Chakaria Health and Demographic Surveillance System Report–2020

By Srizan Chowdhury

WORD COUNT	14877	TIME SUBMITTED	21-DEC-2022 01:49PM
		PAPER ID	94235037

CHAKARIA HEALTH AND DEMOGRAPHIC SURVEILLANCE SYSTEM REPORT - 2020

Focusing on Health and Climate Change

icddr,b

Scientific Report No. 14x

CHAKARIA HEALTH AND DEMOGRAPHIC SURVEILLANCE SYSTEM REPORT – 2020

Focusing on Health and Climate Change

Srizan Chowdhury
Ashish Paul
Md. Sharif Al Hasan
Muhammad Zahirul Haq
Md. Mehedi Hasan
Nur E Jannat Amee
Md. Sharoardy Shagar
Shehrin Shaila Mahmood, PhD
Sabrina Rasheed, PhD
Manzoor Ahmed Hanifi, PhD

icddr,b

All staff members of the Chakaria HDSS, Dhaka and Chakaria, have contributed to the preparation of this report.

Cover page: Community health worker collecting data in COVID-19 situation.

ISBN: 978-984-551-386-9
Scientific report No. 145
November 2021

Cover and layout design by
Muhammad Zahirul Haq

Published by
Health Systems and Population Studies Division
icddr,b
68. Shaheed Tajuddin Ahmed Sarani
Mohakhali, Dhaka 1212, Bangladesh
Tel: (+8802) 9827001-10, Fax: (8802) 9827091
Email: hanifi@icddrb.org
URL: http://www.icddrb.org

Printed by
~~Dina Offset Printing Press~~
~~Cell: +88 01820 508340, +88 01919 508340~~
~~E-mail: dina.offset@yahoo.com, dinaoffset.bd@gmail.com~~

ACKNOLEDGEMENT

ACKNOLEDGEMENT

This activities of Chakaria Health and Demographic Surveillance System (HDSS) are run by the core fund of icddr,b. Current donors providing unrestricted support are government of Bangladesh, Canada, Sweden and the United Kingdom. We gratefully acknowledge these donors for their support and commitment to icddr,b's research efforts.

Data presented in this report were collected through the Chakaria Health and Demographic Surveillance System (HDSS), one of the activities of the Chakaria Community Health Project, maintained by icddr,b. The Chakaria HDSS team is thankful to Dr. Md. Nurul Alam, *Emeritus Scientist*, icddr,b and Dr. Abdur Razzaque, *Emeritus Scientist*, icddr,b, for reviewing an earlier version of the report. The team is grateful to the Chakaria community for their cooperation in providing invaluable information. Last but not least, the untiring efforts of the team members of the Chakaria Community Health Project in maintaining the surveillance system are gratefully acknowledged.

CMH	Christian Memorial Hospital
CSBA	Community Skilled Birth Attendant
EPR	Employment to population ratio
FDSR	Family Development Services and Research
FWV	Family Welfare Visitor
GAC	Global Affairs Canada
GIS	Geographic Information System
HIV	Human immunodeficiency virus
HDSS	Health and Demographic Surveillance System
INDEPTH	International Network of field sites with continuous Demographic Evaluation of Population and Their Health in developing countries
MDG	Millennium Development Goals
NGO	Non-government Organization
PNC	Postnatal care
SACMO	Sub-Assistant Community Medical Officer
SBA	Skilled Birth Attendant
SDG	Sustainable Development Goals
Sida	Swedish International Development Cooperation
SMAM	Singulate mean age at marriage
SW	Surveillance Worker
TBA	Traditional Birth Attendant
TFR	Total Fertility Rate
UHFWC	Union Health and Family Welfare Centre
UKAid	Foreign, Commonwealth and Development Office, UK
VHP	Village health post
WHO	World Health Organization

CONTENTS

TABLES

FIGURES

APPENDICES

CHAPTER 1

Introduction

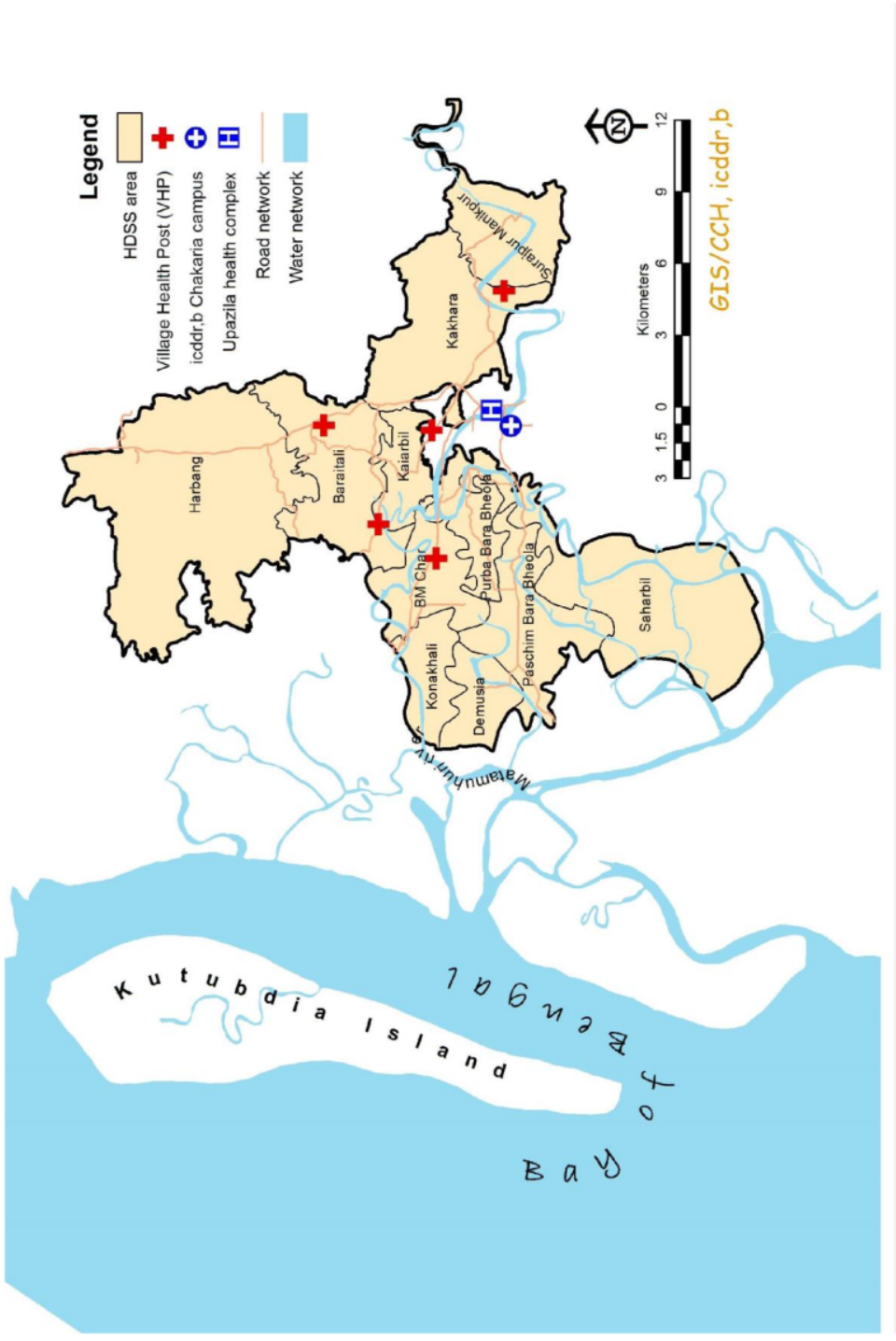
Chakaria is one of the 492 *Upazilas* (sub-district) in Bangladesh, located between latitudes 21°34' and 21°55' North and longitudes 91°54' and 92°13' East in the southeastern coast of the Bay of Bengal. Administratively, it is under Cox's Bazar district with an estimated population of 5,77,115* in 2020. 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 HDSS area 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 to improve of the 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 an 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 include assessment of health needs, defining actions for health, implementing them, and monitoring their implementation and outputs. Among the health-related activities, identifying volunteers for health education, mobilizing local resources to establish village health posts (VHP) and their management, introducing a pre-paid family health card, and establishing 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 the 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 the area since 1999. The primary purpose of this surveillance system is to monitor the impact of interventions with a focus on equity and to generate relevant health, demographic and socioeconomic information for policies and programmes, and further research. Also, Chakaria HDSS monitors 23 SDG indicators using its longitudinal data. This report presents data collected through the Chakaria HDSS during 2020.

*Estimated population based on 45sus 2011, Bangladesh Bureau of Statistics (BBS), 45, Ministry of Planning, Government of The People's Republic of Bangladesh, December 2013.

Existing health services in Chakaria HDSS area, 2020	
Healthcare facility/provider	**Number**
icddr,b facilitated and Community initiated	
Village health post	5
Trained midwife	12
Physician	1
Male paramedic	10
Medical assistant	2
Government	
Union Health and Family Welfare Centre (UHFWC)	11
EPI outreach centre	264
Physician	0
Family Welfare Visitor (FWV)	5
Sub-Assistant Community Medical Officer (SACMO)/Medical assistant	4
Family Welfare Assistant (Community skilled birth attendant)	18
Community Clinics	24
Community Healthcare Provider	24
Private	
Village doctor (allopathic)	241
Village doctor (homeopathic)	102
Allopathic pharmacy	177
Homeopathic pharmacy	15
Diagnostic centre	4
NGO	
Health and development activities	5
Paramedic	4
Health worker	30
Outdoor Hospital (Christian Memorial & Hope Foundation)	2

Figure 1. Map of Chakaria HDSS area



CHAPTER 2

Methods and Materials

The Chakaria HDSS covers 11 unions, namely Baraitali, Kayerbil, Bheola Manik Char, Paschim Bara Bheola, Saharbil, Kakara, Harbang, Purba Bara Bheola, Surajpur Manikpur, Kakhali, and Demoshia. In 1999, 1,66,405 people were living in 26,979 households. A household is defined as a 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 they have left the household and do not intend to come back within six months since they left. A person is considered to have migrated in if they were not previously included in the list of household members and intend to live in the household at least once 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 a 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, an 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 required 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 13 work areas, and 13 SWs residing in each of the work areas were recruited for data collection. Most of the households included in the system prior to this modification were also included in the new system. The modification of the system 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 surveillance system includes complete villages (3). Currently, surveillance covers 88,144 individuals (17,315 households). From the beginning of 2015, the data collection process was shifted from paper-based to a web-based system. A web-based software application has been designed and developed. 14 tabs (smartphones) are connected with mobile internet through mobile operator network. The SWs collect data using these devices, and data are stored directly in a database in the central server.

One supervisor had been assigned to supervise the data-collection process. To detect any anomalies, a team of four independent interviewers re-visited 5% of the households, chosen randomly, within 2 days of the SW's visit. Afterward, the supervisor and the relevant field workers together sorted out any inconsistencies in the collected data. All the filled-up questionnaires were electronically checked within the database for completeness and 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 the spouses or any other adult member. The list includes 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 (4). The major demographic indicators and safe motherhood practices have been tabulated for the various asset quintiles.

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

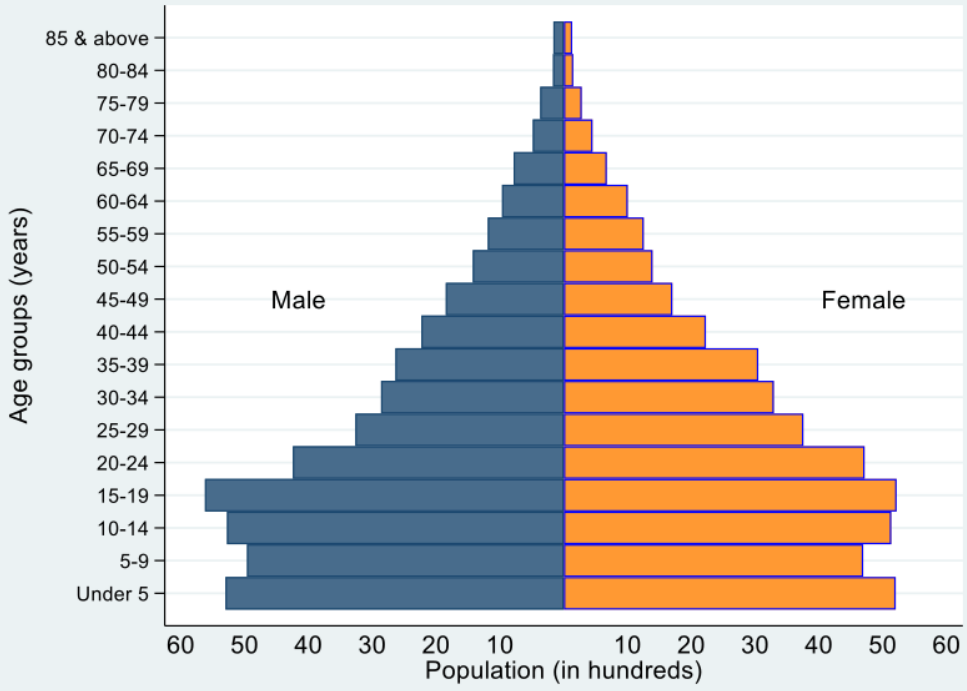
CHAPTER 3

Population and Population Changes

The population pyramid based on the population of Chakaria HDSS area in 2020 is presented in Figure 2. The shape of the pyramid is typical of a developing country with

declining rates of mortality and fertility. The population sex ratio (male per 100 females) was 98.9 in 2020. The age dependency ratio[1] was 63.5% in 2020 (see Appendix A).

Figure 2. Male and female population by age, Chakaria HDSS, 2020



CHAPTER 4

Mortality

Crude death rates and age-specific mortality rates by sex are presented in Table 1. The crude death rate was 5.9 per 1,000 population in 2020. The infant mortality rate was 41.8 per 1,000 live births. The child mortality rate was 2.8 per 1,000 children aged 1-4 years (Table 1).

[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).

Abridged Life Tables for males and females are presented in Table 2. Life expectancy at birth was about 68 years for males and 71 years for females. Figure 3 shows the probability of survival by sex during various age groups. The survivorship curve for males lies closely beneath that for females from early on and remains lower; however, after the age of 75 the female survivorship curve goes down faster and the gap between the two curve decreases. The rate of mortality of children aged less than 5 years (under-five mortality) was 51.3 per 1,000 live births in Chakaria HDSS in 2020 (Table 3).

