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Research article

Do healthy people migrate more? A 21-year follow-up of a rural cohort in Bangladesh

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ABSTRACT

Demographers have long suspected that health influences whether a person migrates–a "healthy migrant effect" –but this has rarely been tested for a longer period with high-quality, longitudinal data. This study aimed to assess which measures of health are associated with subsequent migrations among young adults from a rural community in Bangladesh, adjusted for socio-demographic characteristics, and how long these associations persist. The 1996 Matlab Health and Socioeconomic Survey (MHSS) characterized health (by self-reported chronic, and acute morbidity symptoms in the past 12 months and one month, respectively, and self-rated health status) of adults within the Matlab Health and Demographic Surveillance System (HDSS) cohort. Analyses included 3756 (M = 1,496, F = 2260) adults aged 18–34 years (the age when migration peaks) to study the effect of health on migration. Cox Proportional Hazards models were estimated to describe associations between health status and subsequent out-migration in 1996–2017, controlling for age, sex, education, religious affiliation, and household asset quintiles. Discrete-time logistic models were estimated to assess the sustained effects of health status measures on out-migrations. Results reveal that self-reported chronic morbidity, neither acute morbidity nor self-rated health status, inhibited subsequent migration. More reported chronic morbidity symptoms were associated with a lower migration (hazard ratio, HR = 0.82, CI = 0.74–0.92 for one symptom and HR = 0.73, CI = 0.63–0.84 for ≥2 symptoms relative to no symptoms). The differences diminished but persisted over time. Socio-demographic variables inhibiting migration were female sex, older age, and lower-level education. In conclusion, healthy young rural adults were more likely to migrate than their counterparts with symptoms of chronic morbidity, and the effect of chronic morbidity on subsequent migrations waned but not eliminated over time.

1. Introduction

Migration is increasing within and across borders as migrants seek better earnings or living conditions or to escape social and political insecurity, discrimination, or repression [1–4]. An estimated 281 million (or 3.6 %) of the global population migrated from

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their country of origin in 2020, and a much larger number (than an estimated 763 million in 2013) of people migrated within their home country [3,5]. Internal and international migrants together are more than one billion, making every seventh person in the world a migrant [6,7].

Bangladesh is one of the most densely populated countries [8] and the sixth largest country of origin for international migrants globally, with 7.8 million Bangladeshi migrants living abroad as of 2019 [9,10]. A much larger number of people move within the country [11]. The main reasons for the out-migration flow from rural to urban areas or abroad are widespread poverty, decreasing land ownership due to population increase [12,13], increasing climate-change-related vulnerabilities in coastal areas, and increasing access to national and international markets for labor and goods [14,15]. Particularly labor and economic migrations play a role in economic development and poverty reduction [16–18]. Over the years, the incidence of poverty (based on the cost-of-basic-needs methodology) has reduced from 53% nationally (57% in rural areas and 35% in urban areas) in 1995–1996 [19] to 24% nationally (26% in rural areas, and 19% in urban areas) in 2016 [20].

Migration flows primarily toward higher wages and living standards and greater employment, as well as entrepreneurial and educational opportunities [21,22]. Migration, particularly labor, and economic migration, facilitates the supply of human resources where and when needed and contributes to poverty reduction and economic growth in sending and receiving communities [22,23].

Migration is influenced by macro-, meso- and micro-level drivers and plenty of observed and unobserved contextual factors. The push and pull theory of migration, proposed by Lee in 1966 [24], embodies these multilevel factors in origin and destination communities that influence migration decisions [25]. The decisions to migrate are strategic and adaptive to a situation, resulting from the combined effects of the national or sub-national (macro) level harsh factors pushing people out of home communities and the lenient factors pulling them towards destinations [26,27]. Macro-level push factors are largely environmental, political, social, economic, and demographic at the national, sub-national, or local level. They are out of the control of common people but together shape people's aspirations and desires for migration [21,25]. Meso-level factors are barriers or facilitators of migration, including political or legal processes and costs of migration, mass media exposure, social networks, and diaspora links. In the digital era, accessible communication with the diaspora and family members who migrated earlier may reinforce the desire to migrate and ease challenges to migration [21]. Micro-level factors are individual characteristics such as age, sex, education, skills, ethnicity, religion, social connectedness, and wealth to cope with the macro-level harsh situations in origin and mitigate challenges in living and earning in destinations.

