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Abstract

Previous studies have shown that immigrants are generally healthier than the native-born populations of receiving societies, a result generally attributed to the positive selection of migrants with respect to health. This hypothesis, however, has not been adequately evaluated due to data limitations. Using high-quality longitudinal data from Indonesia, I explicitly examine the health selectivity hypothesis, also referred to as the healthy migrant hypothesis, with respect to internal migration. Specifically, I study whether pre-migration health status affects the likelihood of migration by comparing those from the sending population who do and do not move. Results show that migrants in Indonesia do tend to be selected with respect to health and that this aspect of selection is robust to household unobserved heterogeneity. However, the strength and direction of the health-migration association vary by different types of migration and distinctive dimensions of health.

Introduction

Migration and health are two areas that have each received a significant amount of attention in demography. However, only recently have researchers begun to examine the link between these two population processes. There is growing evidence, albeit incomplete, that the process of migration and the health of individuals are intertwined in complex ways. Health itself can impact the decision to move and migration may affect the health of those who move, those who stay, and perhaps even those who host migrants (Hull, 1979). Considering health in the context of migration thus offers a better understanding of the complexity and diversity of the various migratory patterns. Such an understanding is especially critical, as migration has become a persistent phenomenon that is changing the structure of family units, communities and societies in our modern world.

Previous work on the link between migration and health largely compares the health of immigrants to that of the native population at destination places. Studies of this kind usually find that immigrants are generally healthier than the native-born populations as indicated by mortality rates, chronic conditions, mental health, etc., though the advantage enjoyed by immigrants tends to deteriorate over time (Anson, 2004; Cabral, Fried, Levenson, Amaro, & Zuckerman, 1990; Feranil, 2005; Marmot, Adelstein, & Bulusu, 1984a, 1984b; Palloni & Morenoff, 2001; William, 1993). Such an observation is often referred to as the "epidemiological paradox", as immigrants usually face disadvantages in many socioeconomic aspects that have negative implications for health. Therefore, immigrants are expected to have worse health outcomes.

One of the most frequently offered explanations is the "healthy migrant hypothesis". It states that migrants represent a selectively healthy group that are not representative of all potential migrants from origin societies (Palloni & Morenoff, 2001). As a result, their health advantage stands out when they are compared with the general population at destination.

The “healthy migrant hypothesis” is often regarded as a sensible explanation for the positive health outcomes. However, this theory has been purely speculative and inadequately tested. This is in clear contrast to the abundant research on the selection of migration with respect to demographic and socioeconomic characteristics. Actually, in almost none is there an attempt to compare the health of migrants with that of populations in sending communities other than the U.S. This is largely due to the lack of adequate data, which require collecting information on the population from the home region prior to migration.

This research represents one of the first attempts to examine the potential influence of health on the likelihood of and reason for migration. An explicit test of the “healthy migrant hypothesis” is crucial for a sound understanding of health disparities between migrants and native population, because it enables us to disentangle the impact of migration on health from the selection of migration with respect to health. By contrast, most earlier work establishing an “epidemiological paradox” inevitably confounds these two aspects linking migration and health, as a result of their exclusive focus on studying health after migration.

In this study I assess the health selectivity of migration by comparing the pre-migration health status between those from the sending population who do and do not move. I focus on internal migration, for which data on comparable nonmigrant population are more readily available. Data used are from the Indonesia Family Life Survey (IFLS), a national representative longitudinal sample survey conducted in 1993, 1997, and 2000. The longitudinal structure and the detailed migration histories facilitate the examination of my research questions, by establishing temporal order and treating migration and health as dynamic rather than static processes. In addition to exploring the general pattern of how health is related to migration decisions, I further distinguish different types of migration to take account of substantial heterogeneity among migrants, and various dimensions of health given that they may have different implications for migratory decisions. Adjustment for unobserved heterogeneity, which may contaminate the relationship, is built into the analysis.

Indonesia, the fourth most populous nation in the world, is drawn on as a case study. The country has enjoyed rapid economic growth over the past three decades, along with concomitant improvements in access to health care and common measures of health status such as life expectancy and infant mortality rate (Frankenberg & Thomas 2000; Muhidin, 2002). With respect to migration, Indonesia is recognized as one of the world's major sources of unskilled migrant workers (Hugo, 2005; Sukamdi & Brownlee, 1998). As the industrialization process has intensified, geographical mobility within the country also has increased in recent years (Hugo, 2005; Muhidin, 2002).[1] In the most recent census, one in ten Indonesians was classified as a migrant. This stream is largely characterized by rural to urban and economically motivated migration, with the largest cities as the main destinations. A few studies have examined the characteristics of internal migrants in Indonesia (Muhidin, 2002; Speare & Harris, 1986), which suggest that migrant workers are drawn disproportionately from young adult males who are better educated and who are from relatively poor households than are comparable nonmigrants.

