CHAKARIA HEALTH AND DEMOGRAPHIC SURVEILLANCE SYSTEM REPORT-2017

Focusing on Health and Climate Change

% of miscarriages

9　11　13

Bay of Bengal

Matamuhuri River

2km
1mi

Chakaria

icddr,b

CHAKARIA HEALTH AND DEMOGRAPHIC SURVEILLANCE SYSTEM REPORT-2017

Focusing on Health and Climate Change

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ACKNOWLEDGEMENT

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INTRODUCTION

Chakaria is one of the 492 upazilas (sub-districts) in Bangladesh. It is located between latitudes 21°34' and 21°55' North and longitudes 91°54' and 92°13' East in the southeastern coast of the Bay of Bengal. Administratively, it is under Cox's Bazar district with an estimated population of 5,36,712 in 2017. The highway from Chattogram to Cox's Bazar passes through Chakaria. The east side of Chakaria is hilly, while on the west side towards the Bay of Bengal is lowland. A map showing the location of Chakaria is presented in Figure 1.

icddr,b started its activities in Chakaria in 1994. The focus of the activities has been to facilitate local initiatives for the improvement of health of the villagers in general and of children, women, and the poor in particular. Thus, the activities of the project have been participatory with emphasis on empowering the people by raising awareness about health, inducing positive preventive behavior through health education, and providing technical assistance to any health initiatives taken by the village-based indigenous self-help organizations. Some major initiatives taken by the villagers included assessment of health needs, defining actions for health, implementing them, and monitoring their implementation and outputs. Among the health-related activities, identification of volunteers for health education, mobilizing local resources for the establishment of village health posts and their management, introduction of a pre-paid family health card, and establishment of health cooperatives have been the major ones. Details of the activities of the project and the outcomes have been reported elsewhere (1, 2). Health services that are currently available in surveillance area are presented in the box below. Collection of data from households on a quarterly basis, referred hitherto as Chakaria Health and Demographic Surveillance System (Chakaria HDSS), has been initiated in this area since 1999. The primary purpose of this surveillance system is to monitor the impact of interventions with equity focus and generate relevant health, demographic and socioeconomic information for policies and programmes, and further research. Also, Chakaria HDSS is the only surveillance in Bangladesh that monitors SDG indicators using its longitudinal data. This report presents data collected through the Chakaria HDSS during 2017.

Health services in Chakaria HDSS area

Healthcare facility/provider	2015	2016	2017
icddr,b facilitated and Community initiated			
Village health post	5	5	5
Trained midwife	12	12	12
Qualified physician	1	1	1
Male paramedic	10	10	10
Medical assistant	4	4	2
Government			
Union Health and Family Welfare Centre (UHFWC)	11	11	11
EPI outreach centre	264	264	264

Healthcare facility/provider	2015	2016	2017
Qualified physician	8	3	0
Family Welfare Visitor (FWV)	11	11	5
Sub-Assistant Community Medical Officer (SACMO)/Medical assistant	4	4	4
Family Welfare Assistant (skilled birth attendant)	18	18	18
Community Clinics	23	23	23
Community Healthcare Provider	23	23	23
Private			
Village doctor (allopathic)	240	240	240
Village doctor (homeopathic)	102	102	102
Allopathic pharmacy	177	177	177
Homeopathic pharmacy	15	15	15
Diagnostic centre	4	4	4
NGO			
Health and development activities	5	5	5
Paramedic	4	4	4
Health worker	30	30	30
Outdoor Hospital (Christian Memorial & Hope Foundation)	2	2	2

HDSS = Health and Demographic Surveillance System.

Figure 1. Map of Chakaria HDSS area

METHODS AND MATERIALS

The Chakaria HDSS covered 11 unions, namely Baraitali, Kaiarbil, Bheola Manik Char, Paschim Bara Bheola, Saharbil, Kakhara, Harbang, Purba Bara Bheola, Surajpur Manikpur, Konakhali, and Demosia. In 1999, 1,66,405 people were living in 26,979 households. A household is defined as blood or otherwise related group of members and unrelated individuals living in the same compound at least once a month and sharing the food from the same kitchen. A household member is considered to have migrated out if s/he has left the household and does not intend to come back within six months of the time s/he left. A person is considered to have migrated in if s/he was not previously included in the list of household members and intends to live in the household for at least once in a month for the next six months.

Although Chakaria HDSS started in 1999, covering 183 villages of 166,405 individuals living in 26,979 households, data collection was interrupted during 2001–03. Since 2004, quarterly data collection has resumed, and data have been systematically collected from 7,042 households, randomly chosen from the total of 26,979 households. Data have been collected through quarterly visits by a team of surveillance workers (SWs) with supervision from a team of two supervisors. On a typical day, prior to 2011 a SW would come to the office and take a list of households assigned by the supervisors, travel to respondents' households, update the events and return the collected data sheets to the office. Using this system, data collection and data management took a significant amount of time and money, involving daily travel to the households by SWs. The above system of data collection was modified in 2011. The modification involved choosing 49 villages randomly from a total of 183. The 49 villages were divided into 14 work areas and 14 SWs were recruited from the 14 work areas where they resided. Most of the households included in the system prior to this modification were also included in the new system. The modification of the system has resulted in the SWs visiting almost double the number of households in comparison with the previous system, saving time spent on travel in the earlier system. In addition, the modification allowed the possibility of estimating migration as the system includes complete villages. Currently, surveillance covers 85,332 individuals (17,448 households). From beginning of 2015, the data collection process sifted from paper-based to web-based system. A web-based software application has been designed and developed. Fourteen tabs (Smartphone) are connected with mobile internet through mobile operator network. The SWs collect data using these devices and data are stored directly in the central database server.

One supervisors supervised the data-collection process. To detect any anomalies, a team of four independent re-interviewers re-visited 5% of the households, chosen randomly, within 2 days of data collection by the SWs. Later on, the supervisor and the relevant field workers together sorted out any inconsistencies in the collected data. All the filled-up questionnaires were manually checked for completeness and for any inconsistencies. Subsequently, computer-based data-editing procedures were applied to ensure the quality of data.

Asset quintiles based on ownership of various assets by any member of the households were used to examine differences in various demographic and health indicators. The asset list of the household is updated annually from the household head or his/her spouse. The list included almirah, table/chair, choki/khat, television, cycle, motorcycle, fridge, sofa, electric fan, sewing machine, telephone, electricity, showcase, and watch/clock. The principal component analytical technique was used for

calculating household asset index scores (3). The major demographic indicators and safe motherhood practices have been tabulated for the five asset quintiles.

It should be mentioned that the number of observations in the tables presented in this report differ in some instances due to missing information for some variables.

Surveillance worker collecting data during quarterly household visit

POPULATION
AND POPULATION CHANGES

The population pyramid based on the population of Chakaria HDSS area in 2017 is presented in Figure 2. The shape of the pyramid is typical of a developing country with declining rates of mortality and fertility. The sex ratio (male per 100 females) was 99.5 in 2017. The age dependency ratio was 70 in 2017 (see Appendix A), which was higher in 2016 (72).
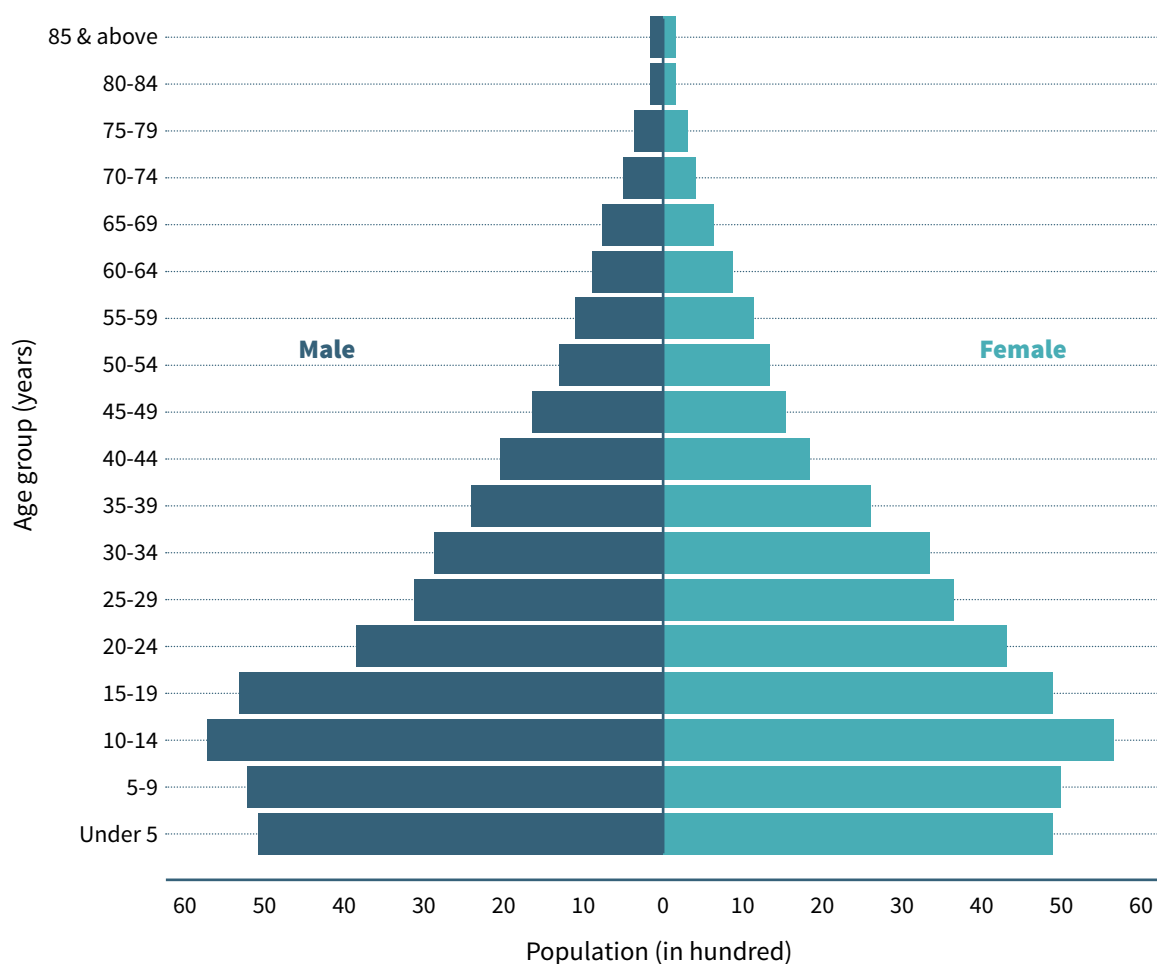
HDSS = Health and Demographic Surveillance System.

Figure 2. Male and female population by age, Chakaria HDSS, 2017

[1] The age dependency ratio represents the ratio of the combined child population (under 15) and aged population (65 and over) to the population of intermediate age (15 to 64).

Ethnic minority at Rakhain
Para in Chakaria.

MORTALITY

Age-specific mortality rate by sex are presented in Table 1. The crude death rate was 5.9 per 1,000 population in 2017. Infant mortality rate was 51.3 per 1,000 live births. Child mortality rate was 2.9 per 1,000 children aged 1-4 years (Table 1).

Abridged Life Table for males and females are presented in Table 2. Life expectancy at birth was about 68 years for males and 71 years for females. The rate of mortality of children aged less than 5 years (under-five mortality) was 61.8 per 1,000 live births in Chakaria HDSS in 2017 (Table 3). Figure 3 shows the probability of survival by sex during various age groups. Up to the age of 55, the probability of survival remained almost the same for both males and females. After that till 65 years of age the survival probability of females increased.

Table 1: Age-specific death rate per 1,000 population by sex, Chakaria HDSS, 2017

Age (years)	No. of death			Death rate		
	Male	Female	Both	Male	Female	Both
<1*	63	49	112	60.3	46.3	51.3
<1 month	41	37	78	36.0	35.3	35.7
1-11 month	22	12	34	19.3	11.5	15.6
1-4	12	11	23	3.0	2.9	2.9
5-9	5	3	8	1.0	0.6	0.8
10-14	4	2	6	0.7	0.4	0.5
15-19	2	1	3	0.4	0.2	0.3
20-24	2	7	9	0.5	1.6	1.1
25-29	2	2	4	0.6	0.5	0.6
30-34	2	5	7	0.7	1.5	1.1
35-39	6	7	13	2.5	2.7	2.6
40-44	7	6	13	3.4	3.2	3.3
45-49	4	8	12	2.4	5.2	3.8
50-54	10	6	16	7.7	4.4	6.1
55-59	16	13	29	14.6	11.4	13.0
60-64	20	17	37	22.3	19.6	21.0
65-69	25	11	36	32.8	17.2	25.7
70-74	26	16	42	52.8	40.6	47.4
75-79	24	18	42	63.8	61.2	62.7
80-84	20	18	38	121.2	117.6	119.5

Age (years)	No. of death			Death rate		
	Male	Female	Both	Male	Female	Both
85+	26	24	50	149.4	148.1	148.8
All	276	224	500	6.5	5.2	5.9

*Per 1,000 live births; HDSS=Health and Demographic Surveillance System.