Table 1. Age-specific death rate per 1,000 population by sex, Chakaria HDSS, 2020

Age (years)	No. of death			Death rate		
	Male	Female	Both	Male	Female	Both
<1*	54	48	102	43.0	40.5	41.8
<1 month	46	37	83	36.7	31.2	34.0
1-11 month	8	11	19	6.4	9.3	7.8
1-4	17	6	23	4.1	1.5	2.8
5-9	4	2	6	0.8	0.4	0.6
10-14	8	0	8	1.5	0.0	0.8
15-19	2	4	6	0.4	0.8	0.6
20-24	3	5	8	0.7	1.1	0.9
25-29	2	1	3	0.6	0.3	0.4
30-34	3	2	5	1.0	0.6	0.8
35-39	7	4	11	2.7	1.3	1.9
40-44	6	8	14	2.7	3.6	3.1
45-49	12	14	26	6.5	8.2	7.3
50-54	13	9	22	9.1	6.5	7.8
55-59	20	12	32	16.8	9.6	13.1
60-64	19	17	36	19.6	16.9	18.3
65-69	23	19	42	29.2	28.2	28.7
70-74	31	19	50	63.8	42.2	53.4
75-79	24	17	41	64.9	60.5	63.0
80-84	19	18	37	112.4	120.8	116.4
85+	21	25	46	128.8	189.4	155.9
All	**288**	**230**	**518**	**6.6**	**5.2**	**5.9**

*Per 1,000 live births

Table 2. Abridged Life Table, Chakaria HDSS, 2020

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	0.0464	0.0445	100,000	95,992	68.0	0.0429	0.0413	100,000	96,286	70.6
1	0.0041	0.0163	95,547	379,073	70.2	0.0015	0.0059	95,873	382,369	72.6
5	0.0008	0.0040	93,990	469,004	67.3	0.0004	0.0021	95,311	476,049	69.0
10	0.0015	0.0075	93,612	466,293	62.6	0.0000	0.0000	95,108	475,542	64.2
15	0.0004	0.0018	92,905	464,114	58.0	0.0008	0.0038	95,108	474,632	59.2
20	0.0007	0.0035	92,740	462,884	53.1	0.0011	0.0053	94,744	472,469	54.4
25	0.0006	0.0031	92,413	461,360	48.3	0.0003	0.0013	94,243	470,903	49.7
30	0.0010	0.0052	92,131	459,451	43.4	0.0006	0.0030	94,118	469,876	44.7
35	0.0027	0.0132	91,650	455,229	38.6	0.0013	0.0065	93,832	467,628	39.9
40	0.0027	0.0133	90,442	449,193	34.1	0.0036	0.0178	93,219	461,945	35.1
45	0.0065	0.0319	89,235	439,052	29.6	0.0082	0.0403	91,559	448,572	30.7
50	0.0091	0.0445	86,386	422,310	25.5	0.0065	0.0318	87,869	432,354	26.9
55	0.0168	0.0805	82,538	396,078	21.5	0.0096	0.0468	85,072	415,414	22.7
60	0.0196	0.0935	75,893	361,715	18.2	0.0169	0.0813	81,094	388,986	18.7
65	0.0292	0.1362	68,793	320,545	14.8	0.0282	0.1317	74,501	347,980	15.1
70	0.0638	0.2751	59,425	256,261	11.7	0.0422	0.1910	64,691	292,573	12.0
75	0.0649	0.2791	43,079	185,341	10.3	0.0605	0.2628	52,338	227,311	9.3
80	0.1124	0.4388	31,057	121,216	8.3	0.1208	0.4639	38,586	148,179	6.7
85+	0.1288	1.0000	17,429	135,285	7.8	0.1894	1.0000	20,685	109,219	5.3

The Abridged life table is constructed by 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, 2020

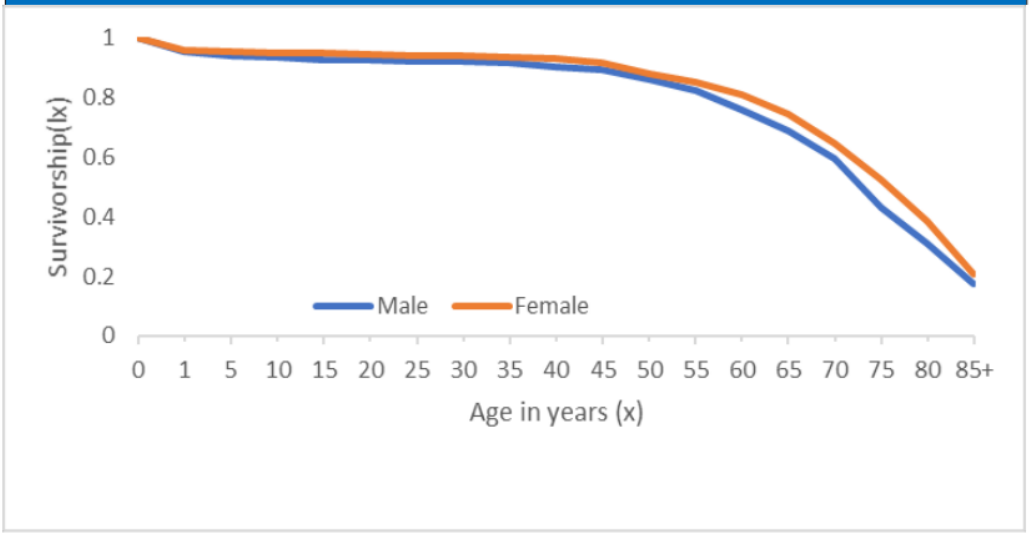


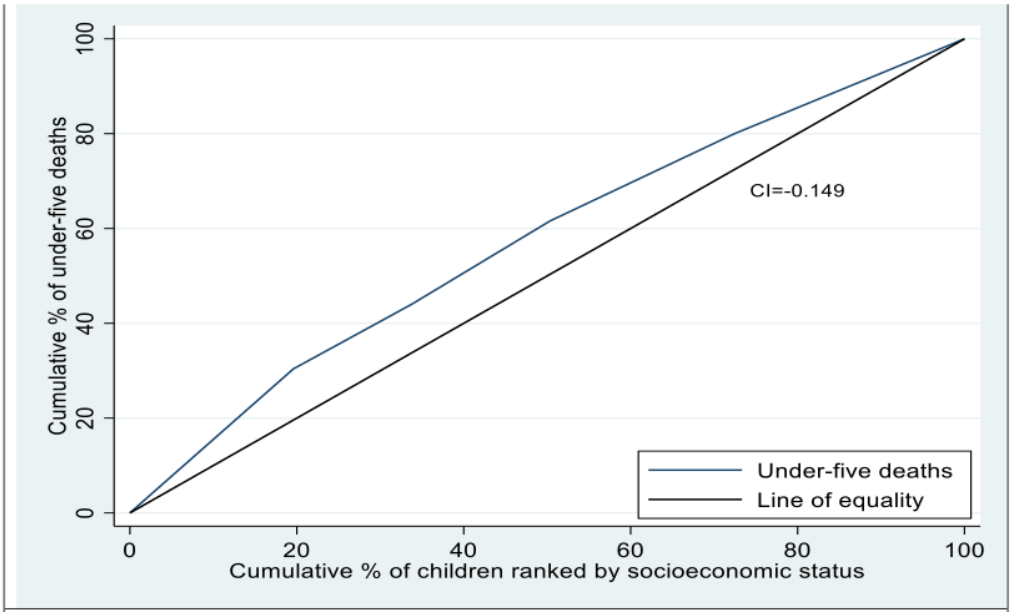
Table 3 presents the under-five mortality rate by household asset quintile. The under-five mortality rate was the lowest in the highest asset quintile. The under-five mortality rate from the lowest quintile was almost twice as much as that of the highest quintile. The under-five mortality rate was higher 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 are 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, 2020

Asset quintile	No. of births			No. of under-five deaths			Under-five mortality rate		
	Boy	Girl	Both	Boy	Girl	Both	Boy	Girl	Both
Lowest	268	210	478	20	18	38	74.6	85.7	79.5
Second	175	170	345	11	6	17	62.9	35.3	49.3
Middle	210	195	405	14	8	22	66.7	41.0	54.3
Fourth	259	280	539	13	10	23	50.2	35.7	42.7
Highest	343	329	672	13	12	25	37.9	36.5	37.2
All	1,255	1,184	2,439	71	54	125	56.6	45.6	51.3

Figure 4. Concentration curve for under-five mortality, Chakaria HDSS, 2020

[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 is distributed in favour of the poor (6). A value of zero indicates no relation between health and socioeconomic status (7).



CI=Concentration Index[2];

Causes of death

Verbal Autopsy (VA) 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 518 deaths were registered in 2020. Data were collected using a structured VA questionnaire developed by WHO and modified in 2016 (5). A group of trained medical personnel analyzed the information available against each case of death and ascertained the causes of death as per International Classification of Diseases (10th Revision).

Broad pattern of the causes of death

Non-communicable conditions were the leading cause of death for both males and females (58%). This was followed by maternal and neonatal condition (male-13%, female-17%) and trauma (male-13%, female-5%), and communicable diseases (male-7%, female-8%). For trauma, the proportion of deaths was higher for males than for females (Figure 5). Neonatal conditions were the leading causes of death in <15 years children and non-communicable diseases were the leading causes of death for adults and elderly people (Table 4).

Figure 5. Distribution of deaths by leading causes for males and females, Chakaria HDSS, 2020

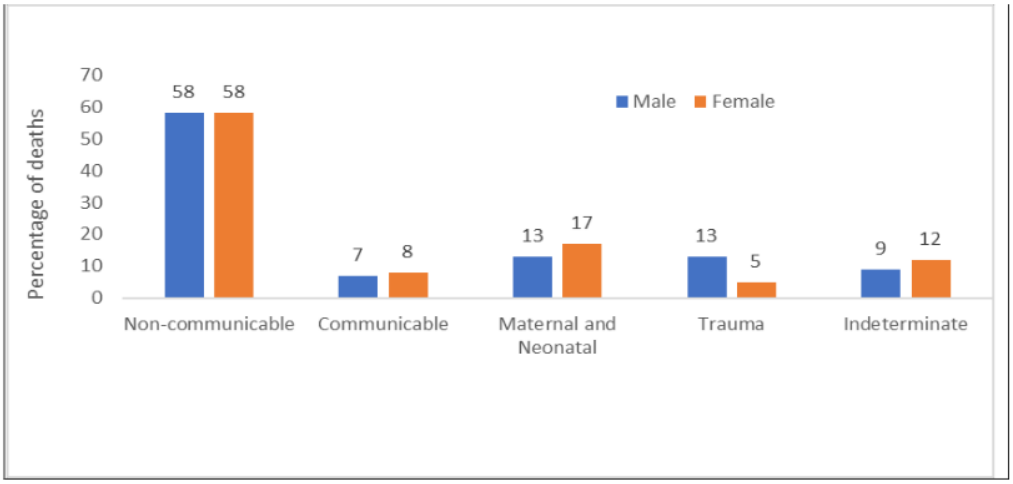


Table 4. Distribution of deaths by leading causes according to age groups, Chakaria HDSS, 2020

Cause group	Children (<15 years) (%)	Adults (15-49 years) (%)	Elderly (50+ years) (%)
Communicable	10.8	4.1	6.5
Non-communicable	12.9	69.9	75.8
Maternal and neonatal	51.8	5.5	0.0
Trauma	17.3	15.1	4.9
Indeterminate	7.2	5.5	12.7
Total	100.0	100.0	100.0

Stroke, malignant neoplasm, ischemic heart diseases, other forms of heart diseases, COPD, lastly, premature and low birth weight were the leading six causes of death for all ages. Table 5 presents the distribution of causes of death for males and females.

Table 5. Distribution of causes of death among males and females, Chakaria HDSS, 2020

Causes	Male (n=288)	Female (n=232)	Both (n=518)
Diarrhea	0.7	1.3	1.0
Tuberculosis	0.7	0.0	0.4
EPI Related	0.7	0.0	0.4

Respiratory Infections	2.4	4.3	3.3
Septicemia	0.7	0.0	0.4
Covid-19	0.7	1.3	1.0
All Other Communicable Diseases	1.0	0.9	1.0
Maternal Deaths	0.0	1.7	0.8
Premature and Low Birth Weight	5.9	4.3	5.2
Birth Asphyxia	3.1	4.3	3.7
All Other Neonatal Conditions	4.2	6.1	5.0
Malignant neoplasm	12.2	7.8	10.2
Malignant neoplasms of female genital organs	0.0	0.4	0.2
Congenital Malformation	2.1	1.3	1.7
Diabetes	2.4	4.3	3.3
All Other Endocrine Disorders	0.3	0.4	0.4
Neuro-psychiatric	1.0	0.4	0.8
Hypertensive Diseases	0.7	0.9	0.8
Ischemic Heart Diseases	9.4	6.1	7.9
Stroke	9.4	16.1	12.4
Other forms of heart disease	8.7	5.7	7.3
All Other Circulatory System Diseases	1.4	0.4	1.0
COPD	3.8	10.0	6.6
All Other Respiratory Diseases	1.4	0.0	0.8
Digestive Diseases	3.8	1.3	2.7
Renal Failure	1.4	2.2	1.7
All Other Non-Communicable Diseases	0.0	0.9	0.4
Transport Accidents	2.4	0.4	1.5
Falls	1.4	1.7	1.5
Drowning	4.5	2.2	3.5
All Other External Causes of Accidental	1.7	0.0	1.0
Suicide	1.0	0.9	1.0
Homicide	1.7	0.0	1.0
All Other External Causes of Mortality	0.3	0.0	0.2
Fever of unknown Origin	2.4	2.2	2.3
Sudden Infant Death	0.3	0.9	0.6
All Other Unknown and Unspecified Cause	5.9	9.1	7.3
All	**100.0**	**100.0**	**100.0**

CHAPTER 5

Fertility

The crude birth rate in 2020 was 27.7 per 1,000 population, which was higher than the rate in 2019 (24.2 per 1,000 population) (Table 20). The fertility rate was highest among women aged 20-24 years (Table 6). The total fertility rate (TFR) in 2020 was 2.8 per woman, which was slightly higher than that of 2019 (2.7 per woman).

Table 6. Age-specific fertility rate per 1,000 women aged 15-49 years, Chakaria HDSS, 2020

Age (years)	No. of females	No. of births			Birth rate
		Male	Female	Both	
15-19	5216	164	194	358	68.6
20-24	4714	465	435	811	172.0
25-29	3755	320	294	577	153.7
30-34	3292	202	166	362	110.0
35-39	3048	90	76	142	46.6
40-44	2227	14	14	24	10.8
45-49	1702	0	2	2	1.2
All	23,954	1,255	1,181	2,276	-
TFR (15-49)					2.8

TFR=Total fertility rate expressed per woman

Table 7 presents crude birth rates by household asset quintiles. The crude birth rate for both sexes was lowest among the third quintile and was higher for the fourth and fifth quintile.

Table 7. Crude birth rate per 1,000 population by asset quintile and sex, Chakaria HDSS, 2020

Asset quintile	Midyear population			No. of births			Birth rate		
	Male	Female	Both	Boy	Girl	Both	Boy	Girl	Both
Lowest	9,621	9,868	19,489	268	210	478	27.9	21.3	24.5
Second	7,011	7,006	14,017	175	170	345	25.0	24.3	24.6
Middle	8,388	8,306	16,694	210	195	405	25.0	23.5	24.3
Fourth	9,183	9,071	18,254	259	280	539	28.2	30.9	29.5
Highest	9,629	10,061	19,690	343	329	672	35.6	32.7	34.1
All	43,832	44,312	88,144	1,255	1,184	2,439	28.6	26.7	27.7

Of the 2,874 pregnancy outcomes in 2020, 84.9% ended with live births. Among the

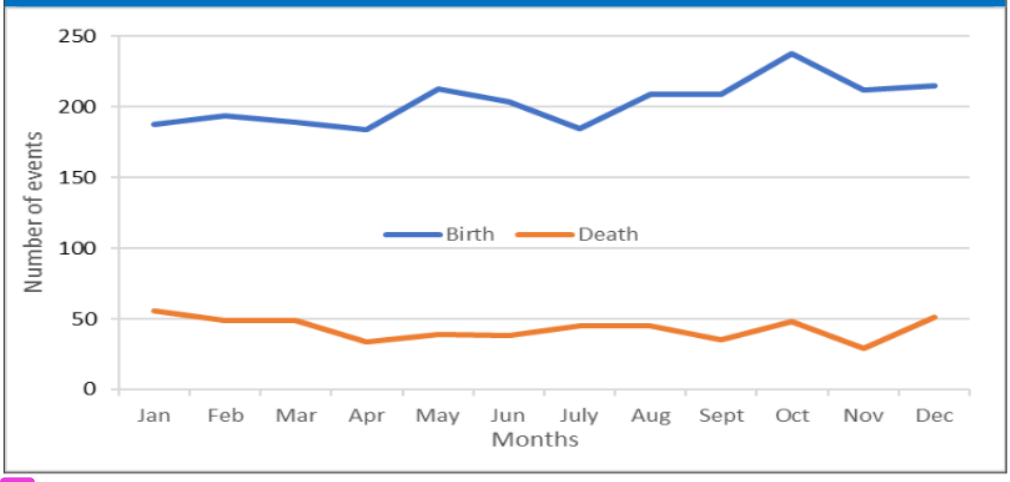
remaining 15.1%, 9.0 percentage points were spontaneous abortions, 2.2 percentage points were induced abortions, and 3.9 percentage points resulted in stillbirths (Table 8).

Table 8. Pregnancy outcome, Chakaria HDSS, 2020

Pregnancy outcome	No.	%
Spontaneous abortion	258	9.0
Induced abortion	64	2.2
Stillbirth	111	3.9
Live birth	2,441	84.9
Total number of pregnancy outcomes*	2,874	100.0

*Forty (two live births-32 and one live birth and one stillbirth-4, two stillbirths-2) multiple births were recorded, hence total number of pregnancies were 2,854.