Thus, migration involves economic and social costs to the migrant, the migrant's family, and community members left behind, regardless of whether the move is across or within the national border [25]. Financial and social costs are usually higher for international migrations. Particularly, the financial costs for the international migration of Bangladeshi labourers are among the highest in the world [28]. High financial costs make family members and relatives assess the potential of potential migrants, the availability of needed resources for migration, and the risks and benefits of migrating versus staying, and choose the options best suited to their situations [25,29]. They likely view the high financial cost of migration as a form of investment in human capital to get a positive net return from movement [29]. Decision for migration backed by the review of the potential of migrants for positive gains exhibits sociodemographic selectivity in migration [30].

The potential of potential migrants to harvest benefits that the family members and relatives consider before making migration decisions are overall (physical, mental, and social) health, age, gender, skills, education, and other psychosocial traits. There is a good reason to think that good health status influences the migration decision and thus increases the probability of migration as much as it aids in mitigating challenges in destinations, including social and psychological costs and the physical rigors of labour [2,21,22]. Two studies explicitly evaluated whether and to what extent health affected the probability of migration, even though there are many good reasons to think it should. Young Mexicans (age 15–29 y) and Indonesians (age 18–45 y) with positive self-rated health migrated at higher rates to the USA and within the country, respectively [31,32]. They provided evidence of health selectivity in migration within and across national borders over a short 3-year period. Short follow-up does not allow for conclusive testing of this 'healthy migration' hypothesis, nor for assessment of how long the effect of poor health is.

No study has, so far, examined the association between health and subsequent migration over a long period, adjusting for socio-demographic characteristics in South Asia, including Bangladesh, perhaps due to a lack of longitudinal follow-up data. Matlab, one of 495 subdistricts in Bangladesh, is an ideal setting to test the hypothesis that better health increases the probability of migration (i.e., the "healthy migrant effect") because migration rates are high and prolonged labor migration is common. The 1996 Matlab Health and Socioeconomic Survey (MHSS) data are linkable to the high-quality Matlab Health and Demographic Surveillance System (HDSS) data encompassing two decades of mortality and migration. Further details about the Matlab HDSS and the linking of the 1996 MHSS with the Matlab HDSS are provided in **Appendix A** and **Appendix B**.

Given the scopes above for revisiting the 'healthy migrant effect' hypothesis and differential background of men and women, this study aimed to assess the association between the health status of young adults and subsequent migration from a rural community in Bangladesh over a longer period with the following specific objectives:

a) To investigate the associations between self-reported health status and successive migration among young adults.
b) To examine how long the health status at a specific point of time remains influential in the act of migration (if health is found associated with migration).

2. Methods

2.1. Data sources

This study used health and socioeconomic data from the Matlab Health and Socioeconomic Survey (MHSS) conducted in 1996, using the Matlab HDSS population list as the sampling frame. The survey data is thus linkable to the HDSS's longitudinal follow-up data on vital events and migration with dates (**Appendix A**). The 1996 MHSS recorded self-reported chronic and acute morbidity symptoms and self-rated general and relative health status from ~13,300 individuals aged 15 years and above. Barham and Kuhn tabulated comprehensive details of the MHSS 1996 elsewhere [33,34].

The 1996 MHSS participants linked to ongoing Matlab HDSS vital events and migration allowed us to determine the survival and migration status of each HDSS resident following the survey date with event dates over time (this study followed up for 21 years). An out-migrant is an HDSS resident in a household (listed in the last HDSS census or has become a resident by birth or immigration) who moved out of the HDSS area for at least six months or permanently. The readers may find further details regarding the geographical location of the surveillance area and population coverage, HDSS field operations, registration of vital events and migration, and operational definitions of specific events, etc. (**Appendix B**).

2.2. Variable description

The primary outcome variable of the study is out-migration from the Matlab HDSS area (a rural community) over the 21-year follow-up period. The key predictor variable is health status on the survey date measured by self-reported chronic morbidity symptoms (CMS) in the preceding 12 months, acute morbidity symptoms (AMS) in the preceding one month, and self-rated general and relative health status with prompted answer choices. Morbidity symptoms were summed to yield a count of CMS and AMS separately. The count of symptoms was categorized into 0, 1, or $\geq$2. Self-rated current health status variables (general, relative to someone of the comparable age and gender as the respondent, relative to the preceding year, and expected in the coming year) were reported on a 3-point scale; this scale was then dichotomized as either good if rated better or fairly healthy or same as reference (coded '0'), or poor if rated unhealthy or worse (coded '1').