Table 2: Abridged Life Table, Chakaria HDSS, 2017

Age (years)	Male					Female				
	$_nm_x$	$_nq_x$	l_x	$_nL_x$	e_x	$_nm_x$	$_nq_x$	l_x	$_nL_x$	e_x
0	0.0603	0.0572	100,000	94,849	68.1	0.0462	0.0444	100,000	96,002	70.6
1	0.0030	0.0118	94,276	374,888	71.3	0.0029	0.0114	95,558	380,049	72.9
5	0.0010	0.0048	93,168	464,727	68.1	0.0006	0.0030	94,466	471,624	69.7
10	0.0007	0.0035	92,723	462,809	63.4	0.0004	0.0018	94,183	470,500	64.9
15	0.0004	0.0019	92,400	461,567	58.6	0.0002	0.0010	94,017	469,843	60.0
20	0.0005	0.0026	92,227	460,535	53.7	0.0016	0.0080	93,920	467,712	55.1
25	0.0006	0.0032	91,988	459,198	48.9	0.0005	0.0027	93,165	465,187	50.5
30	0.0007	0.0035	91,692	457,664	44.0	0.0015	0.0074	92,910	462,823	45.6
35	0.0025	0.0123	91,374	454,054	39.2	0.0027	0.0133	92,219	458,036	41.0
40	0.0034	0.0171	90,248	447,380	34.6	0.0032	0.0160	90,995	451,329	36.5
45	0.0024	0.0121	88,704	440,848	30.2	0.0052	0.0256	89,536	441,945	32.0
50	0.0077	0.0380	87,635	429,851	25.5	0.0044	0.0220	87,242	431,412	27.8
55	0.0146	0.0704	84,305	406,697	21.4	0.0114	0.0556	85,323	414,760	23.4
60	0.0223	0.1055	78,374	371,200	17.9	0.0196	0.0934	80,581	384,098	19.6
65	0.0328	0.1516	70,106	323,960	14.7	0.0172	0.0823	73,058	350,264	16.4
70	0.0528	0.2334	59,478	262,684	11.8	0.0406	0.1843	67,047	304,340	12.6
75	0.0638	0.2752	45,596	196,607	9.7	0.0612	0.2655	54,688	237,145	9.9
80	0.1212	0.4651	33,047	126,807	7.4	0.1176	0.4545	40,169	155,200	7.5
85+	0.1494	1.0000	17,676	118,294	6.7	0.1481	1.0000	21,911	147,896	6.8

HDSS = Health and Demographic Surveillance System.

The Abridged life table is constructed applying the Greville's method illustrated in "The Methods and Materials of Demography", edited by Jacob S. Siegel and David A. Swanson, Second edition; Elsevier Academic Press, 2004: 301-40.

$_nm_x$ = Central mortality rate

$_nq_x$ = Probability of dying between the ages x and x+n;

$_nq_x$ = $_nm_x/[(1/n) + {}_nm_x\{1/2+n/12({}_nm_x-\log_e c)\}]$;
log$_e$c = .095

l_x = Survivors to exact age x = $(1- {}_nq_{x-n})\, l_{x-n}$

$_nL_x$ = Numbers of years lived by the total of the cohort of 100,000 births in the interval;
$L_0 = .20l_0 +.80l_1$, $L_{85+} = l_{85+}/m_{85+}$

e_x = Life expectancy at age x = T_x / l_x Where, $T_x = \sum L_Y$
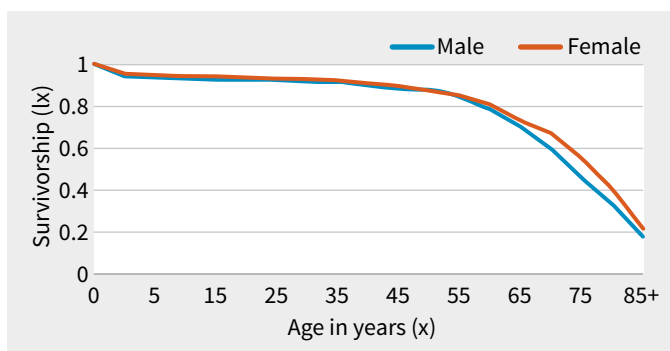
Figure 3. Probability of survival by age and sex, Chakaria HDSS, 2017

Table 3 presents under-five mortality rate by household asset quintile. Under-five mortality rate was inversely correlated with household asset scores. The mortality rate of children from the lowest quintile was more than 5 times greater than that of the highest quintile. Under-five mortality rate was higher among the boys compared to the girls. The concentration curve for under-five mortality is presented in Figure 4. The curve lies above the line of equality and the concentration index for the area came out to be negative. These indicate that under-five deaths concentrated among the poorer segment of the population.

Table 3: Under-five mortality rate per 1,000 live births by asset quintile and sex, Chakaria HDSS, 2017

Asset quintile	No. of births			No. of under-five deaths			Under-five mortality rate		
	Boy	**Girl**	**Both**	**Boy**	**Girl**	**Both**	**Boy**	**Girl**	**Both**
Lowest	192	190	383	16	24	40	83.3	126.3	104.7
Second	209	190	399	23	8	31	110.0	42.1	77.7
Middle	232	218	450	18	12	30	77.6	55.0	66.7
Fourth	205	198	403	11	11	22	53.7	55.6	54.6
Highest	299	252	551	7	5	12	23.4	19.8	21.8
All	**1,137**	**1,048**	**2,186**	**75**	**60**	**135**	**66.0**	**57.3**	**61.8**

HDSS = Health and Demographic Surveillance System.
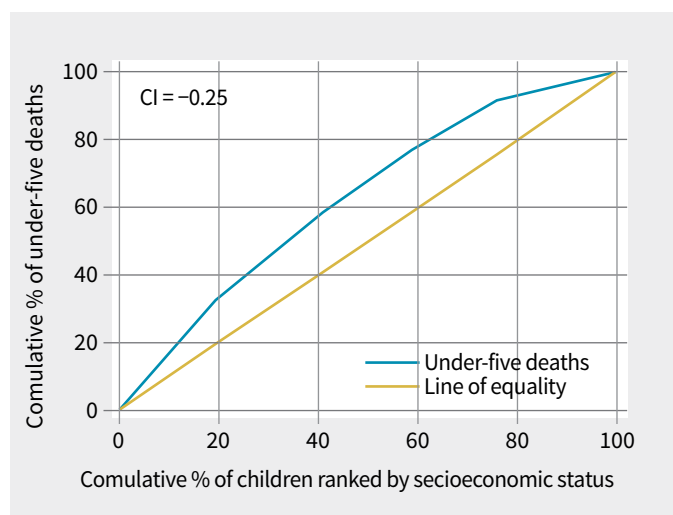
Figure 4: Concentration curve for under-five mortality, Chakaria HDSS, 2017

CI=Concentration Index[2]; HDSS=Health and Demographic Surveillance System.

CAUSES OF DEATH

Verbal autopsy data on signs, symptoms and circumstances leading to death, and medical history of the deceased were collected during the quarterly household visits from an informed household member. A total of 500 deaths were registered in 2017. Data were analyzed using "InterVA-4.04" (4) to ascertain causes of death.

BROAD PATTERN OF CAUSE OF DEATH

Non-communicable conditions (47%) were the leading cause of death for both men and women. This was followed by communicable diseases (20%), maternal and neonatal condition (13%), and trauma (8%). For communicable disease, the proportion of deaths was higher for males than for females (Figure 5). Neonatal conditions were the leading cause of death in children and accounted for one-third of child deaths. Non-communicable diseases were the leading cause of death for adults and elderly people (Table 4).

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[2] Concentration Index (CI) is a measure of the socioeconomic inequality of health based upon information on the socioeconomic ranks and the health levels of all individuals in the population. A positive value of CI indicates that health is distributed in favour of the rich, and a negative one that it is distributed in favour of the poor (5). A value of zero indicates no relation between health and socioeconomic status (6).
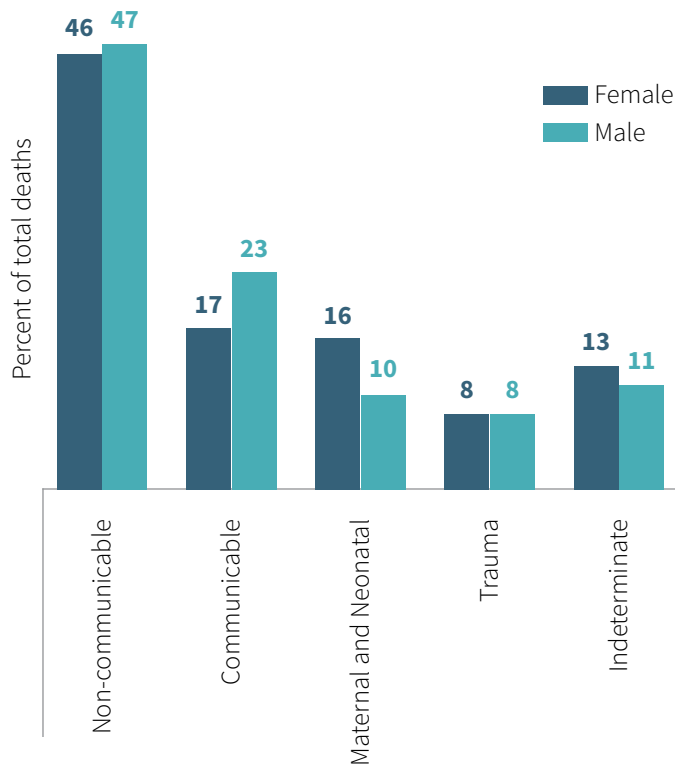
Figure 5: Distribution of deaths by leading causes for males and females, Chakaria HDSS, 2017

HDSS=Health and Demographic Surveillance System.

Table 4: Distribution of deaths by leading causes according to age groups, Chakaria HDSS, 2017

Cause group	Children (<15 years) (%)	Adults (15-49 years) (%)	Elderly (50+ years) (%)
Communicable	25.4	15.5	19.1
Non-communicable	4.7	55.1	66.5
Maternal and neonatal	39.2	9.9	0.0
Trauma	18.0	6.8	3.5
Indeterminate	12.6	12.7	10.9
Total	**100.0**	**100.0**	**100.0**

HDSS=Health and Demographic Surveillance System.

Stroke, acute respiratory infection (including pneumonia), chronic obstructive pulmonary disease, digestive neoplasms, unspecified cardiac diseases and pulmonary tuberculosis are the leading six causes of death for all ages. Table 5 presents the distribution of cause of death for males and females.

Table 5: Distribution of causes of death among males and females, Chakaria HDSS, 2017

Cause	Male (n=276)	Female (n=224)	Both (n=500)
01.01 Sepsis (non-obstetric)	0.3	0.2	0.3
01.02 Acute respiratory infection, including pneumonia	14.8	8.6	12.0
01.03 HIV/AIDS related death	0.7	2.0	1.3
01.04 Diarrhoeal diseases	0.2	0.6	0.4
01.05 Malaria	0.0	0.0	0.0
01.06 Measles	0.0	0.0	0.0
01.07 Meningitis and encephalitis	2.7	2.1	2.4
01.09 Pulmonary tuberculosis	3.9	3.1	3.5
01.10 Pertussis	0.0	0.0	0.0
01.11 Haemorrhagic fever	0.0	0.0	0.0
01.99 Other and unspecified infectious diseases	0.8	0.6	0.7
02.01 Oral neoplasms	0.7	0.3	0.5
02.02 Digestive neoplasms	5.9	3.4	4.8
02.03 Respiratory neoplasms	1.8	1.2	1.5
02.04 Breast neoplasms	0.0	2.5	1.1
02.05 & 02.06 Reproductive neoplasms M, F	0.5	4.8	2.4
02.99 Other and unspecified neoplasms	4.2	2.4	3.4
03.01 Severe anaemia	0.0	0.2	0.1
03.02 Severe malnutrition	0.4	0.4	0.4
03.03 Diabetes mellitus	2.5	3.1	2.8
04.01 Acute cardiac disease	3.2	3.2	3.2
04.02 Stroke	13.7	9.9	12.0
04.03 Sickle cell with crisis	0.0	0.0	0.0

Table 5. (contd…)

