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Cohort Profile: The Health of Philippine Emigrants Study (HoPES) to examine the health impacts of international migration from the Philippines to the United States

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Manuscripts

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3 **Cohort Profile: The Health of Philippine Emigrants Study (HoPES) to examine the health**
4 **impacts of international migration from the Philippines to the United States**
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ABSTRACT

Purpose: The Health of Philippine Emigrants Study (HoPES) longitudinally investigates over three years whether migrating from the Philippines to the United States (U.S.) results in increased risk for obesity relative to non-migrants in the Philippines. The study is designed to test the healthy immigrant hypothesis by collecting health measures from migrants starting from a pre-migration baseline and enrolling a non-migrant cohort matched on age, gender, and education for comparison.

Participants: A migrant cohort (n=832) was recruited from clients of the Commission on Filipinos Overseas prior to exiting the Philippines. A non-migrant cohort (n=805) was recruited from among community households in municipalities throughout the cities of Manila and Cebu. By intention, these two cohorts are comparable demographically, including urban/rural status of residency in the Philippines at baseline.

Findings to date: At baseline, migrants report significantly better self-rated health and less depression, and have significantly lower body mass index and waist-to-hip ratio. Migrants had a lower mean level of c-reactive protein, however higher mean level of Apolipoprotein B.

Future plans: Data collection is scheduled to be completed in December 2020, time that the final data collection wave (36 months after baseline) will conclude for the non-migrant cohort. Both migrant and non-migrant cohorts will be maintained so long as research funding allows and emerges for new proposed study questions. Findings can inform the need and design of health-related/relevant interventions, whether clinical, behavioral, educational, policy, that are implemented at the individual or population level.

STRENGTHS AND LIMITATIONS

- Migrant cohort enrolled starting from pre-migration baseline data collection in country of origin and followed prospectively post-migration in destination country.
- A matched cohort of matched non-migrants in the country of origin is enrolled providing opportunities for comparative data analyses.

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3 • Data collected involved both subjective and objective, biological measures of health status,
4 including frozen banking of dried blood spots creating future opportunities for laboratory
5 assays.
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9 • Non-migrant cohort is not representative of the general population, however the study
10 objective is for them to be demographically similar to the migrant cohort.
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14 • Possibility of participant attrition, including because of continued migration domestically and
15 internationally.
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- Data collected involved both subjective and objective, biological measures of health status, including frozen banking of dried blood spots creating future opportunities for laboratory assays.
 - Non-migrant cohort is not representative of the general population, however the study objective is for them to be demographically similar to the migrant cohort.
 - Possibility of participant attrition, including because of continued migration domestically and internationally.

INTRODUCTION

The prevailing view of the immigrant health literature asserts that immigrants arrive in the destination country with better health status relative to their same race/ethnicity counterparts born in that country. However, this health advantage has been observed to decline over time with duration in the new country. Research has documented this phenomenon across a variety of physical and mental health outcomes, as well as population groups [1-6]. In the U.S. context, immigrants originating from developing often exhibit the *immigrant health paradox* [7-9], referring to the contradiction that immigrants generally have better health than U.S. born individuals who presumably have access to better healthcare services, reside in better environmental conditions, and have better opportunities for employment and education. As well, the phrase *healthy immigrant hypothesis* has been coined to suggest that immigrants generally have better health as a function of higher social class (e.g., having education, employability, and fiscal resources) compared to others in their country of origin, which positions them with the prospect and opportunity to emigrate. While a body of research has informed these perspectives, the preponderance of studies have not been designed to thoroughly investigate them. More specifically, conventional understanding of immigrant health has been premised on cross-sectional studies utilizing self-report survey data collected after arrival in the U.S. and without a comparison group in the country of origin. The Health of Philippine Emigrants Study (HoPES) was created to address these major limitations in the field of immigrant health by collecting both survey and objective health measures starting from a pre-migration baseline and enrolling a non-migrant cohort matched on age, gender, and education.

Filipinos have a long history of migration to the U.S., dating back to the late 1500's and continuing over subsequent centuries, with migration at various times tied to labor, political, and military service reasons. In 2016, there were 4.1 million Filipinos in the U.S., approximately half of whom were immigrants [10]. As such, Filipino immigrants are a significant population group within which to explore the health effects of migration. A well-documented health issue among

