

Inequities in Healthcare Seeking Among Migrants and Residents of Climate Affected Coastal Area of Bangladesh

Mosammat Ivylata Khanam (✉ dw.mosammat.khanam@icddr.org)

International Centre for Diarrhoeal Disease Research

Abdul Khalek

International Centre for Diarrhoeal Disease Research

Syed Manzoor Ahmed Hanifi

International Centre for Diarrhoeal Disease Research

Sabrina Rasheed

International Centre for Diarrhoeal Disease Research

Research Article

Keywords: Migration, healthcare seeking behavior, coastal area, climate change, Bangladesh

Posted Date: February 4th, 2022

DOI: <https://doi.org/10.21203/rs.3.rs-1234008/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background:

Climate change induced sea level rise, increased soil salinity and poor socio-economic condition have triggered migration around the world. So far, the impact of migration on health and healthcare utilization have not been studied adequately especially in Bangladesh. Our study examines impact of migration on healthcare seeking behavior of people living in low-lying coastal areas of Bangladesh.

Methods:

We analyzed data from Chakaria, Health and Demographic Surveillance System, 2017-18. Univariate analysis and regression analysis were conducted to assess the determinants of migration. Finally, we assessed differences in health care seeking behavior between migrants in low-lying coastal areas and plain areas. Stata version 14 was used for analysis.

Results:

In terms of determinants of migration, adults, males, educated, unemployed and poor were significantly more like to migrate compared to children, females, people with little education, those engaged in agriculture or other occupations and wealthier households. For pregnancy related services healthcare utilization was significantly lower in coastal areas compared to the plains. In terms of utilization of maternal and child health services, service use was 2-28 % lower among residents of low-lying coastal regions and 13-70% lower among coastal migrants compared to those living in plains.

Conclusion:

Our findings suggest that in terms of maternal health services there was geographic inequity in service utilization favoring the residents of plains and being a migrant significantly increases the geographical disadvantage in terms of maternal health services. The existing inequity indicates the necessity of immediate action to address the health and healthcare utilization of residents of coastal area with special attention to the migrants in Bangladesh.

Introduction

Bangladesh has been recognized as one of the most vulnerable countries to natural disasters aggravated by global climate change due to its unique geographical location [1]. Bangladesh currently is ranked sixth on Global Climate Risk Index in 2017 for climate vulnerability [2]. Within Bangladesh, densely populated country the coastal communities have experienced highest number of natural disasters than any other regions of Bangladesh [3, 4]. In addition to the prevailing population density, poverty and weak infrastructure, population of coastal areas have suffered from frequent natural disasters such as floods, cyclone, storm and saline intrusion of soil and water due to proximity to the ocean, low elevation and river bank erosion, which has impact on their livelihood and health [1, 5]. In global literature and research

conducted in Bangladesh, researchers have reported that the climate change has adversely affected land and water leading to food and water insecurity and therefore, reduced health and wellbeing [6–8]. In terms of health indicators coastal population tend to suffer from greater burden of communicable and non-communicable diseases such as hypertension and cardiovascular diseases (CVD) [9, 10]. Researchers have associated the rise in CVDs, still birth and miscarriage to higher consumption of salt among coastal population [10–12]. Also, poor coastal people find difficulties in accessing necessary primary healthcare services particularly maternal and child healthcare (MCH) because of the sub-standard healthcare delivery system (availability, accessibility, utilization, adequate and effective coverage) and limited skilled healthcare providers compared to other parts of the country [13, 14]. Further, the adverse impact of climate change on livelihood has led to impoverishment and migration [15, 16].

In Bangladesh about 2.5 million coastal residents are displaced each year due to natural disasters [17]. Researchers have studied the impacts of climate change on health, resources, human settlement, as well as adaptation to climate change such as migration in Bangladesh [3, 18–23]. It is projected by 2050, around 140,000 coastal residents will be forced to migrate within the district and about 60,000 outside the district to increased soil salinity [24]. Based on some projections the number of Bangladeshis displaced by impacts of climate change could reach 13.3 million by 2050 [25]. In previous studies of migration pattern in Bangladesh researchers described migration as a coping strategy to deal with poverty with mostly male members and sometimes families migrating out of their area in search of better employment opportunities [26]. Migration is less likely among women, children, elderly and disabled population [27]. When the reason for not migrating was explored, researchers found that attachment to property and power, homeland and familial responsibilities were important factors for people to stay in their area of residence [28]. Migration have shown to impact the health of migrants adversely [29, 30]. Little is known about the impact of migration on health service utilization specially if migrant settle in climate affected coastal communities. In the current study we have utilized the strength of existing data from Health and Demographic Surveillance System (HDSS) to investigate the impact of migration on healthcare service utilization geographically diverse coastal region of Bangladesh. The findings will provide an insight about strengthening the health systems for migrants in Bangladesh.