Cause	Male (n=276)	Female (n=224)	Both (n=500)
04.99 Other and unspecified cardiac diseases	4.0	2.8	3.5
05.01 Chronic obstructive pulmonary disease	5.4	4.4	4.9
05.02 Asthma	0.5	0.4	0.5
06.01 Acute abdomen	1.0	1.5	1.3
06.02 Liver cirrhosis	1.9	2.1	2.0
07.01 Renal failure	1.0	2.5	1.7
08.01 Epilepsy	0.7	0.4	0.6
09.01 Ectopic pregnancy	0.0	0.0	0.0
09.02 Abortion-related death	0.0	0.0	0.0
09.03 Pregnancy-induced hypertension	0.0	0.7	0.3
09.04 Obstetric haemorrhage	0.0	0.9	0.4
09.05 Obstructed labour	0.0	0.2	0.1
09.06 Pregnancy-related sepsis	0.0	0.3	0.2
09.08 Ruptured uterus	0.0	0.3	0.2
09.99 Other and unspecified maternal causes of death	0.0	0.2	0.1
10.01 Prematurity	1.9	2.6	2.2
10.02 Birth asphyxia	2.5	2.0	2.3
10.03 Neonatal pneumonia	1.8	3.8	2.7
10.04 Neonatal sepsis	1.1	1.5	1.2
10.06 Congenital malformation	0.4	0.8	0.5

Cause	Male (n=276)	Female (n=224)	Both (n=500)
10.99 Other and unspecified neonatal causes of death	2.9	2.7	2.8
12.01 Road traffic accident	2.0	1.2	1.6
12.02 Other transport accident	1.2	2.7	1.9
12.03 Accidental fall	0.7	0.9	0.8
12.04 Accidental drowning and submersion	2.9	2.7	2.8
12.05 Accidental exposure to smoke fire & flame	0.0	0.5	0.2
12.06 Contact with venomous plant/ animal	0.0	0.0	0.0
12.07 Accidental poisoning & noxious substances	0.0	0.0	0.0
12.08 Intentional self-harm	1.0	0.0	0.5
12.09 Assault	0.3	0.4	0.4
12.10 Exposure to force of nature	0.0	0.0	0.0
12.99 Other and unspecified external causes of death	0.0	0.0	0.0
98 Other and unspecified non-communicable diseases	0.0	0.0	0.0
99 Indeterminate	10.5	13.0	11.7
All	**100.0**	**100.0**	**100.0**

HDSS = Health and Demographic Surveillance System.

icddr,b's Medical Assistant checking patient in Village Health Post, Pahar Chada

FERTILITY

The crude birth rate in 2017 was 25.6 per 1,000 population, which was similar in 2016 (25.7 per 1,000 population) (Table 20). The fertility rate was highest among women of age-group of 25-29 years (Table 6).

Table 6: Age-specific fertility rate per 1,000 women aged 15-49 years, Chakaria HDSS, 2017

Age (years)	No. of females	No. of births			Birth rate
		Male	Female	Both	
15-19	4,872	132	138	270	55.4
20-24	4,332	348	363	711	164.1
25-29	3,657	333	303	636	173.9
30-34	3,348	231	170	401	119.8
35-39	2,620	76	65	141	53.8
40-44	1,856	15	10	25	13.5
45-49	1,541	2	0	2	1.3
All	**22,226**	**1,137**	**1,049**	**2,186**	**581.8**
TFR					**2,909**

TFR=Total fertility rate per 1,000 women; HDSS=Health and Demographic Surveillance System.

Table 7 presents the crude birth rate by household asset quintiles. The crude birth rate was the lowest among the middle asset quintile.

Table 7: Crude birth rate per 1,000 population by asset quintile and sex, Chakaria HDSS, 2017

Asset quintile	Midyear population			No. of births			Birth rate		
	Male	Female	Both	Boy	Girl	Both	Boy	Girl	Both
Lowest	7,570	7,809	15,379	192	191	383	24.5	24.5	24.9
Second	7,829	7,859	15,688	209	190	399	26.7	24.2	25.4
Middle	9,496	9,368	18,864	232	218	450	24.4	23.3	23.9
Fourth	8,129	7,890	16,019	205	198	403	25.2	25.1	25.2
Highest	9,544	9,838	19,382	299	252	551	31.3	25.6	28.4
All	**42,568**	**42,764**	**85,332**	**1,137**	**1,049**	**2,186**	**26.7**	**24.5**	**25.6**

HDSS = Health and Demographic Surveillance System.

Of the pregnancies in 2017, 10.8% of 2,608 were terminated prematurely and spontaneously, 3.4% were terminated through induction, and 3.0% resulted in stillbirths (Table 8).

Table 8: Pregnancy outcome, Chakaria HDSS, 2017

Pregnancy outcome	Number	Percentage
Spontaneous abortion	281	10.8
Induced abortion	88	3.4
Stillbirth	77	3.0
Live birth*	2,162	82.8
Total number of pregnancies	2,608	100.0

*Multiple live births included; HDSS = Health and Demographic Surveillance System.
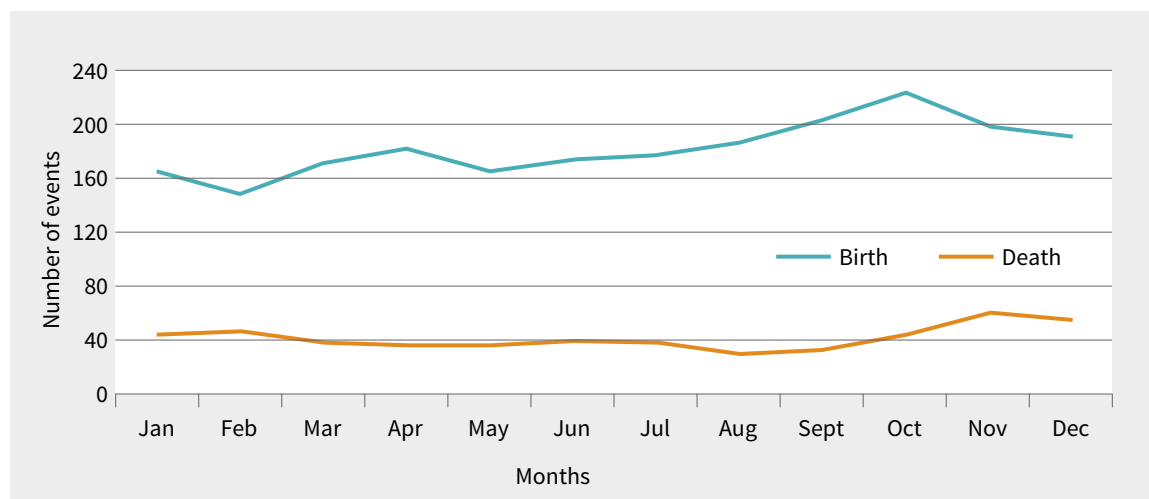
Figure 6: Number of births and deaths by month, Chakaria HDSS, 2017
HDSS=Health and Demographic Surveillance System.

Distribution of births and deaths by month are shown in Figure 6. There is no apparent seasonality in the death pattern but in case of birth some seasonality was observed where a rise in birth rate was observed during the time period March and June to October.

MIGRATION

In 2017, the rate of out-migration was higher at 47.8 per 1,000 population than that of in-migration at 34.4 per 1,000 population (Table 9). The rates were lower in 2016 (Table 20). Monthly data on migration are presented in Table 10. Data showed that the number of in-migrants was lower than that of out-migrants during 2017. The sex differential in migration was prominent. The number of the both migration of males and females was highest in January.

Table 9: Migration rate per 1,000 population by asset quintile and sex, Chakaria HDSS, 2017

Asset quintile	Midyear population			In-migration rate			Out-migration rate		
	Male	**Female**	**Both**	**Male**	**Female**	**Both**	**Male**	**Female**	**Both**
Lowest	7,570	7,809	15,379	38.3	42.9	40.6	65.1	77.9	71.6
Second	7,829	7,859	15,688	28.2	37.8	33.0	40.0	53.6	46.8
Middle	9,496	9,368	18,864	22.6	35.0	28.8	33.2	44.0	38.5
Fourth	8,129	7,890	16,019	21.4	39.4	30.3	37.0	43.0	40.0
Highest	9,544	9,838	19,382	25.3	52.8	39.2	45.5	44.6	45.0
All	**42,568**	**42,764**	**85,332**	**26.8**	**41.9**	**34.4**	**43.6**	**51.9**	**47.8**

HDSS = Health and Demographic Surveillance System.

Table 10: Number of migrants by sex and month, Chakaria HDSS, 2017

Month	In-migration			Out-migration		
	Male	**Female**	**Both**	**Male**	**Female**	**Both**
January	209	269	478	235	261	496
February	94	156	250	146	194	340
March	79	145	224	109	161	270
April	93	165	258	144	178	322
May	97	159	256	139	198	337
June	110	99	209	156	150	306
July	83	129	212	173	175	348
August	77	100	177	178	188	366
September	80	134	214	119	167	286
October	93	154	247	169	182	351
November	43	100	143	139	153	292
December	83	180	263	149	212	361
All	**1,141**	**1,790**	**2,931**	**1,856**	**2,219**	**4,075**

HDSS = Health and Demographic Surveillance System.

ORIGIN AND DESTINATION OF MIGRANTS

During 2017, 8.3% of 2,931 in-migrants moved into Chakaria HDSS households from outside of Bangladesh whereas 13.8% of 4,075 out-migrants moved out of Bangladesh from Chakaria HDSS area, and in both cases male migrants were dominant compared to the female migrants. The proportion of migrants that moved out of Bangladesh was higher than the proportion of migrants that moved into Bangladesh. Overall, the rates of movement of people to and from Chakaria were similar (Table 11).

Table 11: Origin and destination of migrants by sex, Chakaria HDSS, 2017

Origin or destination	In-migration			Out-migration		
	Male	Female	Both	Male	Female	Both
Inside Bangladesh	79.6	99.4	91.7	70.6	99.1	86.2
Outside Bangladesh	20.4	0.6	8.3	29.4	0.9	13.8
Total	100.0	100.0	100.0	100.0	100.0	100.0
Total number of migrants	**1,141**	**1,790**	**2,931**	**1,856**	**2,219**	**4,075**
Cox's Bazar District						
Inside Chakaria	73.9	77.3	76.2	83.8	81.4	82.3
Outside Chakaria	26.1	22.7	23.8	16.2	18.6	17.7
Total	100.0	100.0	100.0	100.0	100.0	100.0
Total no. of migrants	**651**	**1,394**	**2,045**	**1,158**	**1,954**	**3,112**
Chakaria Upazila						
Inside HDSS area	66.3	64.8	65.3	61.3	62.4	62.0
Outside HDSS area	33.7	35.2	34.7	38.7	37.6	38.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
Total no. of migrants	**481**	**1,078**	**1,559**	**613**	**1,169**	**1,782**

HDSS = Health and Demographic Surveillance System.

REASONS FOR MIGRATION

Table 12 presents the reasons of migration by sex. Forty one percent of the migrants moved out due to family-related issues - mostly marriage, followed by work (29.4%), housing (22.9%), and education (3.5%). Reasons for moving out for males were different from those of females. Twenty eight percent of male in-migrants moved due to work related issues whereas only 18.9% of the females moved due to that reason. On the other hand, 65.8% of female in-migrants moved due to family related issues - mostly marriage, while 25.8% of males moved due to family related reasons (Table 12). The reasons of movement for out-migration were mostly similar to the reasons for in-migration.

Table 12: Reasons for migration, Chakaria HDSS, 2017

Reasons for migration	In-migration			Out-migration		
	Male (%)	Female	Both (%)	Male	Female	Both
Family-related	25.8	65.8	50.2	21.8	56.8	40.9
Work-related	27.8	18.9	22.4	32.2	27.0	29.4
Housing-related	39.8	10.3	21.8	39.7	8.9	22.9
Education	5.4	3.9	4.5	3.6	3.4	3.5
Other	1.2	1.1	1.1	2.8	3.9	3.4
Total	100.0	100.0	100.0	100.0	100.0	100.0
Total no. of migrants	**1,141**	**1,790**	**2,931**	**1,856**	**2,219**	**4,075**

HDSS=Health and Demographic Surveillance System.

MARRIAGE

In total 1,776 marriages took place in the surveillance villages in Chakaria during 2017 and the crude marriage rate was 20.8 per 1,000 population, with greater rate among the females than to the males. Among the males, highest marriage rate was found in the age group of 25-29 years and for females in the age group of 15-19 years. Throughout 2017, 91 divorces were took place in Chakaria HDSS area and the crude divorce rate was 1.1 per 1,000 population with similar rates among males and females (Table 13). The highest number of marriages took place in December and the lowest in June (Figure7).