Age of the young adults is categorized into 18–24 years, 25–29 years, and 30–34 years; sex into male and female; education (grade passed) is categorized into up to primary (grade V), secondary incomplete (grade VI-IX) and secondary (grade X) and above; and religious affiliation into Muslim and non-Muslim. The household-level possession of durable assets in 1996 is used to calculate asset scores and divide all HDSS households into quintiles. The Household Expenditure Survey 1995–96 in Bangladesh reported that 53 % of the population was below the poverty line [19]. The 1996 household asset quintile is categorized into the bottom two, middle, and top two quintiles. It icluded most of the absolute poor individuals in the bottom two quintiles.

2.3. Data analysis

Descriptive statistics present gender differences in sociodemographic and reported health status and subsequent migrations of adults aged 18–34 years on the 1996 MHSS date. Chi-square ($\chi2$) is used to test statistical significance (if any) in gender difference. Both bivariate and multivariate techniques were used to analyze the data to address the study objectives.

Associations between health measures and successive emigration (objective a): Over the 21-year follow-up period, attrition due to death and repeated migrations (after returning and staying in origin for 6 months or more from destination living for 6 months or more) with dates of events are likely. Kaplan-Meier survival analysis estimated the crude first-time migration rates in 1996–2017 by counts of CMS, AMS, self-rated relative health status, and gender. The Cox proportional hazards (CPH) model treated the out-migration of young adults as a failure with censoring for death (on the event date) and staying in origin till the end of the follow-up period. The CHP model of first-time out-migration estimated unadjusted hazard ratios (HRs) of out-migration for each variable and retained the age, sex, education, household asset quintiles, and religious affiliation as control variables while estimating the adjusted HRs for each health variable. Over the 21-year follow-up period, some adults migrated out (after returning and staying in the origin for 6 months or more) for the second, third, and fourth time with in and out migration dates. Dates of repeated migrations allowed us to reintegrate repeated movements in the risk pool at the date of immigration and to treat each emigration as a failure of the same person. The CPH model for each out-migration of the same person over the study period also estimated unadjusted HRs for each variable and adjusted HRs while accounting for individual clustering at the individual level, including the same control variables.

Power of self-reported health in predicting migration (Objective b): We presented decay in the strength of associations between health and migration during 1996–2017, comparing marginal hazard functions of out-migrations from the CHP models for the first-time migrations and all (including repeated) migrations. To our person-period data set, we applied discrete-time logistic models to predict the probability of out-migration by pre-migration health status measures, adjusting for the same individual clustering and control variables. Estimated marginal predicted probabilities (per 100 person-years) of out-migrations by health status measures were compared and tested for statistical significance during 0–4, 5–9, and 10–21 years of follow-up.

3. Results

3.1. Baseline descriptive statistics

The study included 3756 (M = 1,496, F = 2260) adults aged 18–34, peaking in migration to study health effects. (Table 1). The sex ratio of the participants is consistent with the sex ratio in young adult age groups in the HDSS area in 1996. Females and males differed in formal education and household assets, with higher attainments for males. The distribution of males and females by religious affiliation was similar. More females than males reported CMS (single and multiple, or ≥2) and AMS in the past 12 months and one month, respectively. Similarly, more females than males rated their general health, relative health (compared to peers of similar age and gender), current health (compared to the last year), and expected health in the next year as poor.

3.2. Migration over 21-year follow-up period

Over the 21-year follow-up period, 57% of males and 31.5% of females moved out at least once (Table 2). Among males, 16.9% migrated at least twice (preceded by returning from their destination and staying in origin for 6 months or longer) and 3.1% thrice. Among females, 5.3% migrated out at least twice, and 15 (0.1%) migrated at least thrice.