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3 Filipinos in the U.S., as well as in the Philippines, is obesity and concomitant chronic health
4 conditions such as hypertension, diabetes, and cardiovascular disease [11-16]. HoPES
5 principally examines changes in dietary patterns and body weight in the context of migration. A
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7 popular hypothesis is that immigrants become acculturated to U.S. lifestyles and behaviors,
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9 including eating larger food portion sizes, consuming more convenient processed, unhealthy
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11 fast foods, and being more sedentary [17-21]. Immigrants are also exposed to stressors
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13 associated with living in a new country (e.g., struggling with employment and having low
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15 income, discrimination, and separation from family and friends in the country of origin) which
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17 may prompt feelings of stress and lead to unhealthy dietary practices [22-24]. However,
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19 whether risk of unhealthy eating and weight gain can be attributed solely to the immigrant
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21 experience has not been conceptualized through the lens of globalization. Indeed, rates of
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23 obesity have been rising worldwide, including the Philippines. [25-27]. Accordingly, the
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25 overarching empirical question, which HoPES seeks to answer, is whether migrating to the U.S.
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27 results in increased risk for obesity (losing the healthy immigrant advantage) or if this risk would
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29 have been the same had an immigrant remained in the Philippines.
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34 **COHORT DESCRIPTION**

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37 The HoPES study includes a migrant cohort and a non-migrant cohort. The migrant
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39 cohort consists of emigrants with legal permission to exit the Philippines for permanent
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41 residency in the U.S. Migrant cohort participants were enrolled starting at a pre-migration
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43 baseline before departing the Philippines and are followed prospectively after arriving in the
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45 U.S. up to three years. These migrant participants were recruited onsite at either the Manila or
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47 Cebu office of the Commission on Filipinos Overseas (CFO), the national Philippine government
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49 agency that oversees legal migration and where legal emigrants must register and process their
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51 exit from the Philippines. HoPES research staff approached and screened individuals at the
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53 CFO locations for study eligibility: aged 20-59 years, departing the Philippines for the U.S. within
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55 three months, ability to speak English, Tagalog, or Cebuano, and not known to be pregnant (as
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3 this study prospectively assesses weight gain). From a total of 3,412 individuals approached,
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5 2,279 met eligibility criteria, and 832 (36.5% of those eligible) consented and enrolled in the
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7 study. While there were no target numbers for the migrant cohort by gender, age, and
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9 education; distributions along these categories ended up reflecting similar demographic profiles
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11 of the recent immigrant Filipino population in the U.S. For example, according to the 2011-2013
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13 American Community Survey (<https://www.census.gov/programs-surveys/acs>), among
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15 immigrant Filipinos who have been in the U.S. for less than two years, 11% are males aged 20-
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17 34 with a college education, which is the same percentage of this same group in the HoPES
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19 migrant cohort. Additional details are reported elsewhere [28].
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22 The second cohort consists of non-migrants who remain in the Philippines. Recruitment
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24 of this non-migrant cohort was based on stratified random sampling of households using three
25
26 strata: Metro Manila (urban), Cebu (urban), and Cebu (rural). For each of these stratum,
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28 *barangay* (smallest administrative government division, somewhat like a census tract) were
29
30 sampled with probability proportional to population size. Within each selected *barangay*, cluster
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32 sampling of households was conducted, then individuals were sampled within each household.
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34 Non-migrants were screened with the same age, language, and pregnancy inclusion criteria as
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36 migrants, with additional criteria of having resided in the *barangay* for the past two years and
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38 having no plans to move out of the *barangay* over the next three years. As non-migrants were
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40 sampled, numbers were tracked to achieve comparability to the gender, age, education, and
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42 urbanicity frequencies of the migrant cohort. Of the 2,215 non-migrant individuals approached,
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44 1,173 met eligibility criteria, and 805 (68.6% of those eligible) consented and enrolled in the
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46 study.
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49 Table 1 provides demographic characteristics at time of recruitment and enrollment of
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51 the migrant and non-migrant participants, as well as those who were eligible but did not
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53 participate. Attrition rate for each of the cohorts has not yet been determined because collection
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55 of follow-up data is still ongoing; thus we report only on the baseline stage of the study.
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Table 1. Demographic characteristics of HoPES participants and non-participants at time of recruitment and enrollment.

	Migrants			Non-migrants		
	Participants (n=832)	Eligible non- participants (n=1447)	<i>p</i> -value	Participants (n=805)	Eligible non- participants (n=355)	<i>p</i> -value
Age in years (mean; SD)	35.46 (11.57)	38.53 (11.64)	.000	36.53 (11.47)	35.77 (10.81)	.304
Female (number; %)	553 (66.47%)	865 (60.15%)	.003	548 (68.07%)	185 (50.41%)	.000
Education (number; %)			.049			.000
Some high school or less	50 (6.08%)	63 (4.41%)		101 (12.85%)	15 (4.18%)	
High school degree	170 (20.68%)	247 (17.30%)		143 (18.19%)	59 (16.43%)	
Some college or vocational training	190 (23.11%)	354 (24.79%)		320 (40.71%)	127 (35.38%)	
College degree or higher	412 (50.12%)	764 (53.50%)		222 (28.24%)	158 (44.01%)	

NOTE: Pearson's chi-squared tests were conducted to calculate *p*-values indicating if participant and non-participant groups were statistically different from each another.

