (37%) of them stunted.

Variables		AOR	95% C.I for AOR		P-Value
			Lower	Upper	
Eating yesterday	Yes	Ref			
	No	0.498	0.241	1.031	0.060
Eating Grains, roots and tubers	Yes	Ref			
	No	0.757	0.389	1.470	0.410
Eating Vitamin A rich food yesterday	Yes	Ref			
	No		0.905	0.619	0.605
Deworming in last six months	Yes	Ref			
	No	0.497	0.312	0.792	0.003

Table 4: Immediate drivers of stunting among under two-year children in Nyabihu district (Multivariate).

Deworming is a process of elimination of parasitic worms by using appropriate medicine. The findings from multivariate analysis revealed that children who didn't taken for deworming in last six months were less likely to be stunted [AOR = 0.497; 95%CI = 0.002-0.792; P = 0.003] compared to children took medicine of deworming. This means that the children who have been taken for deworming are the one with worms in their stomach and this can affect the nutritional status of a child and lead to the stunting.

Underlying drivers of stunting among under two-year children in Nyabihu district

The third objective of this study was to determine the underlying drivers of stunting among under two-year children in Nyabihu District and those were household, environmental and health care systems factors.

Variable Stunted		Stunting		Chi-Square	P-Value
		Not stunted			
Main caregiver of the child	Mother	154 (40.7)	224 (59.3)	0.527	0.649
	Grandmother	1 (25.0)	3 (75.0)		
Source of drinking water	Piped water available at home	6 (23.9)	20 (76.1)	8.000	0.069
	Public tap	106 (40.0)	159 (60.0)		
	River stream	13 (37.1)	22 (62.9)		
	Rainwater	19 (48.7)	20 (51.3)		
	Other	11 (64.7)	6 (35.3)		
Availability of latrine in the household	Yes	140 (40.0)	210 (60.0)	0.458	0.448
	No	15 (46.9)	17 (53.1)		

Hand washing methods	Nothing	2 (1.0)	4 (1.0)	0.444	0.40
	Water and soap	145 (92.0)	207 (58.8)		
	Plain water	10 (33.3)	20 (66.7)		
Availability of lands	Yes	103 (39.5)	158 (60.5)	0.576	0.516
	No	52 (43.0)	69 (57.0)		
Availability of livestock	Yes	84 (40.0)	126 (60.0)	0.834	0.80
	No	71 (41.3)	101 (58.7)		
Number of cows in the households	1	10 (45.5)	12 (54.5)	0.571	0.752
	2 or more	8 (47.1)	9 (52.9)		
Number of goats in the household	1	9 (39.1)	14 (60.9)	0.227	0.893
	2 or more	3 (33.3)	6 (66.7)		
Number of sheep in the household	1	20 (41.7)	28 (59.3)	2.688	0.261
	2 or more	19 (31.1)	42 (69.9)		
Number of chickens in the household	1	26 (43.3)	34 (56.7)	0.298	0.861
	2 or more	4 (44.4)	5 (55.6)		
Number of pigs in the household	1	22 (36.7)	38 (63.3)	0.489	0.783
	2 or more	4 (44.4)	5 (55.6)		
Availability of kitchen	Yes	144 (41.0)	207 (59.0)	0.574	0.547
	No	11 (35.5)	20 (64.5)		
Sex of the child	Male	88 (47.8)	96 (52.2)	0.007	0.005
	Female	67 (33.8)	131 (66.2)		

Table 5: Underlying drivers of stunting among under two-year children in Nyabihu district (Bivariate analysis).

The finding from bivariate analysis of Underlying drivers of stunting among under two-year children in Nyabihu District revealed that there was statistically significant association between sex of the child and stunting with < 0.05 P-value calculated to 95% CI.

Basic drivers of stunting among under two-year children in Nyabihu district

The fourth objective was to determine basic drivers of stunting among under two-year children in Nyabihu District and those were factors related to finance and policy.

