DEPRESSIVE MOOD AMONG WITHIN-COUNTRY MIGRANTS IN PERIURBAN SHANTYTOWNS OF LIMA, PERU

Paulo Ruiz-Grosso¹, Antonio Bernabe-Ortiz^{1,2}, Francisco Diez-Canseco¹, Robert H. Gilman^{1,3,4}, William Checkley^{1,3,5}, Ian M. Bennett^{6,§}, J. Jaime Miranda^{1,7,§}, and CRONICAS Cohort Study Group[¶]

¹CRONICAS Center of Excellence in Chronic Diseases, Universidad Peruana Cayetano Heredia, Lima, Peru

²Epidemiology Unit, School of Public Health and Administration, Universidad Peruana Cayetano Heredia, Lima, Peru

³Department of International Health, Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD, USA

⁴Área de Investigación y Desarrollo, Asociación Benéfica PRISMA, Lima, Perú

⁵Division of Pulmonary and Critical Care, School of Medicine, Johns Hopkins University, Baltimore, MD, USA

⁶Perelman School of Medicine of the University of Pennsylvania, Philadelphia, USA

⁷Department of Medicine, School of Medicine, Universidad Peruana Cayetano Heredia, Lima, Peru

Abstract

In low- and middle-income countries, migration to urban settings has reshaped the sprawl and socio demographic profiles of major cities. Depressive episodes make up a large portion of the burden of disease worldwide and are related to socio-demographic disruptions. As a result of terrorism, political upheaval, followed by economic development, Peru has undergone major demographic transitions over the previous three decades including large migrations within the

Corresponding author: J. Jaime Miranda, MD, MSc, PhD, CRONICAS Center of Excellence in Chronic Diseases, Universidad Peruana Cayetano Heredia, Armendáriz 497, Miraflores, Lima 18, Peru, Jaime.Miranda@upch.pe.

[§]Joint senior authors.

[¶]CRONICAS Cohort Study Group

Members listed in alphabetic order:

Cardiovascular Disease: Antonio Bernabé-Ortiz, Juan P. Casas, George Davey Smith, Shah Ebrahim, Raúl Gamboa (RIP), Héctor H. García, Robert H. Gilman, Luis Huicho, Germán Málaga, J. Jaime Miranda, Víctor M. Montori, Liam Smeeth; **Chronic Obstructive Pulmonary Disease:** William Checkley, Gregory B. Diette, Robert H. Gilman, Luis Huicho, Fabiola León-Velarde, María Rivera, Robert A. Wise; **Training & Capacity Building:** William Checkley, Héctor H. García, Robert H. Gilman, J. Jaime Miranda, Katherine Sacksteder.

COMPETING INTEREST

None declared.

AUTHOR CONTRIBUTORS

PR-G, AB-O and JJM drafted the first version of the manuscript. AB-O and PR-G performed most of the statistical analysis. RHG, WC and JJM conceived, designed and supervised the overall study. IMB led the development and completion of the later versions of the manuscript. All authors participated in writing of the manuscript, provided important intellectual content and gave their final approval of the version submitted for publication.

country. We aimed to determine the prevalence of current depressive mood and its relationship with parameters of internal migration, i.e. region of origin, age at migration, and years since migration. A community-wide census was carried out between January and June 2010 within a shantytown immigrant receiving community in Lima, Peru. One male or female adult per household completed a survey. Depressive mood was assessed with a 2-item Center for Epidemiologic Studies Depression (CESD) scale. Migration-related variables included place of birth, duration of residence in Lima, and age at migration. Prevalence ratios (PR) and 95% confidence intervals (95%CI) were calculated. A total of 8 551 out of 9 561 participants, response rate 89%, participated in the census. Of these, 8 091 records were analyzed: 71.8% were women (average age 39.4 [SD: 13.9 years]) and 59.3% were immigrants. The overall prevalence of individuals with current depressive mood was 17.1% (95%CI: 16.2% – 17.9%) and varied significantly by all socio-demographic and migration variables assessed. On unadjusted analyses, immigrants to Lima had higher prevalence of depressive mood if they originated in other coastal or Andean areas, had lived in Lima for more than 20 years, or were less than 30 years of age when they out-migrated. When controlling for age, gender and socio-demographic variables the association was no longer significant, the only exception being a 20% lower prevalence of current depressive mood among those who out-migrated aged ≥ 30 years old (PR = 0.79; 95%CI 0.63 – 0.98). In conclusion, these results suggest that current depressive mood is very prevalent in this immigrant receiving community. Among all proxies for internal migration explored, in fully adjusted models, there was evidence of an association between age at migration (≥ 30 years old) and a lower probability of current depressive mood compared to non-migrants.