For the migrant cohort, pre-migration baseline data (both survey-based and objective, biological measures; see below) was collected between February to September 2017. Subsequent collection of survey data is scheduled after arrival in the U.S. at 3, 12, and 24 months after baseline and will be conducted by telephone (because of logistical and budget

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3 constraints, since migrants can be located all across the U.S.). At 36 months after baseline, an
4 in-person home visit will be made to collect both survey data and objective, biological measures.
5 For the non-migrant cohort in the Philippines, baseline data (both survey-based and objective,
6 biological measures) was collected between May to September 2017. Follow-up data collection
7 for non-migrants will follow the same pattern as for migrants, except without the 3-month follow-
8 up, and will be done via in-person home visits unless participant residence at the 12- and 24-
9 month mark necessitates conducting by phone.
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18 Baseline data collection for both the migrant and non-migrant cohorts was conducted in
19 the Philippines. For migrants, this was done in private office spaces in the CFO buildings in
20 Manila and Cebu. For non-migrants, this was done with in-home visits in community settings.
21 Table 2 lists the types and topics of data collected at baseline. Self-report measures were
22 collected via interviewer-administered survey. Migrants and non-migrants were asked the same
23 survey questions, with migrants being asked an additional set of questions related to migration.
24 Objective measures (e.g., height, weight, hip and waist circumferences, blood pressure) were
25 obtained by trained nurses. A point-of-care device was used to measure a non-fasting lipid
26 panel. Dried blood spots (DBS) were collected for laboratory analysis of c-reactive protein
27 (CRP) and Apolipoprotein B (ApoB) levels. DBS specimens are being kept in frozen storage (-
28 80° Celsius) and are available for other additional laboratory assay analyses in the future. The
29 survey questions will be repeated for each follow-up data collection wave (as above); with
30 phrasing modifications made to fit the post-migration context for the migrant cohort. As
31 mentioned, objective, biological measures are only collected at baseline and 36 months later.
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Table 2. HoPES measures obtained at baseline for migrant and non-migrant cohorts.

Self-report measures:	
Health status	Self-rated health, chronic health conditions (MOS), medication use, depressive symptoms (Patient-Reported Outcomes Measurement Information System); cognitive impairment; homesickness
Health behaviors	Physical activity (International Physical Activity Questionnaire), smoking (CDC Behavioral Risk Factor Surveillance System), alcohol consumption (BRFSS), sleep quality and duration; help seeking
Diet	Food frequency questionnaire; food procurement and insecurity, dietary acculturation
Stress	Perceived stress, acculturative stress, unfair treatment
Culture	Filipino attitudes and beliefs, social identity, language use and proficiency (including English)
Socioeconomic position	Currently employed, current occupation and job duties, personal income, financial strain, remittances
Social networks	Family and friends in the U.S. and Philippines, social isolation, social capital
Geography	Barangay and province for migrants; postal address for non-migrants; postal address in U.S. for migrants
Migration (migrant cohort only)	Visa type, family accompaniment, preparation, reasons for migrating, views about U.S., job waiting in U.S.
Objective measures:	
Anthropometrics	Height, weight, waist circumference, hip circumference
Biological measurements	Blood pressure, lipids (non-fasting total cholesterol, high-density lipoproteins, low-density lipoproteins, triglycerides), C-reactive protein, and Apolipoprotein B

PATIENT AND PUBLIC INVOLVEMENT

Study participants for this project were not from a clinical patient population, but rather recruited and enrolled from among the general population, and were not involved in the recruitment to and conduct of the study. The study purpose, aims, and design were principally

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3 conceived of and developed by the principal investigators and collaborators. However, prior to
4 execution of the project, input and consultation on these aspects were sought and received from
5 officials at the CFO, the primary government agency responsible for promoting and upholding
6 the interests, rights and welfare of migrant Filipinos. As they are available, data analysis and
7 results are presented to CFO officials, and, captured in lay audience fact sheets made available
8 to study participants as well as to community and local government stakeholders.
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15 **FINDINGS TO DATE**

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18 Table 3 displays initial univariate estimates (unweighted and weighted) across a variety
19 of self-report and objective measures indicative of baseline health status for both the migrant
20 and non-migrant cohorts. At baseline, migrants report significantly better self-rated health and
21 less depressive symptoms, and have significantly lower body mass index and waist-to-hip ratio.
22 Migrants also had lower mean level of CRP, however higher mean level of ApoB. Collectively,
23 these results suggest that migrants have less morbidity than non-migrants, which aligns with the
24 *healthy immigrant effect* perspective.
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32 **STRENGTHS AND LIMITATIONS**

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35 HoPES is one of the very few longitudinal studies of migration and health that has
36 enrolled participants starting from a pre-migration baseline phase in one country (Philippines)
37 and followed them into a post-migration period in another (U.S.). Other known studies have
38 followed migrants from Mexico to the U.S. and migrants from Russia and Ukraine to Israel [29-
39 32]. Our study has the added feature of following a migrant cohort across continents from Asia
40 to North America. As mentioned above, the demographic profile of our migrant cohort is very
41 similar to that of the recent immigrant Filipino population in the U.S., per the 2011-2013
42 American Community Survey. A group of non-migrants (similar in age, gender, and education)
43 in the country of origin is enrolled, which other studies of migration and health have not
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Table 3. Mean or proportion (and standard error) for health status measures comparing migrants and non-migrants (weighted vs. unweighted; both adjusted for age and sex).

