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Mental Health and Risk Behaviors of Rural-urban Migrants: Longitudinal Evidence from Indonesia

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Abstract

Using longitudinal data from Indonesia and drawing on the literature on the stress process, social support, and migration assimilation, this paper examines the consequences of rural-to-urban labor migration for mental health (as measured by depressive symptoms) and risk behaviors (as measured by smoking). The study also addresses two analytic difficulties facing previous studies —the choice of appropriate comparison group and potential migration selection. Results demonstrate considerable mental health and behavioral costs of migration, which manifest differently for women and men: female migrants tend to internalize the stress experienced in migration and display depressive symptoms, whereas male migrants tend to externalize various stressors by increasing the level of smoking but not initiation of smoking. Nevertheless, factors including family-level social support and a high degree of migrants' incorporation serve to mitigate the negative impacts of migration.

Keywords

Migration; Internal migration; Mental health; Depression; Risk behaviors; Smoking

Introduction

Migration is more than the mobility of people. It is closely connected to many aspects of individual and family life. So far, little work has systematically documented the health consequences of internal migration within developing countries. This is in contrast to the growing attention given to the health implications of immigration to developed societies. Such studies usually find that, despite their socioeconomic disadvantages, immigrants are healthier than the native-born population as indicated by various dimensions of health and health behaviors (Marmot et al. 1984; Williams and Collins 1995). This health advantage of immigrants, however, tends to diminish over the course of acculturation into the host societies (Landale et al. 2000; Abraido-Lanza et al. 2005). Though not all immigrants undergo the same process, this pattern of declining advantage largely results from various socioeconomic and psychosocial processes accompanying migration, including a loss of social support, added work stressors, various legal and social barriers, and a detrimental effect of acculturation stress. (Bhugra 2004; Takeuchi et al. 2007).

The literature on the stress process and social support illuminates how migration may influence the psychosocial outcomes of migrants. The disruption of family life can be viewed as a form of loss of social support. This is often compounded with arduous life circumstances and heightened stress in the migration and adjustment process, leading to

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diminished psychological and physical well-being (Lin and Ensel 1989; Aneshensel 1992). Migrants may continue to experience various stressful circumstances even as they adapt to the new social environments and lifestyles, referred to as the acculturation stress (Finch et al. 2004). In addition to its direct influence on health, social support can intervene in the stress process by providing essential resources to cope with stress (Cohen and Wills 1985). This suggests that the reduced social support facing migrants likely further aggravates the costs of stress.

The degree to which these previous findings from immigrants to the Western societies apply to internal migration has not been thoroughly investigated. There are signs that internal migrants may face many of the same problems that international migrants do. For example, mental illness, which used to be seen as a problem confined to industrialized societies, has become an increasing concern and has drawn widespread attention in developing countries (Miller 2006). One of the most prevalent illnesses is depression, which can lead to poor quality of life and renders individuals vulnerable to health problems and unhealthy behaviors such as drug use and smoking (Sullivan and Rehm 2005). With respect to smoking, the World Health Organization projects that tobacco is expected kill 10 million people globally in two decades, more than any single disease. About 70 per cent of the deaths will be in developing countries (WHO 2008). The process of smoking has been shown as a complex one, involving not only biological but also psychosocial components (Marmot and Wilkinson 2006).

Under these circumstances, studying the mental health and risk behaviors in association with internal migration in developing countries offer a valuable opportunity for advancing the understanding of the migration and disease processes and the stress paradigm. Specifically, this research aims to reflect on the following questions, using Indonesia as a focus of study: Is migration within a country also a stressful experience with health implications? How does the experience affect men and women differently? What are the roles of social support and assimilation in moderating the health effect of internal migration? Another goal is to provide a more accurate account of the effect of migration by addressing two methodological difficulties facing earlier studies: the choice of the appropriate comparison group and potential migration selection.

This paper uses longitudinal data from the Indonesian Family Life Survey to examine the effect of rural-to-urban labor migration on mental health and risk behaviors, respectively measured by depressive symptoms and smoking. Indonesia provides a useful context because it has a large population with a high prevalence of migration, especially internal migration (United Nations 2002). Given the great heterogeneity of migrants, I focus on rural-to-urban labor migration, which involves significant life changes and sparks the most theoretical contention in internal migration. This group also represents the stream that most resembles international migration to developed countries because of the substantial differences between the origin and destination places (Pryor 1981).

Challenges in understanding the health consequences of migration

The methodological difficulties of studying the impact of migration have been summarized by Bilsborrow et al. (1984) and Jasso et al. (2004). First, the research question poses difficulties in conceptualizing the appropriate group for comparison because the movement involves both the origin and the destination. Earlier studies largely concentrate on comparisons between migrants and the population at destination, for which data are readily available. While this is useful for studying migrants' adjustment, the native population is not the proper counterfactual because it conflates the effect of migration with the long-standing socioeconomic and health disparities between the often poor sending regions and the more

developed receiving regions (Benatar 1998). If the receiving population has better or worse health profiles than the sending population, such a comparison tends to, respectively, overstate or understate the plight of migrants. The more appropriate approach is to contrast the situation of migrants to the benchmark—their situation had they stayed in the origin. This can be accomplished by comparing migrants with "similar" people who remained in the sending regions.