Keywords

Migration; adults; depression; mental health; Peru

INTRODUCTION

Depressive disorders are leading causes of burden of disease worldwide [1–3]. Mental and substance use disorders are the largest cause of years lived with disability with depressive disorders contributing the largest proportion, 41%, of this disability [3]. When suicide is included these disorders are the third greatest source of burden of disease globally as measured by disability adjusted life years [4]. Depression is a chronic relapsing disorder with recurrent episodes of disabling depressive symptomatology. Depression is widely acknowledged as a major public health challenge in low- and middle-income countries where there are challenges related to diagnosis [5, 6] and the interaction of depression with other chronic diseases [7]. Treatment strategies for depression have been developed for low- and middle-income countries which target these obstacles [8, 9]. However, public policy decisions related to the implementation of preventive, diagnostic and therapeutic strategies require the identification of population specific characteristics that influence the prevalence of depressive disorders.

Migrant populations are vulnerable to emotional distress and the manifestation of depressive disorders while simultaneously suffering from disparities in health and access to care [10, 11]. In low- and middle-income countries, internal migration from rural or “less urban” to

urban settings has reshaped the urbanization, sprawl, and socio demographic profiles of major cities—particularly in communities at the periphery of established urban sites and often referred to as shantytowns. Cities in most developing countries have expanded with the establishment and growth of periurban areas concomitant with increases in population sizes. Migrants are exposed both to the stresses that prompted the migration, such as violence or economic distress, and the stresses related to living in an under-resourced receiving community [12]. Related to both of these factors include the lack of public planning and preparation for migrating populations in receiving communities. Difficulty with cultural adaptation to the new environment, or downward social mobility among members of displaced populations are additional challenges faced by migrant populations [13, 14]. These potentially toxic environmental factors may affect migrants differentially based on age of migration [15].

An association between migration and depressive symptomatology, a marker of the presence of mood disorders, is not consistently found [16]. With the exception of the field of forced migration and mental health, which has its own body of literature, few studies of within-country internal migration have explored its association with mental health. The large number of low- and middle-income countries facing internal migrations, together with the magnitude of mental health needs that may arise from such demographic and population changes, warrant exploration of the relationship between migration and depressive episodes.

Lima, the capital of Peru and fifth largest city of the Americas, offers an interesting setting to explore the link between migration and depression. During the period from 1970 to 1993, Peru suffered from terrorist violence based on political ideology. The great majority of the nearly 70 000 deaths attributable to these upheavals occurred in rural areas, and approximately 120 000 people were displaced as a consequence [17]. These types of major social shocks are related to different long-term physical and mental health sequelae [18].

Additionally, movement of populations from rural to urban settings as a result of economic development is a frequent social phenomenon in developing countries. Currently 38.2% of the 9 million people who live in Lima are internal migrants [19]. We previously showed higher rates of common mental health disorders among migrants from rural areas compared to those from urban areas [20]. However, they were attenuated by differences in education and income, suggesting that the rate of mental health disorders might be attributed to such social factors rather than to migration itself. This study estimates the prevalence of current depressive mood and compares its magnitude between non-migrant and migrant adult inhabitants currently living in a shantytown community in Lima, Peru, as measured by three facets of internal migration, i.e. place of birth inside or outside of Lima, number of years living in Lima, and age at out-migration.

MATERIALS AND METHODS

Study Design and Participants

The current analysis makes use of data collected in a community-based census performed between January and June of 2010 in the Pampas de San Juan de Miraflores area of Lima, Peru, without aiming for representativeness of the whole of Lima [21, 22]. The area of

Pampas de San Juan de Miraflores underwent through a census to later define the sampling frame of a larger longitudinal population-based cardiopulmonary cohort study [23]. Taking advantage of this opportunity, questions about mental health-related symptoms were nested into this larger fieldwork effort. Surveys were administered to one adult (18 years of age), male or female, household member (>6 months residence).

Setting

Pampas de San Juan de Miraflores, the receiving community for the internal migrants which are the focus of this analysis, is located 25 km south of Lima's city center and has a population of approximately 60 000 people in an area of 4 km². This area has experienced a large amount of unplanned growth, and the physical environment consists of steep and rocky desert hills. Most inhabitants to this community migrated from various areas within Peru including urban and rural areas of the highland Andes, Amazon regions, as well as other coastal areas. According to the latest census, 48% of the total population of the district of San Juan de Miraflores is a lifetime migrant, much higher than the proportion reported for the whole department (36%). In addition, 60% of the population has unmet public service and sanitation needs, 65% lack health insurance, and overcrowding in 25% of households [19].

Fieldwork procedures

Community and health workers were trained to conduct data collection using a standardized survey that was verbally delivered. All households of the study area were visited door-to-door and each household named an adult person to provide answers to the survey, in Spanish. The single adult respondent per household provided socio-demographic information for all members. The respondents then provided self-reported assessment of current depressive symptoms.