	Migrants (n=832)		Non-migrants (n=805)		<i>p</i> -value	
	Unweighted	Weighted	Unweighted	Weighted	Comparing unweighted values	Comparing weighted values
Self-rated health (Excellent/Very good/Good; proportion)	.74 (.02)	.73 (.02)	.34 (.02)	.35 (.02)	.000	.000
Depressive symptoms; range: 5 (low) to 25 (high)	6.55 (.09)	6.52 (.09)	8.53 (.13)	8.51 (.14)	.000	.000
Height (cm); mean	158.09 (.20)	158.00 (.20)	155.88 (.20)	156.20 (.21)	.000	.000
Weight (kg)	60.93 (.38)	61.14 (.39)	60.33 (.44)	60.50 (.46)	.338	.275
Body mass index (kg/m ²)	24.27 (.14)	24.38 (.14)	24.77 (.16)	24.72 (.17)	.057	.132
Waist circumference (cm)	86.00 (.34)	86.32 (.34)	86.41 (.39)	86.37 (.40)	.806	.969
Hip circumference (cm)	95.94 (.26)	96.10 (.26)	94.47 (.30)	94.50 (.31)	.000	.000
Waist-to-hip ratio	.89 (.00)	.89 (.00)	.91 (.00)	.91 (.00)	.000	.000
Systolic blood pressure (mmHg)	120.52 (.53)	121.18 (.55)	119.10 (.61)	119.02 (.63)	.007	.007
Diastolic blood pressure (mmHg)	80.40 (.35)	80.67 (.36)	79.96 (.41)	80.09 (.43)	.144	.274
C-reactive protein (mg/L)	1.68 (.10)	1.69 (.10)	1.90 (.12)	1.91 (.12)	.19	.06
Apolipoprotein B (mg/dL)	33.24 (.53)	33.34 (.53)	24.40 (.46)	23.94 (.46)	.000	.000

NOTE: T-tests for continuous variables and z-tests for categorical variables were conducted using multilinear regression models to calculate *p*-values indicating if migrant and non-migrant groups were statistically different from each another for each predictor and for both weighted and unweighted analyses, controlling for age and sex.

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3 included, providing opportunities for comparative data analyses. For migrants, having started
4 from a pre-migration baseline, data represent health status and life experiences prior to
5 migration. Data, for both migrants and non-migrants, include objective, biological measures of
6 health status, in addition to self-report responses that, to our knowledge, has not been collected
7 in other longitudinal studies of migration. The collection and frozen banking of DBS creates
8 future opportunities for laboratory analyses of emerging and yet to be developed assays. Also,
9 meticulous efforts were undertaken to assure linguistic and cultural appropriateness of survey
10 instruments, including data obtained through a food frequency questionnaire tailored to Filipino
11 foods and diet. Additionally, for each participant, residential address is collected at each follow-
12 up wave, allowing for geocoding and analyses integrating geographical information system data.

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24 Due to the nature of the study, the non-migrants are purposefully not representative of
25 the general population of the Philippines. This was due to our aim to evaluate the effect of
26 migration as a “treatment.” Similar to a randomized clinical trial, it is desirable to have the two
27 cohorts similar on key characteristics at baseline. Thus, our objective for the non-migrant cohort
28 was to enroll a group similar in characteristics (age, gender, education) to the migrant cohort,
29 which would then render the non-migrant sample not representative of the general population.
30 While the overall sample sizes for each cohort are sufficiently large for our study purposes, it
31 may be limiting for analyses focused on specific sub-groups (e.g., only women with less than a
32 high school education). Another potential weakness relates to participation rates and potential
33 for sampling bias. Comparing participants to eligible non-participants, per Table 1, a few
34 demographic differences were statistically significant. For example, migrant participants were
35 older than migrants who were eligible but did not participate; non-migrant participants tended to
36 be more educated than non-migrants who were eligible but did not participate; and for both
37 migrant and non-migrant cohorts, there were more females among participants than among
38 eligible non-participants. With any cohort study, attrition is a concern, particularly when
39 participants are in a state of geographic movement across countries (migrants) and, likely,
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3 within country (migrants after arriving in the U.S. and non-migrants in the Philippines). It is
4 possible, over the course of the study, that migrant participants may return back to the
5 Philippines or re-locate to other countries for periods of time and that non-migrant participants
6 may become migrants themselves (whether to the U.S. or elsewhere). While this poses
7 additional challenges, if such cases emerge and are retained, their data can yield potentially
8 interesting, unanticipated findings about continued migration transitions. Because we currently
9 report only on the baseline stage of this study, retention rates and mobility patterns over the
10 course of the study have yet to unfold. Strategies to promote retention have been implemented,
11 such as phone calls, a newsletter, social media, and birthday greetings. Also, we intentionally
12 over sampled to account for attrition. Lastly, our study does not include a third cohort group of
13 U.S. born Filipinos, which would have provided another comparison group to more fully examine
14 the immigrant health paradox.