Figure 6. Number of births and deaths by month, Chakaria HDSS, 2020



The distribution of births and deaths by month is 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 in May and between August and December.

Migration

In 2020, the out-migration rate was higher at 38.9 than in-migration rate at 34.6, per 1,000 population (Table 9). The rates were slightly higher for out-migration and higher for in-migration compared to those in 2019 (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 2020. The sex differential in both types of migrations was prominent. The number of in-migration and the number of out-migration was highest in January for both males and females.

Table 9. Migration rate per 1,000 population by asset quintile and sex, Chakaria HDSS, 2020

Asset quintile	Midyear population			In-migration rate			Out-migration rate		
	Male	Female	Both	Male	Female	Both	Male	Female	Both
Lowest	9,621	9,868	19,489	30.1	40.5	35.4	36.6	59.9	48.4
Second	7,011	7,006	14,017	21.8	34.1	28.0	21.1	48.5	34.8
Middle	8,388	8,306	16,694	20.0	37.8	28.9	23.4	45.1	34.2
Fourth	9,183	9,071	18,254	22.8	42.4	32.5	25.2	48.2	36.6
Highest	9,629	10,061	19,690	34.5	55.5	45.2	30.4	46.5	38.6
All	43,832	44,312	88,144	26.3	42.8	34.6	27.8	49.9	38.9

Table 10. Number of migrants by sex and month, Chakaria HDSS, 2020

Month	In-migration			Out-migration		
	Male	Female	Both	Male	Female	Both
January	186	228	414	166	244	410
February	142	138	280	144	172	316
March	102	146	248	106	188	294
April	91	140	231	57	117	174
May	52	104	156	42	102	144
June	75	173	248	78	190	268
July	58	149	207	70	170	240
August	101	179	280	83	224	307
September	70	161	231	101	194	295
October	83	152	235	133	181	314
November	85	144	229	132	199	331
December	108	184	292	108	230	338
All	1,153	1,898	3,051	1,220	2,211	3,431

Origin and destination of migrants

In 2020, 25.8% of 1,153 male in-migrants moved into Chakaria HDSS households from abroad, whereas 18.8% of 1,220 male out-migrants moved out of Bangladesh from the Chakaria HDSS area (Table 11). International in and out migration by females was negligible. Around 59% of the in-migrations within Bangladesh originated from the Cox's Bazar district, and similar proportions were observed for out-migrations destined for Cox's Bazar. A change of residence between two households within the same village was not considered a migration. Among all in-migrations and out-migrations within Chakaria upazila in 2020, 84.8% originated from and 86.4% were destined outside the HDSS area.

Table 11. Origin and destination of migrants by sex, Chakaria HDSS, 2020

Origin or destination	In-migration			Out-migration		
	Male (%)	Female (%)	Both (%)	Male (%)	Female (%)	Both (%)
Inside Bangladesh	74.2	98.8	89.5	81.2	99.5	93.0
Outside Bangladesh	25.8	1.2	10.5	18.8	0.5	7.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
Total number of migrants	1,153	1,898	3,051	1,220	2,211	3,431
Cox's Bazar District						
Inside Chakaria	54.6	60.8	58.9	49.0	58.9	55.8
Outside Chakaria	45.4	39.2	41.1	51.0	41.1	44.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
Total no. of migrants	855	1,875	2,730	991	2,200	3,191
Chakaria Upazila						
Inside HDSS area	13.5	15.9	15.2	12.8	13.9	13.6
Outside HDSS area	86.5	84.1	84.8	87.2	86.1	86.4
Total	100.0	100.0	100.0	100.0	100.0	100.0
Total no. of migrants	467	1,141	1,608	486	1,296	1,782

Reasons for migration

Table 12 presents the reasons for migration by sex. 45.2% of the migrants moved out

due to family-related issues, followed by housing (30.6%), work (12.7%), and education (9.0%). The reasons for moving out for males were different from those of females. 52.2% of male in-migrants moved due to housing-related issues whereas only 16.1% of the females moved due to that reason. On the other hand, 63.4% of female in-migrants moved due to family-related issues - mostly marriage, while 18.1% of males moved due to family-related reasons (Table 12). The most prominent reasons for migration for males were housing-related (around 44%), followed by reasons that were family-related (around 25%). For females, the most prevailing reason for migration was family related (around 68%), followed by housing related reasons (around 15%). The reasons for out-migration were similar to the reasons for in-migration, except for the reason due to the COVID-19 pandemic which was an issue newly introduced in the year 2020. Around 9.4% of male in-migrations and 2.1% of female in-migrations were due to the ongoing pandemic situation. Age-specific migration rates and age-specific breakdowns of origin, destination, and reasons for migrations have been provided in Appendix C through F.

Table 12. Reasons for migration, Chakaria HDSS, 2020

Reasons for migration	In-migration			Out-migration		
	Male (%)	Female (%)	Both (%)	Male (%)	Female (%)	Both (%)
Family-related	25.8	69.1	52.7	26.1	66.9	52.4
Work-related	9.8	6.0	7.4	17.2	8.6	11.7
Housing-related	44.2	15.5	26.4	43.8	14.7	25.1
Education	4.6	3.7	4.0	6.5	4.1	4.9
Due to Covid-19 pandemic	9.4	2.1	4.9	0.1	0.3	0.2
Other	6.2	3.5	4.6	6.4	5.3	5.7
Total	100.0	100.0	100.0	100.0	100.0	100.0
Total no. of migrants	1,153	1,898	3,051	1,220	2,211	3,431

CHAPTER 7

Marriage

In total 2,102 marriages took place in the surveillance villages in Chakaria during 2020 and the crude marriage rate was 33.0 per 1,000 population, with the rate among females being almost twice as much the rate among males. Among males, the highest marriage rate was found in the age group of 25-29 years and in the age group of 15-19 years for females. Throughout 2020, 121 divorces were registered in the Chakaria HDSS area, and the crude divorce rate was 1.9 per 1,000 population with rates being higher for females than for males (Table 13). The highest number of marriages took place in July and the lowest in May (Figure 7).

Table 13. Crude rate of marriage and divorce by age and sex, Chakaria HDSS, 2020

Age (years)	Marriage			Divorce		
	Male	Female	Both	Male	Female	Both
10-14	0.2	11.3	5.7	0.0	0.0	0.0
15-19	22.0	200.5	107.9	0.9	5.0	2.9
20-24	66.2	137.0	103.4	2.4	9.3	6.0
25-29	87.2	34.9	59.2	3.4	6.9	5.3
30-34	65.3	10.9	36.2	7.0	1.5	4.1
35-39	18.2	5.6	11.4	3.4	1.0	2.1
40-44	6.3	4.0	5.2	1.3	0.0	0.7
45-49	2.2	0.0	1.1	0.0	1.2	0.6
50-54	9.1	0.7	5.0	1.4	0.0	0.7
55-59	1.7	1.6	1.6	0.0	0.8	0.4
60-64	0.0	0.0	0.0	0.0	0.0	0.0
65+	7.6	0.0	4.1	1.0	0.0	0.5
All	22.0	43.9	33.0	1.4	2.4	1.9

Figure 7. Number of marriages by month, Chakaria HDSS, 2020

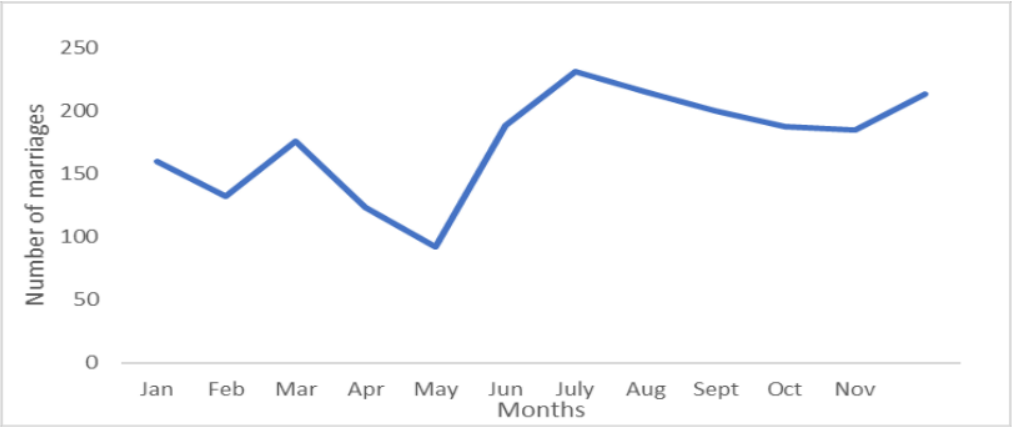


Table 14 presents singulate mean age at marriage (SMAM), and mean and median ages at first marriage. The SMAM, mean and median ages at first marriage for males were 27.2 years, 26.3 years, and 26.8 years respectively. For females, the mean and median ages at first marriage were 19.8 and 20.6 years, and the SMAM was 21.2 years. The SMAM, mean and median ages at first marriage remained nearly the same for males and slightly higher for females compared to those in 2019. 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, 2020

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	25.0	23.1	24.7	20.8	19.2	20.4
Second	26.1	24.0	25.8	20.8	19.2	20.4
Middle	26.4	24.8	25.9	21.2	19.5	20.8
Fourth	28.1	26.5	27.9	21.4	20.1	20.8
Highest	29.2	28.9	29.1	21.1	20.3	20.2
All	27.2	26.3	26.8	21.2	19.8	20.6

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.

CHAPTER 8

Safe Motherhood Practices

The health-related activities of icddr,b in Chakaria included facilitation of provision of safe motherhood services (e.g. antenatal care, delivery services, and postnatal care) by the trained midwives have been providing service from village health posts, 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 Community Skilled Birth Attendants (CSBAs) 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 6 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

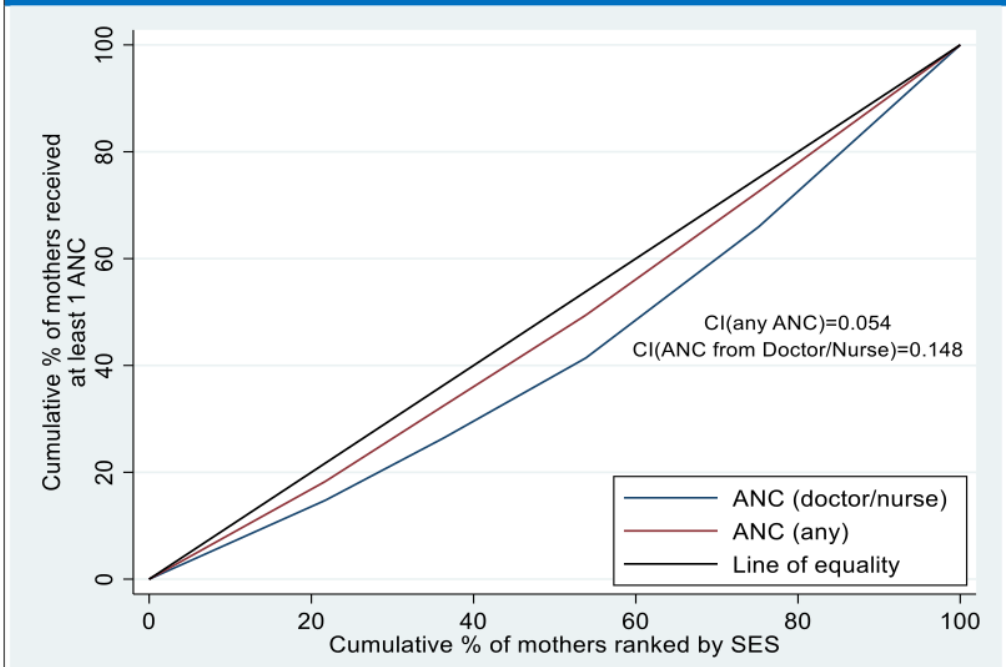
Among 1,772 pregnancies with ANC information available, 82.3% received at least one antenatal care (ANC). These women received services from various sources. Among these sources, the nurses/doctors were dominant, followed by Midwives, FWV, and FDSR/CMH (Table 15). The use of at least one ANC during pregnancy was fairly equitable in 2020 in the Chakaria HDSS area. Sixty-nine percent of the pregnant women from the lowest socioeconomic quintile used at least one ANC during pregnancy as opposed to 91% 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 closely below the line of equality. However, the index of 0.05 indicates the level of disparity to be very low (Figure 8). On the contrary, the use of ANC service from doctors or nurses indicated a higher level of inequity where the rate was 82.7% for women in the highest socioeconomic quintile and only 41.0% 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 with higher concentration index (0.148). Thus, the distribution of ANC service from doctor/nurse was more unequal than the distribution of ANC service from any other sources.

Table 15. Antenatal care by sources and asset quintile, Chakaria HDSS, 2020

Asset quintile	Received any ANC (%)	Midwife (%)	FWV (%)	Nurse/ doctor (%)	FDSR/ CMH (%)	None (%)	No. of Pregnancies*¥
Lowest	69.4	20.5	14.8	41.0	10.6	30.6	385
Second	79.9	27.4	15.8	48.3	9.7	20.1	259
Middle	79.7	21.0	16.5	51.6	7.4	20.3	310
Fourth	89.4	16.9	10.1	69.6	9.3	10.6	378
Highest	90.9	10.9	5.9	82.7	7.3	9.1	440
Total	82.3	18.5	12.0	60.4	8.8	17.7	1772

*Multiple responses from same woman recorded if she had multiple pregnancies in 2020
¥Some pregnancies were omitted due to missing ANC information as mother herself could not be interviewed
ANC=Antenatal care; FWV=Family welfare visitor; FDSR=Family Development Services and Research; CMH= Christian Memorial Hospital

Figure 8. Concentration curve for receiving at least one ANC, Chakaria HDSS, 2020



CI= Concentration Index

Use of postnatal care services

Any postnatal check-up of both women and children up to 42 days of their delivery is of

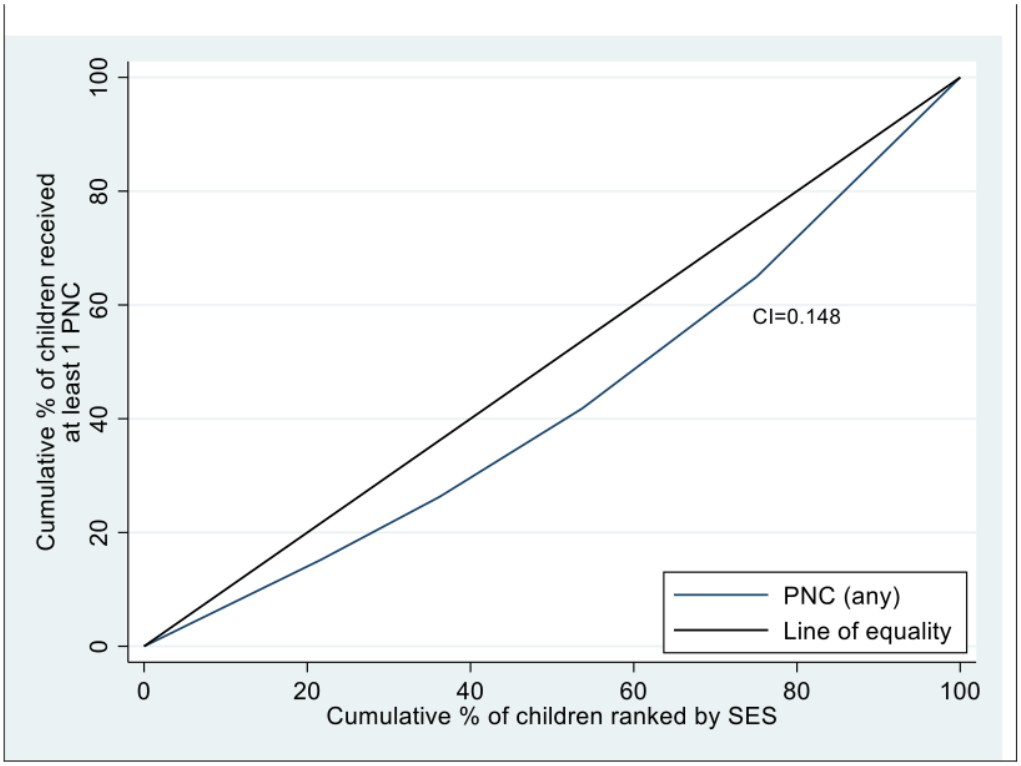
interest here. It was observed that only 49.7% of the delivering women received at least one postnatal care (PNC) in 2020. The nurses, doctors and midwives were the dominant sources for PNC. The utilization of services was characterized by large inequities and the services concentrated among the richest segment of the society (Table 16). Figure 9 also shows the current inequality of the use of PNC services among different socioeconomic groups. The positive value of concentration index (CI) indicates that the rich people were more intended to receive the services compared to the poor.