The second difficulty involves disentangling causation from migration selection. The self-selection of migrants is reflected not only on demographic and socioeconomic characteristics, but also pre-migration health and other personal traits (Lu 2008). Many of these differences are unmeasurable. In such situations, the observed effect is not necessarily evidence of a migration effect, but may arise from the selective feature of migrants on attributes that also affect health status. For example, the rigors and inherent difficulties associated with migration implies that those who choose to migrate tend to be the fittest, who have good physical and mental health as well as the capacity to cope with stress and difficulties (Kuo and Tsai 1986). Failing to control for such pre-existing differences between migrants and non-migrants can lead us to incorrectly conclude that there is a positive migration effect. This is often referred to as the "healthy migrant effect" (Palloni and Morenoff 2001). This healthy migrant effect may apply to health-related behaviors, though some suggest the opposite: migrants are selected of those willing to take calculated risks and thus more prone to risk behaviors (Brockerhoof and Biddlecome 1999).

Thus far, very little empirical work has addressed these difficulties due to a lack of longitudinal data that collect information prior to and after migration in both origin and destination places. One goal of this research is thus to lay out a more proper analytic approach that is adaptable to migration studies elsewhere. Specifically, this study simultaneously addresses these two difficulties by modeling the change in migrants' health prior to and after migration, and contrasting it with the change of the proper counterfactual —people who remain in migrant-sending regions.

The stress process, social support and health

Stress is conceptualized as a socially embedded process with important consequences for mental and physical well-being (Lin and Ensel 1989; Aneshensel 1992). The sources of stress consist of discrete life events or chronic life strains that entail a considerable amount of change or are perceived as disruptive or undesirable. Stress may show a variety of manifestations, including psychological disorder, cardiovascular illness, weakened immune system, and unhealthy behavioral responses. These detrimental health consequences occur as a result of a disequilibrium of organism functioning and the physiological stress reactivity. The unfavorable behavioral responses occur because risk behaviors such as drug use and smoking appear to temporarily enable people to achieve a higher sense of control over the stressors (Niaura et al. 2002).

The stressful experience, however, does not render all people equally vulnerable. Various social resources that people mobilize in response to stress, in particular social support, can intervene at different points in the process and alter the consequences of stress through management of stressful circumstances or modification of the perceptions of problems (Cohen and Willis 1985). Social support represents resources provided by others in the social structure. These resources can be emotional or instrumental (physical, material, and informational) that help meet an individual's functional needs. It is often found to protect individuals from the adverse influences of stressful circumstances (Lin and Ensel 1989).

Social support also has direct and positive effect on health because it entails resources that produce positive experiences and a sense of stability and self-worth (Aneshensel 1992). This

is mainly reflected in the emotional support and companionship made available by the intimate members of the social structure. Informational and physical resources also can be crucial to health if trusted members of the network promote healthier behaviors, help with daily needs, or provide necessary material resources.

Several studies have noted social variations in the health consequences of stress and social support. Gove and Tudor (1973) and Kessler et al. (1985) demonstrate the ramifications of gender roles for mental health and attribute higher levels of emotional vulnerability observed among women to the gendered socialization experiences. This is also related to differing norms of acceptable emotional expression for males and females. As a result, men likely exhibit externalized expressions of distress such as substance abuse and cigarette smoking when facing stress, whereas women tend to show internalized or emotional reactions to stress.

Migration, mental health, and risk behaviors

Immigration has been viewed as stressful processes and linked to mental health complications and risk behaviors, as a result of inherent changes required to adapt to the destination, a loss of social support, and other factors associated with the uprooting process of migration (Vega and Rumbaut 1991; Bhugra 2004). Previous studies also highlight the social variations in the immigration-health relationship by gender and by levels of social support (Shen and Takeuchi 2001; Takeuchi et al. 2007). The health costs tend to be most prevalent among refugees, given the traumatic events that precede their arrival and resettlement (Watters 2001). However, accumulating evidence suggests that many of these losses and adjustments apply to voluntary migration.

While considerable attention has been given to the health of immigrants, a growing body of literature has highlighted the vulnerabilities of internal migrants to infectious diseases (Godfrey and Julien 2005), particularly HIV/AIDS (Lurie et al. 2003; Yang 2006). This is because migration brings a greater mixing of people into closer contact and exposes them to a new social and economic environment. However, very limited work has been done on the mental health consequences of internal migration. The few exceptions yield mixed findings (Almeida-Filho et al. 1995; Wong et al. 2008).

Several forms of change associated with migration may operate as sources of stress (Shuval 2001). The first is physical and economic change. Moving between different places, migrants encounter a rapid change of living and working conditions. While economic migrants generally enjoy upward economic mobility and a sense of fulfillment, the economic gains are often accompanied by work stressors and unfavorable working environments because migrants are over-represented in undesirable and labor-intensive jobs (Walsh and Walsh 1987). The stress is heightened if migrants are committed to send large remittances to families back home or experience a gap between effort and achievement.

Compounding these stressors is substantial social change as migrants disengage from a network of social relations in the sending communities. The loss of social support, along with difficulties in establishing new social networks at the destination, results in feelings of loss and loneliness, and may also exacerbate the negative impact of the stress process (Bhugra 2004). Migration is also associated with reduced social control: when individuals are detached from their social control structure, they may be more prone to external influences and engage in health-adverse behaviors (Shuval 2001).

Structural changes may also accompany migration and settlement. Migratory destinations are generally equipped with better health infrastructures than sending areas. In reality, however, migrants, especially illegal migrants, often encounter structural barriers to

accessing local services. Another structural change is discrimination, a source of diminished self-efficacy that can bear detrimental consequences for health and behaviors (Finch et al. 2000). It may further create segregated residential, economic, and social environments that have adverse effects on migrants' welfare.