3.3. Self-reported health and trends in out-migration

The first-time out-migration rates in 21-year follow-ups among young adults with no chronic or acute morbidity symptoms were higher than those with single or multiple (2+) chronic or acute morbidity symptoms (Appendix Fig. 1). Differences in migration rates between chronic or acute morbidity symptom counts diminished over the follow-up period. Out-migration rates were lower for those with poorer self-rated health than peers of similar age and gender. Other measures of self-rated poor health were also associated with lower out-migration rates than those who reported good health (figures not shown). The rates were lower for females than males.

3.4. Risk variables associated with out-migration

Unadjusted hazard ratios (HRs) of out-migration among young adults for each health status measure were significantly lower than HRs for corresponding health status measures, adjusted for potential confounding variables (age, sex, education, household assets, and

Table 1
Gender differences in socio-demographic characteristics and reported health status of adults aged 18–34 years (on the 1996 survey date).

Name of characteristics and labels	All n (%)	Males n (%)	Females n (%)	Chi-square ($\chi 2$) & p-value
All	3756 (100.0)	1496 (100.0)	2260 (100.0)	–
Age (in years)				$\chi 2 = 58.4$, $p < 0.001$
18–24	1428 (38.0)	680 (45.5)	748 (33.1)	
25–29	1076 (28.7)	380 (25.4)	696 (30.8)	
30–34	1252 (33.3)	436 (29.1)	816 (36.1)	
Mean (& 95 % CI)	26.4 (26.2–26.5)	25.6 (25.3–25.9)	26.9 (26.7–27.1)	
Education level				$\chi 2 = 63.0$, $p < 0.001$
None	1533 (40.8)	540 (36.1)	993 (43.9)	
Primary	1086 (28.9)	394 (26.3)	692 (30.6)	
Secondary+	1137 (30.3)	562 (37.6)	575 (25.4)	
Household asset quintiles				$\chi 2 = 170.9$, $p < 0.001$
Lowest two	1099 (29.3)	542 (36.2)	557 (24.7)	
Middle	1272 (33.9)	323 (21.6)	949 (42.0)	
Top two	1385 (36.9)	631 (42.2)	754 (33.4)	
Religious affiliation				$\chi 2 = 3.4$, $p = 0.063$
Islam	3309 (88.1)	1336 (89.3)	1973 (87.3)	
Hinduism	447 (11.9)	160 (10.7)	287 (12.7)	
Count of chronic symptoms in the last 12 months				$\chi 2 = 312.4$, $p < 0.001$
None	1718 (45.7)	907 (60.6)	811 (35.9)	
Single	1073 (28.6)	415 (27.7)	658 (29.1)	
Multiple (2+)	965 (25.7)	174 (11.6)	791 (35.0)	
Count of acute symptoms in the last month				$\chi 2 = 128.4$, $p < 0.001$
None	1849 (49.2)	872 (58.3)	977 (43.2)	
Single	1312 (34.9)	497 (33.2)	815 (36.1)	
Multiple (2+)	595 (15.8)	127 (8.5)	468 (20.7)	
Self-rated poor health status rate (%) on survey date				
Currently poor	561 (14.9)	127 (8.5)	434 (19.2)	$\chi 2 = 81.3$, $p < 0.001$
Poorer than peers	636 (16.9)	167 (11.3)	467 (20.7)	$\chi 2 = 56.1$, $p < 0.001$
Poorer than last year	876 (23.3)	255 (17.1)	621 (27.5)	$\chi 2 = 54.8$, $p < 0.001$
Expect poorer in the future	279 (7.4)	59 (3.9)	220 (9.7)	$\chi 2 = 43.9$, $p < 0.001$
Body extremities not well	215 (5.7)	31 (2.1)	184 (8.1)	$\chi 2 = 61.4$, $p < 0.001$

**n refers to the number of adults in each category.

Table 2
Number of times migrated out from the area by gender during 21-year follow-up.

Gender of survey participants	Participants at start	Number of times move out during follow-up period					
		Stayed in origin	Died	Moved 1+	Moved 2+	Moved 3+	Moved 4+
Males n (%)	1496 (100%)	598 (40.0%)	46 (3.1%)	852 (57.0%)	253 (16.9%)	47 (3.1%)	11 (0.1%)
Female n (%)	2260 (100%)	1480 (65.5%)	69 (3.1%)	711 (31.5%)	120 (5.3%)	15 (0.1%)	3 (~0 %)

Note: n refers to the number of adults.

religion). The adjusted hazards for the first out-migration from the origin were lower among the adults who experienced single or multiple chronic morbidity symptoms (Model 1 in Table 3). Neither the count of acute morbidity symptoms nor any self-rated health status measure was associated with the aftermath of out-migration. The other variables associated with higher out-migration rates were male sex, young age, higher education, and religious affiliation with Islam. Findings were similar when all (first and repeated) out-migrations were considered (Model 2 in Table 3).