Variables definition

Outcome variable—The outcome of interest was current depressive mood as assessed using a 2-item version of the Center for Epidemiologic Studies Depression Scale (CES-D) [24]. This measure was developed based on evidence that shorter versions have adequate psychometric properties for identifying depression [25, 26], and previous experience using shorter versions of this tool in Peru do exits [27]. Briefly, depressive mood was evaluated for the seven days preceding the survey, thus referring to current or active depressive mood, consistent with the clinical diagnosis of major depressive episode. The two-question scale included: (1) *I felt that I could not shake off the blues even with help from my family or friends*, and (2) *I felt depressed*. Responses to both questions had 4 options: rarely or none of the time (less than 1 day), some or a little of the time (1 – 2 days), occasionally or a moderate amount of time (3 – 4 days), and most or all of the time (5 – 7 days). Both questions were scored from 0 to 3 according to severity and added together to create a final summary score of 0–6. This CES-D has been validated in adult Peruvian population, with and without clinical depression [28]. Compared to clinical diagnosis of current major depressive episode as gold standard, the short 2-item scale had a Cronbach's alpha of 0.83 and an area under the curve of 0.84 (IC95%: 0.78–0.91). Using this 2-item scale, a score of

3 yielded the highest proportion of participants correctly classified (81.2%) individuals with major depressive disorder, with sensibility and specificity of 91.43% and 69.84%, respectively (Ruiz-Grosso, personal communication).

Exposure variable—The exposure of interest was internal migration assessed by place of birth (defined as originating within Peru by the geography of the department of birth as non-migrant, and out-migration areas including Andean, Amazon and other coastal areas); and number of years living in Lima (non-migrant, <20 years, 20–39 years, and 40 years); and age at out-migration (non-migrant, <15 years old, 15 to 29 years old, and 30 years old).

Other variables—Socio-demographic variables, which have been found to be related to risk of depressive episodes and which were also reasonably expected to be related to our exposure variable of migration, were included as potential confounders [29–31]. Specifically we included age (in quartiles), gender, education level (primary or less, secondary, and university/technician), and marital status (never married, currently married, and divorced/widow/widower).

Statistical analysis

Statistical analysis was performed using STATA 11 for Windows (STATA Corporation, College Station, TX, US). Initially, an assessment of bivariate associations of the socio-demographic and migration variables with depressive mood was performed. Our multivariable modeling followed a hierarchical approach in order to disentangle the contributions of age, gender and sociodemographic variables [32]. Poisson regression models [33] were used to calculate adjusted prevalence ratios (PR) and 95% confidence intervals (95%CI). This approach has been described as a better alternative for the analysis of cross-sectional studies with binary outcomes than the usual logistic regression that yields odds ratios. An additional advantage of this technique is that appropriate controlling for confounding variables, and its interpretation, is possible [33].

Ethical issues

All potential participants were provided a resource brochure reviewing mental health and the benefits of seeking care if needed. Study participants provided oral consent before data collection commenced. Institutional Review Board (IRB) of the Universidad Peruana Cayetano Heredia, Lima, Peru, reviewed and approved the study protocol.

Role of the funding source

The study sponsor had no role in study design; in the collection, analysis, and interpretation of data; in the writing of the report; and in the decision to submit the paper for publication.

RESULTS

A total of 9 561 individuals were asked to participate in the census. Of them, 8 551 (89.4%) agreed to participate. Of these, 455 participants were ineligible due to age less than 18 years, and 5 did not respond to the questions assessing depressive symptoms and thus were excluded. A final sample of 8 091 records were used for analysis.

Description of the population and depressive mood

Detailed information regarding socio-demographic variables as well as the association of migration assessment with depressive mood is shown in Table 1. The mean age of participants was 39.4 years (SD: 13.9). The majority of participants were women (71.8%) and migrants (59.3%), with the largest portion (46.4%) coming from Andean areas of Peru.

The overall prevalence of depressive mood was 17.1% (95%CI: 16.2% – 17.9%). All group-specific prevalence estimates of depressive mood by migration status were higher than non-migrants (14%) and are shown in Table 2. The highest prevalences of depressive mood, approximately 20% or higher, were found among those born in an Andean region, migrants living in Lima 20–39 years as well as 40 years, and those who out-migrated aged <15 years old.

Association between migration measures and depressive mood

The results of regression analyses are shown in Table 2. In the unadjusted analysis, strong evidence of higher prevalence of depressive mood was found with all three of the migration measures. Compared to non-migrant groups, the prevalence of depressive mood was higher for out-migrants from other coastal and Andean regions but not Amazonian departments, if the immigrants had lived for more than 20 years in Lima, and if they were <30 years of age when they migrated. Adjustment for age and gender attenuated PR estimations and became not significant in the other coastal areas as well as the group aged 15–29 years old at migration.

Further adjustment for education level and marital status continued attenuating these PR estimates to the point of no observable differences in prevalences compared to non-migrants. However, among those who migrated into Lima aged 30 years old, this full adjustment strategy also attenuated in the same direction the initial PR estimates, which then became significant. This group was found to have a 20% lower prevalence of depressive mood compared to the non-immigrant group.