Analytic Framework

Since migration often involves disruption of individual's life and adaptation to a new environment, migrants tend to be selected for personal characteristics that foster their ability to handle change and adapt to new environments. Good physical health is likely to be one of the selection factors. People with poor health may be less likely to move because they are less capable of moving or managing the difficulties and stress associated with migration. This is especially true for long-distance and work-related migration, which requires considerable level of physical stamina to endure the demanding journey and achieve successful residence.

In contrast, people in good health may be more likely to move since health does not place an impediment to migration, and good health may even foster their ability to make migration a gainful experience. Previous studies suggest that migrants appear to be healthy not because they are selected on health but because they are favorably selected on socioeconomic and demographic characteristics that foster good health (McKinlay, 1975). I, however, argue that even when taking account of potentially confounding demographic and socioeconomic factors, migrants are selective of those with superior health.

The complexity of the health-migration association is stressed in previous literature. Findley (1988) and Freedman (1947) suggest that the direction and strength of the association may depend on individual traits such as age, given that the migration behavior of older people may differ substantively from that of younger adults. Older people are relatively immobile; thus, their decisions to move tend to result primarily from life events in which changing the place of residence is considered necessary. Health-related considerations are likely the common motivations, such as seeking healthier environments, better health care, or the aid of family members to cope with health and functional deficits. Therefore, while younger adult migrants may be generally healthier in comparison to nonmigrants, the elderly migrants tend to be less healthy. In addition, for the elderly health may have a causal impact on migration decisions, especially when they experience poor health or expect future deterioration of their health (Patrick, 1980). For the young, in comparison, health might not be directly related to migration decisions, but rather increases or reduces the likelihood of moving because of the difficulties and stress associated with the migration process.

Discussing the complex relationships between migration and health also requires specifying the types of move involved, particularly with regards to the reasons for moving (Evans, 1987; Findley, 1988; McKinlay, 1975). Family-related and work-related migration is the most common type in Indonesia, which is especially salient for young people. Because the reason for migration to a large extent reflects different levels of uncertainty and hardship associated with the move, I expect that the degree of the selection varies by different groups of migrants. Specifically, among all migrants, those moving for work-related reasons are particularly favorably selected with respect to health, because this type of migration represents the most demanding type of move—it often requires certain capabilities, in particular physical ability, to perform physically demanding jobs and grasp other opportunities at the destination. Family-related migration, by contrast, largely reflects a continuation of family life, with much less uncertainty and hardship. As a result, family migrants do not necessarily need superior health to settle in at the destination.

Furthermore, given that the concept of health is multidimensional, I expect migration behavior to be differentially responsive to various aspects of health. More chronic and severe conditions may have a greater influence on migration decisions because they lead to physical weakness that is highly salient for the victims. Such health deficits usually create a strong impediment to physical activities, which tend to make migration and subsequent adaptation difficult and even impossible. In contrast, acute and mild health conditions may not play a crucial role in migration decision-making because they are likely to heal in a short time interval and the impact may not be strong enough to impede normal life and may not even be acutely felt. This is especially true for illnesses that have no noticeable symptoms and develop slowly and silently. The asymptomatic nature of these conditions implies that they require a professional diagnosis to be recognized. This, however, is less likely to occur in Indonesia due to the extremely limited use of health care services, especially when it comes to preventive health care such as regular medical examination (Chernichovsky & Meesook, 1986; Zevalkink, Riksen-Walraven, & Van Lieshout, 1999). Therefore, a large number of acute and mild cases remain undiagnosed, leaving only severe health conditions visible to the victims.

The hypotheses can be summarized as follows, which should be understood as net effects, after taking count of correlated covariates:

H1. For the young, migrants are positively selected with respect to health.

H2. For the elderly, migrants are negatively selected with respect to health.

H3. Work-related migrants are particularly favorably selected with respect to health.

H4. Selectivity is especially salient with respect to chronic and severe conditions.

Data and Methods

Data

Data used are from the 1997 and 2000 waves of the Indonesia Family Life Survey (IFLS), a high-quality panel survey of individuals, households and communities. To maximize representation of the population, the IFLS was conducted in 13 out of 27 provinces in Indonesia, representing 83% of the population. The first round of data (IFLS1) was collected in 1993 using multi-stage probability sampling and it included interviews with 7,224 households and with 22,347 out of 30,000 individuals within these households (Frankenberg & Karoly, 1995). In each household representative members (typically household heads) provided detailed household demographic and economic information. In addition, several household members were randomly selected and interviewed on a broad range of topics including migration experience, socioeconomic conditions and health status.