Table 16. Postnatal care by sources and asset quintile, Chakaria HDSS, 2020

Asset quintile	Received any PNC (%)	Midwife (%)	FWV (%)	Nurse/ doctor (%)	FDSR/ CMH (%)	None (%)	No. of Pregnancies*¥
Lowest	34.9	10.9	2.3	22.1	0.5	65.1	384
Second	37.8	9.7	5.0	23.2	3.5	62.2	259
Middle	44.2	12.6	3.9	24.8	1.0	55.8	310
Fourth	53.8	11.6	2.4	37.2	3.7	46.2	379
Highest	69.9	11.1	2.9	52.5	5.0	30.1	442
Total	49.7	11.2	3.2	33.5	2.8	50.3	1774

*Multiple responses from same woman recorded if she had multiple pregnancies in 2020
PNC = Postnatal care
¥Some pregnancies were omitted due to missing ANC information as mother herself could not be interviewed

Figure 9. Concentration curve for receiving at least one PNC, Chakaria HDSS, 2020



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. 57.1% of 2,431 deliveries in Chakaria were assisted by the TBAs as opposed to 42.9% of the deliveries assisted by the SBAs. The rate of seeking services from 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.)

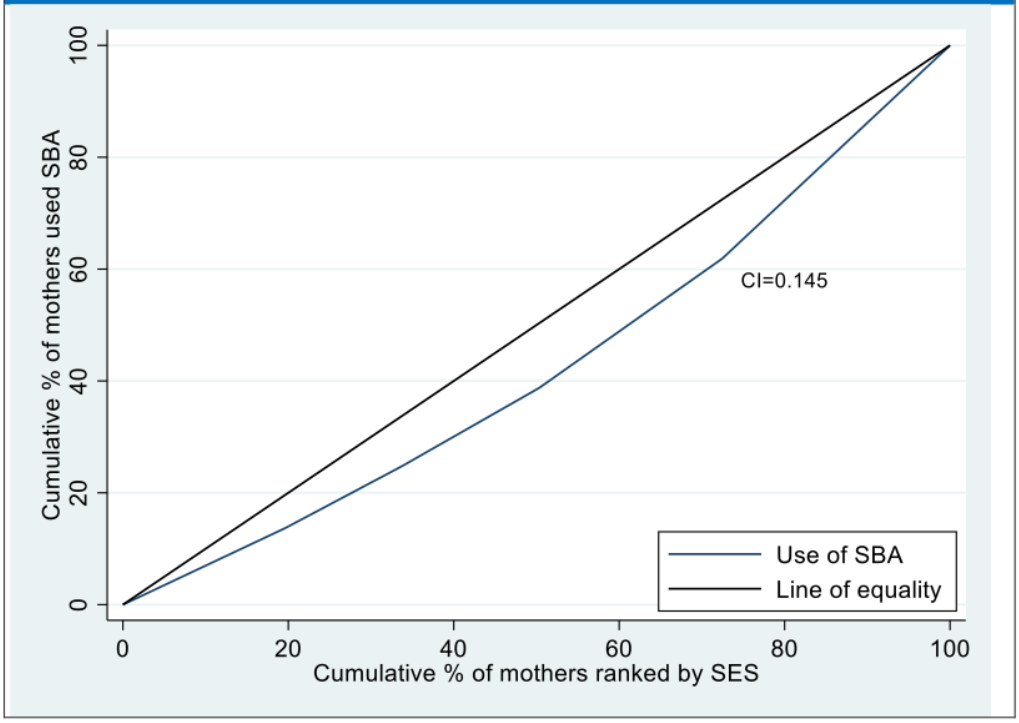
Table 17. Assistance during delivery by asset quintile, Chakaria HDSS, 2020

Asset	Midwife	FWV	Nurse/ doctor	TBA	No. of

quintile	(%)	(%)	(%)	(%)	Pregnancies*
Lowest	13.0	2.9	14.0	70.1	478
Second	9.9	4.7	19.0	66.4	342
Middle	14.4	4.7	17.1	63.9	404
Fourth	13.2	3.5	28.1	55.2	538
Highest	10.2	3.6	45.6	40.7	669
Total	12.1	3.8	27.0	57.1	2431

*Multiple responses from same woman recorded if she had multiple pregnancies in 2020

Figure 10. Concentration curve for use of SBA services, Chakaria HDSS, 2020



Place of delivery

Of the total number of deliveries, 71.3% took place at home. Only 28.7% of 2,431 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 with a very high level of disparity (Table 18 and Figure 11).

Table 18. Place of delivery by asset quintile, Chakaria HDSS, 2020			
Asset quintile	Hospital/Clinic (%)	Home (%)	No. of Pregnancies*
Lowest	13.4	86.6	478
Second	22.2	77.8	342
Middle	18.3	81.7	404
Fourth	28.6	71.4	538
Highest	49.2	50.8	669
Total	28.7	71.3	2431
*Multiple responses from same woman recorded if she had multiple pregnancies in 2020			

Figure 11. Concentration curve for facility-based delivery, Chakaria HDSS, 2020

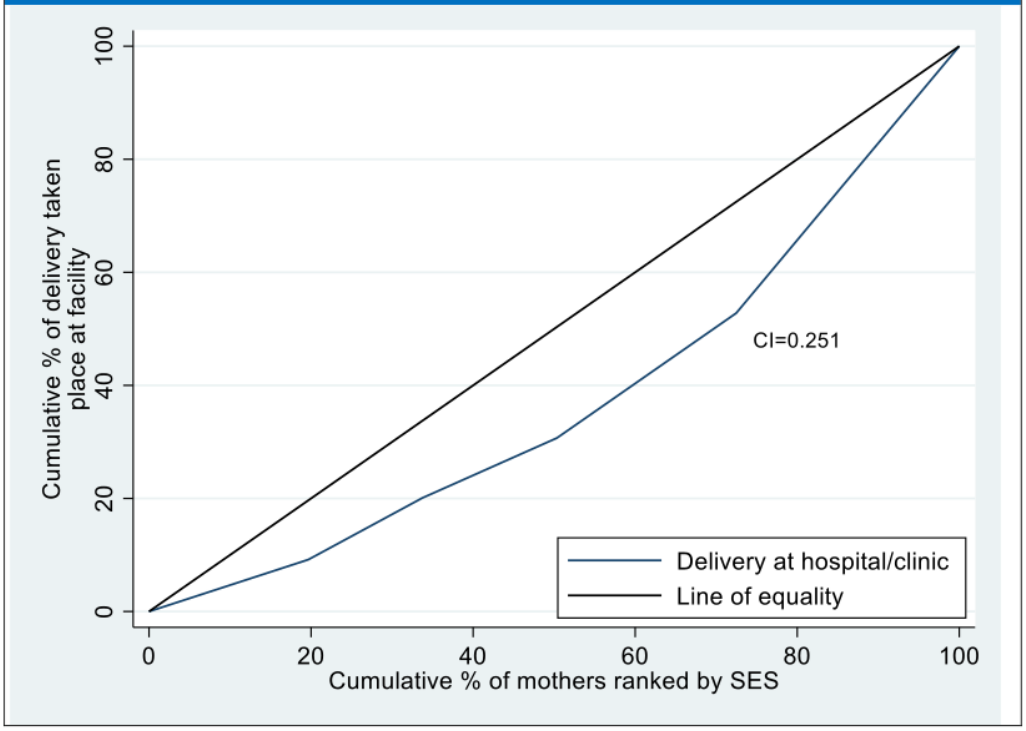
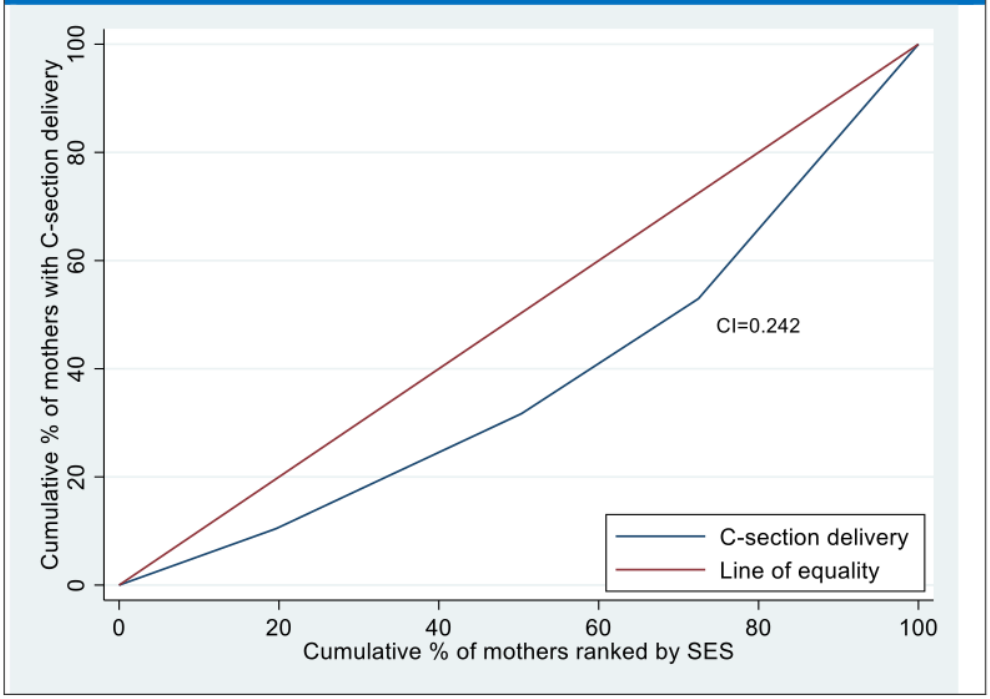


Table 19 shows caesarean-section delivery by household asset quintile in 2020. Caesarean-section delivery accounted for 11.8% of the total deliveries and 41.2% of the facility-based deliveries in the Chakaria HDSS area in 2020. Although the number of deliveries through caesarean sections was small, the number of women giving birth by caesarean sections exhibited high level of discrepancies between the highest and lowest quintiles (Table 19 and Figure 12).

Table 19. Caesarean-section delivery by asset quintile, Chakaria HDSS, 2020			
Asset quintile	**No. of caesarean-section delivery**	**Caesarean-section delivery (%)**	**Total no. of Deliveries***
Lowest	30	6.3	478
Second	28	8.2	342
Middle	33	8.2	404
Fourth	61	11.3	538
Highest	135	20.2	669
Total	287	11.8	2,431

*Multiple responses from same woman recorded if she had multiple pregnancies in 2020

Figure 12. Concentration curve for caesarean-section delivery, Chakaria HDSS, 2020



CHAPTER 9

SDG and Other Health and Socio-demographic Indicators

Sustainable development goals, popularly known as SDGs, include 17 goals with 169 associated targets which were announced for UN member States in order to eradicate poverty, inequality, and injustice, and climatic changes by 2030. Though Millennium Development Goals (MDGs) attainment in Bangladesh was relatively notable, the progress for most indicators could not meet the desired targets. The SDGs address the origins of poverty and universal development needs, which will work for all people and thus expectantly go much further than the MDGs. Sixteen indicators out of all basic and complementary SDG indicators can be calculated using the data of Chakaria HDSS (8).

The major demographic and health indicators (including the SDGs) during 2016-20 are presented in Table 20. The fertility indicators were almost similar and with a declining trend in the natural rate of population increase was observed during 2015-19, which slightly increased in 2020. Indicator rates in the Chakaria HDSS area have been compared with those in the Matlab government service area, another rural field site of icddr,b (9). In 2020, the rate of natural increase and the annual population growth rate in the surveillance area of Chakaria was 21.8 and 1.7%, respectively (Table 20).

In 2020, twenty-nine percent of births in Chakaria HDSS were delivered at facilities (hospitals or clinics). The percentage of births at facilities in 2020 has remained similar to that of the previous year. About forty-three percent of the deliveries were assisted by Skilled Birth Attendants (SBAs) in Chakaria during 2020 (Table 20).

The legal age of marriage is 18 years for females and 21 years for males in Bangladesh. The percentage of underage female marriage had been following a declining trend until 2020. In 2020, 34% of the women were married before reaching their 18th birthday, this rate was higher than the previous year. Among males, 18% were married before the age of 21 years in 2020. The proportion of male marriages before 21 years has remained the same between 2019 and 2020. The percentage of women aged 20-24 years who were in marital union by the age of 18 remains on the decline between 2016 to 2020.

Total fertility rate and death rates in the Chakaria HDSS area during 2020 were higher than their national counterparts. Facility-based deliveries, receiving service from SBAs, antenatal care coverage, and postnatal care coverage were comparatively lower than the national rates. The full immunization coverage rate was found to be slightly lower than both the rates in the previous years and the respective national rate.

Among the boys, 64.1% completed the last grade of primary level education, and 30% completed the last grade of secondary level education; while among the girls, the primary and secondary completion rates are 90% and 42% respectively. The primary level and secondary level rates were higher for the girls than for the boys, and these rates for girls were higher compared to the national level whereas this is otherwise for their male counterparts. The literacy rate of 15-24 years was similar to the national literacy rate in Bangladesh. Compared to the national level, a lower percentage of active

age groups for women were engaged in economic activities in the Chakaria HDSS area.

Table 20. SDG and other health and socio-demographic indicators, Chakaria HDSS, 2016 – 2020, Matlab HDSS and National

Rate	Chakaria HDSS area					Matlab HDSS Govt. service area		National
	2016	2017	2018	2019	2020	2019		
Crude birth rate	25.7	25.6	24.9	24.2	27.7	21.9	-	18.5[e]
Total fertility rate[a]	2.9	2.9	2.8	2.7	2.8	2.6	SDG	2.3[d]
Neonatal mortality[b]	30	35.2	31.3	29.5	34.0	22.3	SDG	30.0[d]
Post-neonatal mortality[b]	11.5	15.6	9.3	13.3	7.8	6.4	-	-
Infant mortality rate[b]	41.5	50.8	40.6	42.9	41.8	28.7	-	38.0[d]
Child mortality rate (1-4 yrs)	2.7	2.9	3.1	2.9	2.8	2.5	-	-
Under-five mortality rate[b]	51.2	61.3	52.3	50.5	51.3	38.6	SGD	45.0[d]
Crude death rate	5.7	5.8	5.9	5.8	5.9	7.9	-	5.5[e]
Rate of natural increase	20	19.8	19	18.4	21.8	14.0	-	-
In-migration rate	36	33.6	34.4	24.6	34.6	46	-	-
Out-migration rate	41.8	46.9	42.7	34.1	38.9	52.8	-	-
Growth rate (%)	1.4	0.6	1.1	0.9	1.7	1.4	-	1.1[e]
Adolescent birth rate	54.9	54.8	43.2	47.0	68.6	72.8	SDG	83.0[e]
Stillbirth rate[c]	39.8	34.0	27.7	39.2	43.5	13.2	SDG	25.0[e]
Facility-based delivery (%)	22.9	23.6	26.6	28.6	28.7	71	-	50.0[d]
Received assistance from [illegible]A during delivery (%)	35.3	38.7	37.4	39.7	42.9	76.1	SDG	53.0[d]
Antenatal care coverage (at least 1 visit) (%)	87.1	87.3	85.2	88.8	82.3	93.6	SDG	92.0[d]
Antenatal care coverage (at least 4 visits) (%)	33.1	32.9	28.6	28.9	24.2	30.3	SDG	47.0[d]
Postnatal care coverage (1 visit) (%)	49.2	53.2	51.6	54.3	49.7	-	SDG	52.5[d]
Male marriage at ages under 21 years (%)	22.8	19.0	20.4	18.1	18.1	6.1	-	-
Female marriage at ages under 1[illegible] years (%)	34.6	32.8	29.2	29.5	34	33.2	-	-
Female aged 20-24 who were married or in a union by age 18 (%)	29.8	28.8	27.1	25.9	24.7	-	SDG	59.0[d]

[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. 2019. *Bangladesh Demographic and Health Survey 2017-2019: Key Indicators*. Dhaka, Bangladesh, and Rockville, Maryland, USA: NIPORT, Mitra and Associates, and ICF International;

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

'-'Data not available

Table 20. (contd...)