Cultural change has sparked perhaps the most debate, as migrants need to adapt to a new socio-cultural environment and cope with a different set of norms and lifestyles (Finch et al. 2004). The debates focus on whether acculturation serves as a protective factor or a source of stress ("acculturation or acculturation stress"). This acculturation process may account for the health of migrants becoming increasingly similar to that of the native population. Previous studies suggest that acculturation is a dynamic and multidimensional process, which depends on various social and personal factors in the origin and destination and can results in different levels and types of adaptation (Portes and Zhou 1993; Berry 1997). The classical assimilation model suggests a favorable consequence of acculturation, which leads to less social stress, better coping behaviors, and better socioeconomic outcomes (Gordon 1964). With respect to mental health, previous studies have documented higher rates of distress among recent immigrants than long-term immigrants (Vega et al. 1987; Pernice and Brook 1996).

This proposition has been challenged by many other studies that point toward a negative effect of acculturation, or acculturation stress. Acculturation stress represents a long-term source of social stress stemming from the requirement to adapt to the new culture and norms, (Moscicki et al. 1989; Marks et al. 1990; Organista et al. 2003). As a result, the health behaviors and lifestyles of migrants become more like those of the native population over the course of acculturation, eroding the protective effects of cultures and behaviors they possessed in their country of origin. Increased time spent in the destination places is associated with deteriorating health outcomes.

Internal versus international migration

While most of the research discussed above has been in the field of immigration, many of the mechanisms operate in the context of internal migration. People moving within the same culture can also experience excessive stress and feelings of alienation, and face similar physical and social changes. However, the difference between the two cultures and two societies determines the amount of adjustment, the level of resistance by the host society, and therefore the degree of stress experienced (Shuval 2001). Under these circumstances, it is sensible to expect different patterns of the migration-health relationship among internal migrants, as the degree of structural and cultural barriers is usually reduced compared to cross-country migration.

The study setting

The study setting is Indonesia, a country characterized by large-scale internal migration and changing health profiles. Indonesia is the fourth most populous nation (234 million) and the largest Muslim country in the world. The country has enjoyed rapid economic growth over the past three decades, along with concomitant improvements in health care and common measures of health such as life expectancy and infant mortality (Frankenberg and Thomas 2001). In addition to government sources of care at hospitals, health centers, and village-level *posyandus* (health centers for children and mothers), various sources of private health care coexist. Government hospitals and private services are located in district capitals, limiting their access to rural residents, who instead rely on health centers and *posyandus* as the basic source of care (Brotowasisto et al. 1988).

The country is undergoing an epidemiologic transition, with a changing health profile increasingly resembling that of developed nations; most deaths in the recent decades are due to noncommunicable rather than infectious diseases (Flood 1997). Mental illness has become an emerging health concern, especially in urban areas (Mackinnon et al. 1998). Indonesia is a major consumer and producer of tobacco products, ranking fifth globally in tobacco consumption (Achadia et al. 2005). Over 65 per cent of Indonesian adult males smoke regularly, but smoking is very rare among women. The rate is particularly high in rural areas, with clove cigarettes being the most popular type consumed. Tobacco control policies, however, have remained low on the political and public health agenda.

Indonesia has rapidly urbanized from under 20 per cent in the 1970s to over 40 per cent in 2000, exceeding the urbanization in many other developing countries (United Nations 2002). The country is also recognized as one of the world's major sources of unskilled emigrating workers, especially to Southeast Asian countries (Hugo 2002). The most recent census reports that one in ten Indonesians can be classified as a migrant, the majority of which are internal migrants (Hugo 2000). This stream is largely characterized by rural-to-urban and inter-urban migration as well as economically motivated migration, with the largest cities such as Jakarta and Surabaya as the main destinations. Earlier work has examined the characteristics of internal migrants (Hugo 2000). It shows that migrant workers are largely drawn from young adults, especially males. They are often better educated and from less well-off households, and generally take labor-intensive or service jobs in informal sectors. Due to the large rural-urban income gap, earnings differentials between migrants and non-migrants are evident.

Research hypotheses

This paper posits four hypotheses to understand internal migration and health. Migration constitutes a stressful process that may trigger mental illness and behavioral responses. Therefore, rural-to-urban labor migrants are more likely to experience depressive symptoms and engage in smoking than rural non-migrants (Hypothesis 1). There may be gender variations in the effect of migration given gender role differences. Men and women tend to respond to stress with gender-typical problems: migrant women are more likely to exhibit internalized affective reactions such as depressive symptoms, whereas migrant men tend to show externalizing behavioral responses such as smoking (Hypothesis 2).

Given the stress-buffering role of social support, the level of stress experienced depends on the amount of social support individual receives. Family support is perhaps the most crucial form of social support (Cohen and Syme 1985), as family is of core importance in many cultures. Therefore, when migrants are accompanied by family members, the negative health and behavioral consequences tend to be largely reduced (Hypothesis 3).

This study also evaluates the moderating role of migrants' incorporation into host societies. In the context of internal migration, many of the challenges and gaps likely diminish compared to those experienced by immigrants. As a result, as migrants integrate into the destination over time, they are better able to establish themselves in the labor market and reconstruct their social networks. The migration-related stress thus tends to decrease over the course of migrants' stay (Hypothesis 4).

Data, measures, and methods

Data

Data used are from the 2000 and 2007 waves of the Indonesia Family Life Survey (IFLS), a high-quality panel survey of individuals, households and communities. The IFLS was

conducted in 13 out of 27 provinces in Indonesia, representing 83 per cent of the population. The first round (IFLS1) was collected in 1993 and interviewed with 7,224 households and 22,347 individuals. In 1997, IFLS2 was conducted to reinterview all IFLS1 households and respondents (Frankenberg and Thomas 2000). The IFLS has very low sample attrition. It represents one of the first efforts in developing countries to track respondents who had moved out of their original households. Following the practice of IFLS2, IFLS3 and IFLS4, which were conducted in 2000 and 2007, successfully interviewed over 90 per cent of the households in previous waves (Strauss et al. 2009). The high follow-up rate substantially reduces data concerns that can arise from selective attrition.