In 1997, a resurvey was conducted of the IFLS1 individuals, households and communities. This survey (IFLS2) attempted to reinterview all IFLS1 households and respondents (and also to interview all these not interviewed in 1993) (Frankenberg & Thomas, 2000). For a household and a target respondent that had moved within the 13 provinces included in IFLS1, information was sought about the new location and the respondent was interviewed in the new place. The IFLS has very low sample attrition. Excluding the households in which everyone had died, IFLS2 succeeded in interviewing 94% of the IFLS1 households and 91% of target individuals, including about 1,500 respondents who had moved out from the original household and were successfully tracked and reinterviewed in a new household (Frankenberg & Thomas, 2000). Following the practice of IFLS2, IFLS3, which was conducted in 2000, attempted to reinterview all households and all members in previous rounds. Again, over 94% of the households in IFLS1, and over 90% of the households in both IFLS1 and IFLS2 were located and reinterviewed (Strauss, Beegle, Sikoki, Dwiyanto, Herawati, & Witoelar, 2004). Given that IFLS represents one of the first efforts in social surveys to track respondents who had moved, sample attrition bias is not likely to be a major concern using IFLS.

The IFLS is a multi-purpose survey. It collected a broad array of demographic, socioeconomic and health information on individuals, households, and communities. Much of these information was repeated across waves of the survey. Importantly, the IFLS contains a detailed migration history and a wide range of health indicators through self-reports as well as physical assessments. In the migration history module, information on birth place, place of residence at age 12, and each trip longer than six months since age 12 and certain characteristics associated with each trip (e.g., date, purpose, and destination) was gathered. In all three waves, self-reported health and measures of height and weight were available. IFLS2 and IFLS3 additionally included a number of physical assessments such as hemoglobin level and blood pressure.

Measurement of variables

Health status is difficult to measure and no agreement exists as to what measures are good indicators of health. This is partly because that the concept of health is complex and is, in fact, multi-dimensional. Strauss and Thomas (1998) have argued that health is composed of distinct components that must be measured and interpreted separately. For this reason, various indicators of health are examined individually in association with migration. The analysis includes several physical assessments as well as self-report of physical functioning, each described later this section. The self-report of general health is not used, as it has been shown in Indonesia and many other settings to be subjective and suffer from systematic biases (Sadana, Mathers, Lopez, Murray, & Iburg, 2000; Thomas and Frankenberg, 2002a).

Activities of daily living (ADL) is used as an indicator of physical functioning. The ADL scale is generally comprised of items measuring functionality, such as the ability to bow and kneel, to carry heavy load, and to dress and stand up without help. ADL measures long-term health, in particular social limitations resulting from severe chronic disease and disability (Johnson & Wolinsky, 1993). Since the data did not collect information on chronic diseases, it is the single measure available that reflect long-term health conditions. Although ADL measures are collected through self-reports, as suggested by Bound (1991), they are easy for people to answer and are less subject to respondent bias than self-reported general health because the questions are well-defined and specific to individual’s ability to function at particular tasks. Sensitivity analysis shows that ADL correlates well with other health measures in IFLS, whereas self-reported general health does not. Many of the standard ADL items are of the greatest salience for the elderly because they concern activities necessary in daily life as basic as dressing and bathing. In IFLS, a few items relevant for prime-age adults were included, which measure the respondent’s capacity to perform physically strenuous activities, such as carrying a heavy load and walking long distance. These ADLs have been utilized effectively in investigating the health of prime-age adults in previous work (Frankenberg & Jones, 2004). I constructed a dichotomous variable, coded 1 if the respondent reported having difficulties with any of the nine tasks included in IFLS. Similarly, I created a dichotomous measure indicating self-reported acute disease condition as a measure of short-term health: whether the respondent had any acute morbidity symptoms in the last four weeks, such as headache, cough, stomach ache, etc. As we know, self-report measures are sometimes contaminated by recall bias. This, however, is less of a concern using IFLS. This is because the ADL measures ask about severe physical impediments and the acute morbidity questions refer to recent events within four weeks, both of which are easy to answer.

Body Mass Index (BMI), which reflects adult nutritional status and is thought to be correlated with physical capacity, is used frequently as an indicator of adult health. It is calculated by dividing individual's body weight in kilograms by the square of individual's height in meters. Extreme values of BMI have been shown to be related to elevated morbidity and mortality (Fogel, Costa, & Kim, 1993). The BMI mainly captures short-term dimensions of nutrition and is subject to changes over a relatively short period of time. I focus on low levels of BMI, and constructed a dichotomous measure of whether an individual has a low BMI based on the WHO cut-off 18.5 (NHLBI, 1998).