Rate	Chakaria HDSS area					Matlab HDSS Govt. area		National
	2016	2017	2018	2019	2020	2019		
Children receiving full immunization (%)	83.3	84.2	86.3	85.5	82.9	-	SDG	85.6[d]
1-year old children immunized against measles (%)	87.7	87.9	88.7	88.5	85.6	-	SDG	87.9[d]
Primary education completion rate for girls (%)	86.2	88.9	90.1	91.6	90.1	-	SDG	89.3[d]
Primary education completion rate for boys (%)	57.5	60.5	63.3	65.2	64.1	-	SDG	82[d]
Secondary education completion rate for girls (%)	35.6	39.2	43.3	44	42.1	-	SDG	34.3[d]
Secondary education completion rate for boys (%)	28.2	31	32.5	32.9	30.2	-	SDG	40.8[d]
Tertiary enrollment rate for women (%)	14.3	15.5	19.2	17.7	12.0	-	SDG	29[d]
Tertiary enrollment rate for men (%)	13.1	13	15	13.4	8.4	-	SDG	37.4[d]
Literacy rate of 15-24-year-old women (%)	97.4	97.8	98.2	98.4	98.6	-	SDG	97.3[d]
Literacy rate of 15-24-year-old men (%)	92	92.5	93.1	93.6	93.9	-	SDG	95.8[d]
Employment to population ratio (EPR) for women (15+ years of age) (%)	15.5	14.8	14.9	14.9	13.4	-	SDG	33.9[e]
Employment to population ratio (EPR) for men (15+ years of age) (%)	83.5	83	82.9	82.7	80.9	-	SDG	78.0[e]
Women without incomes of their own (%)	6.2	5.9	5.6	5.4	5.3	-	SDG	6.7[e]

[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. 2019. *Bangladesh Demographic and Health Survey 2017-2019: Key Indicators*. Dhaka, Bangladesh, and Rockville, Maryland, USA: NIPORT, Mitra and Associates, and ICF International;

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

'-'Data not available

BIBLIOGRAPHY

1. Bhuiya A, Ribaux C, and Eppler P. Community-led primary healthcare initiatives: lessons from a project in rural Bangladesh. In J Rohde and J Wyon (eds.) Community-Based Health Care: Lessons from Bangladesh to Boston. Boston: Management Sciences for Health. 2002:87-111.

2. Eppler P, Bhuiya A, and Hossain M. A process-oriented approach to the establishment of Community-based Village Health Posts. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 1996:37p.

3. Hanifi M A, Mamun A. Profile: The Chakaria Health and Demographic Surveillance System. *International journal of Epidemiology*. 2012; 41:667-675

4. Filmer D, and Pritchett LH. Estimating wealth effects without expenditure data-or tears: an application to educational enrollments in states of India. *Demography*. 2001;38(1):115-132.

5. Nichols EK, Byass P, Chandramohan D, Clark SJ, Flaxman AD, Jakob R. The WHO 2016 verbal autopsy instrument: An international standard suitable for automated analysis by InterVA, InSilicoVA, and Tariff 2.0. *PLoS Med*. 2018;15(1):e1002486. doi: https://doi.org/10.1371/journal.pmed.1002486

6. Erreygers G. Correcting the Concentration Index. *Journal of Health Economics*. 2009;28(2):504–515.

7. Evans T, Whitehead M, Diderichsen F, Bhuiya A, and Wirth M. Challenging inequities in health: from ethics to action. Oxford University Press. 2001.

8. Sustainable Development Solutions Network. Indicators and a monitoring framework for the sustainable development goals: launching a data revolution for the SDGs. Revised working draft (version 7). March 20, 2015.

9. International Centre for Diarrhoeal Disease Research, Bangladesh. Health and Demographic Surveillance System-Matlab. Volume 50. Registration of health and demographic events 2015. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 2019:73p. (Scientific report no. 135).

10. District Statistics 2011, Cox's Bazar, Bangladesh Bureau of Statistics (BBS), SID, Ministry of Planning, Government of The People's Republic of Bangladesh, December 2013.

ADDITIONAL READINGS

1. Hanifi SMA, Jahan N, Sultana N, Hasan SA, Paul A, Reidpath DD. Millions of Bangladeshi Children Missed Their Scheduled Vaccination Amidst COVID-19 Pandemic. Front Public Health. 2022; 9:738623. doi: 10.3389/fpubh.2021.738623. PMID: 35111708; PMCID: PMC8801521.
2. Nielsen S, Sujan HM, Benn CS, Aaby P, Hanifi SMA. Oral Polio Vaccine Campaigns May Reduce the Risk of Death from Respiratory Infections. Vaccines. 2021; 9(10):1133. https://doi.org/10.3390/vaccines9101133
3. Hanifi, Syed Manzoor Ahmed, et al. "Insights Into Excess Mortality During the First Months of the COVID-19 Pandemic From a Rural, Demographic Surveillance Site in Bangladesh."Frontiers in Public Health (2021): 1016.
4. Hanifi, S. M., Nidhiya Menon, and Agnes Quisumbing. The Impact of Changing Climate on Children's Nutritional Status in Bangladesh. No. 14657. Institute of Labor Economics (IZA), 2021.
5. Nielsen, Sebastian, et al. "National immunisation campaigns with oral polio vaccine may reduce all-cause mortality: Analysis of 2004–2019 demographic surveillance data in rural Bangladesh." EClinicalMedicine 36 (2021): 100886.
6. Rabbani MG, Akter O, Hasan MZ, Samad N, Mahmood SS, Joarder T. Knowledge, Attitude, and Practice Towards COVID-19 Among People in Bangladesh: A Telephonic Cross-sectional Survey. JMIR Form Res. 2021 Apr 22. doi: 10.2196/28344. Epub ahead of print. PMID: 34519660
7. Mia MN, Mahmood SS, Iqbal M, Bhuiya A, Pallikadavath S, Stones W. The Bangladesh Maternal Health Voucher Scheme: impact on completeness of antenatal care provision. J Biosoc Sci. 2021 Jan 25:1-8. doi: 10.1017/S0021932020000784. Epub ahead of print. PMID: 33487188.
8. Hanifi, Syed Manzoor Ahmed, et al. "Penta is associated with an increased female-male mortality ratio: cohort study from Bangladesh. "Human vaccines & immunotherapeutics (2020): 1-8.
9. Hanifi, Syed Manzoor Ahmed, et al. "Diphtheria-tetanus-pertussis (DTP) vaccine is associated with increased female-male mortality rate ratios. A meta-analysis of studies of DTP administered before and after measles vaccine."The Journal of Infectious Diseases (2020).
10. Hanifi, Syed Manzoor Ahmed, and Mizanur Rahman. "BCG vaccination in Bangladesh: should it be given at birth or given along with pentavalent?"International Journal of Epidemiology 49.5 (2020): 1735-1738.
11. Mahmood SS, Rasheed S, Chowdhury AH, Hossain A, Selim MA, Hoque S, et al. Feasibility, acceptability and initial outcome of implementing community scorecard to monitor community level public health facilities: experience from rural Bangladesh. International journal for equity in health. 2020;19(1):155.
12. Bennett S, Ekirapa-Kiracho E, Mahmood SS, Paina L, Peters DH. Strengthening social accountability in ways that build inclusion, institutionalization and scale: reflections on FHS experience. International journal for equity in health. 2020;19(1):220.
13. Hanifi, S.M.A., Hossain, A., Chowdhury, A.H., Hoque S, Selim M.A., Mahmood S.S., Bhuiya A. Do community scorecards improve utilisation of health services in community clinics: experience from a rural area of Bangladesh. Int J Equity Health 19, 149 (2020). https://doi.org/10.1186/s12939-020-01266-5.
14. Meyer D, Bishai D, Ravi SJ, Rashid H, Mahmood SS, Toner E, et al. A checklist to improve health system resilience to infectious disease outbreaks and natural hazards. BMJ Global Health. 2020;5(8):e002429.
15. Mahmood SS, Amos M, Hoque S, Mia MN, Chowdhury AH, Hanifi SM, Iqbal M, Stones W, Pallikadavath S, Bhuiya A. Does healthcare voucher provision improve utilisation in the continuum of maternal care for poor pregnant women? Experience from Bangladesh.

Global Health Action. 2019 Jan 1;12(1):1701324.

16. Mahmood SS, Chowdhury AH, Mia MN, Chowdhury R, Iqbal M, Mustafa AHMG, Razzaque A, Hanifi SMA. Coping with Ill health in urban slum-health seeking and healthcare expenditure. In: Slum health in Bangladesh: insights from health and demographic Surveillance (icddr,b special publication no. 154): Dhaka: icddr,b, 2019:142-59.
17. Bloom G, Wilkinson A, Bhuiya A. Health system innovations: adapting to rapid change (editorial). Global Health 2018 Mar 9;14(1):29. doi: 10.1186/s12992-018-0347-8.
18. Hanifi SM, Ravn H, Aaby P, Bhuiya A. Where girls are less likely to be fully vaccinated than boys: Evidence from a rural area in Bangladesh. Vaccine. 2018 May 31;36(23):3323-30.
19. Khan NU, Rasheed S, Sharmin T, Siddique AK, Dibley M, Alam A. How can mobile phones be used to improve nutrition service delivery in rural Bangladesh? BMC health services research. 2018 Dec;18(1):530.
20. Mahmood SS, Hanifi SM, Mia MN, Chowdhury AH, Rahman M, Iqbal M, Bhuiya A. Who enrols in voluntary micro health insurance schemes in low-resource settings? Experience from a rural area in Bangladesh. Global health action. 2018 Jan 1;11(1):1525039
21. Waldman L, Ahmed T, Scott N, Akter S, Standing H, Rasheed S. 'We have the internet in our hands': Bangladeshi college students' use of ICTs for health information. Global Health 2018 Mar 20;14(1):31
22. Chowdhury AH, Hanifi SMA, Mia NM and Bhuiya A, Socioeconomic inequalities in under-five mortality in rural Bangladesh: evidence from seven national surveys spreading over 24 years, International Journal for Equity in Health (2017) 16:197
23. Hanifi SMA, Das S, Rahman M. Bangladeshi neonates miss the potential benefits of early BCG vaccination. International journal of epidemiology 2017;47(1):348-49.
24. Hanifi SMA, Sultana A, Mia MN, Hoque S, Mahmood SS, Iqbal M, and Bhuiya A. Chakaria health and demographic surveillance system report-2016. Focusing on the sustainable development goals. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 2017:57p. (Scientific report no. 137).
25. Khatun F, Heywood A E, Hanifi SMA, Rahman M S, Ray P K, Liaw S and Bhuiya A, Gender differentials in readiness and use of mHealth services in a rural area of Bangladesh, BMC Health Services Research. 2017 Aug 18.
26. Khatun F, Palas MJ, Ray PK. Using the Unified Theory of Acceptance and Use of Technology model to analyze cloud-based mHealth service for primary care. Digital Medicine. 2017 Apr 1;3(2):69
27. M N Mia, S M A Hanifi, M N Rahman, A Sultana, S Hoque, A Bhuiya, Prevalence, pattern and sociodemographic differentials in smokeless tobacco consumption in Bangladesh: evidence from a population-based cross-sectional study in Chakaria. BMJ Open. 2017 January
28. M Iqbal, A H Chowdhury, S S Mahmood, M N Mia, S M A Hanifi, A Bhuiya, Socioeconomic and Programmatic Determinants of Renewal of Membership in the Voluntary Micro Health Insurance Scheme: Evidence from Chakaria, Bangladesh. Global Health Action. 2017 May 4.
29. Peters DH, Bhuiya A, Ghaffar A. Engaging stakeholders in implementation research: lessons from the Future Health Systems Research Programme experience. Health

Research Policy and Systems 2017, 15(Suppl 2):104 DOI 10.1186/s12961-017-0269-6. 28 Dec 2017

30. Paina L, Wilkinson A, Tetui M, Ekirapa-Kiracho E, Barman D, Ahmed T, Mahmood SS, Bloom G, Knezovich J, George A and Bennett S, Using Theories of Change to inform implementation of health systems research and innovation: experiences of Future Health Systems consortium partners in Bangladesh, India and Uganda, Health Research Policy and Systems, 15(Suppl 2):109, 2017 Dec 28
31. Rahman MS, Hanifi S, Khatun F, et al. Knowledge, attitudes and intention regarding mHealth in generation Y: evidence from a population based cross sectional study in Chakaria, Bangladesh. BMJ Open 2017; 7:e016217. doi:10.1136/bmjopen-2017-016217
32. S Das, M N Mia, S M A Hanifi, S Hoque, A Bhuiya, Health Literacy in a Community with Low Levels of Education: Findings from Chakaria, a Rural Area of Bangladesh. BMC Journal. 2017 February 16.
33. Sultana A, Hossain A, Jahan S, Hanifi SMA, Hoque S, Bhuiya A, Female Child Marriage and its Socio-demographic Correlates in a Rural Area of Bangladesh. Demography India. 2017 Oct 27.
34. Bhuiya A, Hanifi SMA, and Hoque S. Unlocking community capabilities through promotion of self-help for health: experience from Chakaria, Bangladesh. BMC Health Services Research. 2016;16:1865. DOI: 10.1186/s12913-016-1865-9.
35. Khatun F, Heywood AE, Ray PK, Bhuiya A, and Liaw S-T. Community readiness for adopting mHealth in rural Bangladesh: a qualitative exploration. International Journal of Medical Informatics. 2016;93:49-56.
36. Hanifi SMA, Sultana A, Mia MN, Hoque S, Mahmood SS, Iqbal M, and Bhuiya A. Chakaria health and demographic surveillance system report-2014. Focusing on the sustainable development goals. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 2016:58p. (Scientific report no. 131).
37. Hanifi SMA, Sultana A, Mia MN, Hoque S, Mahmood SS, Iqbal M, and Bhuiya A. Chakaria health and demographic surveillance system report-2015. Focusing on the sustainable development goals. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 2016:57p. (Scientific report no. 134).
38. Paina L, Vadrevu L, Hanifi SMMA, and et al. What is the role of community capabilities for maternal health? An exploration of community capabilities as determinants to institutional deliveries in Bangladesh, India, and Uganda. BMC Health Services Research. 2016;16:1861. doi: 10.1186/s12913-016-1861-0.
39. Rasheed S, Siddique AK, Sharmin T, Hasan AMR, Hanifi SMA, Iqbal M, and Bhuiya A. Salt intake and health risk in climate change vulnerable coastal Bangladesh: what role do beliefs and practices play? Plos ONE. 2016;11(4):e0152783. doi:10.1371/journal.pone.0152783.
40. Sultana A, Hossain A, Jahan S, Hanifi SMA, Hoque S, and Bhuiya A. Female child marriage and its socio-demographic correlates in a rural area of Bangladesh. Demography India. 2016;45(1&2):89-96.
41. Alamgir F, Nahar P, Collins AE, Ray-Bennett NS, and Bhuiya A. Climate change and food security: health risks and vulnerabilities of the poor in Bangladesh. The International Journal of Climate Change: Impacts and Responses. 2009;1(4):37-54.
42. Bhuiya A. Health for the rural masses: insights from Chakaria. Dhaka: International

Centre for Diarrhoeal Disease Research, Bangladesh. 2009.
43. Bhuiya A, Datta PG, and Chowdhury AMR. Health progress and research culture in Bangladesh. Lancet. 2013;382(9906):1699.
44. Bhuiya A, Hanifi SMA, Urni F, and Mahmood SS. Three methods to monitor utilization of healthcare services by the poor. International Journal for Equity in Health. 2009;8:29.
45. Bhuiya A, Hanifi SMA, Urni F, and Iqbal M. Chakaria health and demographic surveillance system: focusing on the poor and vulnerable. Demographic events and safe motherhood practices - 2008. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 2009:52p. (Scientific report no. 108).
46. Bhuiya A, Hanifi SMA, Urni F, and Iqbal M. Chakaria health and demographic surveillance system: focusing on the poor and vulnerable. Demographic events and safe motherhood practices - 2007. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 2008:47p. (Scientific report no. 105).
47. Bhuiya A, Hanifi SMA, and Urni F. Chakaria health and demographic surveillance system: focusing on the poor and vulnerable. Demographic profile and utilization of healthcare services - 2006. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 2008:51p. (Scientific report no. 102).
48. Bhuiya A, Hanifi SMA, and Mahmood SS. Chakaria health and demographic surveillance system: focusing on the poor and vulnerable. Demographic profile, family-planning use, and safe motherhood practices, 2005. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 2007:50p. (Scientific report no. 100).
49. Bhuiya A, Hanifi SMA, and Mahmood SS. Chakaria health and demographic surveillance system: focusing on the poor and vulnerable. Socioeconomic, health and demographic profile, 1999-2000. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 2006:56p. (Scientific report no. 94).
50. Bhuiya A, Hanifi SMA, Chowdhury M, Jahangir M, and Gwatkin DR. Rapid methods for monitoring the utilization of healthcare facilities by the poor: findings from a pilot project in rural Bangladesh. FHS Working paper 2, Bangladesh series. 2007. Available at: http://www.futurehealthsystems.org/publica- tions/WP%202%20final.pdf.
51. Bhuiya A, Hanifi SMA, Roy N, and Streatfield PK. Performance of the lot quality assurance sampling method compared to surveillance for identifying inadequately performing areas in Matlab, Bangladesh. J Health Popul Nutr. 2007;25(1):37-46.
52. Bhuiya A, Hanifi SMA, Hossain M, and Aziz A. Effects of an AIDS awareness ampaign about AIDS in a remote rural area of Bangladesh. Int Q Community Health Educ. 2000;19(1):51-63.
53. Bhuiya A, Mahmood SS, Rana AKMM, Ahmed SM, and Chowdhury AMR. A multidimensional approach to measure poverty in rural Bangladesh. J Health Popul Nutr. 2007;25(2):134-145.
54. Bhuiya A, Aziz A, and Hanifi SMA. Reproductive and sexual health problems as perceived by women and men in a rural area of Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 1997:24p.
55. Bhuiya A, Ribaux C, and Eppler P. Community-led primary healthcare initiatives: lessons learned from a project in rural Bangladesh. In: Rohde J, Wyon J, editors. Community-based health care: lessons from Bangladesh to Boston. Boston: Management Sciences for Health. 2002:87-111.