Table 13: Crude rate of marriage and divorce by age and sex, Chakaria HDSS, 2017

Age (years)	Marriage			Divorce		
	Male	Female	Both	Male	Female	Both
10-14	0.3	8.8	4.5	0.0	0.0	0.0
15-19	16.8	114.9	63.7	1.1	2.1	1.6
20-24	52.4	81.7	67.9	1.8	3.9	2.9
25-29	67.7	24.6	44.4	2.3	2.7	2.5
30-34	39.2	6.9	21.8	4.5	2.1	3.2
35-39	13.6	3.4	8.3	2.5	0.0	1.2
40-44	5.9	2.2	4.1	1.0	0.5	0.8
45-49	1.8	1.3	1.6	0.0	0.0	0.0
50-54	3.9	0.7	2.3	2.3	0.0	1.1
55-59	1.8	0.0	0.9	0.9	0.0	0.4
60-64	2.2	1.2	1.7	0.0	0.0	0.0
65+	4.1	0.0	2.2	0.5	0.0	0.3
All	**16.0**	**25.6**	**20.8**	**1.1**	**1.1**	**1.1**

HDSS = Health and Demographic Surveillance System.
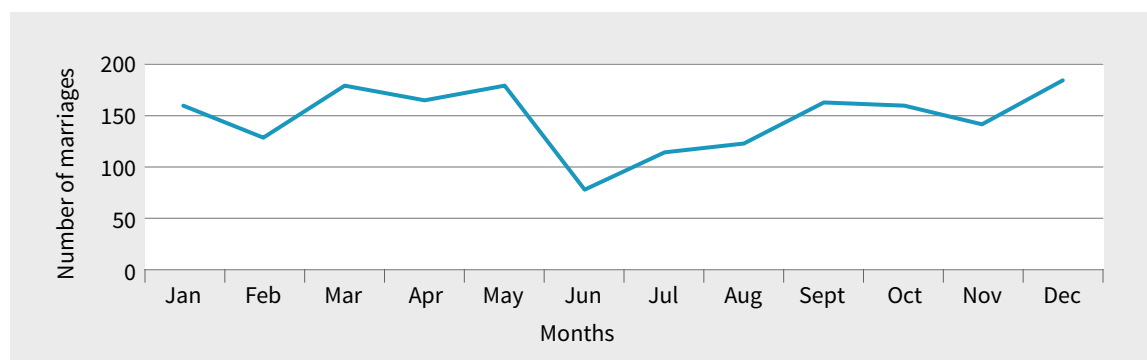
Figure 7: Number of marriages by month, Chakaria HDSS, 2017
HDSS=Health and Demographic Surveillance System.

Table 14 presents singulate mean age at marriage (SMAM), and mean and median ages at first marriage. The SMAM, mean and median ages at first marriage for males were 27 years. For females, both mean and median ages at first marriage were 20 years and the SMAM was 21 years. The SMAM, mean and median ages at first marriage remained nearly same as of 2016 for both males and females. All indicators for males and females were almost positively associated with household socioeconomic status (Table 14).

Table 14: Age at marriage by sex and asset quintile, Chakaria HDSS, 2017

Asset quintile	Male			Female		
	SMAM*	Mean age at first marriage	Median age at first marriage*	SMAM*	Mean age at first marriage	Median age at first marriage*
Lowest	24.8	24.4	24.6	20.4	20.1	20.1
Second	25.8	25.5	25.5	20.4	20.1	20.1
Middle	27.1	26.8	27.1	20.7	20.3	20.4
Fourth	27.9	27.7	28.1	20.8	20.5	20.3
Highest	29.3	29.2	29.5	20.9	20.7	20.2
All	27.3	27.1	27.2	20.8	20.4	20.4

HDSS = Health and Demographic Surveillance System.

SMAM = Singulate mean age at marriage

*The SMAM and median age at first marriage are calculated by applying indirect methods illustrated in "The Methods and Materials of Demography", edited by Jacob S. Siegel and David A. Swanson, Second edition; Elsevier Academic Press, 2004: 196-202.

SAFE MOTHERHOOD
PRACTICES

The health-related activities of icddr,b in Chakaria included facilitation of provision of safe motherhood services (e.g. antenatal care, postnatal care, and delivery services) by the trained midwives who has been providing service from village health posts (VHP), established and managed by the villagers since the late nineties. Apart from this, the physicians and the paramedics employed by icddr,b also provide healthcare services to the villagers from these VHPs. Government trained Skilled Birth Attendants (SBAs) are providing safe motherhood services at Union Health and Family Welfare Centres (UHFWCs), community clinics and at domiciliary level.

At present, the Upazila Health Complex of the government and six private hospitals provide healthcare services at the headquarters of Chakaria. At the union level, 11 Union Health and Family Welfare Centres (UHFWCs) of the government, and 5 village health posts which were initiated by the community members provide healthcare services. The Family Development Services and Research (FDSR), an NGO also provides healthcare services in Chakaria surveillance area.

USE OF ANTENATAL CARE SERVICES

Table 15: Antenatal care by sources and asset quintile, Chakaria HDSS, 2017

Asset quintile	Received any ANC (%)	Midwife* (%)	FWV* (%)	Nurse/ doctor* (%)	FDSR/ CMH* (%)	None (%)	No. of women
Lowest	70.2	19.6	21.5	27.0	19.6	29.8	383
Second	78.7	16.3	20.6	37.8	16.3	21.3	399
Middle	79.1	15.1	18.4	49.8	15.1	20.9	450
Fourth	79.9	16.4	19.6	49.9	16.4	20.1	403
Highest	76.6	9.3	10.9	64.1	9.3	23.4	551
Total	77.0	14.9	17.7	47.2	14.9	23.0	2,186

*Multiple responses recorded
ANC=Antenatal care
FWV=Family welfare visitor
FDSR=Family Development Services and Research
CMH= Christian Memorial Hospital
HDSS=Health and Demographic Surveillance System.

Among 2,186 pregnant women who gave live births, 77% received at least one antenatal care (ANC). These women received services from various sources. Among these sources, the nurses/doctors were dominant, followed by FWV and FDSR/CMH and then midwives (Table 15). Use of at least one ANC during pregnancy was almost equitable during 2017 in Chakaria HDSS area. Seventy percent of the pregnant women from the lowest socioeconomic quintile used at least one ANC during pregnancy as oppose to 77% of the women in the

highest socioeconomic quintile (Table 15). The concentration curve and the concentration index of at least one ANC use also depicts similar picture where the curve lies below the line of equality indicating a comparatively higher rate among the highest socioeconomic quintile. However, the index of 0.01 indicates the level of disparity to be very low (Figure 8). On the contrary, use of ANC service from doctors or nurses indicated a higher level of inequity where the rate was 64% for women in highest socioeconomic quintile and only 27% for women in the lowest socioeconomic quintile (Table 15). This is visible in Figure 8 where the concentration curve for ANC use from doctors or nurses lies further away from the line of equality. Thus, the ANC service was more unequal for doctor/nurse.

USE OF POSTNATAL CARE SERVICES

Any postnatal check-up of both women and children within 42 days of their delivery are of interest here. And it was observed that only 46.9% of the pregnant women received at least one postnatal care (PNC) in 2017. The nurses, doctors and midwives were the dominant sources for PNC. The utilization of services was characterized by large inequities and the services concentrated among the richest segment of the society (Table 16). Figure 9 also shows the current inequality of the use of PNC

Figure 8: Concentration curve for receiving at least one ANC, Chakaria HDSS, 2017

CI= Concentration Index; HDSS=Health and Demographic Surveillance System.

services among different socioeconomic groups. The positive value of concentration index (CI) indicates that the rich people were more intended to receive the service compared to the poor. In 2016 and 2017 the CI were 0.14 and 0.12 respectively which means the gap of receiving PNC services shrink a bit.

Table 16: Postnatal care by sources and asset quintile, Chakaria HDSS, 2017

Asset quintile	Received any PNC (%)	Midwife* (%)	FWV* (%)	Nurse/ doctor* (%)	FDSR/ CMH* (%)	None (%)	No. of women
Lowest	33.2	8.4	2.6	20.6	2.9	66.6	383
Second	40.1	11.3	4.0	26.3	1.5	59.9	399
Middle	44.0	9.8	2.4	30.9	2.0	56.0	450
Fourth	49.8	8.4	3.5	37.9	3.7	50.0	403
Highest	61.7	9.5	4.9	50.3	3.5	38.6	551
Total	46.9	9.5	3.6	34.4	2.7	53.1	2,186

*Multiple responses recorded
PNC = Postnatal care; FWV = Family welfare visitor ; FDSR = Family Development Services and Research; CMH = Christian Memorial Hospital; HDSS = Health and Demographic Surveillance System.
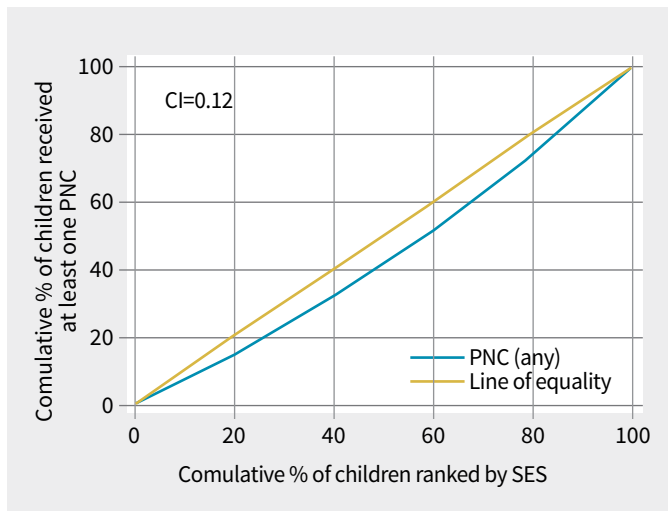
Figure 9: Concentration curve for receiving at least one PNC, Chakaria HDSS, 2017

CI=Concentration Index; HDSS=Health and Demographic Surveillance System.

ASSISTANCE DURING DELIVERY

In Chakaria, the traditional birth attendants (TBAs) were used more than the skilled birth attendants (SBAs) (e.g. nurses/doctors, FWVs, midwives) for assisting deliveries. Sixty one percent of 2,186 deliveries in Chakaria were assisted by the TBAs as op-posed to 39% of the deliveries assisted by the SBAs. The use rate of nurses/doctors by the women from the highest quintile was much higher than those by women from the lowest quintiles (Table 17). Overall, the services of SBAs were more concentrated towards the richer segment of the population as the concentration curve lies below the line of equality (Figure 10.)
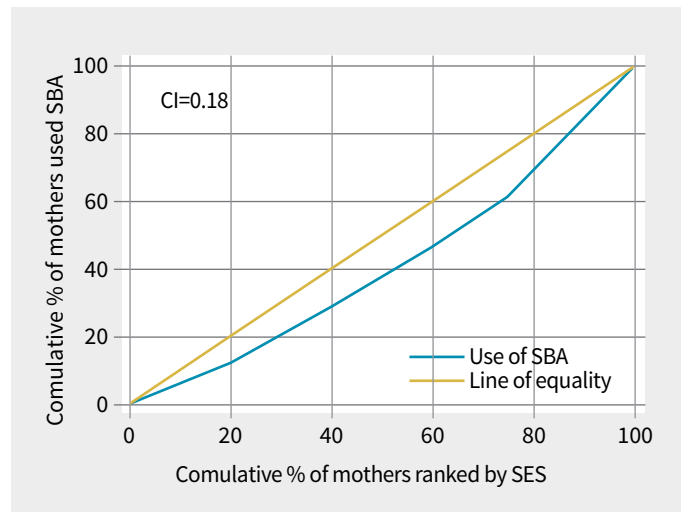
Figure 10. Concentration curve for use of SBA services, Chakaria HDSS, 2017

CI=Concentration Index; HDSS=Health and Demographic Surveillance System.

Table 17. Assistance during delivery by asset quintile, Chakaria HDSS, 2017

Asset quintile	Midwife (%)	FWV (%)	Nurse/ doctor (%)	TBA (%)	No. of Women
Lowest	9.7	2.9	9.2	78.3	383
Second	11.8	4.3	15.5	68.4	399
Middle	12.4	4.4	17.3	65.8	450
Fourth	10.7	4.5	21.8	63.0	403
Highest	12.7	6.5	40.8	39.9	551
Total	11.6	4.7	22.3	61.4	2,186

FWV = Family Welfare Visitor
HDSS = Health and Demographic Surveillance System.

PLACE OF DELIVERY

Seventy six percent of the deliveries took place at home. Only 23.6% of 2,186 deliveries took place either at hospitals or at clinics (Table 18). The women from the households in the highest asset quintile had a much higher rate of facility based delivery than those from the lowest quintile (Table 18 and Figure 11).