High blood pressure, or hypertension, is a major health concern in adult population. It has no noticeable symptoms, and can be heightened in a relatively short period or develop over many years. I created a dichotomous indicator of whether the respondent has hypertension using cutoffs defined by the American Medical Association—a systolic blood pressure of at least 140 or a diastolic blood pressure of at least 90.

Iron-deficiency anemia is a common health problem in developing countries, not only among children but also among adults (WHO, 2002). It is measured by hemoglobin level, with low levels of hemoglobin connected to greater susceptibility to diseases, fatigue, reduced cognitive development and lower levels of productivity (Thomas & Frankenberg, 2002b). Anemia captures short-term nutritional status or long-term chronic conditions such as ulcers. Similar to hypertension, it has few noticeable symptoms and is usually unknown to people until formal diagnosis. I constructed a dichotomous measure indicating whether the respondent is anemic, based on the WHO cut-off of 12g/dl for women and 13g/dl for men.

Statistical methods

To explicitly test the healthy migrant hypotheses identified above, I estimated a set of logistic regressions predicting whether an individual moved between 1997 and 2000 from each health indicator along with other control variables measured in 1997. I used the 1997 and 2000 IFLS, for which longitudinal health data were available. The outcome variables, migration status, were created using information from the migration history module. I first created a binary measure indicating whether a person moved between 1997 (after the completion of the IFLS2 interviews) and 2000 using information on the date of migration. I further distinguished different types of migrants by the reason for moving, which is readily available from the data. I differentiated three types of migration by purpose: migration for work, for family-related reasons (including moving for marriage, moving with a family member and moving to live with a family member), and for all other purposes.

Other control variables include age (an indicator variable defined by 10-year age groups ranging from 18 to 75, except for the youngest group), gender, education (a continuous variable indicating years of completed schooling), log per capita annual household income, place of residence (a dichotomous variable indicating rural vs. urban residence), marital status (an indicator variable distinguishing between never married, married and living with spouse, married not living with spouse, and all other status such as divorced, separated, and widowed), and previous migration experience (a dichotomous variable indicating whether an individual ever moved before the 1997 interview).

These covariates were incorporated throughout the analyses because they have been shown as important factors affecting migration decisions. The inclusion of these factors also leads to more accurate estimates because they are likely to be confounders that are correlated with both migration and health status. Importantly, the control of previous migration experience enables us to capture unmeasured aspects of individual's propensity to move, which plays a similar part to a lagged dependent variable. The key test in all models is the statistical significance of the health measure examined. In the analysis, respondents older than 75 were excluded to reduce bias due to selective mortality, similarly for those younger than 16, for whom migration is likely to be motivated by decisions of adult family members.

Using binary migration status as the outcome, I estimated separate equations for the prime-age adults (age 18-45 in 1997) and older respondents (age 46-75 in 1997), given the distinctive hypotheses regarding each group. The models can be formulated as:

$$\log\left(\frac{p_{ti}}{1-p_{ti}}\right) = \alpha + \beta hlt_{(t-1)i} + \gamma X_{(t-1)i} \qquad (1)$$

where p_{ti} is the probability that i th individual moved between 1997 and 2000; $hlt_{(t-1)i}$ is the dichotomous health status measured in the 1997 wave; and $X_{(t-1)i}$ is a column vector of individual and household characteristics described above.

I next studied migration for different purposes focusing on the younger group, which give adequate sample in each disaggregated migration category. Multinomial logistic regressions were estimated to model the probability of being in each of the three migration groups relative to the nonmigrant group. The models can be formulated as:

$$\log \frac{p_{tij}}{p_{ti1}} = \alpha + \beta hlt_{(t-1)i} + \gamma X_{(t-1)i} \tag{2}$$

where $\frac{p_{tij}}{p_{ti1}}$ is the relative probability for ith individual to choose alternative j rather than alternative 1 (stay); and the left-hand side variables are similar to those in equation (1), all of which were measured in 1997.

In all models described above, I used the Huber-White robust estimator to adjust standard errors for clustering of individuals within households to take account of homogeneity within the same family (White, 1980). If left unadjusted, the models tend to underestimate the variability in the data, thereby leading to overly small standard errors.