Methods

This secondary data analysis was conducted by using Chakaria HDSS data from 2017-2018. Chakaria HDSS is one of the field sites of International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b) established in 1999 that collects data regarding socio-demographic and health indicators such as birth, death, marriage, education, occupation, health and health services utilization in regular intervals in Chakaria [31]. Chakaria is subdistrict under Cox's Bazar district located in the South-East of Bangladesh. Chakaria is geographically diverse and contains hilly areas in the east, coastal low-lying areas in the west as well as plain land.

For our analysis we used information from mothers and children (12-23 months of age) who were residents of plains and the low-lying coastal regions of Chakaria. In terms of migration we exclude any

migration that happened within the same area and migration due to marriage for our analysis. In terms of healthcare utilization, we considered maternal and child care services such as antenatal care, postnatal care, trained assistance during delivery (skilled birth attendant, doctor or nurses) among recently delivered mothers and immunization (12-23) month old children.

To explore the association between healthcare seeking behavior and contextual variables, Chi-square test was performed. A logistic regression analysis was carried out to assess the factors that are significantly associated with migration. To identify the inequity in health service utilization we used the service utilization rates of plain area as reference and compared this with service utilization rates in coastal residents and coastal migrants to assess inequities. Data analysis was done using Stata version 14.

Results

Table 1: Socio-demographic characteristics of migrant and non-migrant population in coastal area and plains of Chakaria in 2018

Variables		Low-lying coastal area		Plain area	
		Migrants (n=709)	Non-migrants (n=15,234)	Migrants (2,320)	Non-migrants (49,704)
		n (%)	n (%)	n (%)	n (%)
Age	<15 y	254 (35.8)	5,576 (36.6)	893 (38.5)	17,630 (35.5)
	(15-49) y	418 (59.0)	7,762 (51.0)	1,309 (56.4)	25,229 (50.7)
	50+ y	37 (5.2)	1,896 (12.4)	118 (5.1)	6,845 (13.8)
Sex	Male	382 (53.9)	7,726 (50.7)	1,222 (52.7)	24,855 (50.0)
	Female	327 (46.1)	7,508 (49.3)	1,098 (47.3)	24,849 (50.0)
Years of schooling	No education	408 (57.5)	9,135 (60.0)	979 (42.2)	22,019 (44.3)
	0-5 years	175 (24.7)	3,664 (24.1)	665 (28.7)	14,837 (29.8)
	6-10 years	75 (10.6)	1,816 (11.9)	505 (21.7)	10,021 (20.2)
	10+	51 (7.2)	619 (4.1)	171 (7.4)	2,827 (5.7)
HH occupation	Agriculture	58 (8.2)	2,211 (14.5)	257 (11.1)	9,703 (19.5)
	Day laborer	329 (46.4)	6,668 (43.8)	739 (31.8)	15,208 (30.6)
	Others	189 (26.7)	3,717 (24.4)	777 (33.5)	16,112 (32.4)
	Unemployed	133 (18.7)	2,638 (17.3)	547 (23.6)	8,681 (17.5)
Wealth quantile	Lowest	272 (38.4)	4,802 (31.5)	597 (25.7)	8,609 (17.3)
	Middle	270 (38.1)	6,387 (42.0)	745 (32.1)	18,577 (37.4)
	Highest	167 (23.5)	4,045 (26.5)	978 (42.2)	22,518 (45.3)

In terms of socio-demographic characteristics, most of the migrants and non-migrants of both areas were adults (Table 1). Majority people (both migrants and local) from both areas had no institutional education and were engaged as day laborer compare to other professions. Wealth quantile of migrant people from both areas were comparatively lower than local people.