DISCUSSION

The aim of the current study was to assess the relationship between measures of internal migration and depressive mood in adults in a low-income periurban shantytown in Lima, Peru. In crude models, the three distinct measures of migration assessed—region of out-migration, duration of time in the receiving community, and age at out-migration—were all associated with increased prevalence of depressive mood in comparison to non-migrants. Compared to non-migrants, out-migration from Andean and other coastal areas, longer residence in the receiving community, and younger age at the time of migration showed higher prevalence of depressive mood. Age and gender attenuated these estimations, but continued to be significant except for coastal out-migration communities and the group aged 15–29 years old at the point of migration. After further adjustment for education level and marital status the association between depressed mood and migration disappeared. Yet, greater age at migration became significant: those who migrated at age 30 years or more exhibited a 20% lower probability of current depressive mood compared to non-immigrant

members of the receiving community. These findings suggest that older age at migration represents a particular profile that is more resilient to the negative effects of receiving community affecting both immigrant and non-immigrant residents.

Our findings, generated in the context of internal within-country migration, are not consistent with previous work that has shown that international migration is associated with depressive mood [11, 34, 35]. However, we found evidence that migrating after the age of 30, decreased the probability of suffering from depressive mood. An older age at migration has been found to be positively correlated with general health outcomes and somatic symptoms linked to depression, but there is no evidence that is associated with depressive disorders [15, 36, 37]. This finding suggests that there are age-related vulnerabilities to migration that should be considered when designing interventions to prevent negative outcomes on mental health as the result of sustained violent environments. The observation that those who lived longer in the receiving community and those migrating at young age had increased prevalence of any depressive mood are also consistent with studies indicating that longer exposure to rapid urbanization and increasing population can enhance the risk of poor health outcomes including depression [12, 38]. More in depth exploration of the specific factors existing in the receiving communities which negatively affect the mood status of migrants are required to inform public health policy [39].

It is not surprising that we found that the associations between migration and depressive mood were attenuated by participant socio-demographic characteristics. Both education level and marital status are known to be strongly associated with depressive disorders [40–42]. Increased focus on the educational needs of immigrant communities is indicated as a component of interventions to improve the functioning of these populations in periurban shantytown settings. It has benefits that may include reduced emotional distress.

Regarding the prevalence of depressive mood, a recent analysis of the Peruvian data of the World Mental Health Survey estimated the point prevalence of any mood disorder at 3.5%, while the estimate for major depressive disorder was 2.3% [43]. A previous study performed in the city of Lima reported depressive disorder point prevalence on adults of 6.7% and a rate of self reported sadness of 21% [44]. This study also found that in southern districts of Lima the prevalence of depressive disorders was 7.1%, whereas for the Lima-wide lower strata of socioeconomic status, defined as those who reported “not being able to afford food”, the point prevalence was found to be 17.5% [44]. In studies of Peruvian migrants to Chile depressive disorder prevalence rate of 10.3% was reported [45]. The estimate of depressive mood compatible with major depressive episode found on the present study (17.1%) was much higher than what was reported on national (2.3%), metropolitan (6.7%) and local (7.1%), and only comparable to the lower socio-economic status estimates for Lima. Caution should be exercised when making comparisons between these estimates since the definition of depression was different across studies. Also, the use of different psychometric instruments to assess depressive symptoms may account for some of these differences. We made use of a screening instrument with high sensitivity rather than a diagnostic interview, which might lead to a higher rate of false positives. However, the prevalence of depressive mood among immigrants in some populations is even higher than what we identified. In one study of Taiwanese immigrants living in Canada a prevalence of

depression of 22% was found [11]. Overall our findings are consistent with the range of prevalence rates for migrant populations [46]. Moreover, a meta-analysis found that international migration increased the risk of any mood disorder above that seen in internal migrations [47].

A range of mechanisms may contribute to the development of depressive disorders among migrants including negative life events [48], the preparation for migration [13], social assimilation and perceived discrimination [49], and acculturation [50]. Research into the role of life events in predisposing adults to experience a depressive episode has identified significant trauma such as neglect and abuse among children as significant risk factors [51]. The psychosocial context of adults clearly also plays a role in these vulnerabilities with supportive social contexts providing a relative protective influence on individuals facing stresses [52, 53]. The effects of social upheaval related to violence and economic turmoil can easily fit within these conceptualizations of how social forces influence the prevalence of depressive episodes in populations. However, studies exploring these factors have not found consistent patterns for their role in the development of poor mental health among migrants [16]. Additional work to further refine our understanding of individuals who experience depressive episodes in this context, perhaps with in depth explorations of psychosocial contexts, would enhance our ability to define the mechanisms at play and formulate interventions to ameliorate these risks.

In our methods section, we also have offered some explanations about our use of Poisson regression and the description of our associations in terms of ‘prevalence ratios’. We are hopeful that these clarifications may help other investigators interested in pursuing research of this type using cross sectional designs. Additional strengths of this work include the use of a unique large and complete census level data set from a disadvantaged shantytown with high rates of internal migrants. Results of this study help to better define the profile of depressive disorders among migrant populations. This information can inform planning, identification, treatment and rehabilitation within receiving communities of immigrants [54, 55]. In relation to the outcome used, our approach aligns with recent recommendations indicating that “global mental health needs a pragmatic classification that addresses the prevalent disorders in primary care and community settings, acknowledges both the dimensional and categorical nature of common mental health symptoms, addresses contextual issues, and that can easily be incorporated into routine health-care platforms across diverse settings” [6].