3.4.1. Power of self-reported health in predicting migration over time

Among pre-migration health status measures, none, except CMS showed a negative association with out-migrations. Predicted hazards of out-migration (estimated from CHP models above) among young adults with no CMS were higher than those with single or multiple (2+) CMS. They had declined over the follow-up period (Fig. 1).

We further estimated predicted probabilities (rates per 100 person-years) of out-migration by CMS from discrete-time logistic models (details in **Appendix C**), controlling for age, sex, education, household assets, and religion. The probabilities reveal decay in the effects of CMS on out-migrations but persist over time (Fig. 2). The differences in out-migration rates by CMS remained significant over the follow-up period.

4. Discussion

We have provided one of the most robust tests of the "healthy migrant" hypothesis available to date in terms of sample size,

Table 3
Hazard ratios (HRs) of first out-migration only and all out-migrations from the origin over 21-year by health measures and socio-demographic covariates.

Variables	Model 1: First-time migration only since the health survey		Model 2: All migrations since the health survey	
	Unadjusted HR	Adjusted HR (95 % CI)	Unadjusted HR	Adjusted HR (95 % CI)
Reported CMS				
0	Reference	Reference	Reference	Reference
1	0.67**	0.87* [0.77,0.98]	0.67**	0.87* [0.78,0.98]
2+	0.46**	0.81** [0.69,0.94]	0.46**	0.83* [0.71,0.96]
Reported AMS				
0	Reference	Reference	Reference	Reference
1	0.85**	1.02 [0.92,1.13]	0.84**	0.99 [0.90,1.09]
Self-rate current health status				
Not poor	Reference	Reference	Reference	Reference
Poor	0.61**	0.94 [0.77,1.15]	0.59**	0.91 [0.75,1.11]
Self-rate current health compared to peers				
Not poor	Reference	Reference	Reference	Reference
Poor	0.71**	0.94 [0.79,1.12]	0.70**	0.95 [0.80,1.13]
Self-rated current health compared to last year				
Not poor	Reference	Reference	Reference	Reference
Poor	0.79**	1.00 [0.87,1.15]	0.80**	1.02 [0.90,1.17]
Age (ref: 18-24y) per 5-year increase	0.53**	0.63** [0.59,0.68]	0.52**	0.61** [0.57,0.66]
Sex				
Male	Reference	Reference	Reference	Reference
Female	0.45**	0.56** [0.50,0.62]	0.45**	0.57** [0.51,0.63]
Education (grade passed)				
None	Reference	Reference	Reference	Reference
Primary	1.31**	1.26** [1.10,1.45]	1.25**	1.18* [1.03,1.35]
Secondary+	2.91**	2.27** [1.98,2.59]	2.83**	2.14** [1.87,2.44]
Household asset quintile				
Lowest two	Reference	Reference	Reference	Reference
Middle	0.85*	0.81** [0.71,0.94]	0.85*	0.81** [0.71,0.92]
Top two	1.28**	0.86* [0.75,0.98]	1.30**	0.89$ [0.78,1.01]
Religious affiliation				
Islam	Reference	Reference	Reference	Reference
Hinduism	0.74**	0.73** [0.62,0.86]	0.68**	0.69** [0.59,0.81]

Note: **p < 0.01; *p < 0.05; $p < 0.1. CI: confidence interval.