Table 2: Sociodemographic determinants of migration during 2018 in rural Chakaria

Socio-demographic characteristics		Migration	
		AOR (95% CI)	P value
Geographical location	Low-lying coastal	Reference	
	Plain	1.04 (0.99-1.08)	0.067
Age	<15 years	Reference	
	(15-49) years	1.09 (1.01-1.17)	0.025
	50+ years	0.37 (0.31-0.44)	0.000
Sex	Female	Reference	
	Male	1.14 (1.06-1.23)	0.000
Years of schooling	No education	Reference	
	0-5 years	1.02 (0.93-1.11)	0.633
	6-10 years	1.11(1.00-1.24)	0.037
	10+	1.54 (1.31-1.81)	0.000
Occupation	Agriculture	Reference	
	Day laborer	1.54 (1.35-1.766)	0.000
	Others	1.74 (1.52-1.99)	0.000
	Unemployed	2.27 (1.98-2.60)	0.000
Wealth quintile	Highest	Reference	
	Middle	1.04 (0.94-1.14)	0.386
	Lowest	1.69 (1.52-1.87)	0.000

In terms of geographical location, people from the plains were more likely to migrate compared to those living in the coastal area although this association was not significant (Table 2). Compared to people aged less than 15 years, migration rate was significantly higher among 15-49 age group (OR:1.09, 95% CI:1.01-1.17) and lower among people older than 50 years of age (OR:0.37, 95% CI: 0.31-0.44). Males were significantly more likely to migrate (OR:1.14, 95% CI:1.06-1.23) compared to females. Compared to those with little or no education those with higher education (OR:1.54, 95% CI:1.31-1.81) were significantly more likely to migrate. Compared to those engaged in agriculture, those in other occupations (OR:1.74, 95% CI:1.52-1.99) were significantly more likely to migrate with unemployed people (OR:2.27, 95% CI:1.98-2.60) having the highest likelihood of migration. In terms of household wealth quintile,

compared people from wealthier households, those from poorest households (OR:1.69, 95% CI:1.52-1.87) were significantly more likely to migrate.

Table 3: Healthcare utilization based on area of residence during 2017 and 2018

Variables	Chakaria [recently delivered mothers, n=3218; (12-23) months old children, n=4188]		P-value
	Plain area, n (%)	Coastal area, n (%)	
ANC (received at least 4 visit)	673 (20.9)	153 (4.7)	0.000
Delivery by SBA	1067 (33.2)	242 (7.5)	0.000
PNC (received at least 1 visit)	1328 (41.3)	326 (10.1)	0.000
Child immunization	2791 (66.6)	963 (23.0)	0.16

In a subsection of population, pregnant women and mothers of young children we explored the utilization of primary health care services such as antenatal care (ANC), delivery attendance by skilled birth attendants (SBA), postnatal care (PNC) and child immunization. We found that maternal service utilization was significantly higher among residents of plains compared to those living in coastal areas. However, in terms of utilization of immunization services there was no significant differences between residents of plain and low-lying coastal area (Table 3).

Table 4: Inequities of healthcare utilization based on area of residence and migration status in rural Chakaria (2017 & 2018)

Variables	Plain non-migrants %	Coastal non-migrants %	Coastal migrants %	% change	
				Plain non-migrants vs. Coastal non-migrants	Plain non-migrants vs. Coastal migrants
ANC (received at least 4 visits)	27.5	19.8	9.7	28.0	64.7
Delivery by SBA	43.5	31.5	13.0	27.6	70.1
PNC (received at least 1 visit)	54.4	42.3	22.6	22.2	58.5
Child immunization (12-23) months	89.5	91.3	77.5	2.0	13.4

Assuming that the health service utilization of the residents of the plains were the benchmark for what is expected in Chakaria, we compared the rates of health service utilization among residents of plains with that of the coast and the migrants living in coastal area. Compared to residents of plains, utilization of different maternal and child health care services among coastal residents were 2-28% lower (Table 4). Compared to residents of plains, utilization of different maternal and child health care services among coastal migrants were 13-70% lower.

Discussion

Although studies on impact of climate change human lives, both health and non-health aspects, and migration as a coping mechanism has been studied around the world, less is known about utilization of health services among migrants especially in climate vulnerable coastal areas. Our study is the first to use strength of longitudinal data on migration and health care utilization to study the determinants of migration in climate vulnerable coastal area of Bangladesh and assess how intersection of coastal residence and migration create inequities in health care utilization. The findings from the study will be applicable to 2.5 million residents of several coastal regions of Bangladesh who are displaced every year due to frequent natural disasters and similar populations in low resource settings [17]. Further the insights will help to inform policies and programs to reduce inequities in health service utilization among migrants who live in coastal areas.