56. Bhuiya A, and Ribaux CA. Rethinking community participation: prospects of health initiatives by indigenous self-help organizations in rural Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research Bangladesh. 1997:31p. (Special publication no. 65).
57. Bhuiya A, Sharmin T, and Hanifi SMA. Nature of domestic violence against women in a rural area of Bangladesh: implication for preventive interventions. J Health Popul Nutr. 2003;21(1):48-54.
58. Bhuiya A, Yasmin F, Begum F, and Rob U. Community participation in health, family planning and development programmes. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 1997:53p.
59. Bhuiya A. Health knowledge and behaviour in five unions of Chakaria. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 1996:38p (Special publication no. 52).
60. Choudhury KK, Hanifi SMA, Mahmood SS, and Bhuiya A. Sociodemographic characteristics of tobacco consumers in a rural area of Bangladesh. J Health Popul Nutr. 2007;25(4):456-464.
61. Choudhury KK, Hanifi SMA, Rasheed S, and Bhuiya A. Gender inequality and severe malnutrition among children in a remote rural area of Bangladesh. J Health Popul Nutr. 2000;18(3):123-130.
62. Fantahun M, Fottrell E, Berhane Y, Wall S, Högberg U, and Byass P. Assessing a new approach to verbal autopsy interpretation in a rural Ethiopian community: the InterVA model. Bulletin of the World Health Organization. 2006;84(3):204-210.
63. Hanifi SMA, Sultana A, Mia MN, Hoque S, Mahmood SS, Iqbal M, and Bhuiya A. Chakaria health and demographic surveillance system-2014. Focusing on the sustainable development goals. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 2016:58p. (Scientific report no. 131).
64. Hanifi SMA, Sultana A, Mia MN, Hoque S, and Bhuiya A. Chakaria health and demographic surveillance system: focusing on the poor and vulnerable. Demographic events and safe motherhood practices-2013. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 2015:52p. (Scientific report no. 127).
65. Hanifi SMA, Sultana A, Mia MN, Hoque S, and Bhuiya A. Chakaria health and demographic surveillance system: focusing on the poor and vulnerable. Demographic events and safe motherhood practices-2012. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 2014:50p. (Scientific report no. 125).
66. Hanifi SMA, Sultana A, Mia MN, Hoque S, and Bhuiya A. Chakaria health and demographic surveillance system: focusing on the poor and vulnerable. Demographic events, safe motherhood practices, and childhood immunization-2011. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 2014:50p. (Scientific report no. 122).
67. Hanifi SMA, Rasheed S, Mamun AA, Urni F, Hoque S, Iqbal M, Mahmood SS, and Bhuiya A. Chakaria health and demographic surveillance system: focusing on the poor and vulnerable. Demographic events, and safe motherhood and infant feeding practices, and care-seeking behaviour for malaria and tuberculosis - 2010. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 2011:58p. (Scientific report no. 116).
68. Hanifi SMA, Haq MZ, Aziz RR, and Bhuiya A. High concentration of childhood deaths in the low-lying areas of Chakaria HDSS, Bangladesh: findings from a spatial analysis.

Global Health Action. 2010;3:70-76.
69. Hanifi SMA, Mahmood SS, and Bhuiya A. Smoking has declined but not for all: findings from a study in a rural area of Bangladesh. Asia-Pacific Journal of Public Health. 2010;24:1-10.
70. Hanifi MA, Mamun AA, Paul A, Hasan SA, Hoque S, Sharmin S, Urni F, Khan IR, Mahmood SS, Rasheed S, Iqbal M, Moula A,Rahman M and Bhuiya A. Profile: the Chakaria Health and Demographic Surveillance System. Int J Epidemiology. 2012;41(3):667-675.
71. Hanifi SMA, Urni F, Iqbal M, Hoque S, and Bhuiya A. Chakaria health and demographic surveillance system: focusing on the poor and vulnerable. Demographic events, safe motherhood, and water and sanitation practices – 2009. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh. 2010:56p. (Scientific report no. 110).
72. Hanifi SMA, and Bhuiya A. Family-planning services in a low-performing rural area of Bangladesh: insights from field observations. J Health Popl Nutr. 2001;19(3):209-214.
73. Hanifi SMA, Mahmood SS, and Bhuiya A. Cause-specific mortality and ocioeconomic status in Chakaria, Bangladesh. Global Health Action. 2014;7:25473.
74. Hossain SMM, Bhuiya A, Khan AR, and Uhaa I. Community development and its impact on health: South Asian experience. BMJ. 2004;328(7443):830-833.
75. Hossain SMM, Bhuiya A, and Rasheed S. Correlates of perceived malarial episodes and treatment-seeking behavior in a malarial-endemic rural area in Bangladesh. Southeast Asian J Trop Med Public Health. 2001;32(4):707-719.
76. Iqbal M, Rasheed S, Hanifi SMA, and Bhuiya A. Reaching the poor with performance based payment for safe delivery services in rural Bangladesh. Medicus Mundi Bulletin. 2009;112:37-42.
77. Khan NUZ, Rasheed S, Sharmin T, Ahmed T, Mahmood SS, Khatun F, Hanifi SMA, Hoque S, Iqbal M, and Bhuiya A. Experience of using mHealth to link village doctors with physicians: lessons from Chakaria, Bangladesh. BMC Med Inform Decis Mak. 2015;15:62.
78. Khatun F, Heywooda AE, Ray PK, Bhuiya A, and Liawa ST. Community readiness for adopting mHealth in rural Bangladesh: a qualitative exploration. International Journal of Medical Informatics. 2016;93:49-56.
79. Khatun F, Heywood AE, Ray PK, Hanifi S, Bhuiya A, Liaw ST. Determinants of readiness to adopt mHealth in a rural community of Bangladesh. International Journal of Medical Informatics. 2015;84:847-856.
80. Khatun F, Hanifi S, Iqbal M, Rasheed S, Rahman MS, Ahmed T, Hoque S, Sharmin T, Khan NUZ, Mahmood SS, Peters DH, and Bhuiya A. Prospects of mHealth services in Bangladesh: recent evidence from Chakaria. PLoS One. 2014;9(11):e111413.
81. Khatun F, Heywood AE, Bhuiya A, Liaw ST, Ray PK. Prospects of mHealth to improve the health of the disadvantaged population in Bangladesh. mHealth Multidisciplinary Verticals. 2014;465.
82. Nahar P, Collins AE, Bhuiya A, Alamgir F, Ray-Bennett N, and Edgeworth R. Indigenous indicators of health security in relation to climatic disasters in Bangladesh. Environ Hazard. 2013;12(1):32-46.
83. Nahar P, Alamgir F, Collins AE, and Bhuiya A. Contextualizing disaster in relation to human health in Bangladesh. Asian journal of water environment and pollution. 2010;7(1):55-62.
84. Rasheed S, Siddique AK, Sharmin T, Hasan AMR, Hanifi SMA, Iqbal M, and Bhuiya A. Salt

intake and health risk in climate change vulnerable coastal Bangladesh: what role do beliefs and practices play? Plos ONE. 2016;11(4):e0152783. Doi:10.1371/journal.pone.0152783.

85. Rasheed S, Jahan S, Sharmin T, Hoque S, Khanam MA, Land MA, Iqbal M, Hanifi SM, Khatun F, Siddique AK, and Bhuiya A. How much salt do adults consume in climate vulnerable coastal Bangladesh? BMC Public Health. 2014;14:584.
86. Rasheed S, Hanifi SMA, Iqbal M, Nazma N, and Bhuiya A. Policy of universal salt iodization in Bangladesh: do coastal people benefit? J Health Popul Nutr. 2001;19(2):66-
87. Rasheed S, Iqbal M, Hanifi SMA, and Bhuiya A. Chakaria health project: achieving community participation. In Cash R, Chowdhury AMR, Smith GB, and Ahmed F, Editors. From one to many: scaling up health programs in low income countries. Dhaka: UPL. 2010.
88. Rasu RS, Iqbal M, Hanifi S, Moula A, Hoque S, Rasheed S, and Bhuiya A. Level, pattern, and determinants of polypharmacy and inappropriate use of medications by village doctors in a rural area of Bangladesh. ClinicoEconomics and outcomes research: CEOR. 2014;6:515-521.
89. Sankoh O, Sharrow D, Herbst K, Whiteson Kabudula C, Alam N, Kant S, Ravn H, Bhuiya A, and et al. The INDEPTH standard population for low- and middle-income countries, 2013. Global Health Action. 2014;7:23286.
90. Sankoh O, Welaga P, Debpuur C, Zandoh C, Gyaase S, Poma MA, Mutua MK, Hanifi SMMA, and et al. The non-specific effects of vaccines and other childhood interventions: the contribution of INDEPTH Health and Demographic Surveillance Systems. International Journal of epidemiology. 2014;43(3):645-653.
91. Siegel JS, and Swanson DA. The methods and materials of demography (second edition). Elsevier Academic Press. 2004:196-340.
92. Streatfield PK, Khan WA, Bhuiya A, and et al. Cause-specific mortality in Africa and Asia: evidence from INDEPTH health and demographic surveillance system sites. Global Health Action. 2014;7:25362.
93. Streatfield PK, Khan WA, Bhuiya A, Hanifi SMA, and et al. Cause-specific childhood mortality in Africa and Asia: evidence from INDEPTH health and demographic surveillance system sites. Global Health Action. 2014;7:25363.
94. Streatfield PK, Khan WA, Bhuiya A, Hanifi SMA, and et al. Adult non-communicable disease mortality in Africa and Asia: evidence from INDEPTH Health and Demographic Surveillance system sites. Global Health Action. 2014;7:25365.
95. Streatfield PK, Khan WA, Bhuiya A, Hanifi SMA, and et al. Mortality from external causes in Africa and Asia: evidence from INDEPTH Health and Demographic Surveillance System Sites. Global Health Action. 2014;7:25366.
96. Streatfield PK, Khan WA, Bhuiya A, Hanifi SMA, and et al. Malaria mortality in Africa and Asia: evidence from INDEPTH Health and Demographic Surveillance System Sites. Global Health Action. 2014;7:25369.
97. Streatfield PK, Khan WA, Bhuiya A, Hanifi SMA, and et al. HIV/AIDS-related mortality in Africa and Asia: evidence from INDEPTH health and demographic surveillance system sites. Global Health Action. 2014;7:25370.

APPENDIX A

Mid-year population by age and sex, Chakaria HDSS, 2020

Age (years)	Mid-year population			Percentage distribution of mid-year Population		
	Male	Female	Both	Male	Female	Both
<1	1,164	1,120	2,284	2.7	2.5	2.6
1-4	4,139	4,081	8,220	9.4	9.2	9.3
5-9	4,965	4,692	9,657	11.3	10.6	11.0
10-14	5,279	5,132	10,411	12.0	11.6	11.8
15-19	5,624	5,216	10,840	12.8	11.8	12.3
20-24	4,247	4,714	8,961	9.7	10.6	10.2
25-29	3,267	3,755	7,022	7.5	8.5	8.0
30-34	2,864	3,292	6,156	6.5	7.4	7.0
35-39	2,639	3,048	5,687	6.0	6.9	6.5
40-44	2,233	2,227	4,460	5.1	5.0	5.1
45-49	1,849	1,702	3,551	4.2	3.8	4.0
50-54	1,427	1,391	2,818	3.3	3.1	3.2
55-59	1,192	1,253	2,445	2.7	2.8	2.8
60-64	968	1,003	1,971	2.2	2.3	2.2
65-69	787	674	1,461	1.8	1.5	1.7
70-74	486	450	936	1.1	1.0	1.1
75-79	370	281	651	0.8	0.6	0.7
80-84	169	149	318	0.4	0.3	0.4
85+	163	132	295	0.4	0.3	0.3
All	43,832	44,312	88,144	100.0	100.0	100.0

APPENDIX B

Cause-specific mortality rate per 1,000 population by age and sex, Chakaria HDSS, 2020

Causes	Age groups (years)						
	Neonate	Infant	1-4	5-14	15-49	50-64	65+
Male							
Diarrhea	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Tuberculosis	0.0	0.0	0.0	0.0	0.0	0.0	1.0
EPI Related	0.0	0.0	0.2	0.0	0.0	0.3	0.0
Respiratory Infections	0.8	2.4	0.0	0.0	0.0	0.0	1.5
Septicemia	0.0	0.8	0.0	0.0	0.0	0.0	0.5
Covid-19	0.0	0.0	0.0	0.0	0.0	0.3	0.5
All Other Communicable Diseases	0.0	0.0	0.0	0.1	0.0	0.3	0.0
Premature and Low Birth Weight	13.5	0.0	0.0	0.0	0.0	0.0	0.0
Birth Asphyxia	7.2	0.0	0.0	0.0	0.0	0.0	0.0
All Other Neonatal Conditions	8.0	0.0	0.0	0.0	0.0	0.0	0.0
Congenital pneumonia	1.6	0.0	0.0	0.0	0.0	0.0	0.0
Malignant neoplasm	0.0	0.0	0.0	0.2	0.3	3.1	7.6
Congenital Malformation	3.2	0.8	0.0	0.1	0.0	0.0	0.0
Diabetes	0.0	0.0	0.0	0.0	0.0	0.3	3.0
All Other Endocrine Disorders	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Neuro-psychiatric	0.0	0.0	0.2	0.0	0.1	0.0	0.0
Hypertensive Diseases	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Ischemic Heart Diseases	0.8	0.0	0.0	0.0	0.3	2.0	6.1
Stroke	0.0	0.0	0.0	0.0	0.0	1.7	10.1
Other forms of heart disease	0.0	0.8	0.0	0.0	0.1	2.8	5.6
All Other Circulatory System Diseases	0.0	0.0	0.0	0.0	0.0	0.0	2.0
COPD	0.0	0.0	0.0	0.0	0.0	0.3	5.1
All Other Respiratory Diseases	0.0	0.0	0.0	0.0	0.0	0.3	1.5
Digestive Diseases	0.0	0.0	0.0	0.0	0.2	1.4	1.0
Renal Failure	0.0	0.0	0.2	0.0	0.0	0.0	1.5
Transport Accidents	0.0	0.0	0.2	0.1	0.0	0.3	1.5
Falls	0.0	0.0	0.0	0.0	0.0	0.3	1.5
Drowning	0.0	0.8	2.4	0.2	0.0	0.0	0.0
All Other External Causes of Accidental	0.0	0.0	0.2	0.1	0.1	0.0	0.5
Suicide	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Homicide	0.0	0.0	0.0	0.1	0.1	0.3	0.0

Causes	Age groups (years)						
	Neonate	Infant	1-4	5-14	15-49	50-64	65+
All Other External Causes of Mortality	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fever of unknown Origin	0.0	0.0	0.0	0.1	0.0	0.3	2.5
Sudden Infant Death	0.0	0.8	0.0	0.0	0.0	0.0	0.0
All Other Unknown and Unspecified Cause	1.6	0.0	0.5	0.0	0.0	0.8	5.1
All causes	36.7	6.4	4.1	1.2	1.5	14.5	59.7

Appendix B. (contd...)