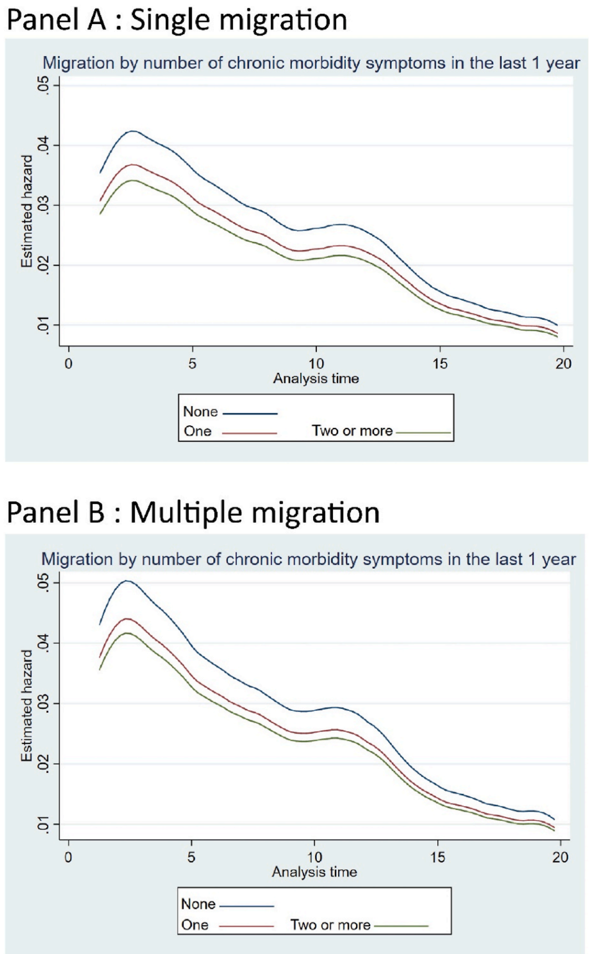

Fig. 1. Predicted hazards of out-migration: results from multivariable Cox-PH model.

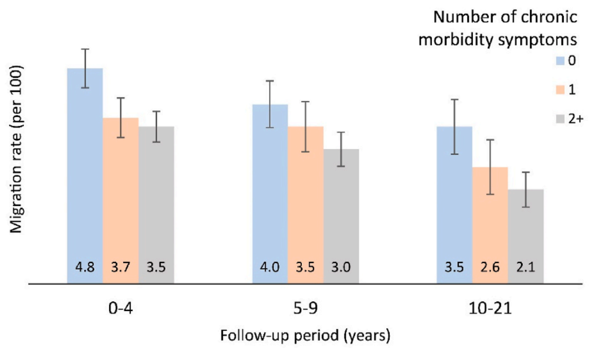

Fig. 2. Marginal predicted probability of out-migration (per 100 person-years): results from discrete logistics regression.

migration rate, and duration of follow-up and demonstrated strong support for the assertion that poor health reduces the probability a person will migrate. This effect seems to be primarily attributable to CMS. This finding is consistent with the existing literature, showing, for example, that Indonesian youth in good health (indicated by no health problem in performing activities of daily living and no morbidity in the last month) and Mexican youth with normal body mass index and blood pressure migrated at higher rates than their less healthy counterparts [31,32]. We argue that the lower rate of out-migration among those with chronic morbidity is attributable to long-term physical impairments and inability to work, which make migration and adaptation to a new environment difficult and often impossible. Chronic morbidities also make a person more dependent on their existing family and social supports and shake up his/her confidence to move. Some of the 'healthy migrant effect' could be attributable to active general health checkups and screening of international migrants for infections like tuberculosis, HIV, or hepatitis B. However, the extent to which these health checkups and screenings explain the differences in health between migrants and non-migrants remains to be evaluated.

Our findings support the common notion that health (observed morbidity and mortality) differences between low- and middle-income country migrants and their high-income country local counterparts arise from higher rates of migration among healthy people in origin countries, rather than an effect of migration itself on health [36–39]. Implications of out-migrations in both the origin (Matlab) setting and the destination settings are more persons with positive health in destination communities than in the origins. The high income of migrants may improve health and economic mobility and increase the per capita need for healthcare resources in origins [40]. The higher rate of migrations we observed among men could reference the impact on sex-health disparities, setting up the scope for more research.

The overall effect of health on the probability of out-migration is moderate compared to the effects of age, sex, and education, all of which are in expected directions, based on our understanding of the study area and the broader literature [12,15,27]. The higher rate of migrations we observed was among young educated men, who reported migrating primarily to explore employment, learn new skills, or other economic opportunities, which corroborates the findings of other studies [12,14,15].