According to our study findings, adults (≥ 15 years) were more likely to migrate compared to other age groups and more males migrated compared to females. Previous researches also reported that mostly adults were migrated in search of employment opportunities and in our cultural setting gender role assigned to men as breadwinners made them more likely to move in search of opportunities [32, 33]. On the other hand, we also observed that compared to those with little or no education, those with better educational status were more likely to migrate. Several studies suggested the similar findings which may indicate that education provide more job opportunities to people which in turn encourages migration [34–37]. In our study, we found that people engaged in agricultural professions were less likely to migrate compared to people in other professions. In previous studies, researchers explained that those engaged with agriculture often owned land and had better social status and power in the context of rural Bangladesh which probably discourages migration [38, 39]. Our study findings also demonstrated that members from poorest households were more likely to migrate than wealthier households. Similar findings were reported in several studies where researchers explained that the poor with limited resources are very vulnerable to natural disasters and lacking the resources to recover, often resort to migration for better employment opportunities [40, 41].

In this study, we found only 4.7%, 7.5% and 10.1% women of coastal areas accessed maternal healthcare services in terms of ANC, assisted delivery by SBA and PNC services respectively, significantly lower compared to those living in plains and the national average [42]. Previous research conducted in geographically adverse rural areas of Bangladesh and other countries also reported the similar findings [43–49]. Researchers discussed a number of barriers of healthcare utilization at individual, community and health systems-level. At individual-level, lack of education, knowledge and awareness, poverty, limited mobility and autonomy of women; at community-level, difficulties in accessing health facilities due to lack of road and transport, cultural barriers related to using health facilities, and tradition of using local untrained traditional birth attendants; and at health systems-level, limited and expensive services and disrespectful behavior of health workers towards poor were associated with low service utilization [46, 49, 50]. The low service utilization was also apparent for child immunization, a primary care service with 95% national coverage [51] in the study population. The rate of child immunization coverage was only 23% among children of coastal areas, compared to that of the residents of the plains (67%). Previous studies conducted in rural or hard to reach areas of Bangladesh and other developing countries reported the lower childhood immunization rate than national average [52–58]. Although in Bangladesh the vaccination services are free of charge, Factors such as geographical and social inequalities, poor income, transportation cost, fragile communication system, limited knowledge and awareness about the benefit of vaccination, fear, stigma and lack of autonomy in decision making among mothers, have been associated with low rates of immunization among children [59–67].

Our research indicated that the intersection of living in disadvantaged areas and migration compounded the inequities in healthcare utilization. Our study findings showed that people who migrate in geographically vulnerable low-lying coastal areas have lower service utilization than residents. Researchers have described inequities in healthcare utilization among migrants compared to residents of the areas [68] [69]. Several factors such as higher mobility, financial hardship, being poorly informed

about health risk and available health facilities, high healthcare cost relative to income have shown to adversely affect the use of healthcare services among the migrants [46, 70–72].

Bangladesh has made remarkable progress in achieving several health indicators as indicated by the achievement of Millennium Development Goals (MDG 4 and 5) related to maternal mortality and child mortality [73]. However, given that Bangladesh is one of the countries most affected by climate change and contain 2.5 million climate migrants, it is imperative that health of the migrant population is given priority [1, 17]. To achieve Sustainable Development Goal (SDG10) related to reducing inequality in the population, it is important that gaps in service provision are addressed and barriers to healthcare seeking among vulnerable and hard to reach populations such as the migrants, are removed [74]. While climate migrants use migration as an adaptation strategy it is important that health systems have the provision to ensure that primary care is accessible and available to the migrants while they make efforts to overcome poverty. Multi-sector partnership, coordinated efforts, migration-friendly policies and strategies are needed to develop the migration-sensitive health systems.

The significant strength of this paper was that we analyzed the longitudinal data from multiple years which allowed us to look at trends over time and have sufficient numbers to look at determinants. This study also had few limitations that should be acknowledged. This study was cross sectional in nature, so it does not permit any cause and effect relationship to be inferred. As the analysis was done based on existing data we could not add any questions to refine our inquiry.

Conclusion

In terms of determinants of migration adults, males, educated, poor and unemployed were more likely to migrate than the others. In terms of utilization of maternal and child health care services, residents of coastal areas had lower health healthcare utilization rates than those who lived in adjacent plain area. The disadvantages of living in coastal area were more pronounced among the migrants. The insights from this study would be useful for creating a migration -sensitive health systems in the future.