Some limitations deserve consideration. First, we used a screening tool for detecting depressive disorder in a population; thus, prevalence findings can be biased upwards. Nonetheless, our prevalence rates are within the range generally seen for this kind of vulnerable population [46]. Second, there is some selection bias associated with our sampling methodology. Since this study was performed using a census, women staying at home were more likely to respond to the questionnaire about depressive symptoms. This fact could have increased the prevalence of depressive mood in this population, since women are at greater risk of depression [56–58]. Additionally, the data did not allowed to control for the specific reason to migrate, which might be economic, withdrawal from environmental violence or a combination of both. Hence, as the current work focuses on receiving

community factors and not migration related factors, we were not able to disentangle the social versus economic drivers of migration among the study participants. Another limitation is that we did not collect information on the history of depression for these immigrants, a robust predictor of future depression [53] which would have provided a more complete picture of the relationship between migration and depressive episode. The cross sectional nature of the study design limits our ability to establish causation. Yet, given that we are evaluating past exposure to migration, a lifetime event with low chances of ascertainment bias, and its relationship with depression, our findings are consistent with a sequential chain of events. Finally, income, a well-known factor associated with depressive disorder [40, 59], was not available for analysis as a confounder. Given the high rate of poverty in this geographic area however, the range of income we would have identified would be very constricted and unlikely to have contributed greatly to the outcome.

In conclusion, this study found a high prevalence of depressive mood, beyond of what is to be expected for a similar population. Our results indicate that, in crude analysis, internal migration was associated with depressive mood among residents of an under-resourced periurban shantytown area, however, this association was removed when controlling for age, gender, education level and marital status. Yet, in fully adjusted models, there was evidence of an association between age at migration (> 30 years old) and a lower probability of current depressive mood compared to non-migrants. Future studies should focus on modifiable determinants of the relationship between migration and depressive disorders in order to identify potential targets for population-based interventions.

Acknowledgments

FUNDING

This project has been funded in whole with Federal funds from the United States National Heart, Lung, and Blood Institute, National Institutes of Health, Department of Health and Human Services, under Contract No. HHSN268200900033C.

Our special gratitude to various colleagues at Universidad Peruana Cayetano Heredia and A.B. PRISMA in Lima, Peru, who contributed to different parts of this study. Our special recognition to our personnel in Pampas de San Juan de Miraflores and also to Lilia Cabrera, who coordinated the fieldwork activities in this study.

References

1. Prince M, Patel V, Saxena S, et al. No health without mental health. *Lancet*. 2007; 370:859–77. [PubMed: 17804063]
2. Velasquez A. The burden of disease and injuries in Peru and the priorities of the universal assurance essential plan. *Rev Peru Med Exp Salud Publica*. 2009; 26:222–31.
3. Whiteford HA, Degenhardt L, Rehm J, et al. Global burden of disease attributable to mental and substance use disorders: findings from the Global Burden of Disease Study 2010. *Lancet*. 2013; 382:1575–86. [PubMed: 23993280]
4. Ferrari AJ, Norman RE, Freedman G, et al. The burden attributable to mental and substance use disorders as risk factors for suicide: findings from the Global Burden of Disease Study 2010. *PloS one*. 2014; 9:e91936. [PubMed: 24694747]
5. Ball HA, Siribaddana SH, Kovas Y, et al. Epidemiology and symptomatology of depression in Sri Lanka: a cross-sectional population-based survey in Colombo District. *J Affect Disord*. 2010; 123:188–96. [PubMed: 19762085]