In addition, I took into account potential confounding stemming from economic shocks and crisis, which is relevant in all models. Any sort of socioeconomic shocks external or internal to the household, such as economic crisis, crop failure, layoffs and natural disaster, may be an impetus for migration as well as causing health problems. This may underestimate the association between health and migration. I first included a measure indicating whether the household experienced any economic shocks in the past five years. This information is directly available in the 1997 IFLS.

In a similar vein, socioeconomic shocks external to the household are also pertinent in the present study, especially since Indonesia entered a period of financial crisis in 1997-1998. Despite that previous work finds moderate impact of the crisis on a range of socioeconomic and health outcomes (Frankenberg, Beegle, Sikoki, & Thomas, 1998), and in general there was hardly any persistent influence of the crisis by the time of the 2000 wave, I attempt to correct for potential bias due to the financial crisis to provide more conservative estimates. The impact of the crisis has been shown to vary by region and household economic conditions (Frankenberg, Thomas, & Beegle, 1999). Based on this finding, I controlled for household per capita income as an indicator of economic conditions, and province of residence as an indicator of regional heterogeneity (which also helps correct for various contextual differentials). The adjustments for internal and external shocks were built into all model specifications.

Moreover, I attempt to address potential biases due to unobserved heterogeneity that occurs when unmeasured factors are associated with both health status and the propensity of migration (examples of such factors include previous life exposure, genetics, etc.). In this situation, the observed relationship is not necessarily evidence of an association between health and migration, but rather indications of certain traits specific to migrant households that increase or reduce the propensity of moving. I used a household fixed-effect (FE) model to absorb the unobserved confounding factors constant at the household-level. Here I assumed that the unobserved heterogeneity, such as genetic disposition and family background, is stable across adults within the household, which is a relatively reasonable assumption.

The FE approach contrasts eligible household members (of which there must be more than one per household) who moved with those who stayed with respect to their differences in health status and other factors. In essence, it controls for unobserved heterogeneity between households which affects the propensity of migration among their members. This approach also provides further insight into the health selectivity of migration because it conceptualizes migration as a household decision-making process, which is often documented in developing countries (Bhattacharyya, 1985; Lauby & Stark, 1988; Mincer, 1978). In other words, the FE model examines not only the question of whether migrants tend to be healthier on average than nonmigrants, but also whether within a household, healthier members are more likely to move than less healthy members. To estimate a household FE model, equation (1) can be reformulated as:

$$\log(\frac{p_{ij}}{1-p_{ij}}) = \alpha + \beta hlt_{ij} + \gamma X_{ij} + \chi Z_j + \varepsilon_j \tag{3}$$

where Z_j is a column vector of observed characteristics that are constant within the household (i.e., household income); X_{ij} is a column vector of variables that vary both across individual *i* and household *j* (i.e., age, health status); ε_j represents all differences between households (stable within each household)—observed or unobserved—that are not accounted for by Z_j. It is regarded as a set of fixed parameters, one per household. The basic idea of conditional fixed-effect logit models is to reformulate the likelihood function so that equation (3) no longer contains the household-specific parameter ε_j. A more detailed description can be found in Wooldridge (2002), and is thus not repeated here.

FE models were utilized only in binary logistic regressions. FE methods for multinomial logistic regression are difficult to estimate and require estimation algorithms not widely available. I thus used results from the binary FE models to gauge the extent to which unobserved heterogeneity affects the estimates in multinomial logit models.

Results

Descriptive statistics

Table 1 presents descriptive statistics for the analytic sample with complete information on all variables, separately for the old and the young. We note substantial differences by age. The overall rate of migration is significantly higher for the younger group (11%) than for the older group (3%). There are also noticeable differences by purpose, with younger people more likely to move for work-related reasons while older respondents for other and family-related reasons. After I further break down by detailed categories, results show that among the older group, a large proportion reported health-related reasons, in particular sickness and move to live with family members. This, to some extent, lends support to the speculation that older people tend to migrate to seek care and support, especially when they experience or expect declines in health. Additionally, Indonesia turns out to be a country with high rates of lifetime migration, as more than 50% of the respondents ever moved before 1997.

As for demographic and socioeconomic status, the younger group appear to benefit enormously from educational expansion: they received 3 years more schooling on average than the older group. Younger people also tend to enjoy better household economic conditions. The per capita income averaged 100,000 Rupiah higher per year in households that were largely comprised of young people (in 1997, 1 US dollar $\approx$ 2,500 Indonesian Rupiah). The pattern of marital status mainly reflects the aging of the population: the majority of adults above age 45 were once married but they were also more likely to experience marriage dissolution of various kinds.