The IFLS collected a broad array of demographic, socioeconomic, and health information on individuals, households, and communities. Much of the information was repeatedly collected across the waves. Importantly, the IFLS contains detailed migration histories and a wide range of health indicators. In the migration history module, information on each trip longer than six months since age 12 and several characteristics associated with each trip (e.g., date, purpose, whether moved with other family members) was gathered. The data also gathered useful mental and physical health measures and health-related behaviors through self-reports and physical assessments. The questions asked about depressive symptoms are available in IFLS3 and 4. For this reason, the 2000 and 2007 waves are used.

Measures

One of the outcome variables is depressive symptoms. The IFLS adopted a short screening survey of psychological distress. It is not intended to diagnose specific psychological illnesses, but to assess the prevalence of symptoms of distress that are highly correlated with these illnesses. One question was designed to measure depressive symptoms: “Have you experienced sadness in the last four weeks?” Although this measure is less than ideal, it has been suggested by other studies to identify people with depressive affect reasonably well compared to clinical assessments in Indonesia and many other settings (Goldberg 1972; Jirojwong and Manderson 2001; Salomon et al. 2003). I constructed a dichotomous variable, coded 1 if the respondent had often or sometimes experienced the symptom in the past month.

In IFLS4, a short version (10-question) of the Center for Epidemiologic Studies Depression Scale (CES-D) was added. CES-D is a widely used depression measure (Radloff 1977), and is a reliable and valid screening instrument for symptoms of depression in developing as well as developed societies (Mackinnon et al. 1998). A short version rather than the complete 20-question version was adopted to minimize respondent burden. I constructed a continuous scale by adding all 10 inventories (each in a four-point Likert scale from 0 to 3). The measure ranges from 0 to 30, with higher scores representing more depression.

Two indicators of smoking behaviors were used. The first is a dichotomous measure indicating whether the respondent currently smokes, including smoking cigarettes, chewed tobacco, and pipe. The second indicator is the intensity of smoking, measured by the number of cigarettes consumed per day. I truncated it at 10 to reduce the leverage of the small number of very heavy smokers, because the majority of smokers in Indonesia consume fewer than 10 cigarettes daily (Ganiwijaya et al. 1995). Sensitivity analysis suggests that this procedure does not change the results. Smoking is the only measure of risky behaviors. Information on other behaviors such as alcohol and drug use is not available because they are considered much more deviant behaviors in the Muslim culture and are thus not asked in the survey.

The major predictor, migration status, was constructed using information from the two consecutive waves on place of residence and the migration histories. I restricted the analysis

to respondents who lived in rural areas in 2000 and contrasted rural-to-urban labor migrants with rural non-migrants. An individual is considered a rural-to-urban labor migrant if the person moved from a rural area for work-related reasons and lived in an urban area by the 2007 wave. Those who stayed in the same rural area and never moved between the two waves are rural non-migrants. I excluded a small number of return migrants because they may contaminate the results if health deterioration is the reason for return (the "Salmon Bias"). I kept respondents who had moved before 2000 but controlled for their past migration through fixed-effect modeling. This is because life-time migration rate is relatively high and removing previous migrants would reduce the sample size. As discussed in detail later, the fixed-effect approach effectively controls for stable characteristics over the study period (2000-2007), including the respondent's migration experience before 2000.

To examine the variations in social support, I incorporated information on whether the migrant was accompanied by family members and constructed a three-category predictor that distinguishes rural non-migrants, rural-urban labor migrants moving with family members, and rural-urban labor migrants moving alone. Furthermore, to differentiate migrants by varying degrees of assimilation, I created a three-category predictor differentiating rural non-migrants, short-term rural-urban labor migrants (those who moved to the destination after 2004 and had stayed in the destination for less than 3 years), and longer-term rural-urban labor migrants (those who moved to the destination in or before 2004 and had stayed for 3 years and more). I carried out sensitivity analysis by varying the cutpoint of length of stay, which does not change the substantive story.

Other covariates include standard demographic and socioeconomic characteristics of the individual and household that may be important predictors of health and migration: age, sex, years of schooling, logged per head annual household income, household size, and marital status. Because physical health may be related to mental health and behaviors (Heidrich 1993), I also included a binary measure of self-reported poor or fair health in the model to obtain more conservative estimates. The exclusion of this measure does not change the results.

Methods

This study used longitudinal data to study both how the health of migrants evolves over time (prior to and after migration), and whether this temporal change of migrants differs from that of rural non-migrants. I resorted to the fixed-effect models (FE) (Wooldridge 2002), which help disentangle the migration effect from potential migration selection. The FE models essentially use each individual as his or her own control, and purge out stable but unmeasured attributes at the individual-, family-, and community-level that may predispose migrants to worsen or improve their health over time, independent of their actual migration experience. The stable unobserved heterogeneity assumption of the FE approach is likely to hold in the present study because many of the unobserved factors are past events or are highly heritable. Importantly, the FE approach also helps remove potential sample attrition bias that results from stable factors.