6. Jacob KS, Patel V. Classification of mental disorders: a global mental health perspective. *Lancet*. 2014; 383:1433–5. [PubMed: 24759250]
7. Moussavi S, Chatterji S, Verdes E, et al. Depression, chronic diseases, and decrements in health: results from the World Health Surveys. *Lancet*. 2007; 370:851–8. [PubMed: 17826170]
8. Patel V, Araya R, Bolton P. Treating depression in the developing world. *Trop Med Int Health*. 2004; 9:539–41. [PubMed: 15117296]
9. Patel V, Simon G, Chowdhary N, et al. Packages of care for depression in low- and middle-income countries. *PLoS Med*. 2009; 6:e1000159. [PubMed: 19806179]
10. Nadeem E, Lange JM, Miranda J. Perceived need for care among low-income immigrant and U.S.-born black and Latina women with depression. *J Womens Health (Larchmt)*. 2009; 18:369–75. [PubMed: 19281320]
11. Lai DW. Prevalence and correlates of depressive symptoms in older Taiwanese immigrants in Canada. *J Chin Med Assoc*. 2005; 68:118–25. [PubMed: 15813245]
12. Wheaton FV, Crimmins EM. In Hindsight: Urban Exposure Explains the Association Between Prior Migration and Current Health of Older Adults in Mexico. *J Aging Health*. 2013
13. Chou KL. Pre-migration planning and depression among new migrants to Hong Kong: the moderating role of social support. *J Affect Disord*. 2009; 114:85–93. [PubMed: 18625520]
14. Nicklett EJ, Burgard SA. Downward social mobility and major depressive episodes among Latino and Asian-American immigrants to the United States. *Am J Epidemiol*. 2009; 170:793–801. [PubMed: 19671834]
15. Hull D. Migration, adaptation, and illness: a review. *Soc Sci Med Med Psychol Med Sociol*. 1979; 13A:25–36. [PubMed: 551523]
16. McKay, L.; Macintyre, S.; Ellaway, A. Occasional paper No. 12. Glasgow: Medical Research Council, Social & Public Health Sciences Unit, University of Glasgow; 2003. Migration and health : a review of the international literature.
17. Comisión de la Verdad y Reconciliación. . Informe Final de la Comisión de la Verdad y Reconciliación [Peruvian Truth and Reconciliation Comision's Final Report]. Lima: Comisión de la Verdad y Reconciliación; 2003. Available at: <http://www.cverdad.org.pe/ifinal/index.php>
18. Pedersen D, Tremblay J, Errazuriz C, et al. The sequelae of political violence: assessing trauma, suffering and dislocation in the Peruvian highlands. *Soc Sci Med*. 2008; 67:205–17. [PubMed: 18423959]
19. Instituto Nacional de Estadística e Informática. Censos de Población y Vivienda 2007. Lima, Perú: INEI; 2010. Sistema de Difusión de los Censos Nacionales. [updated 2010; cited 2014 28 May]; Available from: <http://ineidw.inei.gob.pe/ineidw/>
20. Loret de Mola C, Stanojevic S, Ruiz P, et al. The effect of rural-to-urban migration on social capital and common mental disorders: PERU MIGRANT study. *Soc Psychiatry Psychiatr Epidemiol*. 2012; 47:967–73. [PubMed: 21667301]
21. Richiardi L, Pizzi C, Pearce N. Commentary: Representativeness is usually not necessary and often should be avoided. *International journal of epidemiology*. 2013; 42:1018–22. [PubMed: 24062290]
22. Rothman KJ, Gallacher JE, Hatch EE. Why representativeness should be avoided. *International journal of epidemiology*. 2013; 42:1012–4. [PubMed: 24062287]
23. Miranda JJ, Bernabe-Ortiz A, Smeeth L, et al. Addressing geographical variation in the progression of non-communicable diseases in Peru: the CRONICAS cohort study protocol. *BMJ open*. 2012; 2:e000610.
24. Radloff LS. The CES-D Scale: A self-report depression scale for research in the general population. *Appl Psychol Meas*. 1977; 1:385–401.
25. Santor DA, Coyne JC. Shortening the CES-D to improve its ability to detect cases of depression. *Psychol Assess*. 1997; 9:233–43.
26. Akena D, Joska J, Obuku EA, et al. Comparing the accuracy of brief versus long depression screening instruments which have been validated in low and middle income countries: a systematic review. *BMC Psychiatry*. 2012; 12:187. [PubMed: 23116126]
27. Ugarte-Gil C, Ruiz P, Zamudio C, et al. Association of major depressive episode with negative outcomes of tuberculosis treatment. *PloS one*. 2013; 8:e69514. [PubMed: 23922728]