For similar reasons, health deficit measures generally show remarkable differentials favoring the younger group. The disease rates for younger people average half of those for the old in most cases. In addition, we see that all health measures exhibit sufficient variability, even for younger respondents. Take ADL for example, almost 20% of the younger group reported difficulties with ADL, confirming its validity even for prime-age adults. The extremely high rate of short-term morbidity symptoms stands out as expected, because they measure mild and acute conditions that are commonly experienced in everyday life.

The attrition rate for the analytic sample is 8.7%, substantially lower than the majority of longitudinal studies. The issue of concern here is whether panel respondents and people lost to follow-up are different with respect to health. Additional analysis demonstrates that only anemia reveals a significant difference favoring those who dropped out, which does not pose a major concern. Ideally, I also would like to distinguish those who dropped out due to various reasons such as death, migration, refusal, etc. However, the data do not provide sufficient information.

Health selectivity of migration

Table 2 and 3 present logistic regression models predicting whether an individual moved between 1997 and 2000 based on his or her health status and other controls measured in 1997. I estimated separate models for each health measure, and for the young and the old respectively. Because information on ADLs and morbidities was gathered via self-reports, they have fewer missing data in comparison to physical assessments, which were collected in a subsample. The analyses were thus based two sample sizes, a smaller one for those concerning physical assessments and a larger one for those involving self-reports, to preserve more information. I conducted sensitivity analysis restricting all models to the same group of respondents, which gave consistent results but reduced the sample size by almost 1,000.

We see from Table 2 that age is negatively associated with the propensity to migrate for both age groups. Gender does not significantly affect the likelihood of moving. Among younger respondents education increases the likelihood of migration whereas household income diminishes the probability. Among the elderly, however, neither education nor income is related to migration. Previous migration experience is a strong predictor of future migration behavior for both groups. Importantly, health impairment as measured by ADLs is negatively associated with the likelihood of migration for the younger group, but positively for the older group. The results are consistent with Hypotheses 1 and 2.

Results for other health indicators are reported in Table 3. Coefficients of other control variables reveal similar patterns to those in Table 2, and are thus not shown. The same is true for the rest of the tables. Inspecting Table 3, we see that the remaining health measures do not seem to matter for either age group, though most of them are in the expected direction. These results lend support to Hypothesis 4 that health deficits with a short course or minimal symptoms are unlikely to enter the migration decision-making process. Hypertension, the "silent killer," shows no symptoms until there is a catastrophic vascular event. Anemia must be quite severe before its symptoms, mainly chronic fatigue, become salient. Low BMI may be regarded as an individual trait rather than a symptom of poor health. And morbidity in the month before the survey presumably mainly refers to acute conditions, from which individuals recover. By contrast, ADL deficits are clear and unambiguous signals that something is amiss. People who experience shortness of breath or have difficulty walking a distance or carrying a load know that they are not strong enough to risk migration. Thus, it is unsurprising that ADL deficits are associated with a reduced probability of migrating, but that the remaining health indicators show no relationship.

Table 4 disaggregates migration by purpose, and repeats the analysis of Tables 2 and 3. I restricted the analysis to the younger group because the data do not provide sufficient cases for the older group when I subdivide migrants. Here we see that ADL deficits affect only migration for work but not that for other reasons. This is consistent with Hypothesis 3, which suggests that health is mainly implicated in labor migration decisions. Health deficits as measured by three biometric indicators also seem to be negatively related to labor migration, though they lack sufficient statistical significance. The patterns for other types of migration are mixed, suggesting a different decision-making process. As for other covariates not shown here, most of them have similar impacts on labor migration as in Table 2, with the exception of gender and place of residence. Males and rural residents clearly have a much higher propensity of moving for work-related reasons comparing to females and urban residents, a pattern that is made unambiguous when I subdivide by types of migration.

Table 5, in which models are corrected for unobserved heterogeneity, gives consistent results as in Table 2 and 3. ADL deficits reduce the probability of moving, which does not hold for other health conditions. This finding demonstrates that the association between migration and health is relatively robust to unobserved confounding factors at the household-level. Hence, there are reasons to believe that results from multinomial analysis are not very likely to be seriously contaminated by this source of bias. Because household FE models in effect contrast the health status of individuals within the same household who moved versus who stayed, this result can be interpreted as indicating that even within a household, healthier members are more likely to move than are others, net of the series of demographic and socioeconomic controls.