Abbreviations

ANC: Antenatal Care; CVD: Cardiovascular diseases; HDSS: Health and Demographic Surveillance System; MCH: Maternal and Child Healthcare; MDG: Millennium Development Goal; PNC: Postnatal Care; SBA: Skilled Birth Attendant; SDG: Sustainable Development Goal

Declarations

Ethics approval and consent to participate:

We conducted a secondary analysis of Chakaria HDSS data. Chakaria HDSS survey protocol (ACT-00230) was approved by Research Review Committee (RRC) and Ethical Review Committee (ERC) of International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b) and written informed consent

was obtained from all the participants before participating in the study. The original Chakaria HDSS data collection with all methods were carried out in accordance with national ethical guidelines and regulations (which conforms to the declaration of Helsinki).

Consent for publication:

Not applicable

Availability of data and materials:

Data we used in this manuscript are not publicly available due to the data policy of icddr,b. Data are available upon reasonable request for researchers from Armana Ahmed (armana@icddr.org), Head of Research Administration of icddr,b, and as per the data access policy of icddr,b.

Competing interests:

None declared.

Funding:

This study was funded by Swedish International Development Cooperation Agency (SIDA). No other specific grant from any funding agency or from any other non-profit sectors was received for this research.

Author's contribution:

Mosammat Ivylata Khanam: Conceptualization, data curation, analysis and interpretation of data, writing original draft, Abdul Khalek: Analysis and interpretation of data, Sabrina Rasheed: Conceptualization and writing original draft. SR provided guidance with respect to the whole research, including methodological guidance. All authors critically reviewed, edited and approved the final manuscript

Acknowledgements:

icddr,b acknowledges with gratitude the commitment of SIDA to its research efforts. We would also like to thank Dr. Daniel D Reidpath and the whole team of Chakaria HDSS of icddr,b for their guidance and assistance in the data analysis. icddr,b is grateful to the Governments of Bangladesh, Canada, Sweden and the UK for providing core/unrestricted support.

References

1. Rahman S, Rahman MA: **Climate extremes and challenges to infrastructure development in coastal cities in Bangladesh.** *Weather and Climate Extremes* 2015, **7**:96-108.
2. Kreft S, Eckstein D, Melchior I: **Global climate risk index 2017: who suffers most from extreme weather events.** *Weather-related loss events in 2015.*

3. Kabir R, Khan HT, Ball E, Caldwell K: **Climate Change Impact: The experience of the coastal areas of Bangladesh affected by Cyclones Sidr and Aila.** *Journal of environmental and public health* 2016, **2016**.
4. Leridon H: **World population outlook: Explosion or implosion?** *Population Societies* 2020(1):1-4.
5. Sarwar MGM: **Impacts of sea level rise on the coastal zone of Bangladesh.** See [http://static weadapt.org/placemarks/files/225/golam_sarwar_pdf](http://static.weadapt.org/placemarks/files/225/golam_sarwar_pdf) 2005.
6. Gitz V, Meybeck A, Lipper L, Young CD, Braatz S: **Climate change and food security: risks and responses.** *Food and Agriculture Organization of the United Nations (FAO) Report* 2016, **110**.
7. Shah T, Lele U: **Climate change, food and water security in South Asia: Critical issues and cooperative strategies in an age of increased risk and uncertainty.** In: *Synthesis of Workshop Discussions A Global Water Partnership (GWP) and International Water Management Institute (IWMI) Workshop: 2011; 2011: 23-25*.
8. Ismail H: **Climate Change, Food and Water Security in Bangladesh.** *Future Directions international* 2016.
9. Kabir R, Khan HT, Ball E, Caldwell K: **Climate change and public health situations in the coastal areas of Bangladesh.** *Int'l J Soc Sci Stud* 2014, **2:109**.
10. Rasheed S, Siddique A, Sharmin T, Hasan A, Hanifi S, Iqbal M, 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**.
11. Strazzullo P, D'Elia L, Kandala N-B, Cappuccio FP: **Salt intake, stroke, and cardiovascular disease: meta-analysis of prospective studies.** *Bmj* 2009, **339**.
12. Hossain S: **Salinity and miscarriage: Is there a link? Impact of climate change in coastal areas of Bangladesh-A systematic review.** *European Journal of Environment and Public Health* 2020, **4(1):em0036**.
13. Huda FA, Mahmood HR, Hossain AT, Khan J, Faruk O, Razzak ZS, Kamal KTB, El Arifeen S: **Analysis of Health Needs and Health System Response in the Coastal Districts of Bangladesh.**
14. Iqbal MH: **Universal Health Coverage for the Poor in Southwest Coastal Region of Bangladesh and Linkage between Ethics and Economics of Responsibility.**
15. Naser MM, Swapan MSH, Ahsan R, Afroz T, Ahmed S: **Climate change, migration and human rights in Bangladesh: Perspectives on governance.** *Asia Pacific Viewpoint* 2019, **60(2):175-190**.
16. Alam SS: **International Centre for Climate Change and Development (ICCCAD).** Email: sarder shafiqul@bcas.net 2019.
17. Khan MAA: **7 Bangladesh.** *Climate Change, Disasters, and Internal Displacement in Asia and the Pacific: A Human Rights-Based Approach* 2020:138.
18. Agrawala S, Ota T, Ahmed AU, Smith J, Van Aalst M: **Development and climate change in Bangladesh: focus on coastal flooding and the Sundarbans:** OECD Paris; 2003.