Variables Stunted		Stunting		Chi-Square	P-Value
		Not stunted			
Wealth Category	A	4 (44.4)	5 (55.6)	0.343	0.843
	B	10 (35.7)	18 (64.3)		
	C	141 (40.9)	204 (59.1)		
Head of Household	Mother	130 (41.5)	183 (58.5)	0.744	0.689
	Father	19 (37.3)	32 (62.7)		
	Grandparents	6 (33.3)	12 (66.7)		

Number of children under five years	one child	93 (45.8)	110 (54.2)	4.986	0.030
	two children	42 (34.7)	79 (65.3)		
	three children	7 (30.4)	16 (69.6)		
Marital status of the parents	Married	86 (43.2)	113 (56.8)	1.444	0.695
	Cohabiting	53 (38.7)	84 (61.3)		
	Never been married	10 (35.7)	18 (64.3)		
	Divorced	6 (33.3)	12 (66.7)		
Level of Education for Care givers	Illiterate	49 (49)	51 (51)	4.782	0.092
	Primary	84 (36.4)	147 (63.6)		
	Secondary and above	22 (43.1)	29 (56.9)		
Primary source of income	Crop farming +livestock	20 (46.5)	23 (53.5)	1.646	0.649
	Crop farming + regular employment	5 (39.5)	78 (60.5)		
	Livestock +Casual wage labour	30 (44.8)	37 (55.2)		
	Regular employment + livestock	54 (37.8)	89 (62.2)		

Table 6: Basic drivers of stunting among under two-year children in Nyabihu district (Bivariate analysis).

The finding from bivariate analysis of basic drivers of stunting among under two-year children in Nyabihu District revealed that there was statistically significant association between number of children under five years and stunting with < 0.05 P-value calculated to 95% CI.

Discussion

The aim of this study was to determine drivers of stunting among under two years old children and the present study revealed that among those children a significant percentage of 40.6% was stunted and this was almost a half of study population (study children under two years old in Nyabihu District). There were three group of factors (immediate, underling and basic) which have been associated with stunting.

The previous study conducted by Anthony was in the same line with present study where revealed that children who live in poor sanitation Pathogens and heartworm disease are more likely to infect the setting, disrupting digestion process and weakening the immune response. Immune deficiency makes them more susceptible to chronic pathogens. There are a number of environment determinants that were proven to increase the risks of childhood stunting, for instance the lack of access to better-quality sanitation was found to be linked with stunting in childhood, the issue of not owning the basic latrine in a given household and/or the high rates of lack of latrine in a given area is mostly subject to increasing the risks of stunting among the children [10].

The present study revealed that in Nyabihu District, deworming in last six months was the main immediate driver of stunting. It shown that children who didn't taken for deworming in last six months were less likely to be stunted compared to children took medicine of deworming. This factor shown statistical association with stunting among children under two years old.

This was contrary with study conducted from University of Toronto jointly with Aga Khan University in Pakistan, which revealed that socioeconomic status, maternal health services access and pregnancy spacing constituted the main immediate drivers of stunting among children [11].

The present study revealed that sex of the children which was under the underlying drivers of stunting showed the statistical significant with stunting and showed that the male had more chance to be stunted compared to female.

This study was in the same line with the study conducted in Rwanda which was assessing the factors of stunting among children under five years old and revealed that girls were less likely to be stunted compared to boys and stated that this is just because boys tend to grow at low rate compared to girls [12].

Conclusion

The purpose of this study was to determine drivers of stunting among under two years old children in Nyabihu district, Rwanda.

The study revealed that in general almost a half of study population (study children under two years old in Nyabihu District) had stunting and that stunting was statistically associated with both immediate, underlying and basic drivers. The results can't be generalized for whole country in consideration of the study design, sample size and the characteristics of study population in one rural District area can differ from those characteristics in other Districts as well as urban population.

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