Discussion

This paper examines the question of whether health conditions are associated with migration decisions, in the context of a rapidly growing migration population in Indonesia. It represents one of the first attempts to explicitly examine the "healthy migrant hypothesis" by incorporating pre-migration health information on people who move and who stay. In addition, I study the health-migration association taking into account the heterogeneity of migrants and various dimensions of health. Because the relationship is further complicated by the fact that the highly selective characters of migrants may affect both the decision to move and the health status (in ways that are not measured by the typically limited variables available in sample surveys), I employ analytic strategies that control for household unmeasured heterogeneity to offer a more accurate assessment.

I find that the relationship between health and migration is complex: younger migrants are positively selected with respect to health whereas older migrants are negatively selected. This is not surprising, especially since it turns out that the positive selection of younger migrants is mainly restricted to labor migrants. Among older people health problems appear to be a major reason for migrating, and they often move to seek improved medical care, less stressful living environments, and the support of relatives who can provide care. Younger migrants, and labor migrants in particular, tend to be negatively selected for chronic health conditions and disabilities, reflected in the inability to perform one or more “Activities of Daily Living”. No other health indicators seem to matter, presumably because they either are not known to respondents (e.g., anemia and hypertension) or because they are regarded as temporary (e.g., acute morbidity within last month). This is especially true in the context of a developing setting like Indonesia, where the use of health care services remains limited and the under-diagnosis of health problems continues to be common. Moreover, the health selectivity of migration is relatively robust to household unobserved heterogeneity. I find not only that migrants are healthier on average than are non-migrants, but within households, migrants are healthier than non-migrant household members, net of age, sex, education, and the other individual factors included in the models.

I would like to acknowledge some limitations. The survey only captures relatively long-term internal migration (moves that cross a village boundary and last more than six months), thus limiting the generalizeability of the results to short-term and international migrants. Also, information on the purpose of migration is not very fined-tuned, and was actually gathered after the moves. Therefore, considerable error may be introduced in the distinction; for example, we see that in the data a large number of cases are grouped into the “other” category.

Despite the limitation, the data, quite convincingly, lend support to the long-standing presumption—the “healthy migrant hypothesis”, which states that there is a selection bias for the movement of healthier individuals. This finding helps explain the “epidemiological paradox” that associates immigrants with lower mortality and morbidities. The paper also sheds light on some future directions regarding studies linking health and migration. First, although the present study examines a number of health indicators, migrants may very well be intrinsically selected on domains of health not studied here. This topic deserves more effort. In addition, I examine internal migration, which shares many similarities but also bear considerable differences with international migration. This tends to have different implications for the selection process. For example, international migration may be more physically demanding as it implies crossing national boundaries and overcoming various cultural and legal barriers. It might thus be sensible to expect that immigrants are even more rigorously selected in terms of health. The extent to which this conjecture is true, however, needs further investigation.

Finally, the present study helps create an understanding of health as an integral component of migration that cuts across all facets of migration from the decision to move to the reception in a new environment. Results point to the possible applicability of the health selectivity of migration in better understanding variations in health as outcomes for the migrant population. This question will be examined as the next stage of this project. Early work has illustrated either a protective or a disruptive effect of the migration experience and acculturation on health over the course of migrants' stay. However, most of them fail to take account of potential selection of migration with respect of health. To obtain a more accurate understanding, I will explore this aspect of the health-migration link—namely the impact of migration on health—while adjusting for the health selectivity of migration by incorporating health conditions prior to as well as after migration.

Endnotes

1. Whereas most migrants move on their own, some migration has been organized by the government-sponsored “Transmigration Program” in Indonesia to redistribute the population from overpopulated to less populated regions. I do not specifically examine this type of migration since it constitutes a very small proportion of the population and thus, the sample.

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Tables

Table 1.

Means and percentages of variables used in the analysis by age group, Indonesian adults age 18-75 (standard deviations in parentheses).

Variables [a]	Age 18-45	Age 46-75
Migration status		
Migration between waves*	11.1%	3.1%
Migration by purpose (for migrants only) *	(N=1074)	(N=137)
Labor migrant	21.5%	16.7%
Family migrant	42.4%	34.3%
Other migrants	36.1%	49.0%
Ever moved before*	49.4%	55.3%
Health measures		
Problems with ADL*	19.2%	44.4%
Morbidity in last month*	78.1%	83.1%
Low BMI*	13.2%	22.8%
Hypertension*	18.7%	46.7%
Anemia*	28.5%	38.0%
Control variables		
Age*	31.3 (8.0)	57.2 (7.7)
Male*	42.2%	47.0%
Years of completed schooling*	7.3 (4.4)	4.1 (4.2)
Per capita annual income (in thousands of 1997 Rupiah)*	693.3 (939.0)	579.3 (906.6)
Marital status*		
Never married	22.5%	0.7%
Married, living with spouse	70.9%	77.2%
Married not living with spouse	3.0%	1.2%
Other	3.7%	21.0%
Rural residence*	51.9%	57.1%
Economic shock in past five years	41.4%	41.3%
N	9666	4455

[a] All variables were measured in 1997, with the exception of migration between waves and by purpose, which were gathered in 2000.