Table 18. Place of delivery by asset quintile, Chakaria HDSS, 2017

Asset quintile	Hospital/Clinic (%)	Home (%)	No. of women
Lowest	9.2	90.8	383
Second	14.5	85.5	399
Middle	19.1	80.9	450
Fourth	23.8	76.2	403
Highest	43.6	56.4	551
Total	23.6	76.4	2,186

HDSS =Health and Demographic Surveillance System.
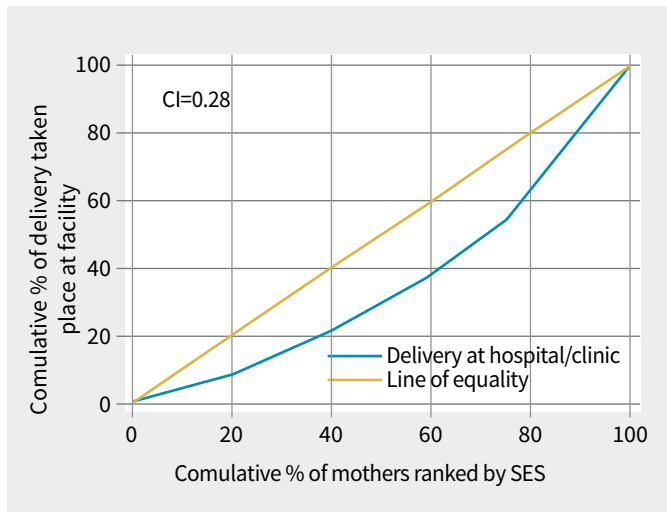
Figure 11. Concentration curve for facility-based delivery, Chakaria HDSS, 2017

CI=Concentration index; HDSS=Health and Demographic Surveillance System.

Table 19 shows caesarean-section delivery by household asset quintile in 2017. Caesarean-section delivery accounted for 10.0% of the total deliveries and 42.0% of the facility-based deliveries in the Chakaria HDSS area in 2017. Although the number of deliveries through caesarean sections was small, the number of women giving birth by caesarean sections exhibited discrepancies between highest and lowest quintiles (Table 19 and Figure 12).
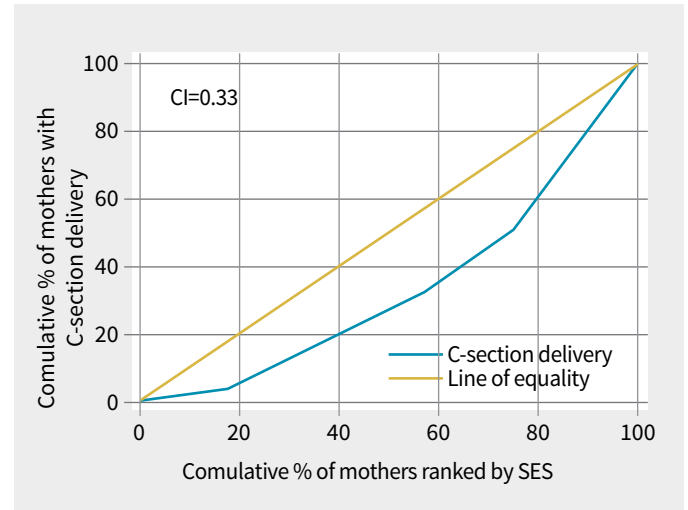
Figure 12. Concentration curve for caesarean-section delivery, Chakaria HDSS, 2017

CI=Concentration index; HDSS=Health and Demographic Surveillance System.

Table 19. Proportion of caesarean-section delivery by asset quintile, Chakaria HDSS, 2017

Asset quintile	No. of caesarean-section delivery	Caesarean-section delivery (%)	Total no. of Deliveries
Lowest	7	1.8	383
Second	29	7.3	399
Middle	33	7.3	450
Fourth	41	10.2	403
Highest	108	19.6	551
Total	**218**	**10.0**	**2,186**

HDSS =Health and Demographic Surveillance System.

SDG AND OTHER HEALTH AND
SOCIO-DEMOGRAPHIC INDICATORS

Sustainable development goals, popularly known as SDGs, including 17 goals with 169 associated targets, were announced for UN member States in order to eradicate poverty, inequality and injustice and to deal with climatic changes by 2030. Though Millennium Development Goals (MDGs) attainment in Bangladesh was relatively notable, but the progress for most indicators could not meet with desired target. The SDGs address the origins of poverty and the universal development needs which will work for all people and thus expectantly go much further than the MDGs. Twenty five indicators among all basic and complementary SDG indicators can be calculated using the data of Chakaria HDSS (7).

The major demographic and health indicators (including the SDGs) during 2013-17 are presented in Table 20. The fertility indicators were almost similar and a declining trend in natural rate of population increase was observed during 2013-17. Most of the rates in Chakaria HDSS area are much higher than those in the Matlab government service area, another rural field site of icddr,b (8). In 2017, the rate of natural increase and the annual population growth rate in the surveillance area of Chakaria was 2.0 % and 0.6% respectively (Table 20).

Twenty four percent of births in Chakaria HDSS were delivered at facilities (hospital or clinic) in 2017. The percentage of births at facilities in 2017 remained nearly same as of 2016. About one-third of the births were attended by Skilled Birth Attendants (SBAs) in Chakaria during 2017 and the rate of deliveries assisted by SBAs was 38.7% (Table 20).

The birth registration of under-five children decreases from 16% (n=291) in 2013 to 14% (1757) in 2016. In case of the birth registration of infant it was 7% (n=30) in 2013 and was 5% (n=379) in 2016.

The legal age of marriage is 18 years for female and 21 years for male in Bangladesh. In 2017, 32.8% of the women married before reaching their 18th birthday. The percentage of underage female marriage is following a declining trend. Nineteen percent of the males were married before the age of 21 years in 2017. The proportion of male marriages before 21 years has been declined between 2016 and 2017. The percentage of underage marriage for females remained higher than males during 2016 to 2017.

Total fertility rate and death rates in Chakaria HDSS area during 2017 were higher than their national counterparts. Facility-based deliveries, receiving service from Skilled Birth Attendants (SBAs) and antenatal care coverage were lower, and postnatal care coverage was comparatively higher than the national rates. Immunization rate was slightly higher than the national figure.

Among the boys, 81% of those enrolled completed the last grade of primary level education and 67% completed last grade of secondary level education. The rates were, however, similar or higher for both boys and girls than the national level. Literacy rate of 15-24 year olds was significantly higher than the national rate in Bangladesh. Compared to the national level, a lower percentage of active age group women and a higher percentage of active age group men were engaged in economic activities in Chakaria HDSS area.

Table 20. SDG and other health and socio-demographic indicators, Chakaria HDSS, 2013 – 2017, Matlab HDSS and National

Rate	Chakaria HDSS area					Matlab HDSS Govt. service area 2016		National
	2013	2014	2015	2016	2017			
Crude birth rate	24.9	25.5	25.6	25.7	25.6	21.7	-	-
Total fertility rate[a]	2.8	2.9	2.9	2.9	2.9	2.6	SDG	2.3[d]
Neonatal mortality[b]	40.6	31.5	34.1	30.0	35.7	27.5	SDG	28.0[d]
Post-neonatal mortality[b]	5.9	15.3	14.0	11.5	15.6	4.0	-	-
Infant mortality rate[b]	46.5	45.3	44.4	41.5	53.3	31.5	-	38.0[d]
Child mortality rate (1-4 yrs)	5.0	2.8	2.9	2.7	2.9	2.3	-	-
Under-five mortality rate[b]	65.6	57.4	58.9	51.2	61.8	40.2	SDG	46.0[d]
Crude death rate	5.4	5.3	5.9	5.7	5.9	6.9	-	-
Rate of natural increase	19.4	20.3	20.5	20.0	19.8	14.9	-	-
In-migration rate	37.4	32.7	33.2	36.0	34.4	59.9	-	-
Out-migration rate	44.0	35.9	37.3	41.8	47.8	62.1	-	-
Growth rate (%)	1.3	1.7	1.6	1.4	0.6	1.3	-	-
Adolescent birth rate	56.2	62.0	65.8	54.9	54.8	74.5	SDG	79.4[e]
Stillbirth rate[c]	24.4	33.6	36.5	39.8	34.4	25.5	SDG	36.0[f]
Facility-based delivery (%)	16.7	20.5	23.4	22.9	23.6	59.6	-	37.4[d]
Received assistance from SBA during delivery (%)	29.7	31.4	35.3	35.3	38.6	58.9	SDG	42.1[d]
Antenatal care coverage (at least 1 visit) (%)	66.6	74.1	76.6	77.9	77.0	-	SDG	78.6[d]
Antenatal care coverage (at least 4 visits) (%)	-	27.8	29.3	29.7	29.1	-	SDG	31.2[d]
Postnatal care coverage (1 visit) (%)	36.2	42.2	43.3	44.0	46.9	-	SDG	38.0[d]
Infant birth registration (%)	6.7	-	-	4.5	-	-	SDG	-
Under-five birth registration (%)	16.2	-	-	13.7	-	-	SDG	-

Table 20. (contd…)

Rate	Chakaria HDSS area					Matlab HDSS Govt. service area 2016		National
	2013	2014	2015	2016	2017			
Male marriage at ages under 21 years (%)	23.3	23.9	23.5	22.8	19.0	7.5	-	-
Female marriage at ages under 18 years (%)	37.2	35.0	35.9	34.6	32.8	36.9	-	-
Female aged 20-24 who were married or in a union by age 18 (%)	-	40.8	39.2	39.0	40.0	-	SDG	65.0[g]
Children receiving full immunization (%)	-	79.0	81.8	82.4	84.0	88.6	SDG	83.8[d]
1-year old children immunized against measles (%)	-	81.7	84.6	87.9	89.8	89.4	SDG	86.1[d]
Primary education completion rate for girls (%)	-	75.3	74.3	74.8	79.8	-	SDG	79.8[h]
Primary education completion rate for boys (%)	-	77.7	76.4	75.9	80.7	-	SDG	69.5[h]
Secondary education completion rate for girls (%)	-	58.1	66.5	66.7	66.2	-	SDG	64.9[h]
Secondary education completion rate for boys (%)	-	72.0	73.4	71.8	66.5	-	SDG	52.2[h]
Tertiary enrollment rate for women (%)	-	3.8	4.1	4.0	4.6	-	SDG	11.0[h]
Tertiary enrollment rate for men (%)	-	6.4	7.3	7.4	7.7	-	SDG	15.4[h]
Literacy rate of 15-24 year-old women (%)	-	93.6	94.1	97.2	98.3	-	SDG	83.3[h]
Literacy rate of 15-24 year-old men (%)	-	85.9	88.6	91.9	93.0	-	SDG	78.9[h]
Employment to population ratio (EPR) for women (15+ years of age) (%)	-	20.7	20.8	16.8	16.0	-	SDG	33.9[h]
Employment to population ratio (EPR) for men (15+ years of age) (%)	-	83.9	83.6	86.5	84.0	-	SDG	79.2[h]
Women without incomes of their own (%)	-	6.7	7.0	6.2	5.9	-	SDG	7.4[h]

[a]Per woman; [b]Per 1,000 live births; [c]Per 1,000 total births;

Sources:

[d]National Institute of Population Research and Training (NIPORT), Mitra and Associates, and ICF International. 2015. Bangladesh Demographic and Health Survey 2014: Key Indicators. Dhaka, Bangladesh, and Rockville, Maryland, USA: NIPORT, Mitra and Associates, and ICF International;

[e]Bangladesh: Adolescent Fertility Rate. United Nations Population Division, World Population Prospects. 2013;

[f]Cousens, S., H. Blencowe, C. Stanton, and others. National, regional, and worldwide estimates of stillbirth rates in 2009 with trends since 1995: a systematic analysis." Lancet. 2011:377(9774):1319–1330;

[g]National Institute of Population Research and Training (NIPORT), Mitra and Associates, and ICF International. 2013. Bangladesh Demographic and Health Survey 2011. Dhaka, Bangladesh and Calverton, Maryland, USA: NIPORT, Mitra and Associates, and ICF International;

[h]The World Bank. Available at: http://data.worldbank.org;

'-'Data not available; SDG = Sustainable development goals; HDSS = Health and Demographic Surveillance System.

Village Health Post at Kaiarbil

CLIMATE CHANGE
AND HEALTH

There is increasing evidence that the overall health effects of a changing climate are likely to be overwhelmingly negative and climate change affects social and environmental determinants of health – clean air, safe drinking water, sufficient food and secure shelter. It is estimated that two top climate hotspots will be Cox's Bazar and Bandarban – which may suffer from more than 18 percent decline in living standards (9).

SALINITY AND MISCARRIAGES

People living in coastal area have a potential link to increased salinity exposure through tube well water for drinking and cooking. Tube wells which are nearer to coast have much higher concentration of sodium than the WHO recommended limit.

There are 7,500 tube wells in 49 villages of Chakaria HDSS area;. The depth of the tube wells varied between 60 feet to 900 feet. The cost of tube well installation also varied USD 35 to USD 825.

Distance of HDSS households from the coast varies from 7 - 28 km. Salinity level of tube-well water varies from 34 mg/L to 2000 mg/L – increases with decreasing distance from sea.