4.1. Strengths and limitations of the study

Our study is particularly well-positioned to evaluate the "healthy migrant" hypothesis. Unlike many early observations in this literature, which compared migrants to members of their destination community [35–39], we compared migrants to non-migrants from their community of origin, the more appropriate comparison for testing the hypothesis. We assessed health before migration, minimizing selection bias compared to retrospective study designs. The ongoing HDSS has been operating in the study area since 1966, capturing vital events, including migrations, with high accuracy. We analyzed both the first-time migration and repeated migration. These strengths mean we have provided the most definitive test of the healthy migrant hypothesis to date.

Our study also has some limitations. In rural areas, agriculture activities are seasonal, and more males migrate out in the off-season [41]. HDSS does not record short-term (less than 6 months) circulatory seasonal movements, a distress-driven strategy adopted by the poor and benefits the poorest of the poor [41,42]. Not counting the short-term seasonal migration, we might have underestimated the level of migration of males more than females. We neither differentiated between internal and international migrations, nor between short- and long-distance moves, nor between different expressed reasons for migration. We could not consider control variables, such as participants' links to diaspora, social networks, and history of migration (before the study period). These may be factors influencing migration, which we could not include in models. In addition to these variables, we did not consider how variables beyond age interacted with health as predictors of migration.

We relied on self-reported CMS, AMS, and self-rated health status. Large-scale health surveys commonly use these data. However, they likely introduce some errors, including under-estimate ascertainment of morbidity, particularly mild courses of chronic morbidity that cause few symptoms early in their etiology. The reported health status is further influenced by what participants consider ill health, which likely leads to some under-estimation of morbidity. Nonetheless, these measures predict mortality and important disease outcomes, such as cardiovascular disease [43]. Other domains of health, such as physical health (grip strength, body mass index, and mental and social states), were not assessed in these data. Further, our analyses did not capture change in health status since it was reported during the survey in 1996, so we may have underestimated the impact of health on migration. Additional research will be needed to establish the generalizability of our findings beyond Matlab, Bangladesh.

4.2. Policy implications

Our research is focused on whether health status affects the decision to migrate. At the family level, the migration of one healthy working-age family member has various implications for those left behind, including spouses, children, and elderly dependents. His/her sustained absence may adversely affect the well-being of aging parents and other vulnerable household members, particularly in vulnerable households. An explicit implication of the higher migration rate of healthy and educated males from a community is that those left behind are less healthy. This likely increases the per capita healthcare needs and decreases the economic productivity in the community. However, migration has several positive benefits to override some of these social costs to migrants and their families. Migration alleviates unemployment and poverty, increases the incomes of the remaining workers, promotes the home economy, and improves health and educational outcomes [44]. These gains through higher income increase inequality in the sending community [40,45,46]. In addition, as we have discussed elsewhere, excess male migration distorts the sex distribution of the population. It creates a sex disparity in health among those who do not migrate that would otherwise not be observed [47], with implications for communities' healthcare needs.

5. Conclusion

CMS decreased the probability of migration among 18-34-year-old adults from the study area, supporting the "healthy migrant" hypothesis. This effect was robust enough to control for other characteristics likely to impact migration and it declined with time. Elevated migration rates among a community's healthy and young members are likely to profoundly affect health and well-being in origin and destination communities.

CRediT authorship contribution statement

Nurul Alam: Writing – original draft, Supervision, Formal analysis, Data curation, Conceptualization. **M. Moinuddin Haider:** Writing – review & editing, Visualization, Methodology. **Md Mahabubur Rahman:** Writing – original draft, Visualization, Formal analysis. **Mamun Ibn Bashar:** Writing – original draft, Formal analysis. **Md Tazvir Amin:** Writing – review & editing, Writing – original draft, Visualization. **Katherine S. Wander:** Writing – review & editing.

Ethics statement

This study used secondary data from the Matlab Health and Socioeconomic Survey (MHSS) conducted in 1996 within the Health and Demographic Surveillance System (HDSS) site in Matlab. Both the projects; MHSS and HDSS were approved by the Institutional Review Board of icddr,b, Bangladesh.

Submission declaration

This research article has not been published or accepted for publication and is not under consideration for publication in another journal or book. Its publication is approved by all authors. If accepted, it will not be published elsewhere in the same form, in English, or any other language, including electronically without the written consent of the copyright holder.

Data sharing statement

The HDSS data is sharable on request and only for the purposes related to this study.

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Declaration of competing interest

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Appendix A. Supplementary data

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