The FE models were implemented using conditional logistic regressions (when the outcome is mental health or current smoking) and conditional poisson regressions (when the outcome is level of smoking). When there are two waves, the FE models are similar to modeling changes in the outcome based on changes in the predictors, that is, before and after migration. For logistic FE regressions, in each year:

$$\log\left(\frac{p_{it}}{1-p_{it}}\right)=\mu_t+\beta M_{it}+\gamma \mathbf{X}_{it}+\alpha_i \quad (1)$$

where p_{it} is the probability that an individual i experiences a health condition at year t; M_{it} is the measure of migration status; $\mathbf{X}_{it}$ is a column vector of the explanatory variables; μ_t is an intercept; and α_i represents time-invariant unobserved heterogeneity—it is regarded as a fixed parameter, one per person. The basic idea is to cancel out α_i using conditional maximum likelihood. The logic of FE poisson models is similar, as shown in equation (2), where y_{it} is the expected number of cigarettes consumed per day.

$$\ln \quad y_{it}=\mu_t+\beta M_{it}+\gamma \mathbf{X}_{it}+\alpha_i \quad (2)$$

The interpretation of the FE models is similar to that of the corresponding logistic and poisson regressions. A caveat is that when the outcome is not continuous, the conditional maximum likelihood algorithm deletes individuals without outcome variations over time, which reduces the sample size. Hence, when the outcome is level of smoking, I also estimated corresponding linear fixed-effect models as sensitivity test, which retain all cases. Another caveat to the FE approach is that time-invariant factors such as sex cannot be explicitly modeled. However, the tradeoff is that many unmeasured confounders are effectively adjusted for. Although I cannot rule out all sources of bias, by focusing on labor migrants, the problem is largely reduced because this group is motivated by economic-related factors that are exogenous to health.

I also estimated corresponding random-effect (RE) logistic and poisson models, which can be formulated the same way as in (1) and (2). The difference is that α_i in RE models is considered to have a normal distribution and is explicitly modeled. Because the RE models assume that unobserved heterogeneity is uncorrelated with migration status, comparing them with the FE models offers the opportunity to evaluate the presence and degree of selection bias.

The FE model of depressive symptoms uses the one-item question measure. The more accurate measure of depressive symptoms, CES-D, is only available in IFLS4. This precludes the use of FE models. To assess whether the results hold when depression is measured by the better measure, I conducted sensitivity analysis using OLS regressions to predict mental illness (CES-D) based on the same set of explanatory variables described above, further controlling for pre-migration mental health state measured in IFLS3. Although this approach is not as rigorous as the FE models in addressing selection bias, it provides additional evidence on the impact of migration on mental health based on a better measure and the full sample. It also allows for the incorporation of the native (urban) population in the analysis and helps evaluate how the results may differ using the native population as the comparison category.

Sample, attrition and missing data

The analytic sample includes panel respondents aged 18-45 who originated from rural areas in 2000. I focused on this age group because it accounts for the bulk of rural-urban migration in Indonesia. This also avoids bias due to the possibility of older adults moving for health-related considerations. The individual attrition rate for the sample between 2000 and 2007 is about 24 per cent. This is substantially lower than many other panel studies, especially considering that the sample consists of the most mobile population, young rural adults. Additional analysis suggests that, after controlling for background demographic and socioeconomic factors, attrition does not seem to be associated with previous health conditions. As for missing data, most variables are missing on a few dozen cases. The final sample was thus based on complete cases, after deleting 3 per cent of cases that contain any missing data.

Results

Descriptive statistics

Table 1 presents the summary statistics for the analytic sample in 2007. Results show that males account for about 45 per cent of the sample and the majority of the sample are married. The average years of education is a little over 6 years and the per head household annual income is roughly 316 U.S. dollars. These results confirm the low levels of educational attainment and income in Indonesia. With respect to health, over 11 per cent report poor or fair health and almost 12 per cent report depressive symptoms in the past month. The smoking rate is high, almost 35 per cent on average. When separating the statistics by sex, females are slightly more likely to report depressive symptoms (12 per cent vs. 11 per cent). Also, while only 1 per cent of females smoke, over 75 per cent of males are smokers.

As for migration status, rural-urban labor migrants make up over 5 per cent of the sample. Although lower than 10 per cent, this is consistent with the national-level statistics because migrants in other directions and for other purposes are excluded from the sample. Among the rural-urban labor migrants, almost 36 per cent moved with family members and over 65 per cent moved to their current destination after 2004.

The data also confirm the common knowledge regarding the characteristics of rural-to-urban labor migrants based on their pre-migration characteristics measured in 2000 (results not shown). Migrants tend to be younger than non-migrants and more often to be male and single. They come from the better educated in relatively poor households. The mental health state and smoking behavior does not seem to be predictive of later migration behavior. Although the coefficients are in the expected direction, namely that those with better health are more likely to migrate, they are insignificant.

Health and behavioral consequences of migration

Regression results are shown in Table 2. Studying the FE models, we see strong evidence of the psychological costs of migration. Migrants are significantly more likely to report depressive symptoms than non-migrants (OR=1.73). In contrast, there is no clear impact of migration on smoking initiation. Although migration seems to increases the risk of smoking, the coefficient is insignificant. However, the intensity of smoking turns out to be associated with the migration experience, with migrants consuming more than one cigarette per day (exp(0.291)). Corresponding analysis of the level of smoking using linear FE regression tells a similar story (β=0.887, p-value <0.001). These results are consistent with Hypothesis 1.

Turning other covariates, age is not related to depressive symptoms but is negatively associated with smoking. Higher levels of education and income lower the risk of depression but seem to contribute to smoking. The results resonate with previous studies documenting a protective effect of economic resources on mental health and a behavioral transition process (Marmot and Wilkinson 2006). In the early stage of development, high socioeconomic status (SES) contributes to unhealthy behaviors because it is mostly people with high SES that can afford to adopt such behaviors. It should be noted that income could serve as a mediating factor of the relationship between migration and health. Here it is included as a covariate to provide more conservative estimates. Sensitivity analysis without the income measure gives very similar results. I also conduct a similar set of analyses for all other types of migrants, which show no clear patterns. This is probably due to the great heterogeneity of non-labor migrants, who may move for a variety of different reasons that are less likely to present stressful experiences than labor migration (family-related reasons, marriage, social visit, etc.).