Causes	Age groups (years)						
	Neonate	Infant	1-4	5-14	15-49	50-64	65+
Female							
Diarrhea	0.0	0.0	0.0	0.0	0.0	0.0	1.2
Respiratory Infections	0.0	6.8	0.0	0.0	0.0	0.3	0.6
Covid-19	0.0	0.0	0.0	0.0	0.0	0.5	0.6
All Other Communicable Diseases	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Maternal Deaths	0.0	0.0	0.0	0.0	0.2	0.0	0.0
Premature and Low Birth Weight	8.4	0.0	0.0	0.0	0.0	0.0	0.0
Birth Asphyxia	8.4	0.0	0.0	0.0	0.0	0.0	0.0
All Other Neonatal Conditions	11.0	0.0	0.0	0.0	0.0	0.0	0.0
Congenital pneumonia	0.8	0.0	0.0	0.0	0.0	0.0	0.0
Malignant neoplasm	0.0	0.0	0.0	0.0	0.3	1.9	3.0
Malignant neoplasms of female genital o	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Congenital Malformation	0.8	0.8	0.2	0.0	0.0	0.0	0.0
Diabetes	0.0	0.0	0.0	0.0	0.0	1.1	3.0
All Other Endocrine Disorders	0.0	0.0	0.2	0.0	0.0	0.0	0.0
Neuro-psychiatric	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hypertensive Diseases	0.0	0.0	0.0	0.0	0.0	0.3	0.6
Ischemic Heart Diseases	0.0	0.0	0.0	0.0	0.2	1.6	2.4
Stroke	0.0	0.0	0.0	0.0	0.2	1.1	16.6
Other forms of heart disease	0.0	0.8	0.0	0.0	0.1	0.8	3.6
All Other Circulatory System Diseases	0.0	0.0	0.0	0.0	0.0	0.0	0.6
COPD	0.0	0.0	0.0	0.0	0.1	1.4	9.5
Digestive Diseases	0.0	0.0	0.0	0.0	0.0	0.0	1.8
Renal Failure	0.0	0.0	0.0	0.0	0.1	0.5	0.6
All Other Non-Communicable Diseases	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Transport Accidents	0.0	0.0	0.0	0.0	0.0	0.3	0.0
Falls	0.0	0.0	0.0	0.0	0.0	0.0	2.4
Drowning	0.0	0.0	0.7	0.2	0.0	0.0	0.0
Suicide	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Fever of unknown Origin	0.0	0.0	0.0	0.0	0.0	0.3	2.4
Sudden Infant Death	0.8	0.8	0.0	0.0	0.0	0.0	0.0
All Other Unknown and Unspecified Cause	0.8	0.0	0.2	0.0	0.2	0.3	8.3
All causes	31.2	9.3	1.5	0.2	1.6	10.4	58.1

APPENDIX C

Migration rate per 1,000 population by age and sex, Chakaria HDSS, 2020

Age	No. of migrants			Migration rate per 1,000 population		
(years)	Male	Female	Both	Male	Female	Both
	In-migration					
<1	60	60	120	51.5	53.6	52.5
1-4	122	138	260	29.5	33.8	31.6
5-9	117	99	216	23.6	21.1	22.4
10-14	85	109	194	16.1	21.2	18.6
15-19	70	617	687	12.4	118.3	63.4
20-24	104	446	550	24.5	94.6	61.4
25-29	157	160	317	48.1	42.6	45.1
30-34	152	101	253	53.1	30.7	41.1
35-39	113	61	174	42.8	20.0	30.6
40-44	67	29	96	30.0	13.0	21.5
45-49	45	21	66	24.3	12.3	18.6
50-54	25	12	37	17.5	8.6	13.1
55-59	8	19	27	6.7	15.2	11.0
60-64	12	7	19	12.4	7.0	9.6
65-69	6	9	15	7.6	13.4	10.3
70-74	6	4	10	12.3	8.9	10.7
75-79	3	3	6	8.1	10.7	9.2
80-84	0	1	1	0.0	6.7	3.1
85+	1	2	3	6.1	15.2	10.2
All	1,153	1,898	3,051	26.3	42.8	34.6
Out-migration						
<1	40	51	91	34.4	45.5	39.8
1-4	118	133	251	28.5	32.6	30.5
5-9	141	113	254	28.4	24.1	26.3
10-14	99	137	236	18.8	26.7	22.7
15-19	127	699	826	22.6	134.0	76.2
20-24	152	593	745	35.8	125.8	83.1
25-29	172	231	403	52.6	61.5	57.4
30-34	140	100	240	48.9	30.4	39.0
35-39	98	47	145	37.1	15.4	25.5
40-44	51	31	82	22.8	13.9	18.4
45-49	31	21	52	16.8	12.3	14.6
50-54	12	12	24	8.4	8.6	8.5
55-59	11	11	22	9.2	8.8	9.0
60-64	12	7	19	12.4	7.0	9.6
65-69	4	12	16	5.1	17.8	11.0
70-74	8	2	10	16.5	4.4	10.7
75-79	3	5	8	8.1	17.8	12.3
80-84	1	4	5	5.9	26.8	15.7
85+	0	2	2	0.0	15.2	6.8
All	1,220	2,211	3,431	27.8	49.9	38.9

APPENDIX D

Number of migrants by origin and migration, Chakaria HDSS, 2020

Origin/ Destination	All ages	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	855	179	116	84	64	73	84	82	70	40	20	43
Outside Bangladesh	298	3	1	1	6	31	73	70	43	27	25	18
Inside Chakaria	467	103	73	50	38	35	44	41	28	19	11	25
Outside Chakaria	388	76	43	34	26	38	40	41	42	21	9	18
Inside HDSS area	63	8	9	10	5	3	9	6	5	2	1	5
Outside HDSS area	404	95	64	40	33	32	35	35	23	17	10	20
Female												
Inside Bangladesh	1,875	195	98	109	616	443	156	98	54	29	21	56
Outside Bangladesh	23	3	1	0	1	3	4	3	7	0	0	1
Inside Chakaria	1,141	109	59	65	423	253	83	51	34	18	13	33
Outside Chakaria	734	86	39	44	193	190	73	47	20	11	8	23
Inside HDSS area	182	14	4	7	73	49	17	6	1	1	3	7
Outside HDSS area	959	95	55	58	350	204	66	45	33	17	10	26
Out-migration												
Male												
Inside Bangladesh	991	156	140	99	101	100	120	111	60	36	21	47
Outside Bangladesh	229	2	1	0	26	52	52	29	38	15	10	4
Inside Chakaria	486	80	74	62	51	44	55	38	28	16	10	28
Outside Chakaria	505	76	66	37	50	56	65	73	32	20	11	19
Inside HDSS area	62	8	9	10	5	3	8	6	5	2	1	5
Outside HDSS area	424	72	65	52	46	41	47	32	23	14	9	23
Female												
Inside Bangladesh	2,200	182	112	137	699	589	230	99	46	31	20	55
Outside Bangladesh	11	2	1	0	0	4	1	1	1	0	1	0
Inside Chakaria	1,296	100	64	82	440	345	126	59	26	15	11	28
Outside Chakaria	904	82	48	55	259	244	104	40	20	16	9	27
Inside HDSS area	180	13	4	7	73	48	17	6	1	1	3	7
Outside HDSS area	1,116	87	60	75	367	297	109	53	25	14	8	21

APPENDIX E

Number of in-migrants by reasons for migration, Chakaria HDSS, 2020

Reason for migration	All ages	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	9	0	0	0	0	0	4	2	1	2	0	0
Family friction/ breakdown	209	38	22	12	13	22	27	25	22	13	6	9
Others	34	8	3	4	5	2	1	2	1	2	1	5
Work-related												
New job/job transfer	236	3	1	3	8	23	57	59	29	20	18	15
To look for work/lost job	228	96	41	22	13	11	14	10	9	2	4	6
Others	122	8	7	14	8	14	14	18	18	10	3	8
Housing-related												
Wanted to own home/ new house	90	11	14	10	6	6	10	12	8	5	1	7
Education												
To acquire education	53	4	16	13	8	3	0	2	4	0	1	2
Special reasons												
Due to Covid-19 pandemic	108	2	3	3	5	15	21	17	18	9	9	6
Reasons not reported	64	12	10	4	4	8	9	5	3	4	2	3
All	1153	182	117	85	70	104	157	152	113	67	45	61
Female												
Family related												
To join spouse	843	0	0	15	498	267	39	10	5	6	1	2
Family friction/breakdown	371	42	23	22	59	85	62	35	15	6	6	16
Others	41	6	6	3	4	5	4	1	1	2	1	8
Work-related												
New job/job transfer	36	3	4	2	6	5	4	4	7	0	0	1
To look for work/lost job	253	110	31	20	14	32	11	15	2	5	1	12
Others	90	9	4	9	5	17	17	9	10	2	5	3
Housing-related												
Wanted to own home/new house	106	15	9	12	13	12	10	14	6	2	3	10
Education												
To acquire education	70	5	16	16	9	6	3	9	3	2	1	0
Special reasons												
Due to Covid-19 pandemic	40	2	0	3	6	11	4	2	6	3	1	2
Reasons not reported	48	6	6	7	3	6	6	2	6	1	2	3
All	1,898	198	99	109	617	446	160	101	61	29	21	57

APPENDIX F

Number of out-migrants by reasons for migration, Chakaria HDSS, 2020

Reason for migration	All ages	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	20	0	0	0	5	6	4	2	2	0	1	0
Family friction/ breakdown	205	25	21	14	23	31	30	22	11	8	5	15
Others	64	5	11	10	8	2	4	6	6	4	3	5
Work-related												
New job/job transfer	237	2	1	3	27	53	53	29	38	15	10	6
To look for work/	206	93	49	25	14	5	3	5	1	5	3	3
Others	242	17	9	8	16	34	58	59	18	12	5	6
Housing-related												
Wanted to own home/ new house	83	10	9	8	8	10	7	7	9	4	2	9
Education												
To acquire education	79	2	32	19	17	2	3	1	1	0	0	2
Special reasons												
Due to Covid-19 pandemic	1	0	0	0	0	0	0	0	1	0	0	0
Reasons not reported	83	4	9	12	9	9	10	9	11	3	2	5
All	1220	158	141	99	127	152	172	140	98	51	31	51
Female												
Family-related												
To Join spouse	1046	0	0	35	516	374	93	19	6	2	0	1
Family friction/ breakdown	334	22	11	15	88	95	48	25	6	10	4	10
Others	76	14	7	7	9	7	10	8	2	4	4	4
Work-related												
New job/job transfer	25	2	2	4	3	5	2	1	2	0	1	3
To look for work/lost job	252	101	40	29	19	25	11	6	4	4	0	13
Others	193	17	13	9	23	58	27	13	16	4	3	10
Housing-related												
Wanted to own home/ new house	100	10	11	7	9	17	18	9	3	4	3	9
Education												
To acquire education	90	2	20	22	21	5	9	6	3	1	1	0
Special reasons												
Due to Covid-19 pandemic	7	2	1	1	1	2	0	0	0	0	0	0
Reasons not reported	88	14	8	8	10	5	13	13	5	2	5	5
All	2,211	184	113	137	699	593	231	100	47	31	21	55

APPENDIX G

Population, births, deaths, in and out-migration by village, Chakaria HDSS, 2020

Village	Population	Birth	Death	In-migration	Out-migration	Birth rate	Death rate	In-migration rate	Out-migration rate
Maizpara	1763	38	6	74	78	21.6	3.4	42.0	44.2
Daingakata	1834	55	11	50	77	30.0	6.0	27.3	42.0
Baniachara	3390	91	13	138	176	26.8	3.8	40.7	51.9
Dakshin Baraitali	2283	73	19	65	88	32.0	8.3	28.5	38.5
Gobindapur	5125	158	38	159	192	30.8	7.4	31.0	37.5
Hapaliakata	3858	100	22	114	169	25.9	5.7	29.5	43.8
Baraitali	**18,253**	**515**	**109**	**600**	**780**	**28.2**	**6.0**	**32.9**	**42.7**
Katakhali	418	11	3	19	12	26.3	7.2	45.5	28.7
Rakhainpara	638	14	12	25	20	21.9	18.8	39.2	31.3
Shantinagar	2006	55	12	124	118	27.4	6.0	61.8	58.8
Kulalpara	182	1	1	1	12	5.5	5.5	5.5	65.9
Palpara	214	1	2	3	12	4.7	9.3	14.0	56.1
Stationpara	658	12	4	31	26	18.2	6.1	47.1	39.5
Kattoli	453	15	4	23	20	33.1	8.8	50.8	44.2
Harbang	**4569**	**109**	**38**	**226**	**220**	**23.9**	**8.3**	**49.5**	**48.2**
Purbo Kunakhali	1770	47	10	48	47	26.6	5.6	27.1	26.6
Maddhya Kunakhali	5039	149	34	76	150	29.6	6.7	15.1	29.8
Furotia Khali	3296	105	17	133	127	31.9	5.2	40.4	38.5
Konakhali	**10,105**	**301**	**61**	**257**	**324**	**29.8**	**6.0**	**25.4**	**32.1**
Krisnapur	1641	45	7	76	75	27.4	4.3	46.3	45.7
Chhainama Para	3074	101	20	110	109	32.9	6.5	35.8	35.5
Dakshin Bahaddarkata	2617	70	16	86	95	26.7	6.1	32.9	36.3
BM Char	**7,332**	**216**	**43**	**272**	**279**	**29.5**	**5.9**	**37.1**	**38.1**

Registration of Chakaria Health and Demographic events 2020

Appendix G. (contd…)

Village	Population	Birth	Death	In-migration	Out-migration	Birth rate	Death rate	In-migration rate	Out-migration rate
Chotta Bheola	904	28	3	27	41	31.0	3.3	29.9	45.4
Hasimar Kata	977	21	5	45	46	21.5	5.1	46.1	47.1
Hamidullah Sikderpara	847	25	10	56	44	29.5	11.8	66.1	51.9
Dwipkul	976	33	4	38	41	33.8	4.1	38.9	42.0
Baniarkum	1233	29	5	72	47	23.5	4.1	58.4	38.1
Dakshin Khilsadok	1776	53	12	61	82	29.8	6.8	34.3	46.2
Kayerbil	**6,713**	**189**	**39**	**299**	**301**	**28.2**	**5.8**	**44.5**	**44.8**
Kaddachura	1765	53	6	64	64	30.0	3.4	36.3	36.3
Sikder Para	4254	112	22	193	148	26.3	5.2	45.4	34.8
Baniarchar	1005	25	8	40	51	24.9	8.0	39.8	50.7
Kalagazi Sikderpara	1386	36	9	75	66	26.0	6.5	54.1	47.6
Mabiar Baper Para	754	10	4	10	32	13.3	5.3	13.3	42.4
Jele Para	633	15	4	14	21	23.7	6.3	22.1	33.2
Purba B. Bheola	**9,797**	**251**	**53**	**396**	**382**	**25.6**	**5.4**	**40.4**	**39.0**
Sharharbil Purba Para	1246	35	11	45	49	28.1	8.8	36.1	39.3
Saharbil Paschim Para	1123	40	7	49	57	35.6	6.2	43.6	50.8
Madrasha Para	529	14	4	35	30	26.5	7.6	66.2	56.7
Maizghona Purba Para	1604	54	9	74	72	33.7	5.6	46.1	44.9
Shahapura	1089	39	5	45	46	35.8	4.6	41.3	42.2
Failla Para	347	8	5	11	20	23.1	14.4	31.7	57.6
Saharbil	**5,938**	**190**	**41**	**259**	**274**	**32.0**	**6.9**	**43.6**	**46.1**