19. Akter T: **Climate change and flow of environmental displacement in Bangladesh.** *Centre for Research and Action on Development, Dhaka* 2009.
20. Haque MA, Budi A, Malik AA, Yamamoto SS, Louis VR, Sauerborn R: **Health coping strategies of the people vulnerable to climate change in a resource-poor rural setting in Bangladesh.** *BMC public health* 2013, **13**(1):1-11.
21. Islam MR, Hasan M: **Climate-induced human displacement: A case study of Cyclone Aila in the south-west coastal region of Bangladesh.** *Natural hazards* 2016, **81**(2):1051-1071.
22. Islam MM, Sallu S, Hubacek K, Paavola J: **Vulnerability of fishery-based livelihoods to the impacts of climate variability and change: insights from coastal Bangladesh.** *Regional Environmental Change* 2014, **14**(1):281-294.
23. Kabir MI, Rahman MB, Smith W, Lusha MAF, Azim S, Milton AH: **Knowledge and perception about climate change and human health: findings from a baseline survey among vulnerable communities in Bangladesh.** *BMC public health* 2016, **16**(1):1-10.
24. **TWO LAKH PEOPLE LIKELY TO MIGRATE FROM COASTAL AREAS** [<http://bangladesh.ifpri.info/2018/10/two-lakh-people-likely-to-migrate-from-coastal-areas/>]
25. Rigaud KK, Jones B, Bergmann J, Clement V, Ober K, Schewe J, Adamo S, McCusker B, Heuser S, Midgley A: **Groundswell: Preparing for Internal Climate Migration.** Washington, DC: World Bank. In.; 2018.
26. Uddin M, Firoj M: **Causes and consequences of rural-urban migration in Bangladesh: An empirical study in Chittagong City.** 2013.
27. Barkat A, Ahsan M: **Gender and migration from Bangladesh: mainstreaming migration into the national development plans from a gender perspective.** ILO; 2014.
28. Afsar R: **Internal migration and the development nexus: the case of Bangladesh.** In: *Regional Conference on Migration, Development and Pro-Poor Policy Choices in Asia: 2003*; 2003: 22-24.
29. Dodd W, Humphries S, Patel K, Majowicz S, Little M, Dewey C: **Determinants of internal migrant health and the healthy migrant effect in South India: a mixed methods study.** *BMC international health and human rights* 2017, **17**(1):1-12.
30. Islam MR: **Climate change, natural disasters and socioeconomic livelihood vulnerabilities: migration decision among the Char land people in Bangladesh.** *Social Indicators Research* 2018, **136**(2):575-593.
31. Hanifi MA, Mamun AA, Paul A, Hasan SA, Hoque S, Sharmin S, Urni F, Khan IR, Mahmood SS, Rasheed S: **Profile: The Chakaria health and demographic surveillance system.** *International journal of epidemiology* 2012, **41**(3):667-675.
32. Bhatta GD, Aggarwal PK, Poudel S, Belgrave DA: **Climate-induced migration in South Asia: Migration decisions and the gender dimensions of adverse climatic events.** *Journal of Rural and Community Development* 2015, **10**(4).
33. Gibson MA, Gurm E: **Rural to urban migration is an unforeseen impact of development intervention in Ethiopia.** *PLoS One* 2012, **7**(11):e48708.