Evidence of selection

Comparisons between the FE and RE models in Table 2 reveal the presence of migration selection. The effect of migration on mental health in the RE model is smaller than that in the FE model. The Hausman test of the difference is significant at the 0.05 level (Hausman 1978). This indicates a positive selection of migrants with respect to health that fosters their ability to move. Because I find no direct effect of mental illness on the propensity for migration, this favorable selection is likely to present in the form of resiliency to health insults, which can dampen the stress and help migrants overcome the adversity associated with migration and settlement. If this aspect of selection were not properly adjusted, the impact of migration would be underestimated.

As for smoking behaviors, results from the dichotomous smoking measure suggest a selection of migrants of those who are risk takers. But according to the Hausman test, the difference is not significant. Results from the analysis of the intensity of smoking suggest otherwise: migrants are selected from those with healthier behaviors. If left unadjusted, this leads to an underestimation of the migration effect. This, however, is not an indication that migrants are not selected of those who tend to take risks, as the smoking measures may not well capture the propensity to risk-taking.

Variations by gender, family social support, and duration of stay

Separate results by gender are shown in Table 3 and 4, as interactions with gender are jointly significant at the 0.01 level. Results reveal substantial gender differences (Hypothesis 2). Female migrants have a higher risk of developing depressive symptoms than female non-migrants (Model 1, Table 3). By contrast, there is no clear impact of migration on smoking (Model 4 and 7), because cigarette use is very rare among women. Results of smoking behaviors for women should thus be interpreted with caution.

For males (Table 4), the pattern is reversed. No significant effect of migration on depressive symptoms is found, though the coefficient is in the expected direction (Model 1). This is consistent with the gender norm expectations proposition. As for smoking behaviors, while migration seems to trigger the onset of smoking (Model 4), the evidence is inconclusive. This may be partially attributed to the fact that the majority of rural males are already smokers prior to migration. However, the intensity of smoking is closely associated with migration, with migrants becoming heavier smokers after migration (Model 7).

I further studied the buffering role of family social support in Models 2, 5, and 8 in Table 3 and 4. Results show that social support from families represents an important factor in moderating the impact of migration on mental health among females and on smoking behaviors among males (Hypothesis 3). The deleterious mental health outcomes are largely experienced by female migrants moving alone. For those accompanied by families, the detrimental effect seems to be negligible. This pattern holds for smoking among males, with solo male migrants particularly vulnerable to the uptake and progression of smoking.

Analysis of the role of assimilation is reported in Models 3, 6, and 9 in Table 3 and 4. In contrast to many immigration studies that document a negative assimilation effect, the results reveal a beneficial impact of incorporation in the case of internal migration in Indonesia (Hypothesis 4). As female migrants become better integrated into the destinations and begin to establish their own social networks, the negative consequences of migration on mental health disappears. But the detrimental effect remains strong for relatively recent migrants, those who stay at the destination for less than 3 years. In a similar vein, the detrimental impact of migration on smoking is concentrated for migrants who arrived recently and begins to improve over time as migrants reside longer in the destination.

Sensitivity analyses

Results reported in Table 5 verify the earlier findings on depressive symptoms using a more reliable depression measure, CES-D, and the full sample. Migration appears to contribute to depressive symptoms (Model 1), especially among females (Model 4). For this reason, results for males are not shown. The ameliorating effects of family social support and level of assimilation are supported (Model 5 and 6).

Model 2 and 3 incorporate urban non-migrants in the analysis to illustrate how using the native population as the group of comparison may bias the results. Urban residents are more likely to report depressive symptoms than rural residents, but less so than rural-urban migrants (Model 2). Following most previous studies, I changed the group of comparison to urban non-migrants (the native population). After this change, the impact of migration on mental health is largely reduced (Model 3). The coefficient decreases by half and becomes insignificant. This result highlights the importance of using the proper group of comparison. Even though migrants tend to experience heightened stress and mental distress, the higher prevalence of depression in urban areas (destination) than in rural areas (origin) conflates the effect of migration with the rural-urban disparities in mental illness, leading to biased estimates.

DISCUSSION

Migration has become an integral feature of the national economy and family life in many parts of the developing world. A core element in assessing the consequences of migration is to understand its impact on social well-being with respect to health, which is critical in facilitating migrants' socioeconomic attainments and integration into host communities. Previous studies on immigrants to developed societies suggest that migration and settlement is a stressful process compounded by a loss of social support, with potentially negative impacts on mental health and health behaviors. This paper has exploited longitudinal data to study the effect of rural-urban internal labor migration on mental health and risk behaviors in Indonesia while addressing the methodological challenges. It provides a basis for understanding similarities and differences between the phenomena of international migration and internal migration.

Results demonstrate an adverse effect of internal migration on psychological health measured by depressive symptoms, and on risk behaviors measured by levels of smoking. Similar to the case of international migration, this is largely a consequence of the rupture of social support systems and arduous life circumstances associated with migration. The study also endorses the gender role theory, showing that the migration-health association varies by gender and is disorder-specific: male migrants are more prone to externalized stress-induced manifestations such as the use of tobacco products; female migrants are more susceptible to internalized psychological distress such as depression.

The research also identifies several protective factors. First, the buffering effect of social support from families in the stress process is supported. This speaks to the well-documented role of social support for health found in Western societies: in resource-constrained settings, social support also can not only have a direct and positive effect on health but cushion the detrimental influences of various life stressors.