Women living within 20 kilometers from the sea side had 1.3-fold (1.13-1.52) greater risk of pregnancy termination with miscarriage compared to women living in 20 km and above (Table 21 and Figure 13). The risk of miscarriage was 1.20 (1.05-1.38) times higher for women living within 7 meters of elevation from sea level than women living in 7m and above (Table 21 and Figure 14).

Table 21. Percentage of miscarriage according to distance from sea side and elevation from sea level

Characteristics	% of miscarriage (no. of miscarriage/no. of pregnant women)
Distance households from sea side	
Within 20 km	11.3(1055/9342)
20 km and above	8.7(307/3525)
Elevation of households from sea level	
Within 7 m	11.2 (865/7753)
7 m and above	9.5 (446/4695)
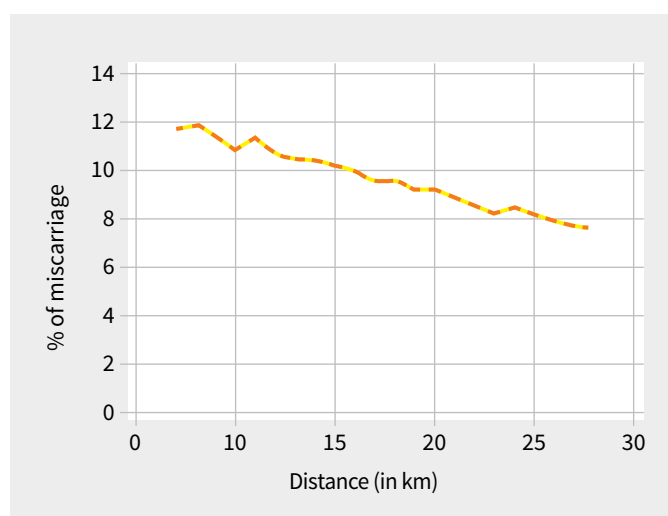
Figure 13. Risk of miscarriage according to the distance from households to sea side

Salt field at Saharbil
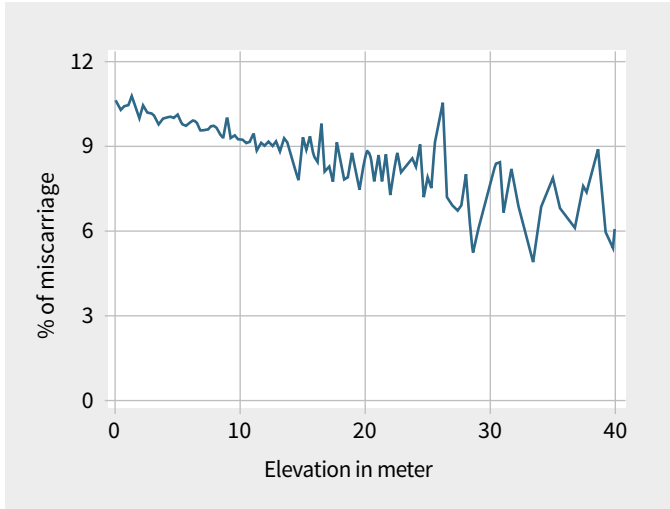
Figure 14. Risk of miscarriage according to the elevation of households from sea level

MALNUTRITION

Measurements of mid-upper arm circumference (MUAC), was taken using the tape developed by Teaching Aids at Low Cost (TALC), London, UK. According to the standard cut-off of WHO, children were categorized as 'severely malnourished' with MUAC less than 125 mm and 'not severely malnourished' with MUAC greater than or equal to 125 mm.

MUAC has been measured among children aged 6-11 months of age. Among the 6205 children, 11% were severely malnourished.

This percentage was higher nearest to the coast, being almost 14% within 15 kilometers of distance from the sea. With increasing distance from coast, proportion of malnourished children decreases (Figure 15).
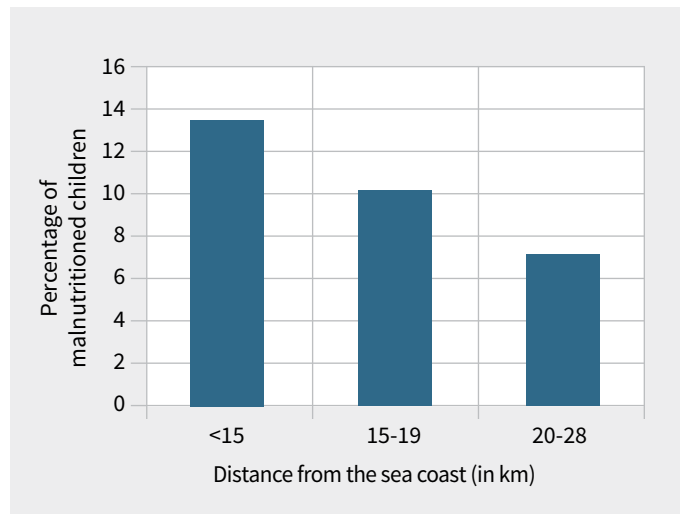
Figure 15. Percentage of malnourished children aged 6-11 months, Chakaria HDSS, 2012-2018

Perceptions of patients and service providers about causes of miscarriage

Pregnant women should stay inside their house and restrict their movements. Free movement during pregnancy causes them to come in contact with evil spirit which in turn, causes miscarriage. Food mixed with formalin also causes miscarriages.

Traditional Birth Attendant (TBA)

Repeated miscarriages occur due to evil spirits and women's own short-comings.

Patient

Miscarriages occur due to lack of nutrition and health check-ups during pregnancy. Heavy household work during pregnancy is also a cause of miscarriage.

Physician

Pregnant women having hypertension are observed to have frequent miscarriages. Women are found to develop hypertension due to family stress.

Midwife

Kabiraj **(traditional healer)**

Using *tabij* (talisman) and *pani pora* ("blessed" water given by traditional healers) during pregnancy reduces the risk of miscarriage.

Miscarriage (ADINNO)

Women living nearer to the coast and the Matamuhuri River have a higher risk of miscarriage.

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APPENDIX

Midyear population by age and sex, chakaria HDSS, 2017

Age (years)	Midyear population			Percentage distribution of midyear Population		
	Male	Female	Both	Male	Female	Both
<1	1,044	1,059	2,103	2.5	2.5	2.5
1-4	4,057	3,830	7,887	9.5	9.0	9.2
5-9	5,097	4,858	9,955	12.0	11.4	11.7
10-14	5,865	5,793	11,658	13.8	13.5	13.7
15-19	5,313	4,872	10,185	12.5	11.4	11.9
20-24	3,856	4,332	8,188	9.1	10.1	9.6
25-29	3,103	3,657	6,760	7.3	8.6	7.9
30-34	2,881	3,348	6,229	6.8	7.8	7.3
35-39	2,419	2,620	5,039	5.7	6.1	5.9
40-44	2,029	1,856	3,885	4.8	4.3	4.6
45-49	1,649	1,541	3,190	3.9	3.6	3.7
50-54	1,291	1,349	2,640	3.0	3.2	3.1
55-59	1,097	1,137	2,234	2.6	2.7	2.6
60-64	898	868	1,766	2.1	2.0	2.1
65-69	762	641	1,403	1.8	1.5	1.6
70-74	492	394	886	1.2	0.9	1.0
75-79	376	294	670	0.9	0.7	0.8
80-84	165	153	318	0.4	0.4	0.4
85+	174	162	336	0.4	0.4	0.4
All	42,568	42,764	85,332	100.0	100.0	100.0

Cause-specific mortality rate per 1,000 population by age and sex, Chakaria HDSS, 2017

Causes	Age groups (years)						
	Neonate	Infant	1-4	5-14	15-49	50-64	65+
Male							
01.01 Sepsis (non-obstetric)	0.0	0.5	0.0	0.0	0.0	0.0	0.2
01.02 Acute respiratory infection including pneumonia	0.0	15.4	0.0	0.0	0.2	1.1	9.4
01.03 HIV/AIDS related death	0.0	0.5	0.0	0.0	0.0	0.5	0.0
01.04 Diarrhoeal diseases	0.0	0.5	0.0	0.0	0.0	0.0	0.0
01.05 Malaria	0.0	0.0	0.0	0.0	0.0	0.0	0.0
01.06 Measles	0.0	0.0	0.0	0.0	0.0	0.0	0.0
01.07 Meningitis and encephalitis	55.2	1.0	0.0	0.1	0.0	0.0	0.0
01.09 Pulmonary tuberculosis	0.0	0.0	0.0	0.0	0.0	0.4	4.2
01.10 Pertussis	0.0	0.0	0.0	0.0	0.0	0.0	0.0
01.11 Haemorrhagic fever	0.0	0.0	0.0	0.0	0.0	0.0	0.0
01.99 Other and unspecified infectious diseases	0.0	0.0	0.0	0.0	0.0	0.0	1.1
02.01 Oral neoplasms	0.0	0.0	0.0	0.0	0.0	0.3	0.0
02.02 Digestive neoplasms	0.0	0.0	0.0	0.0	0.2	1.9	3.2
02.03 Respiratory neoplasms	0.0	0.0	0.0	0.0	0.0	0.0	2.5
02.04 Breast neoplasms	0.0	0.0	0.0	0.0	0.0	0.0	0.0
02.05 & 02.06 Reproductive neoplasms M, F	0.0	0.0	0.0	0.0	0.0	0.0	0.7
02.99 Other and unspecified neoplasms	0.0	0.0	0.0	0.1	0.2	0.6	2.6
03.01 Severe anaemia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
03.02 Severe malnutrition	0.0	0.0	0.0	0.1	0.0	0.0	0.2
03.03 Diabetes mellitus	0.0	0.0	0.0	0.0	0.0	0.6	2.5
04.01 Acute cardiac disease	0.0	0.0	0.0	0.0	0.1	0.9	1.8
04.02 Stroke	0.0	0.0	0.0	0.0	0.0	4.2	11.7
04.03 Sickle cell with crisis	0.0	0.0	0.0	0.0	0.0	0.0	0.0
04.99 Other and unspecified cardiac diseases	0.0	0.5	0.2	0.0	0.0	0.6	3.9
05.01 Chronic obstructive pulmonary diseases	0.0	0.0	0.0	0.0	0.0	0.3	6.5
05.02 Asthma	0.0	0.0	0.0	0.0	0.0	0.1	0.5
06.01 Acute abdomen	0.0	0.0	0.0	0.0	0.0	0.0	1.5
06.02 Liver cirrhosis	0.0	0.0	0.2	0.0	0.1	0.6	0.8
07.01 Renal failure	0.0	0.0	0.0	0.0	0.0	0.3	0.9
08.01 Epilepsy	0.0	1.7	0.0	0.0	0.0	0.0	0.2
09.01 Ectopic pregnancy	0.0	0.0	0.0	0.0	0.0	0.0	0.0
09.02 Abortion-related death	0.0	0.0	0.0	0.0	0.0	0.0	0.0
09.03 Pregnancy-induced hypertension	0.0	0.0	0.0	0.0	0.0	0.0	0.0
09.04 Obstetric haemorrhage	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Causes	Age groups (years)						
	Neonate	Infant	1-4	5-14	15-49	50-64	65+
09.05 Obstructed labour	0.0	0.0	0.0	0.0	0.0	0.0	0.0
09.06 Pregnancy-related sepsis	0.0	0.0	0.0	0.0	0.0	0.0	0.0
09.99 Other and unspecified maternal causes of death	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.01 Prematurity	59.8	0.0	0.0	0.0	0.0	0.0	0.0
10.02 Birth asphyxia	80.3	0.0	0.0	0.0	0.0	0.0	0.0
10.03 Neonatal pneumonia	55.4	0.0	0.0	0.0	0.0	0.0	0.0
10.04 Neonatal sepsis	33.8	0.0	0.0	0.0	0.0	0.0	0.0
10.06 Congenital malformation	11.4	0.0	0.0	0.0	0.0	0.0	0.0
10.99 Other and unspecified neonatal causes of death	90.3	0.0	0.0	0.0	0.0	0.0	0.0
12.01 Road traffic accident	0.0	0.0	0.2	0.3	0.0	0.5	0.0
12.02 Other transport accident	0.0	0.0	0.0	0.2	0.0	0.0	0.8
12.03 Accidental fall	0.0	0.0	0.0	0.0	0.0	0.0	1.0
12.04 Accidental drowning and submersion	0.0	0.0	1.7	0.1	0.0	0.0	0.0
12.05 Accidental exposure to smoke fire & flame	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.06 Contact with venomous plant/animal	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.07 Accidental poisoning & noxious substances	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.08 Intentional self-harm	0.0	0.0	0.0	0.0	0.1	0.0	0.0
12.09 Assault	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.10 Exposure to force of nature	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.99 Other and unspecified external causes of death	0.0	0.0	0.2	0.0	0.0	0.0	0.0
98 Other and unspecified non-communicable diseases	0.0	0.0	0.0	0.0	0.0	0.0	0.0
99 Indeterminate	73.6	4.0	0.4	0.1	0.2	0.9	5.2
All causes	**459.7**	**24.0**	**3.0**	**0.8**	**1.2**	**13.7**	**61.5**
Female							
01.01 Sepsis (non-obstetric)	0.0	0.4	0.0	0.0	0.0	0.0	0.0
01.02 Acute respiratory infection including pneumonia	0.0	5.5	0.3	0.0	0.0	1.5	4.8
01.03 HIV/AIDS related death	0.0	1.0	0.3	0.0	0.1	0.0	0.2
01.04 Diarrhoeal diseases	0.0	0.9	0.0	0.0	0.0	0.1	0.0
01.05 Malaria	0.0	0.0	0.0	0.0	0.0	0.0	0.0
01.06 Measles	0.0	0.0	0.0	0.0	0.0	0.0	0.0
01.07 Meningitis and encephalitis	45.0	0.0	0.0	0.1	0.0	0.0	0.0
01.09 Pulmonary tuberculosis	0.0	0.0	0.0	0.0	0.1	0.8	1.4
01.10 Pertussis	0.0	0.0	0.0	0.0	0.0	0.0	0.0
01.11 Haemorrhagic fever	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Causes	Age groups (years)						
	Neonate	Infant	1-4	5-14	15-49	50-64	65+
01.99 Other and unspecified infectious diseases	0.0	0.8	0.0	0.0	0.0	0.0	0.4
02.01 Oral neoplasms	0.0	0.0	0.0	0.0	0.0	0.0	0.3
02.02 Digestive neoplasms	0.0	0.0	0.0	0.0	0.2	0.4	1.9
02.03 Respiratory neoplasms	0.0	0.0	0.0	0.0	0.0	0.4	0.8
02.04 Breast neoplasms	0.0	0.0	0.0	0.0	0.2	0.0	0.5
02.05 & 02.06 Reproductive neoplasms M, F	0.0	0.0	0.0	0.0	0.1	0.3	4.3
02.99 Other and unspecified neoplasms	0.0	0.0	0.0	0.0	0.0	0.7	1.8
03.01 Severe anaemia	0.0	0.0	0.0	0.0	0.0	0.0	0.3
03.02 Severe malnutrition	0.0	0.0	0.0	0.0	0.0	0.0	0.6
03.03 Diabetes mellitus	0.0	0.0	0.0	0.0	0.0	0.5	3.0
04.01 Acute cardiac disease	0.0	0.0	0.0	0.0	0.1	0.6	2.4
04.02 Stroke	0.0	0.0	0.0	0.0	0.1	1.6	8.5
04.03 Sickle cell with crisis	0.0	0.0	0.0	0.0	0.0	0.0	0.0
04.99 Other and unspecified cardiac diseases	0.0	0.0	0.0	0.0	0.1	0.0	2.6
05.01 Chronic obstructive pulmonary diseases	0.0	0.0	0.0	0.0	0.0	0.8	4.4
05.02 Asthma	0.0	0.0	0.0	0.0	0.0	0.3	0.0
06.01 Acute abdomen	0.0	0.6	0.0	0.0	0.0	0.2	0.8
06.02 Liver cirrhosis	0.0	0.0	0.0	0.0	0.1	0.3	1.2
07.01 Renal failure	0.0	0.0	0.0	0.0	0.0	1.1	1.1
08.01 Epilepsy	0.0	0.0	0.0	0.1	0.0	0.0	0.0
09.01 Ectopic pregnancy	0.0	0.0	0.0	0.0	0.0	0.0	0.0
09.02 Abortion-related death	0.0	0.0	0.0	0.0	0.0	0.0	0.0
09.03 Pregnancy-induced hypertension	0.0	0.0	0.0	0.0	0.1	0.0	0.0
09.04 Obstetric haemorrhage	0.0	0.0	0.0	0.0	0.1	0.0	0.0
09.05 Obstructed labour	0.0	0.0	0.0	0.0	0.0	0.0	0.0
09.06 Pregnancy-related sepsis	0.0	0.0	0.0	0.0	0.0	0.0	0.0
09.99 Other and unspecified maternal causes of death	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.01 Prematurity	70.2	0.0	0.0	0.0	0.0	0.0	0.0
10.02 Birth asphyxia	54.2	0.0	0.0	0.0	0.0	0.0	0.0
10.03 Neonatal pneumonia	102.8	0.0	0.0	0.0	0.0	0.0	0.0
10.04 Neonatal sepsis	39.9	0.0	0.0	0.0	0.0	0.0	0.0
10.06 Congenital malformation	20.7	0.0	0.0	0.0	0.0	0.0	0.0
10.99 Other and unspecified neonatal causes of death	73.9	0.0	0.0	0.0	0.0	0.0	0.0
12.01 Road traffic accident	0.0	0.0	0.2	0.1	0.0	0.0	0.0
12.02 Other transport accident	0.0	0.5	0.5	0.1	0.0	0.3	1.1
12.03 Accidental fall	0.0	0.0	0.3	0.0	0.0	0.0	0.6
12.04 Accidental drowning and submersion	0.0	0.0	1.3	0.1	0.0	0.0	0.0