Appendix G. (contd…)

Village	Population	Birth	Death	In-migration	Out-migration	Birth rate	Death rate	In-migration rate	Out-migration rate
Saker Mohammad Char	5923	158	29	221	240	26.7	4.9	37.3	40.5
Uttar Lotony	1965	69	11	81	62	35.1	5.6	41.2	31.6
Proper Kakhara	3027	72	23	103	111	23.8	7.6	34.0	36.7
Kakara	**10,915**	**299**	**63**	**405**	**413**	**27.4**	**5.8**	**37.1**	**37.8**
Dakshin Surajpur	1291	28	2	32	47	21.7	1.5	24.8	36.4
Dakshin Manikpur	2851	64	16	33	46	22.4	5.6	11.6	16.1
Uttar Manikpur	4430	117	21	84	85	26.4	4.7	19.0	19.2
Surajpur Manikpur	**8,572**	**209**	**39**	**149**	**178**	**24.4**	**4.5**	**17.4**	**20.8**
Muchar Para	546	15	1	7	28	27.5	1.8	12.8	51.3
Demoshia Bazar Para	1045	30	10	39	71	28.7	9.6	37.3	67.9
Ammer Dera Para	1416	38	8	36	77	26.8	5.6	25.4	54.4
Daskhali Para	1143	40	5	31	45	35.0	4.4	27.1	39.4
Dhemoshia	**4,150**	**123**	**24**	**113**	**221**	**29.6**	**5.8**	**27.2**	**53.3**
Darbeshkata Manik Para	766	19	3	27	24	24.8	3.9	35.2	31.3
Tekhsira Para	1034	19	5	48	35	18.4	4.8	46.4	33.8
Paschim B. Bheola	**1800**	**38**	**8**	**75**	**59**	**21.1**	**4.4**	**41.7**	**32.8**
All	88,144	2,440	518	3,051	3,431	27.7	5.9	34.6	38.9

APPENDIX H

Percentage of population by age and marital status, Chakaria HDSS, 2020

Age (years)	Married	Divorced	Widower/ Widow	Never married	Population
Male					
10-14	0.04	0	0	99.96	5,279
15-19	2.28	0.04	0	97.69	5,624
20-24	19.4	0.24	0	80.36	4,247
25-29	54.36	0.46	0	45.18	3,267
30-34	82.44	0.45	0.03	17.07	2,864
35-39	94.47	0.57	0.11	4.85	2,639
40-44	98.25	0.45	0.09	1.21	2,233
45-49	99.13	0.32	0.11	0.43	1,849
50-54	98.04	0.35	0.91	0.7	1,427
55-59	98.07	0.42	1.34	0.17	1,192
60-64	97.11	0.1	2.69	0.1	968
65-69	95.3	0.13	4.19	0.38	787
70-74	90.33	0.41	8.85	0.41	486
75-79	85.14	0.27	14.32	0.27	370
80-84	81.66	0	17.75	0.59	169
85+	66.87	1.23	31.29	0.61	163
All	50.26	0.26	0.81	48.66	33,564
Female					
10-14	0.21	0	0	99.79	5,132
15-19	19.46	0.35	0.02	80.18	5,216
20-24	66.63	1.08	0.19	32.1	4,714
25-29	88.5	1.28	0.45	9.77	3,755
30-34	94.41	1.4	1.52	2.67	3,292
35-39	93.73	1.61	3.44	1.21	3,048
40-44	90.03	1.53	7.81	0.63	2,227
45-49	85.02	2.06	12.51	0.41	1,702
50-54	77.35	1.15	20.78	0.72	1,391
55-59	67.52	1.2	30.89	0.4	1,253
60-64	54.24	1.2	44.17	0.4	1,003
65-69	43.03	1.63	55.34	0	674
70-74	28.44	0.44	70.67	0.44	450
75-79	15.66	1.07	83.27	0	281
80-84	12.08	0.67	86.58	0.67	149
85+	7.58	0	92.42	0	132
All	57.71	0.99	8.32	32.98	34,419

APPENDIX I

Chakaria HDSS project team, 2020

Name of Staff	Designation
Dhaka	
Manzoor Ahmed Hanifi	Scientist
Sabrina Rasheed	Associate Scientist
Shehrin Shaila Mahmood	Associate Scientist
Srizan Chowdhury	Research Officer
Ashish Paul	Data Management Officer
Mohammad Shohel Rana	Administrative Officer
Chakaria	
Shahidul Hoque	Field Research Manager
Mijanur Rahaman	Senior Field Research Officer
Md. Sharif Al Hasan	Field Research Officer
Md. Rehmat Ali	Field Research Supervisor
Fatema Zannat	Surveillance Worker (Rural)
Ismat Jahan Khuki	Surveillance Worker (Rural)
Jesmin Akter Rano	Surveillance Worker (Rural)
Kawsar Jannat	Surveillance Worker (Rural)
Kulsuma Akter	Surveillance Worker (Rural)
Monuara Begum	Surveillance Worker (Rural)
Mosharafa Sultana	Surveillance Worker (Rural)
Nasima Jannat	Surveillance Worker (Rural)
Nazma Akter	Surveillance Worker (Rural)
Raihan Zannat	Surveillance Worker (Rural)
Kajal Rekha	Surveillance Worker (Rural)
Tanjina Zannat Ara	Surveillance Worker (Rural)
Umme Habiba Mamata	Surveillance Worker (Rural)

Chakaria Health and Demographic Surveillance System Report–2020

ORIGINALITY REPORT

7%
SIMILARITY INDEX

PRIMARY SOURCES

1	data.unicef.org Internet	23 words — < 1%
2	researchonline.lshtm.ac.uk Internet	23 words — < 1%
3	www.un.org.in Internet	23 words — < 1%
4	Kathleen Cash, Hashima-E-Nasreen, Ayesha Aziz, Abbas Bhuiya, A. Mushtaque R. Chowdhury, Sadia Chowdhury. "Without Sex Education: Exploring the social and sexual vulnerabilities of rural Bangladeshi girls and boys", Sex Education, 2010 Crossref	22 words — < 1%
5	mhealth.amegroups.com Internet	22 words — < 1%
6	www.iiste.org Internet	22 words — < 1%
7	Irène Kränzlin. "Pond management in rural Bangladesh: problems and possibilities in the context of the water supply crisis", Natural Resources Forum, 2000 Crossref	21 words — < 1%

8	Jiong Tu, Manxuan Shen, Jiudi Zhong, Gang Yuan, Miaohong Chen. "The Perceptions and Experiences of Mobile Health Technology by Older People in Guangzhou, China: A Qualitative Study", Frontiers in Public Health, 2021 Crossref	21 words — < 1%
9	Uddin, Md.J.. "Improving low coverage of child immunization in rural hard-to-reach areas of Bangladesh: Findings from a project using multiple interventions", Vaccine, 20120105 Crossref	21 words — < 1%
10	www.un.org Internet	21 words — < 1%
11	www.who.int Internet	21 words — < 1%
12	Jacob Ausubel, Stephanie Kramer, Anne Fengyan Shi, Conrad Hackett. "Measuring age differences among different-sex couples: Across religions and 130 countries, men are older than their female partners", Population Studies, 2022 Crossref	20 words — < 1%
13	Sureender, S.. "Correlates of Female Age at Marriage and an Overview of Legislation, Practices Marriage in Pondicherry.", International Institute for Population Sciences University, 2021 ProQuest	20 words — < 1%
14	archive.ids.ac.uk Internet	20 words — < 1%
15	bmcinthealthhumrights.biomedcentral.com Internet	20 words — < 1%

16	cbs.aw Internet	20 words — < 1%
17	getinthepicture.org Internet	20 words — < 1%
18	globalizationandhealth.biomedcentral.com Internet	20 words — < 1%
19	www.medrxiv.org Internet	20 words — < 1%
20	zimbabwe.unfpa.org Internet	20 words — < 1%
21	catalog.ihsn.org Internet	19 words — < 1%
22	eprints.soton.ac.uk Internet	19 words — < 1%
23	userforum.dhsprogram.com Internet	19 words — < 1%
24	www.statistics.gov.uk Internet	19 words — < 1%
25	Asharaf Abdul Salam, Ibrahim Elsegaey, Rshood Khraif, Abdullah AlMutairi, Ali Aldosari. "Components and Public Health Impact of Population Growth in the Arab World", PLOS ONE, 2015 Crossref	18 words — < 1%
26	Bertrand SAGNIA, Sylvie MOUDOUROU, Ana GUTIEREZ, Jules TCHADJI et al. "Accurate and Reproducible Enumeration of Cd4 T Cell Counts and	18 words — < 1%

Hemoglobin Levels Using a Point of Care System: Comparison With Conventional Laboratory Based Testing Systems in a Clinical Reference Laboratory in Cameroon", Research Square Platform LLC, 2022
Crossref Posted Content

27 Rubhana Raqib, Protim Sarker, Evana Akhtar, Tarique Mohammad Nurul Huda et al. "Seroprevalence of SARS-CoV-2 infection and associated factors among Bangladeshi slum and non-slum dwellers in pre-COVID-19 vaccination era: October 2020 to February 2021", PLOS ONE, 2022
Crossref
18 words — < 1%

28 www.bhas.ba
Internet
18 words — < 1%

29 www.researchgate.net
Internet
18 words — < 1%

30 www.health.state.mn.us
Internet
17 words — < 1%

31 www.iza.org
Internet
17 words — < 1%

32 www.urcn.net
Internet
17 words — < 1%

33 documents1.worldbank.org
Internet
16 words — < 1%

34 gh.bmj.com
Internet
16 words — < 1%

35 iris.paho.org
Internet
16 words — < 1%

36	obgyn.onlinelibrary.wiley.com Internet	16 words — < 1%
37	lse.ac.uk Internet	15 words — < 1%
38	rvc-repository.worktribe.com Internet	15 words — < 1%
39	Abuhaltam, Fidaa J.. "Incorporating Debate Activity Strategies into an Eighth Grade English Language Arts Curriculum: Will They Improve Students' Higher Level Thinking Skills of Analysis, Synthesis, and Evaluation?", Caldwell University, 2021 ProQuest	14 words — < 1%
40	Clawson, David L.. "Latin America and the Caribbean", Oxford University Press Publications	14 words — < 1%
41	Li Chen, Wu Qiong, Michelle Helena van Velthoven, Zhang Yanfeng, Zhang Shuyi, Li Ye, Wang Wei, Du Xiaozhen, Zhang Ting. "Coverage, quality of and barriers to postnatal care in rural Hebei, China: a mixed method study", BMC Pregnancy and Childbirth, 2014 Crossref	14 words — < 1%
42	link.springer.com Internet	14 words — < 1%
43	www.tib.eu Internet	14 words — < 1%
44	Devaki Nambiar, Kabir Sheikh. "How a Technical Agency Helped Scale Up a Community Health Worker Program: An Exploratory Study in Chhattisgarh State, India", Health Systems & Reform, 2016	13 words — < 1%

Crossref

45	Hossain, Mohammed, Shamsun N. Rahman, Prosun Bhattacharya, Gunnar Jacks, Ratnajit Saha, and Marina Rahman. "Sustainability of arsenic mitigation interventions—an evaluation of different alternative safe drinking water options provided in Matlab, an arsenic hot spot in Bangladesh", Frontiers in Environmental Science, 2015. Crossref	13 words — < 1%
46	bibliotecadigital.ccb.org.co Internet	13 words — < 1%
47	dspace.alquds.edu Internet	13 words — < 1%
48	issuu.com Internet	13 words — < 1%
49	www.lenus.ie Internet	13 words — < 1%
50	Amouzou, Agbessi, Aklilu Kidanu, Nolawi Taddesse, Romesh Silva, Elizabeth Hazel, Jennifer Bryce, and Robert E. Black. "Using Health Extension Workers for Monitoring Child Mortality in Real-Time: Validation against Household Survey Data in Rural Ethiopia", PLoS ONE, 2015. Crossref	12 words — < 1%
51	Arto T. Vehviläinen, Esko A. Kumpusalo, Seppo O. Voutilainen, Jorma K. Takala. "Does the doctors' professional experience reduce referral rates? Evidence from the Finnish referral study", Scandinavian Journal of Primary Health Care, 2009 Crossref	12 words — < 1%

52	Eleanor C. Nordyke. "Appendix: Demographic Tables", Walter de Gruyter GmbH, 1989 Crossref	12 words — < 1%
53	Mweete Debra Nglazi, John Ele-Ojo Ataguba. "Overweight and obesity in non-pregnant women of childbearing age in South Africa: subgroup regression analyses of survey data from 1998 to 2017", BMC Public Health, 2022 Crossref	12 words — < 1%
54	National Symposium on Family Issues, 2015. Crossref	12 words — < 1%
55	landportal.org Internet	12 words — < 1%
56	mospi.nic.in Internet	12 words — < 1%
57	www.gov.uk Internet	12 words — < 1%
58	Ashraful Alam, Indranil Dutta, M. Emranul Haque, Ricardo Nogales. "Impact of Rohingya refugees on food prices in Bangladesh: Evidence from a natural experiment", World Development, 2022 Crossref	11 words — < 1%
59	reshare.ukdataservice.ac.uk Internet	11 words — < 1%
60	www.health.govt.nz Internet	11 words — < 1%
61	careevaluations.org Internet	10 words — < 1%

62	files.dcp2.org Internet	10 words — < 1%
63	knowledgesuccess.org Internet	10 words — < 1%
64	"Maternal and Child Health", Springer Science and Business Media LLC, 2009 Crossref	9 words — < 1%
65	canada.explore.openaire.eu Internet	9 words — < 1%
66	journals.sagepub.com Internet	9 words — < 1%
67	minds.wisconsin.edu Internet	9 words — < 1%
68	push-zb.helmholtz-muenchen.de Internet	9 words — < 1%
69	www.daily-sun.com Internet	9 words — < 1%
70	www.ncbi.nlm.nih.gov Internet	9 words — < 1%
71	Agbo, Adanna I.. "Exploring the Factors Associated with the Use of Skilled Birth Attendants at Delivery in Rural South East Nigeria.", Morgan State University, 2021 ProQuest	8 words — < 1%
72	Archavanitkul, Kritaya. "Migration to Small Rural Towns in Thailand", The Australian National University (Australia), 2021 ProQuest	8 words — < 1%

73	James H. Lebovic. "The Millennium Challenge Corporation: Organizational Constraints on US Foreign Aid, 2004–11", World Development, 2014 Crossref	8 words — < 1%
74	Rodriguez, Alana Marie. "Family Planning and Barriers to Fertility in Contemporary Cuba: An Interdisciplinary, Mixed Methods Approach", San Diego State University ProQuest	8 words — < 1%
75	ejournal.almaata.ac.id Internet	8 words — < 1%
76	eprints.qut.edu.au Internet	8 words — < 1%
77	journals.plos.org Internet	8 words — < 1%
78	openresearch-repository.anu.edu.au Internet	8 words — < 1%
79	pdfs.semanticscholar.org Internet	8 words — < 1%
80	seer.cancer.gov Internet	8 words — < 1%
81	www.apa.org.au Internet	8 words — < 1%
82	www.coursehero.com Internet	8 words — < 1%
83	www.csp.nsw.gov.au Internet	8 words — < 1%

84	www.statssa.gov.za Internet	8 words — < 1%
85	www.utm.utoronto.ca Internet	8 words — < 1%
86	Ayesha Fatima, Ahmad Abdul, Rasedee Abdullah, Roghayeh Karjiban, Vannajan Lee. "Binding Mode Analysis of Zerumbone to Key Signal Proteins in the Tumor Necrosis Factor Pathway", International Journal of Molecular Sciences, 2015 Crossref	7 words — < 1%

EXCLUDE QUOTES	OFF	EXCLUDE SOURCES	OFF
EXCLUDE BIBLIOGRAPHY	OFF	EXCLUDE MATCHES	OFF