28 **COLLABORATION**

29
30 Researchers wishing to work with HoPES data can contact the principal investigators
31 (GGGGG@XXXX.UUU and DDDDD@XX.UUU) to discuss analysis ideas (from cross-sectional
32 to longitudinal) and possible collaborative efforts. Requests are invited for studies that
33 investigate the variety of cross-sectional and longitudinal associations between
34 sociodemographic characteristics, geographical locations (e.g. migration patterns,
35 neighborhood/community factors), stressors, cultural shifts and both subjective and objective
36 measures of health and health behaviors (including and beyond obesity risk related outcomes)
37 that characterize how differential burdens of illness/disease play out in the context of migration
38 and globalization. Also, because DBS are frozen and stored, collaborations involving studies
39 with laboratory analysis of analytes other than CRP and Apolipoprotein B are of interest.

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41 A data user agreement is available for interested researchers to specify a working title of
42 their proposed project; a 1-2 paragraph abstract that articulates a research question,
43 hypotheses, and supporting rationale; a description of the analysis plan, including the specific

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3 statistical techniques to be used; the list the specific variables needed for the analysis, including
4 identifying dependent vs. independent variables, and control variables; and a statement of
5 dissemination plans, including prospective journals and conference meetings where the analysis
6 will be reported. The principal investigators will consider the request and determine its
7 approval. The data user agreement also delineates a list of conditions that users must agree to;
8 such as not sharing or distributing the data without prior authorization from the principal
9 investigators, using the requested data only according to the proposed use, sharing with the
10 principal investigators documentation of new variables of major study constructs, and prompt
11 notification of submissions and acceptances for presentations and publications.
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22 **FURTHER DETAILS**

23
24 Drs. DDDDD and GGGGG serve as the co-principal investigators for HoPES and led the
25 overall conceptualization of the research design, directed the analysis, and oversaw logistics to
26 carry out project activities. Dr. DDDDD led the writing of this paper, with the assistance of Dr.
27 GGGGG and Ms. HHHHH who also conducted the statistical analysis. Drs. LLLLLL, MMMMM,
28 WWWWW, and CCCCC were primary collaborators for all project activities including study
29 participant recruitment, data collection and analysis, and assisted with paper writing and review.
30 Ms. LLLLLL served as the HoPES project manager and assisted with reviewing this paper. None
31 of the authors have any competing interests with respect to the HoPES research project or the
32 publication of this paper. Primary funding for HoPES was provided by the XXXXX (grant
33 #XXXXX), and, prior pilot funding was provided by the XXXXX (grant #XXXXX) and the XXXXX
34 (grant #XXXXX). Data can be shared upon request and approval as described above.
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47 **ACKNOWLEDGMENTS**

48
49 HoPES would not have been possible without the imaginative ingenuity, collaborative
50 spirit, and tireless efforts from multiple sources. The interdisciplinary team consists of
51 researchers and staff from the U.S. and the Philippines with a shared interest and vision to
52 advance the health of immigrant populations. Others making important contributions through
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3 their knowledge, skills, and time were (INDIVIDUALS #1-8), and all members of the data
4 collection staff. The cooperation, approval, support, and assistance from staff of the
5 Commission on Filipinos Overseas, namely (INDIVIDUALS #9-13), who made it possible to
6 recruit and enroll migrant participants. We also greatly appreciate permissions granted and
7 facilitated by government officials in local municipal jurisdictions to enter communities to recruit
8 and enroll non-migrant participants from community households. And, we express our deep
9 appreciation to all of the HoPES participants who generously provided their time and willingness
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11 of his truly incomparable friendship and many selfless acts to help make this research project a
12 reality.
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Cohort Profile: The Health of Philippine Emigrants Study (HoPES) to examine the health impacts of international migration from the Philippines to the United States

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3 **Cohort Profile: The Health of Philippine Emigrants Study (HoPES) to examine the health**
4 **impacts of international migration from the Philippines to the United States**
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ABSTRACT

Purpose: The Health of Philippine Emigrants Study (HoPES) longitudinally investigates over three years whether migrating from the Philippines to the United States (U.S.) results in increased risk for obesity relative to non-migrants in the Philippines. The study is designed to test the healthy immigrant hypothesis by collecting health measures from migrants starting from a pre-migration baseline and enrolling a non-migrant cohort matched on age, gender, and education for comparison.