Second, there is evidence of a beneficial role played by migrants' assimilation. Results show that the negative psychological and behavioral impact of migration tends to be concentrated in the first few years after arrival, with a return to normal levels thereafter. The process of incorporation, in other words, marks the course of favorable psychological and behavioral adjustment over time. This suggests that the acculturation stress perspective in the

immigration literature needs to be modified in the context of internal migration. The assimilation process is a highly complex one, as the levels of stress experienced and adjustment required depend on the degree of differences in social and cultural environments between the sending and receiving societies. Although internal migration represents a source of stress, the adjustment process tends to be less disruptive than international migration because many of the difficulties, in particular structural and cultural barriers, and the effort requires for reestablishing social and economic roles are often muted.

Comparisons of the analytic approach used in earlier studies to the approach adopted here underline the importance of addressing selection bias and using the appropriate group for comparison in studies of migration and health. I find that people with healthier psychological and behavioral traits and especially with better ability to handle stress are more likely to migrate. If left unadjusted, this leads to an underestimated effect of migration on health. In addition, using the native population as the group of comparison seems to confound the effect of migration with the longstanding differences in health profiles between the sending and receiving population. To truly understand the effect of migration on health, it is more appropriate to compare the health of migrants to what their health would have been had they stayed in the origin. While the degree to which these findings can be generalized requires further study, the methods used in this study are applicable across settings.

Several limitations of the study need to be acknowledged. The relative small sample size of migrants limit my ability to further disaggregate the analysis by a combination of interesting factors such as age, sex, durations of stay, and whether accompanied by family members. Another important factor is the distance of migration. Migrants moving within a short distance tend to experience reduced level of stress than those moving longer distances, a result of more similar environment and thus less social and cultural adjustments required. This possibility is not explored given the limited information on distance. In addition, given data limitations, smoking is the only indicator of risk behaviors and the measures of social support and assimilation are less than ideal. Our understanding will be substantially enhanced if better data are collected. What is needed to pin down the way migration functions is longitudinal studies that provide information about the characteristics of migrants in both their origin and destination places, a rich set of health and behavioral measures, and better measures of social support and assimilation. Since labor migration continues to be important in many countries, it is well worth investing in improved data on this topic.

Despite these limitations, much has been learned about the health consequences of internal migration. The findings that migration constitutes a nontrivial determinant of mental health and health-related behaviors should be of general interest, as we have entered the age of increasing global migration and surging mental illness. This study identifies several important challenges facing migrants including substantial psychological distress and intensifying risk behaviors, which can have far-reaching health implications. Migrants may benefit from intervention programs that help them cope with family separation, facilitate family migration, rebuild social ties, and deal with various other difficulties entailed in post-migration adjustments. Given the heterogeneous effects by gender, gender-specific interventions would be especially helpful.

The present study focuses on one developing country. To advance the themes addressed here, comparative work in other socioeconomic contexts would be illuminating. Considerable similarities across settings are expected, as migration streams are largely generated by similar forces and, hence, endure similar circumstances. Nevertheless, socioeconomic and institutional variations across settings likely imply variability in the

patterns. While internal migration in Indonesia represents an example of "open" movement, which is generally observed in internal migration settings, there are well-established examples of "constrained" migration that are hampered by restrictive policies (e.g., international migration, the *hukou* system and rural-urban migration in China, and the influx control of Black migration in South Africa during apartheid). A comparative perspective will permit better exploration of questions related to migration and health.

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Table 1

Percentages and means of variables of analytic sample, Indonesia, 2007 (N=5,250)

Variables	Mean or Percentage
Dependent variables	
Depressive symptoms	11.7
CES-D score	3.9
Currently smoking	34.7
Number of cigarettes per day	4.0
Independent variables	
Rural-urban labor migrants	5.2
Among rural-urban labor migrants	
Moved with family members	35.7
Moved without family members	64.3
Among rural-urban labor migrants	
Moved to cities in or before 2004	34.9
Moved to cities after 2004	65.1
Age	
15-25	11.0
26-35	32.4
36-45	36.0
46-55	20.6
Male	45.3
Years of education	6.4
Marital status	
Never married	9.8
Currently married	84.6
Other	5.6
Per head HH annual income	2,940,870
HH size	5.2
Self-reported poor or fair health	11.5

Note: In 2007, 1 U.S. dollar ≈ 9,300 Indonesian Rupiah.

Source: Indonesia Family Life Survey.

Table 2

Results of fixed- (FE) and random-effect (RE) models predicting depressive symptoms and smoking behaviors on migration status and other covariates, Indonesia, 2000-2007 (p-values in parentheses)

	Depressive symptoms [1]		Currently smoking [1]		No. of cigarettes per day [2]	
	FE	**RE**	**FE**	**RE**	**FE**	**RE**
Rural-urban labor migrants (ref. rural non-migrants)	0.549 *	0.455 +	0.399	0.978 *	0.291 ***	0.171 ***
	(0.042)	(0.084)	(0.393)	(0.023)	(0.000)	(0.000)
Age (ref. 15-25)						
26-35	0.053	0.044	−0.849 **	0.124	−0.157 ***	0.089 ***
	(0.750)	(0.738)	(0.006)	(0.605)	(0.000)	(0.000)
36-45	0.012	0.059	−2.539 ***	−0.101	−0.414 ***	0.082 **
	(0.964)	(0.676)	(0.000)	(0.694)	(0.000)	(0.005)
46-55	−0.145	−0.100	−4.478 ***	−1.337 ***	−0 714 ***	0.009
	(0.711)	(0.619)	(0.000)	(0.000)	(0.000)	(0.813)
Male	--	0.025	--	−0.113	--	0 711 ***
		(0.778)		(0.660)		(0.000)
Years of education	−0.070 +	−0.003	0.129 *	−0.007	0.025 **	−0.002
	(0.059)	(0.788)	(0.049)	(0.697)	(0.001)	(0.347)
Marital status (ref. never married)						
Currently married	−0.142	−0.092	−0.358	0.328	−0.001	0.156 ***
	(0.503)	(0.500)	(0.291)	(0.162)	(0.981)	(0.000)
Other	0.524 +	0.286	−0.573	0.323	−0.011	0.193 **
	(0.098)	(0.206)	(0.371)	(0.484)	(0.878)	(0.001)
Log per head HH annual income	−0.038 *	−0.032 *	0.047	0.050	0.011 **	0.013 ***
	(0.024)	(0.040)	(0.218)	(0.112)	(0.009)	(0.000)
HH size	0.013	−0.000	−0.004	0.004	−0.004	0.006
	(0.649)	(0.996)	(0.944)	(0.900)	(0.484)	(0.122)
Self-reported poor or fair health	0.756 ***	0.646 ***	0.088	0.141	−0.004	0.003
	(0.000)	(0.000)	(0.754)	(0.548)	(0.887)	(0.880)
Survey year 2007 (ref. 2000)	−1.268 ***	−2.522 ***	1.397 ***	1.202 ***	0.250 ***	0.060 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	--	1.627 ***	--	−1.377 **	--	0.856 ***
		(0.000)		(0.003)		(0.000)
N	3,262	3,262	866	866	3,956	3,956