34. Bernzen A, Jenkins JC, Braun B: **Climate change-induced migration in coastal Bangladesh? A critical assessment of migration drivers in rural households under economic and environmental stress.** *Geosciences* 2019, **9**(1):51.
35. Williams N: **Education, gender, and migration in the context of social change.** *Social science research* 2009, **38**(4):883-896.
36. Levy MB, Wadycki WJ: **Education and the decision to migrate: An econometric analysis of migration in Venezuela.** *Econometrica: journal of the Econometric Society* 1974:377-388.
37. Ali SN: **Education as a means of smooth rural-urban migration: some evidences from Ethiopia 1, 2.** *Ethiopian Journal of Economics* 2010, **19**(1):1-27.
38. Hassani-Mahmooei B, Parris BW: **Climate change and internal migration patterns in Bangladesh: an agent-based model.** *Environment and Development Economics* 2012, **17**(6):763-780.
39. Gray CL, Mueller V: **Natural disasters and population mobility in Bangladesh.** *Proceedings of the National Academy of Sciences* 2012, **109**(16):6000-6005.
40. Du Y, Park A, Wang S: **Migration and rural poverty in China.** *Journal of comparative economics* 2005, **33**(4):688-709.
41. Lokshin M, Bontch-Osmolovski M, Glinskaya E: **Work-related migration and poverty reduction in Nepal.** *Review of Development Economics* 2010, **14**(2):323-332.
42. BDHS: **Bangladesh Demographic and Health Survey, 2017-2018.** In.; 2019.
43. Akter S, Davies K, Rich JL, Inder KJ: **Barriers to accessing maternal health care services in the Chittagong Hill Tracts, Bangladesh: A qualitative descriptive study of Indigenous women's experiences.** *PloS one* 2020, **15**(8):e0237002.
44. Rahman M, Islam R, Islam AZ: **Rural-urban differentials of utilization of ante-natal health-care services in Bangladesh.** 2008.
45. Langa N, Bhatta T: **The rural-urban divide in Tanzania: Residential context and socioeconomic inequalities in maternal health care utilization.** *Plos one* 2020, **15**(11):e0241746.
46. Haque MAD, Surjya Kanta Chowdhury, Muhammad Abdul Baker: **Maternal health care seeking behavior: the case of Haor (wetland) in Bangladesh.** *BMC public health* 2016, **16**(1):1-9.
47. Islam MR, Odland JO: **Determinants of antenatal and postnatal care visits among Indigenous people in Bangladesh: a study of the Mru community.** 2011.
48. Singh PK, Rai RK, Alagarajan M, Singh L: **Determinants of maternity care services utilization among married adolescents in rural India.** *PloS one* 2012, **7**(2):e31666.
49. Sharma A, Thakur PS, Kasar PK, Tiwari R, Sharma R: **Utilization of post natal care in tribal area of Madhya Pradesh: a community based cross sectional study.** *Int J Med Sci Public Health* 2014, **3**(10):1266-1272.
50. Pulok MH, Sabah MN-U, Uddin J, Enemark U: **Progress in the utilization of antenatal and delivery care services in Bangladesh: where does the equity gap lie?** *BMC pregnancy and childbirth* 2016, **16**(1):1-16.