Causes	Age groups (years)						
	Neonate	**Infant**	**1-4**	**5-14**	**15-49**	**50-64**	**65+**
12.05 Accidental exposure to smoke fire & flame	0.0	0.0	0.0	0.0	0.0	0.0	0.6
12.06 Contact with venomous plant/animal	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.07 Accidental poisoning & noxious substances	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.08 Intentional self-harm	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.09 Assault	0.0	0.5	0.0	0.0	0.0	0.0	0.0
12.10 Exposure to force of nature	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.99 Other and unspecified external causes of death	0.0	0.0	0.0	0.0	0.0	0.0	0.0
98 Other and unspecified non-communicable diseases	0.0	0.0	0.0	0.0	0.0	0.0	0.0
99 Indeterminate	44.5	2.1	0.1	0.0	0.2	1.0	9.3
All causes	**451.2**	**12.3**	**2.9**	**0.45**	**1.6**	**10.7**	**52.9**

Migration rate per 1,000 population by age and sex, Chakaria HDSS, 2017

Age (years)	No. of migrants			Migration rate per 1,000 population		
	Male	Female	Both	Male	Female	Both
In-migration						
<1	54	53	107	51.7	50.0	50.9
1-4	144	120	264	35.5	31.3	33.5
5-9	128	120	248	24.5	24.0	24.3
10-14	102	135	237	17.8	23.9	20.8
15-19	97	593	690	18.3	121.7	67.7
20-24	112	365	477	29.0	84.3	58.3
25-29	121	142	263	39.0	38.8	38.9
30-34	117	83	200	40.6	24.8	32.1
35-39	102	39	141	42.2	14.9	28.0
40-44	62	20	82	30.6	10.8	21.1
45-49	24	26	50	14.6	16.9	15.7
50-54	22	17	39	17.0	12.6	14.8
55-59	18	11	29	16.4	9.7	13.0
60-64	6	13	19	6.7	15.0	10.8
65-69	8	15	23	10.5	23.4	16.4
70-74	8	17	25	16.3	43.1	28.2
75-79	7	5	12	18.6	17.0	17.9
80-84	3	7	10	18.2	45.8	31.4
85+	6	9	15	34.5	55.6	44.6
All	**1,141**	**1,790**	**2,931**	**26.8**	**41.9**	**34.3**
Out-migration						
<1	43	62	105	41.2	58.5	49.9
1-4	177	162	339	43.6	42.3	43.0
5-9	170	164	334	32.5	32.8	32.7
10-14	174	205	379	30.4	36.2	33.3
15-19	209	550	759	39.3	112.9	74.5
20-24	295	456	751	76.5	105.3	91.7
25-29	239	255	494	77.0	69.7	73.1
30-34	223	135	358	77.4	40.3	57.5
35-39	117	68	185	48.4	26.0	36.7
40-44	90	35	125	44.4	18.9	32.2
45-49	36	20	56	21.8	13.0	17.6
50-54	19	20	39	14.7	14.8	14.8
55-59	19	18	37	17.3	15.8	16.6
60-64	9	12	21	10.0	13.8	11.9
65-69	10	17	27	13.1	26.5	19.2
70-74	9	14	23	18.3	35.5	26.0
75-79	7	9	16	18.6	30.6	23.9
80-84	4	9	13	24.2	58.8	40.9
85+	6	8	14	34.5	49.4	41.7
All	**1,856**	**2,219**	**4,075**	**43.6**	**51.9**	**47.8**

APPENDIX D

Number of migrants by origin and migration, Chakaria HDSS, 2017

Origin/ Destination	All age	Age (years)										
		<5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50+
In-migration												
Male												
Inside Bangladesh	908	196	127	102	96	77	79	74	53	27	17	60
Outside Bangladesh	233	2	1	0	1	35	42	43	49	35	7	18
Inside Chakaria	481	101	71	63	53	37	37	37	33	9	8	32
Outside Chakaria	170	36	22	22	19	18	11	8	5	12	4	13
Inside HDSS area	319	61	51	46	32	22	22	26	21	8	4	26
Outside HDSS area	162	40	20	17	21	15	15	11	12	1	4	6
Female												
Inside Bangladesh	1,780	172	120	135	590	364	139	83	38	20	26	93
Outside Bangladesh	10	1	0	0	0	4	3	0	1	0	0	1
Inside Chakaria	1,078	96	69	77	401	224	63	42	19	7	16	64
Outside Chakaria	316	18	20	34	108	62	24	14	12	5	6	13
Inside HDSS area	699	60	43	53	241	146	48	25	14	3	9	57
Outside HDSS area	379	36	26	24	160	78	15	17	5	4	7	7
Out-migration												
Male												
Inside Bangladesh	1,311	220	167	171	125	130	125	142	72	56	25	78
Outside Bangladesh	545	0	3	3	83	166	114	81	45	34	11	5
Inside Chakaria	970	166	119	133	104	99	91	96	48	37	21	56
Outside Chakaria	188	27	27	23	13	18	15	26	10	10	2	17
Inside HDSS area	376	67	51	63	43	30	26	28	21	15	4	28
Outside HDSS area	237	38	38	38	28	23	22	18	5	8	7	12
Female												
Inside Bangladesh	2,200	223	163	204	548	453	252	131	68	33	19	106
Outside Bangladesh	19	1	1	1	2	3	3	4	0	2	1	1
Inside Chakaria	1,591	151	121	141	400	324	179	95	54	23	18	85
Outside Chakaria	363	40	19	32	94	84	45	22	8	7	0	12
Inside HDSS area	729	46	65	204	142	73	36	23	8	10	57	51
Outside HDSS area	440	35	40	117	94	53	24	11	8	3	15	14

Number of in-migrants by reasons for migration, Chakaria HDSS, 2017

Reason for migration	All age	Age (years)										
		<5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50+
Male												
Family-related												
To join spouse	43	1	0	1	3	10	7	9	3	0	0	2
Family friction/ breakdown	23	13	7	7	5	5	7	4	2	2	2	10
Others	30	6	3	1	1	4	3	2	2	0	1	6
Work-related												
New job/job transfer	242	2	1	4	7	36	41	43	48	36	7	17
To look for work/lost job	160	99	30	16	6	2	1	1	0	0	0	5
Others	31	1	1	4	2	2	6	3	6	2	1	3
Housing-related												
Wanted to own home/new house	467	64	54	45	65	46	50	44	37	21	12	29
Education												
To acquire education	61	2	26	22	7	1	0	2	0	0	0	1
Reasons not reported	51	10	6	2	1	6	6	9	4	1	1	5
All	**1,141**	**198**	**128**	**102**	**97**	**112**	**121**	**117**	**102**	**62**	**24**	**78**
Female												
Family related												
To join spouse	745	0	0	21	462	213	29	11	6	1	2	0
Family friction/breakdown	203	12	6	5	33	49	33	16	4	4	1	40
Others	49	10	5	3	5	4	4	3	1	0	0	14
Work-related												
New job/job transfer	18	1	3	5	1	3	4	0	1	0	0	0
To look for work/lost job	163	86	27	12	9	7	3	2	1	0	2	14
Others	23	2	1	1	0	3	8	3	1	1	2	1
Housing-related												
Wanted to own home/new house	478	55	44	60	69	76	53	44	24	13	17	23
Education												
To acquire education	70	2	30	26	7	2	1	1	1	0	0	0
Reasons not reported	41	5	4	2	4	11	7	3	0	1	2	2
All	**1,790**	**173**	**120**	**135**	**590**	**368**	**142**	**83**	**39**	**20**	**26**	**94**