* p value < 0.05

Table 2.
Logistic regression of migration between 1997 and 2000 on health status and other predictors measured in 1997, IFLS 1997-2000 (robust standard errors in parentheses).[a]

Logits	Age 18-45	Age 46-75
Problems with ADL	-0.243**	0.373*
	(0.093)	(0.187)
Age	(ref. 18-25)	(ref. 46-55)
Second decile	-0.601***	-0.175
(26-35 or 56-65)	(0.089)	(0.193)
Third decile	-1.318***	-0.514†
(36-45 or 66-75)	(0.121)	(0.284)
Male	-0.001	0.344*
	(0.060)	(0.164)
Years of schooling	0.071***	0.021
	(0.010)	(0.023)
Log per capita annual income	-0.016†	-0.011
	(0.008)	(0.018)
Marital status (ref. never married)		
Married with spouse	-0.717***	-1.153†
	(0.106)	(0.659)
Married not with spouse	-0.075	-0.431
	(0.187)	(0.822)
Other	-0.126	-0.815
	(0.201)	(0.682)
Ever moved before 1997	0.741***	1.105***
	(0.072)	(0.204)
Rural residence	-0.206*	-0.555**
	(0.087)	(0.211)
Economic shocks	-0.095	0.357†
	(0.080)	(0.196)
Constant	-1.507***	-3.195***
	(0.220)	(0.752)
Log-likelihood	-3371.5	-653.7
N	10520	4787

[a] Estimates for province of residence are not shown.
*** p value < 0.001; ** p value < 0.01; * p value < 0.05; † p value < 0.1

Table 3.
Logistic regression of migration between 1997 and 2000 on health status and other predictors measured in 1997, IFLS 1997-2000 (robust standard errors in parentheses).[a]

Logits	Morbidity last month	Low BMI	Hypertension	Anemia
Age 18-45				
Health measures	-0.014	-0.081	0.059	-0.134
	(0.082)	(0.099)	(0.093)	(0.082)
Log-likelihood	-3375.1	-3001.9	-3002.1	-3000.9
N	10520	9672	9672	9672
Age 46-75				
Health measures	0.130	0.021	-0.025	0.066
	(0.228)	(0.232)	(0.184)	(0.185)
Log-likelihood	-655.6	-578.2	-578.2	-578.1
N	4787	4459	4459	4459

[a] Estimates for other predictors (same as in Table 2) are not shown.
*** p value < 0.001; ** p value < 0.01; * p value < 0.05; † p value < 0.1

Table 4.
Multinomial logistic regression of migration by purpose between 1997 and 2000 on health status and other predictors in 1997, adults age 18-45, IFLS 1997-2000 (robust standard errors in parentheses).[a]

Logits	Labor migrants	Family migrants	Other migrants	Log-likelihood	*N*
ADL	-0.847***	-0.145	-0.120	-4552.1	10520
	(0.238)	(0.132)	(0.138)		
Morbidity last month	0.003	0.028	-0.006	-4558.9	10520
	(0.029)	(0.021)	(0.023)		
Low BMI	-0.164	-0.035	-0.063	-4,039.2	9672
	(0.189)	(0.139)	(0.158)		
Hypertension	-0.109	0.029	0.168	-4,038.8	9672
	(0.192)	(0.140)	(0.141)		
Anemia	-0.262	-0.184	-0.017	-4,037.5	9672
	(0.178)	(0.123)	(0.121)		

[a] The base category is nonmigrants. Estimates for other predictors (same as in Table 2) are not shown.
*** p value < 0.001; ** p value < 0.01; * p value < 0.05; † p value < 0.1

Table 5.
Household fixed-effect logit models of migration between 1997 and 2000 on health status and other predictors in 1997, adults age 18-45, IFLS 1997-2000 (standard errors in parentheses).[a]

Logits	ADL	Morbidity last month	Low BMI	Hypertension	Anemia
Health measures	-0.508*	-0.184	0.339	-0.198	-0.022
	(0.236)	(0.185)	(0.256)	(0.228)	(0.202)
Log-likelihood	-325.5	-327.4	-274.3	-274.9	-275.3
N	1256	1256	1083	1083	1083

[a] Estimates for other predictors (same as in Table 2) are not shown.
*** p value < 0.001; ** p value < 0.01; * p value < 0.05; † p value < 0.1