51. DGHS: **EPI Coverage Evaluation Survey 2019**. In.; 2020.
52. Uddin MJ, Larson CP, Oliveras E, Khan AI, Quaiyum MMA, Chandra Saha N: **Child immunization coverage in rural hard-to-reach Haor areas of Bangladesh: possible alternative strategies**. *Asia Pacific Journal of Public Health* 2009, **21**(1):8-18.
53. Devasenapathy N, Jerath SG, Sharma S, Allen E, Shankar AH, Zodpey S: **Determinants of childhood immunisation coverage in urban poor settlements of Delhi, India: a cross-sectional study**. *BMJ open* 2016, **6**(8):e013015.
54. Singh C, Kaushik A, Jain PK, Kumar S, Srivastava DK, Singh NP, Chandra S, Singh A: **Immunization coverage in Etawah: A border district of Uttar Pradesh**. *Indian journal of community health* 2012, **24**(2):134-139.
55. Vohra R, Bhardwaj P, Srivastava JP, Gupta P, Vohra A: **Immunization coverage and its determinants among 12-23 months old children of Lucknow**. *Muller Journal of Medical Sciences and Research* 2013, **4**(2):90.
56. Hardhantyo M, Chuang Y-C: **Urban-rural differences in factors associated with incomplete basic immunization among children in Indonesia: A nationwide multilevel study**. *Pediatrics & Neonatology* 2021, **62**(1):80-89.
57. Commission NP: **Nigeria demographic and health survey 2013**. In.: National Population Commission, ICF International; 2013.
58. Ijarotimi IT, Fatiregun AA, Adebisi OA, Ilesanmi OS, Ajumobi O: **Urban–rural differences in immunisation status and associated demographic factors among children 12-59 months in a southwestern state, Nigeria**. *PloS one* 2018, **13**(11):e0206086.
59. Lanaspá M, Balcells R, Sacoó C, Nhama A, Aponte JJ, Bassat Q: **The performance of the expanded programme on immunization in a rural area of Mozambique**. *Acta tropica* 2015, **149**:262-266.
60. Shrivastwa N, Gillespie BW, Kolenic GE, Lepkowski JM, Boulton ML: **Predictors of vaccination in India for children aged 12–36 months**. *American journal of preventive medicine* 2015, **49**(6):S435-S444.
61. Oleribe O, Kumar V, Awosika-Olumo A, Taylor-Robinson SD: **Individual and socioeconomic factors associated with childhood immunization coverage in Nigeria**. *The Pan African Medical Journal* 2017, **26**.
62. Clouston S, Kidman R, Palermo T: **Social inequalities in vaccination uptake among children aged 0–59 months living in Madagascar: An analysis of Demographic and Health Survey data from 2008 to 2009**. *Vaccine* 2014, **32**(28):3533-3539.
63. Rahman L, Biswas H, Hossain T, Khan AM, Khan IA: **Study on reasons of dropout of EPI vaccination in selected slum area of Dhaka city, Bangladesh**. *South East Asia Journal of Public Health* 2012, **2**(1):64-67.
64. Kumar P, Ranjan A, Kumar D, Pandey S, Singh C, Agarwal N: **Factors associated with Immunisation coverage in children of migrant brick kiln workers in selected districts of Bihar, India**. *Indian Journal of Community Health* 2020, **32**(1):91-96.

65. Antai D: **Inequitable childhood immunization uptake in Nigeria: a multilevel analysis of individual and contextual determinants.** *BMC infectious diseases* 2009, **9**(1):1-10.
66. Uddin MJ, Koehlmoos TP, Saha NC, Khan IA: **Child immunization coverage in rural hard-to-reach areas of Bangladesh.** *Vaccine* 2010, **28**(5):1221-1225.
67. Uddin MJ, Shamsuzzaman M, Horng L, Labrique A, Vasudevan L, Zeller K, Chowdhury M, Larson CP, Bishai D, Alam N: **Use of mobile phones for improving vaccination coverage among children living in rural hard-to-reach areas and urban streets of Bangladesh.** *Vaccine* 2016, **34**(2):276-283.
68. Goodwin-Gill GS, McAdam J: **UNHCR and climate change, disasters and displacement.** *The United Nations Refugee Agency (UNHCR), Geneva, Switzerland* 2017.
69. Kusuma YS, Kumari R, Pandav CS, Gupta SK: **Migration and immunization: determinants of childhood immunization uptake among socioeconomically disadvantaged migrants in Delhi, India.** *Tropical Medicine & International Health* 2010, **15**(11):1326-1332.
70. Mutton D, Haque CE: **Human vulnerability, dislocation and resettlement: adaptation processes of river-bank erosion-induced displaced in Bangladesh.** *Disasters* 2004, **28**(1):41-62.
71. Sikder R, Xiaoying J: **Climate change impact and agriculture of Bangladesh.** *Journal of Environment and Earth Science* 2014, **4**(1):35-40.
72. Haque MR, Parr N, Muhidin S: **Parents' healthcare-seeking behavior for their children among the climate-related displaced population of rural Bangladesh.** *Social Science & Medicine* 2019, **226**:9-20.
73. Chowdhury S, Banu L, Chowdhury T, Rubayet S, Khatoon S: **Achieving millennium development goals 4 and 5 in Bangladesh.** *BJOG: An International Journal of Obstetrics & Gynaecology* 2011, **118**:36-46.
74. Tulloch O, Machingura F, Melamed C: **Health, migration and the 2030 Agenda for Sustainable Development.** 2016.