Participants: A migrant cohort (n=832; 36.5% of eligible individuals) was recruited from clients of the Commission on Filipinos Overseas prior to exiting the Philippines. A non-migrant cohort (n=805; 68.6% eligible individuals) was recruited from among community households in municipalities throughout the cities of Manila and Cebu. By intention, these two cohorts are comparable demographically, including urban/rural status of residency in the Philippines at baseline.

Findings to date: At baseline, compared to non-migrants, migrants report significantly better self-rated health and less depression, and have significantly larger hip circumference and lower waist-to-hip ratio, as well as significantly higher mean systolic blood pressure and higher mean level of Apolipoprotein B. Baseline results can offer insight into the health status of both migrant and non-migrant populations and may be useful for obesity prevention efforts.

Future plans: Longitudinal data collection is scheduled to be completed in December 2020 when the final data collection wave (36 months after baseline) will conclude. Both migrant and non-migrant cohorts will be maintained beyond the current prospective study, so long as research funding allows and emerges for new study questions. Findings from future longitudinal analyses can inform the need and design of health-related/relevant interventions, whether clinical, behavioral, educational, policy, that can be implemented at the individual or population level.

STRENGTHS AND LIMITATIONS

- A cohort of migrants is enrolled into the study starting with data collection at a pre-migration baseline in the country of origin and will be followed prospectively post-migration into the destination country.
- A cohort of non-migrants matched on gender, age, education, and urbanicity in the country of origin was enrolled providing opportunities for comparative data analyses.
- Data collection involves subjective and objective biological measures of health status, including dried blood spots that are frozen creating future opportunities for laboratory assays.
- The non-migrant cohort is not representative of the general population as the study objective is for them to be demographically similar to the migrant cohort.
- As prospective follow-up continues, there is a possibility for participant attrition, including because of continued migration domestically and internationally among both the migrant and non-migrant cohorts.

INTRODUCTION

The prevailing view of the immigrant health literature asserts that immigrants arrive in the destination country with better health status relative to their same race/ethnicity counterparts born in that country. However, this health advantage has been observed to decline over time with duration in the new country. Research has documented this phenomenon across a variety of physical and mental health outcomes, as well as population groups.[1-6] In the U.S. context, immigrants originating from developing countries often exhibit the *immigrant health paradox*,[7-9] referring to the contradiction that immigrants generally have better health than U.S. born individuals who presumably have access to better healthcare services, reside in better environmental conditions, and have better opportunities for employment and education. As well, the phrase *healthy immigrant hypothesis* has been coined to suggest that immigrants generally have better health as a function of higher social class (e.g., having education, employability, and fiscal resources) compared to others in their country of origin, which positions them with the prospect and opportunity to emigrate. While a body of research has informed these perspectives, the preponderance of studies have not been designed to thoroughly investigate them. More specifically, conventional understanding of immigrant health has been premised on cross-sectional studies utilizing self-report survey data collected after arrival in the U.S. and without a comparison group in the country of origin. The Health of Philippine Emigrants Study (HoPES) was created to address these major limitations in the field of immigrant health by collecting both survey and objective health measures starting from a pre-migration baseline and enrolling a non-migrant cohort in the country of origin matched on age, gender, and education.

Filipinos have a long history of migration to the U.S., dating back to the late 1500's and continuing over subsequent centuries, with migration at various times tied to labor, political, and military service reasons. In 2016, there were 4.1 million Filipinos in the U.S., approximately half of whom were immigrants.[10] As such, Filipino immigrants are a significant population group

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3 within which to explore the health effects of migration. A well-documented health issue among
4 Filipinos in the U.S., as well as in the Philippines, is obesity and concomitant chronic health
5 conditions such as hypertension, diabetes, and cardiovascular disease.[11-16] HoPES
6 principally examines changes in dietary patterns and body weight in the context of migration. A
7 popular hypothesis is that immigrants become acculturated to U.S. lifestyles and behaviors,
8 including eating larger food portion sizes, consuming more convenient processed, unhealthy
9 fast foods, and being more sedentary.[17-21] Immigrants are also exposed to stressors
10 associated with living in a new country (e.g., struggling with employment and having low income
11 and socioeconomic status, discrimination, and separation from family and friends in the country
12 of origin) which may prompt feelings of stress and lead to unhealthy dietary practices as well as
13 adversely impact metabolism.[22-25] Other factors may also play into weight gain among
14 immigrants, such as epigenetics (i.e., individuals born in lower-income countries to
15 undernourished mothers may be metabolically prepared to store calories as fat for food scarce
16 environments, but then are susceptible to weight gain after arrival in a country environment high
17 in calories, fat, and sugars) and physical activity (i.e., immigrants may participate in less leisure
18 physical activity but more work physical activity than those born in the destination country) [25-
19 26]. However, whether risk of unhealthy eating and weight gain can be attributed solely to the
20 immigrant experience has not been conceptualized through the lens of globalization. Indeed,
21 rates of obesity have been rising worldwide, including the Philippines.[27-29] Accordingly, the
22 overarching empirical question that HoPES seeks to answer is whether migrating to the U.S.
23 results in increased risk for obesity (losing the healthy immigrant advantage) or if this risk would
24 have been the same had an immigrant remained in the Philippines.