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Note: N is the number of observations for panel respondents.

Source: Indonesia Family Life Survey.

[1] Thev are logistic FE and RE models. Los odds are shown.

[2] They are poisson FE and RE models. Log odds are shown. Corresponding linear FE and RE models are estimated, which give similar results.

*** *p* value < 0.001

** *p* value < 0.01

* *p* value < 0.05;

+ p value < 0.1.

Table 3

Results of fixed-effect models predicting depressive symptoms and smoking behaviors on migration status and other covariates for females, Indonesia, 2000-2007 (p-values in parentheses)

	Depressive symptoms [1]			Currently smoking [1]			No. of cigarettes per day [2]		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**
Rural-urban labor migrants (ref. rural non-migrants)	0.936 * (0.020)			−5.843 (0.999)			−1.306 (0.999)		
Whether moving with family members (ref. rural non-migrants)									
Moved with family members		0.875 (0.115)			−5.843 (0.999)			−1.306 (0.999)	
Moved without family members		0.992 + (0.062)			--			--	
Length of stay at destination (ref. rural non-migrants)									
Moved to cities in or before 2004			−0.197 (0.801)			−5.843 (0.999)			−1.306 (0.999)
Moved to cities after 2004			1.622 ** (0.001)			--			--
N		1,898			84			100	

Note: Other covariates are omitted, which are the same as in Table 2. N is the number of observations for panel respondents. Number of cases in the analysis of smoking behaviors is very small, which does not permit further disaggregation by social support and assimilation (Model 5, 6, 8 and 9).

Source: Indonesia Family Life Survey.

[1] They are logistic FE models. Log odds are shown.

[2] They are poisson FE models. Log odds are shown. Corresponding linear FE models are estimated, which give similar results.

*** *p* value < 0.001

** *p* value < 0.01

* *p* value < 0.05

+ p value < 0.1.

Table 4

Results of fixed-effect models predicting depressive symptoms and smoking behaviors on migration status and other covariates for males, Indonesia, 2000-2007 (p-values in parentheses)

	Depressive symptoms [1]			Currently smoking [1]			No. of cigarettes per day [2]		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**
Rural-urban labor migrants (ref. rural non-migrants)	0.022 (0.952)			0.793 (0.104)			0.308*** (0.000)		
Whether moving with family members (ref. rural non-migrants)									
Moved with family members		0.403 (0.490)			0.531 (0.540)			0.081 (0.378)	
Moved without family members		−0.168 (0.706)			0.885 (0.114)			0.426*** (0.000)	
Length of stay at destination (ref. rural non-migrants)									
Moved to cities in or before 2004			0.555 (0.320)			0.105 (0.873)			0.110 (0.222)
Moved to cities after 2004			−0.123 (0.794)			1.116+ (0.099)			0 411*** (0.000)
N		1,364			782			3,852	

Note: Other covariates are omitted, which are the same as in Table 2. N is the number of observations for panel respondents.

Source: Indonesia Family Life Survey.

[1] They are logistic FE models. Log odds are shown.

[2] They are poisson FE models. Log odds are shown. Corresponding linear FE models are estimated, which give similar results.

*** *p* value < 0.001

** *p* value < 0.01

* *p* value < 0.05

+ p value < 0.1.

Table 5

Results of linear models predicting depressive symptoms (CES-D) and on migration status and other covariates, Indonesia, 2000-2007 (p-values in parentheses)

	Overall sample			Females		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Rural-urban labor migrants (ref. rural non-migrants)	0.549 * (0.013)			0.857 * (0.014)		
Including urban non-migrants (ref. rural non-migrants)						
Rural-urban labor migrants		0.418 * (0.047)				
Urban non-migrants		0.193 * (0.012)				
Including urban non-migrants (ref. urban non-migrants)						
Rural non-migrants			−0.193 * (0.012)			
Rural-urban labor migrants			0.225 (0.288)			
Whether moving with family members						
(ref. rural non-migrants)						
Moved with family members					0.513 (0.271)	
Moved without family members					1.195 * (0.012)	
Length of stay at destination (ref. rural non-migrants)						
Moved to cities in or before 2004						0.700 (0.360)
Moved to cities after 2004						0.900 * (0.018)
N	5,250	10,019	10,019	2,872	2,872	2,872

Note: Other covariates are omitted, which are the same as those in Table 2. An additional covariate, pre-migration mental health state measured in 2000, is included in the models.

Source: Indonesia Family Lire Survey.

*** *p* value < 0.001

** *p* value < 0.01

* *p* value < 0.05

+ p value < 0.1.