28. Ruiz-Grosso P, Loret de Mola C, Vega-Dienstmaier JM, et al. Validation of the Spanish Center for Epidemiological Studies Depression and Zung Self-Rating Depression Scales: a comparative validation study. *PloS one*. 2012; 7:e45413. [PubMed: 23056202]
29. Andersen I, Thielen K, Nygaard E, et al. Social inequality in the prevalence of depressive disorders. *Journal of epidemiology and community health*. 2009; 63:575–81. [PubMed: 19293167]
30. Carter KN, Blakely T, Collings S, et al. What is the association between wealth and mental health? *Journal of epidemiology and community health*. 2009; 63:221–6. [PubMed: 19028729]
31. Bones Rocha K, Perez K, Rodriguez-Sanz M, et al. Prevalence of mental health problems and their association with socioeconomic, work and health variables: Findings from the Spain National Health Survey. *Psicothema*. 2010; 22:389–95. [PubMed: 20667265]
32. Victora CG, Huttly SR, Fuchs SC, et al. The role of conceptual frameworks in epidemiological analysis: a hierarchical approach. *International journal of epidemiology*. 1997; 26:224–7. [PubMed: 9126524]
33. Barros AJ, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. *BMC Medical Research Methodology*. 2003; 3:21. [PubMed: 14567763]
34. Bernstein KS, Park SY, Shin J, et al. Acculturation, discrimination and depressive symptoms among Korean immigrants in New York City. *Community Ment Health J*. 2011; 47:24–34. [PubMed: 19888652]
35. Takeuchi DT, Zane N, Hong S, et al. Immigration-related factors and mental disorders among Asian Americans. *Am J Public Health*. 2007; 97:84–90. [PubMed: 17138908]
36. Alegría M, Mulvaney-Day N, Torres M, et al. Prevalence of Psychiatric Disorders Across Latino Subgroups in the United States. *Am J Public Health*. 2007; 97:68–75. [PubMed: 17138910]
37. Parker G, Chan B, Tully L, et al. Depression in the Chinese: the impact of acculturation. *Psychological Medicine*. 2005; 35:1475–83. [PubMed: 16164771]
38. Sundquist K, Frank G, Sundquist J. Urbanisation and incidence of psychosis and depression: follow-up study of 4. 4 million women and men in Sweden. *Br J Psychiatry*. 2004; 184:293–8. [PubMed: 15056572]
39. Scribner R. Paradox as paradigm--the health outcomes of Mexican Americans. *Am J Public Health*. 1996; 86:303–5. [PubMed: 8604751]
40. de Wit MA, Tuinebreijer WC, Dekker J, et al. Depressive and anxiety disorders in different ethnic groups: a population based study among native Dutch, and Turkish, Moroccan and Surinamese migrants in Amsterdam. *Soc Psychiatry Psychiatr Epidemiol*. 2008; 43:905–12. [PubMed: 18587679]
41. Gonzalez HM, Haan MN, Hinton L. Acculturation and the prevalence of depression in older Mexican Americans: baseline results of the Sacramento Area Latino Study on Aging. *J Am Geriatr Soc*. 2001; 49:948–53. [PubMed: 11527487]
42. van der Wurff FB, Beekman AT, Dijkshoorn H, et al. Prevalence and risk-factors for depression in elderly Turkish and Moroccan migrants in the Netherlands. *J Affect Disord*. 2004; 83:33–41. [PubMed: 15546643]
43. Piazza M, Fiestas F. Annual prevalence of mental disorders and use of mental health services in Peru: results of the World Mental Health Survey, 2005. *Rev Peru Med Exp Salud Publica*. 2014; 31:30–8. [PubMed: 24718524]
44. Estudio Epidemiológico Metropolitano en Salud Mental 2002. Informe General. *Anales de Salud Mental*. 2002; XVIII:1–199.
45. Rojas G, Fritsch R, Castro A, et al. Mental disorders among immigrants in Chile. *Rev Med Chil*. 2011; 139:1298–304. [PubMed: 22286729]
46. Lindert J, Braehler E, Wittig U, et al. Depression, anxiety and posttraumatic stress disorders in labor migrants, asylum seekers and refugees. A systematic overview. *Psychother Psychosom Med Psychol*. 2008; 58:109–22. [PubMed: 18421650]
47. Swinnen SG, Selten JP. Mood disorders and migration: meta-analysis. *Br J Psychiatry*. 2007; 190:6–10. [PubMed: 17197650]
48. Oei TP, Kwon SM. Evaluation of the integrated cognitive model of depression and its specificity in a migrant population. *Depress Anxiety*. 2007; 24:112–23. [PubMed: 16888757]

49. Merbach M, Wittig U, Brahler E. Anxiety and depression by Polish and Vietnamese migrants in Leipzig depending on their adaptation process. *Psychother Psychosom Med Psychol*. 2008; 58:146–54. [PubMed: 18421654]
50. Bhugra D. Migration and depression. *Acta Psychiatr Scand Suppl*. 2003;67–72. [PubMed: 12956818]
51. Bifulco A, Brown GW, Moran P, et al. Predicting depression in women: the role of past and present vulnerability. *Psychol Med*. 1998; 28:39–50. [PubMed: 9483682]
52. Brown GW. Social roles, context and evolution in the origins of depression. *Journal of health and social behavior*. 2002; 43:255–76. [PubMed: 12467252]
53. Brown GW, Moran PM. Single mothers, poverty and depression. *Psychol Med*. 1997; 27:21–33. [PubMed: 9122302]
54. Blue I, Harpham T. Urbanization and mental health in developing countries. *Curr Issues Public Health*. 1996; 2:181–5. [PubMed: 12291948]
55. Harpham T. Urbanization and mental health in developing countries: a research role for social scientists, public health professionals and social psychiatrists. *Soc Sci Med*. 1994; 39:233–45. [PubMed: 8066502]
56. Screening for depression in adults: U S preventive services task force recommendation statement. *Ann Intern Med*. 2009; 151:784–92. [PubMed: 19949144]
57. Cwikel J, Zilber N, Feinson M, et al. Prevalence and risk factors of threshold and sub-threshold psychiatric disorders in primary care. *Soc Psychiatry Psychiatr Epidemiol*. 2008; 43:184–91. [PubMed: 18026679]
58. Park JH, Kim KW, Kim MH, et al. A nationwide survey on the prevalence and risk factors of late life depression in South Korea. *J Affect Disord*. 2012
59. Kinyanda E, Woodburn P, Tugumisirize J, et al. Poverty, life events and the risk for depression in Uganda. *Soc Psychiatry Psychiatr Epidemiol*. 2011; 46:35–44. [PubMed: 19916062]