25 **COHORT DESCRIPTION**

26 HoPES includes a migrant cohort and a non-migrant cohort. The migrant cohort
27 consists of emigrants with legal permission to exit the Philippines for permanent residency in the
28 U.S. Migrant cohort participants were enrolled starting at a pre-migration baseline before

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3 departing the Philippines and will be followed prospectively after arriving in the U.S. up to three
4 years. These migrant participants were recruited onsite at either the Manila or Cebu office of
5 the Commission on Filipinos Overseas (CFO), the national Philippine government agency that
6 oversees legal migration and where legal emigrants must register and process their exit from
7 the Philippines. Trained research staff approached and screened individuals at the CFO
8 locations for study eligibility: aged 20-59 years; departing the Philippines for the U.S. within
9 three months; ability to speak English, Tagalog, or Cebuano; and not known to be pregnant (as
10 this study prospectively assesses weight gain). From a total of 3,412 individuals approached,
11 2,279 met eligibility criteria, and 832 (36.5% of those eligible) consented and enrolled in the
12 study. While there were no target numbers for the migrant cohort by gender, age, and
13 education; distributions along these categories ended up reflecting similar demographic profiles
14 of the recent immigrant Filipino population in the U.S. For example, according to the 2011-2013
15 American Community Survey (<https://www.census.gov/programs-surveys/acs>), among
16 immigrant Filipinos who have been in the U.S. for less than two years, 11% are males aged 20-
17 34 with a college education, which is the same percentage of this same group in the HoPES
18 migrant cohort. Additional details are reported elsewhere.[30]

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37 The second cohort consists of non-migrants who remain in the Philippines. Recruitment
38 of this non-migrant cohort was based on stratified random sampling of households using three
39 strata: Metro Manila (urban), Cebu (urban), and Cebu (rural). For each of these stratum,
40 *barangay* (smallest administrative government division, somewhat like a census tract) were
41 sampled with probability proportional to population size. Within each selected *barangay*, cluster
42 sampling of households was conducted, then individuals were sampled within each household.
43 Non-migrants were screened with the same age, language, and pregnancy inclusion criteria as
44 migrants, with additional criteria of having resided in the *barangay* for the past two years and
45 having no plans to move out of the *barangay* over the next three years. As non-migrants were
46 sampled, numbers were tracked to achieve comparability to the gender, age, education, and
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urbanicity frequencies of the migrant cohort. Of the 2,215 non-migrant individuals approached, 1,173 met eligibility criteria, and 805 (68.6% of those eligible) consented and enrolled in the study.

Upon recruitment, the purpose and procedures of HoPES was explained to eligible individuals through the informed consent process. Participants were given opportunity to ask questions and contact information of the research team. Signed consent was obtained from participants for baseline and all subsequent data collection waves. Participants were assured that their participation would be kept confidential; and that data would be de-identified and reported only in the aggregate. Participants were also granted a certificate of confidentiality via the U.S. National Institutes of Health.

Table 1 provides demographic characteristics at time of recruitment and enrollment of the migrant and non-migrant participants, as well as those who were eligible but did not participate. Attrition rate for each of the cohorts has not yet been determined because collection of follow-up data is still ongoing; thus we report only on the baseline stage of the study.

Table 1. Demographic characteristics of HoPES participants and non-participants at time of recruitment and enrollment.

	Migrants			Non-migrants		
	Participants (n=832)	Eligible non- participants (n=1447)	<i>p</i> -value	Participants (n=805)	Eligible non- participants (n=355)	<i>p</i> -value
Age in years (mean; SD)	35.46 (11.57)	38.53 (11.64)	.000	36.53 (11.47)	35.77 (10.81)	.304
Female (number; %)	553 (66.47%)	865 (60.15%)	.003	548 (68.07%)	185 (50.41%)	.000
Education (number; %)			.049			.000

Some high school or less	50 (6.08%)	63 (4.41%)		101 (12.85%)	15 (4.18%)	
High school degree	170 (20.68%)	247 (17.30%)		143 (18.19%)	59 (16.43%)	
Some college or vocational training	190 (23.11%)	354 (24.79%)		320 (40.71%)	127 (35.38%)	
College degree or higher	412 (50.12%)	764 (53.50%)		222 (28.24%)	158 (44.01%)	

NOTE: Pearson's chi-squared tests were conducted to calculate p -values indicating if participant and non-participant groups were statistically different from each another.