Number of out-migrants by reasons for migration, Chakaria HDSS, 2017

Reason for migration	All age	Age (years)										
		<5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50+
Male												
Family-related												
To join spouse	34	0	0	0	11	9	8	2	1	2	0	1
Family friction/ breakdown	96	13	6	9	10	15	13	11	4	3	2	10
Others	82	13	14	7	7	5	5	6	6	5	4	10
Work-related												
New job/job transfer	554	2	4	4	86	167	113	83	45	34	11	5
To look for work/lost job	139	65	33	22	7	4	0	2	2	0	0	4
Others	40	1	1	3	3	4	9	10	4	4	0	1
Housing-related												
Wanted to own home/new house	379	56	52	71	47	33	24	30	18	17	6	25
Education												
To acquire education	26	2	10	10	3	1	0	0	0	0	0	0
Reasons not reported	506	68	50	48	34	58	67	79	37	25	13	27
All	**1,856**	**220**	**170**	**174**	**208**	**296**	**239**	**223**	**117**	**90**	**36**	**83**
Female												
Family related												
To join spouse	773	0	0	40	378	250	77	17	6	2	0	3
Family friction/breakdown	201	9	3	9	44	52	30	10	9	2	0	33
Others	85	10	7	9	8	7	9	10	6	0	1	18
Work-related												
New job/job transfer	40	2	4	12	4	7	4	4	0	2	1	0
To look for work/lost job	167	81	32	17	10	6	4	2	1	0	2	12
Others	42	1	4	1	8	9	5	7	3	1	0	3
Housing-related												
Wanted to own home/new house	422	51	55	77	52	38	54	42	18	14	7	14
Education												
To acquire education	22	0	4	9	4	1	1	0	3	0	0	0
Reasons not reported	467	70	55	31	42	86	71	43	22	14	9	24
All	**2,219**	**224**	**164**	**205**	**550**	**456**	**255**	**135**	**68**	**35**	**20**	**107**

Population, births, deaths, in and out-migration by village, Chakaria HDSS, 2017

Village	Population	Birth	Death	In-migration	Out-migration	Birth rate	Death rate	In-migration rate	Out-migration rate
Maizpara	1,687	34	7	61	87	**20.2**	4.1	**36.2**	51.6
Daingakata	1,804	40	13	43	100	22.2	7.2	23.8	55.4
Baniachara	3,341	90	15	180	216	26.9	4.5	53.9	64.7
Dakshin Baraitali	2,244	60	19	43	110	26.7	8.5	19.2	49.0
Gobindapur	4,888	123	29	137	216	25.2	5.9	28.0	44.2
Hapaliakata	3,789	105	18	124	202	27.7	4.8	32.7	53.3
Baraitali	17,753	452	101	588	931	25.5	5.7	33.1	52.4
Katakhali	396	14	3	6	35	35.4	7.6	15.2	88.4
Rakhainpara	655	7	8	23	28	17.7	20.2	58.1	70.7
Shantinagar	1,978	42	8	96	166	106.1	20.2	242.4	419.2
Kulalpara	179	3	1	7	7	7.6	2.5	17.7	17.7
Palpara	230	6	3	4	11	15.2	7.6	10.1	27.8
Stationpara	634	14	1	8	47	35.4	2.5	20.2	118.7
Kattoli	446	14	5	21	27	35.4	12.6	53.0	68.2
Harbang	2772	100	29	165	321	36.1	10.5	59.5	115.8
Purbo Kunakhali	1,785	52	9	76	78	29.1	5.0	42.6	43.7
Maddhya Kunakhali	4,802	135	27	187	223	28.1	5.6	38.9	46.4
Furotia Khali	3,171	81	23	88	137	25.5	7.3	27.8	43.2
Konakhali	9,758	268	59	351	438	27.5	6.0	36.0	44.9
Krisnapur	1,606	48	10	58	82	29.9	6.2	36.1	51.1
Chhainama Para	2,865	88	14	92	97	30.7	4.9	32.1	33.9
Dakshin Bahaddarkata	2,474	80	21	70	94	32.3	8.5	28.3	38.0
BM Char	6,945	216	45	220	273	31.1	6.5	31.7	39.3
Chotta Bheola	930	24	4	22	32	25.8	4.3	23.7	34.4
Hasimar Kata	985	26	1	36	61	26.4	1.0	36.5	61.9
Hamidullah Sikderpara	794	22	6	32	39	27.7	7.6	40.3	49.1
Dwipkul	980	18	4	12	44	18.4	4.1	12.2	44.9
Baniarkum	1,173	28	9	28	39	23.9	7.7	23.9	33.2
Dakshin Khilsadok	1,766	46	18	53	100	26.0	10.2	30.0	56.6
Kaiarbil	6,628	164	42	183	315	24.7	6.3	27.6	47.5
Kaddachura	1,675	56	7	80	58	33.4	4.2	47.8	34.6
Sikder Para	4,076	94	21	154	154	23.1	5.2	37.8	37.8
Baniarchar	940	31	9	19	29	33.0	9.6	20.2	30.9
Kalagazi Sikderpara	1,349	32	7	65	64	23.7	5.2	48.2	47.4

Village	Population	Birth	Death	In-migration	Out-migration	Birth rate	Death rate	In-migration rate	Out-migration rate
Mabiar Baper Para	746	17	3	18	29	22.8	4.0	24.1	38.9
Jele Para	631	25		23	14	39.6	0.0	36.5	22.2
Purba B. Bheola	9,417	255	47	359	348	27.1	5.0	38.1	37.0
Sharharbil Purba Para	1,196	31	8	35	58	25.9	6.7	29.3	48.5
Saharbil Paschim Para	1,066	26	3	34	38	24.4	2.8	31.9	35.6
Madrasha Para	522	14	5	28	42	26.8	9.6	53.6	80.5
Maizghona Purba Para	1,565	42	8	71	77	26.8	5.1	45.4	49.2
Shahapura	1,039	19	3	25	43	18.3	2.9	24.1	41.4
Failla Para	346	12	6	11	19	34.7	17.3	31.8	54.9
Saharbil	5,734	144	33	204	277	25.1	5.8	35.6	48.3
Saker Mohammad Char	5,647	148	25	200	212	26.2	4.4	35.4	37.5
Uttar Lotony	1,862	45	10	54	67	24.2	5.4	29.0	36.0
Proper Kakara	2,925	69	19	72	87	23.6	6.5	24.6	29.7
Kakhara	10,434	262	54	326	366	25.1	5.2	31.2	35.1
Dakshin Surajpur	1,247	29	6	49	58	23.3	4.8	39.3	46.5
Dakshin Manikpur	2,808	63	19	92	178	22.4	6.8	32.8	63.4
Uttar Manikpur	4,391	111	21	101	210	25.3	4.8	23.0	47.8
Surajpur Manikpur	8,446	203	46	242	446	24.0	5.4	28.7	52.8
Muchar Para	521	10	2	21	15	19.2	3.8	40.3	28.8
Demosia Bazar Para	1,046	19	7	35	57	18.2	6.7	33.5	54.5
Ammer Dera Para	1,396	22	6	34	72	15.8	4.3	24.4	51.6
Daskhali Para	1,056	29	14	49	58	27.5	13.3	46.4	54.9
Demosia	4,019	80	29	139	202	19.9	7.2	34.6	50.3
Darbeshkata Manik Para	770	25	10	28	36	32.5	13.0	36.4	46.8
Tekhsira Para	904	16	4	58	48	17.7	4.4	64.2	53.1
Paschim B. Bheola	1674	41	14	86	84	24.5	8.4	51.4	50.2

Percentage of population by age and marital status, Chakaria HDSS, 2017

Age (years)	Married	Divorced	Widower/ Widow	Never married	Population
Male					
10-14	0.02	0	0	99.98	5,865
15-19	2.36	0	0	97.64	5,313
20-24	19.45	0.17	0	80.38	3,856
25-29	51.54	0.52	0.03	47.91	3,103
30-34	81.81	0.53	0	17.66	2,881
35-39	95.44	0.71	0.07	3.77	2,419
40-44	98.39	0.29	0.19	1.12	2,029
45-49	98.65	0.28	0.28	0.79	1,649
50-54	98.56	0.46	0.46	0.53	1,291
55-59	97.71	0.34	1.53	0.42	1,097
60-64	96.57	0.11	2.98	0.33	898
65-69	95.16	0.12	3.48	1.24	762
70-74	91.16	0.39	7.27	1.18	492
75-79	85.57	0.49	13.94	0	376
80-84	81.97	1.09	16.94	0	165
85+	69.63	1.05	29.32	0	174
All	**48.86**	**0.26**	**0.8**	**50.07**	**32,370**
Female					
10-14	0.9	0	0	99.1	5,793
15-19	23.76	0.25	0.02	75.97	4,872
20-24	68.3	0.91	0.23	30.55	4,332
25-29	90.09	1.02	0.61	8.28	3,657
30-34	94.18	1.79	1.56	2.47	3,348
35-39	93.75	1.22	3.63	1.4	2,620
40-44	87.96	1.88	9.07	1.09	1,856
45-49	84.89	1.41	12.72	0.98	1,541
50-54	75.04	1.41	22.67	0.89	1,349
55-59	66.81	1.25	31.27	0.67	1,137
60-64	57.61	1.19	40.13	1.08	868
65-69	42.79	1.5	55.71	0	641
70-74	28.64	0.7	70.66	0	394
75-79	16.83	0.65	82.52	0	294
80-84	14.81	1.23	83.95	0	153
85+	3.41	0	96.59	0	162
All	**56.9**	**0.9**	**8.17**	**34.04**	**33,017**

APPENDIX I

Chakaria HDSS project team, 2017

Age (years)	Designation
Dhaka	
Manzoor Ahmed Hanifi	Project Director
Mohammad Iqbal	Project Coordinator
Sabrina Rasheed	Associate Scientist
Shehrin Shaila Mahmood	Assistant Scientist
Amena Sultana	Research Officer
Mohammad Nahid Mia	Research Officer
Mohammad Shohel Rana	Administrative Officer
Chakaria	
Shahidul Hoque	Field Research Manager
Mijanur Rahaman	Senior Field Research Officer
Ashish Paul	Data Management Officer
Md. Sharif -Al Hasan	Field Research Officer
Md. Rehmat Ali	Field Research Supervisor
Asia Zannat	Surveillance Worker (Rural)
Dezi Akter	Surveillance Worker (Rural)
Farjana Nasrin	Surveillance Worker (Rural)
Fatema Johura Surma	Surveillance Worker (Rural)
Fatema Zannat	Surveillance Worker (Rural)
Ismat Jahan Khuki	Surveillance Worker (Rural)
Jesmin Akter Rano	Surveillance Worker (Rural)
Jesmin Jannat	Surveillance Worker (Rural)
Kawkaba Zannat	Surveillance Worker (Rural)
Kawsar Jannat	Surveillance Worker (Rural)
Kulsuma Akter	Surveillance Worker (Rural)
Merina Jannat Resmi	Surveillance Worker (Rural)
Miftahul Zannat Tamanna	Surveillance Worker (Rural)
Monuara Begum	Surveillance Worker (Rural)
Mosharafa Sultana	Surveillance Worker (Rural)
Nasima Jannat	Surveillance Worker (Rural)
Nazma Akter	Surveillance Worker (Rural)
Nusrat Jannat Sadia	Surveillance Worker (Rural)
Papi Prova Das	Surveillance Worker (Rural)
Raihan Zannat	Surveillance Worker (Rural)
Reshma Akter	Surveillance Worker (Rural)
Riasmin Zannat	Surveillance Worker (Rural)
Segupta Jahan	Surveillance Worker (Rural)
Shabekun Nahar Jesmin	Surveillance Worker (Rural)
Tanjina Zannat Ara	Surveillance Worker (Rural)
Tasmin Akter	Surveillance Worker (Rural)
Tumpa Rani Nath	Surveillance Worker (Rural)
Umme Habiba Mamata	Surveillance Worker (Rural)
Zannatul Maowa	Surveillance Worker (Rural)
Zosna Begum	Surveillance Worker (Rural)

CHARACTERISTICS OF CHAKARIA HDSS

Characteristics	Chakaria
Initiation	1999
Household Visit	Tri-monthly
Villages	49
Households	17,000
Population	85,000
Population Density	782 individuals/km2
Region Type	Hilly and coastal
Data Collection Method	Web-based
Demographic events	• Births • Deaths • Marriages • Divorces • Migrations • Pregnancies
Socio-economic Status	• Education • Occupation • Income • Household possession of asstes
GPS Coordinates	• Households • Health facilities • EPI centre • Community clinic
Family Planning	Initiated since 1999
Reproductive Health	• Antenatal Care (place and provider) • TT vaccination • Delivery care (delivery attendant, place and mode of delivery) • Postnatal care (place and provider) • Lifetime pregnancy history
Child Health	**From birth to 3 years of age** • Vaccination • Morbidity • Hospitalization
Cause of Death	Collected since 2010
Micro Health Insurance/ Hospital Services	Micro Health Insurance since 2012
Scientific Report	Since 1999