Table 1

Socio-demographic and migration variables according to depressive mood

Variables	Current Depressive Mood		p-value
	No [N, (%)]	Yes [N, (%)]	
Age			
1 st (bottom)	1779 (88.7)	227 (11.3)	< 0.001
2 nd	1792 (83.8)	346 (16.2)	
3 rd	1557 (78.7)	421 (21.3)	
4 th (top)	1456 (79.7)	371 (20.3)	
Gender			
Male	2013 (89.5)	236 (10.5)	< 0.001
Female	4605 (80.3)	1133 (19.8)	
Education level			
Primary or less	1382 (75.8)	442 (24.2)	< 0.001
Secondary	3527 (83.6)	690 (16.4)	
Superior/Technician	1701 (87.9)	234 (12.1)	
Marital status			
Never married	1569 (87.3)	229 (12.7)	< 0.001
Married	4411 (82.9)	913 (17.1)	
Divorced/Widow(er)	636 (73.7)	227 (26.3)	
Place of birth			
Non-migrant	2789 (85.9)	458 (14.1)	< 0.001
From other coastal areas	621 (81.7)	139 (18.3)	
From Andean areas	2977 (80.4)	727 (19.6)	
From Amazonian areas	229 (83.6)	45 (16.4)	
Time living in Lima			
Non-migrant	2789 (85.9)	458 (14.1)	< 0.001
<20 years	1192 (84.8)	214 (15.2)	
20 – 39 years	1973 (79.5)	509 (20.5)	
40 years	650 (77.8)	185 (22.2)	
Age at migration			
Non-migrant	2789 (85.9)	458 (14.1)	< 0.001
<15 years	1270 (79.2)	333 (20.8)	
15 – 29 years	2100 (81.5)	476 (18.5)	
30 years	426 (83.4)	85 (16.6)	

* Results may not add due to missing values

Table 2

Prevalence of current depressive mood, and crude and adjusted models of the association between migration and depressive mood

Variables	Subjects with depressive mood n/N	Prevalence of current depressive mood % (95%CI)	Crude model PR (95%CI)	Age-adjusted model PR (95%CI)	Age- and gender-adjusted model PR (95%CI)	Fully-adjusted model* PR (95%CI)
Place of birth						
Non-migrant	458/3247	14.1% (12.9%–15.3%)	Reference	Reference	Reference	Reference
From other coastal areas	139/760	18.3% (15.5%–21.0%)	1.30 (1.09 – 1.54)	1.09 (0.91 – 1.30)	1.07 (0.90 – 1.28)	1.03 (0.86 – 1.23)
From Andean areas	727/3704	19.6% (18.3%–20.9%)	1.39 (1.25 – 1.55)	1.16 (1.03 – 1.31)	1.14 (1.02 – 1.28)	1.04 (0.92 – 1.18)
From Amazonian areas	45/274	16.4% (12.0%–20.8%)	1.16 (0.88 – 1.54)	1.05 (0.79 – 1.39)	0.98 (0.74 – 1.30)	0.94 (0.71 – 1.24)
Time living in Lima						
Non-migrant	458/3247	14.1% (12.9%–15.3%)	Reference	Reference	Reference	Reference
<20 years	214/1406	15.2% (13.3%–17.1%)	1.08 (0.93 – 1.25)	1.05 (0.90 – 1.22)	1.03 (0.89 – 1.20)	0.96 (0.82 – 1.11)
20 – 39 years	509/2482	20.5% (18.9%–22.1%)	1.45 (1.30 – 1.63)	1.18 (1.04 – 1.35)	1.17 (1.02 – 1.33)	1.07 (0.94 – 1.23)
40 years	185/835	22.2% (19.3%–25.0%)	1.57 (1.35 – 1.83)	1.26 (1.04 – 1.51)	1.21 (1.01 – 1.45)	1.11 (0.93 – 1.33)
Age at migration						
Non-migrant	467/3243	14.4% (13.2%–15.6%)	Reference	Reference	Reference	Reference
<15 years old	333/1603	20.8% (18.8%–22.8%)	1.44 (1.27 – 1.64)	1.22 (1.07 – 1.40)	1.17 (1.03 – 1.34)	1.08 (0.94 – 1.23)
15 – 29 years old	476/2576	18.5% (17.0%–20.0%)	1.28 (1.14 – 1.44)	1.06 (0.93 – 1.20)	1.06 (0.93 – 1.19)	0.97 (0.86 – 1.11)
30 years old	85/511	16.6% (13.4%–19.9%)	1.16 (0.93 – 1.43)	0.87 (0.70 – 1.09)	0.89 (0.71 – 1.11)	0.79 (0.63 – 0.98)

* Adjusted for age, gender, education level, and marital status.