For the migrant cohort, pre-migration baseline data (both survey-based and objective, biological measures; see below) was collected by trained research interviewers and nurses between February to September 2017. Subsequent collection of survey data is scheduled after arrival in the U.S. at 3, 12, and 24 months after baseline and will be conducted by telephone call from a trained research interviewer (because of logistical and budget constraints, since migrants can be located all across the U.S.). At 36 months after baseline, an in-person home visit will be made by a trained research nurse to collect both survey data and objective, biological measures. For the non-migrant cohort in the Philippines, baseline data (both survey-based and objective, biological measures) was collected by trained research interviewers and nurses between May to September 2017. Follow-up data collection for non-migrants will follow the same pattern as for migrants, except without the 3-month follow-up, and will be done via in-person home visits by trained research interviewers and nurses unless participant residence at the 12- and 24-month mark necessitates conducting by phone.

Baseline data collection for both the migrant and non-migrant cohorts was conducted in the Philippines. For migrants, this was done in private office spaces in the CFO buildings in Manila and Cebu. For non-migrants, this was done with in-home visits in community settings. Table 2 lists the types and topics of data collected at baseline. Self-report measures were collected via interviewer-administered survey. Migrants and non-migrants were asked the same survey questions, with migrants being asked an additional set of questions related to migration. Objective measures (e.g., height, weight, hip and waist circumferences, blood pressure) were obtained by trained nurses. A point-of-care device was used to measure a non-fasting lipid panel. Dried blood spots (DBS) were collected for laboratory analysis of c-reactive protein (CRP) and Apolipoprotein B (ApoB) levels. DBS specimens are being kept in frozen storage (-80° Celsius) and are available for other additional laboratory assay analyses in the future. The survey questions will be repeated for each follow-up data collection wave (as above); with phrasing modifications made to fit the post-migration context for the migrant cohort. As mentioned, objective, biological measures are only collected at baseline and 36 months later.

Table 2. HoPES measures obtained at baseline for migrant and non-migrant cohorts.

Self-report measures:	
Health status	Self-rated health, chronic health conditions (MOS), medication use, depressive symptoms (Patient-Reported Outcomes Measurement Information System); cognitive impairment; homesickness
Health behaviors	Physical activity (International Physical Activity Questionnaire), smoking (CDC Behavioral Risk Factor Surveillance System), alcohol consumption (BRFSS), sleep quality and duration; help seeking
Diet	Food frequency questionnaire; food procurement and insecurity, dietary acculturation
Stress	Perceived stress, acculturative stress, unfair treatment
Culture	Filipino attitudes and beliefs, social identity, language use and proficiency (including English)

Socioeconomic position	Currently employed, current occupation and job duties, personal income, financial strain, remittances
Social networks	Family and friends in the U.S. and Philippines, social isolation, social capital
Geography	Barangay and province for migrants; postal address for non-migrants; postal address in U.S. for migrants
Migration (migrant cohort only)	Visa type, family accompaniment, preparation, reasons for migrating, views about U.S., job waiting in U.S.
Objective measures:	
Anthropometrics	Height (Charder brand stadiometer model HM200P), weight (Tanita Corporation digital scale model BC-541 N), waist circumference and hip circumference (average of three readings; Weight and Measure brand tape measure model CAN150)
Biological measurements	Systolic and diastolic blood pressure (average of three readings; Omron Healthcare electronic monitor model BP785N), lipids (non-fasting total cholesterol, high-density lipoproteins, low-density lipoproteins, triglycerides; PST diagnostics CardioCheck point-of-care device PA CHECK-1708), C-reactive protein and Apolipoprotein B (via dried blood spots; Whatman 903 Protein Saver card)

Patient and Public Involvement

No patient or public involvement.

FINDINGS TO DATE

Table 3 displays initial univariate estimates (unweighted and weighted) across a variety of self-report and objective measures indicative of baseline health status for both the migrant and non-migrant cohorts. At baseline, migrants report significantly better self-rated health and fewer depressive symptoms, and have significantly larger hip circumference and lower waist-to-hip ratio, as well as significantly higher mean systolic blood pressure and higher mean level of ApoB. For migrants, the principal reasons for emigrating were to join family members already in the U.S. (n=770) and for employment (n=62). Migrants settled across all regions of the U.S., with the top states being California, Texas, Washington, Hawaii, Florida, and Nevada, thus far.

Table 3. Mean or proportion (and standard error) for health status measures comparing migrants and non-migrants (weighted vs. unweighted; both adjusted for age and sex).

	Migrants (n=832)		Non-migrants (n=805)		<i>p</i> -value	
	Unweighted	Weighted	Unweighted	Weighted	Comparing unweighted values	Comparing weighted values
Self-rated health (Excellent/Very good/Good; proportion)	.74 (.02)	.73 (.02)	.34 (.02)	.35 (.02)	.000	.000
Depressive symptoms; range: 5 (low) to 25 (high)	6.55 (.09)	6.52 (.09)	8.53 (.13)	8.51 (.14)	.000	.000
Height (cm); mean	158.09 (.20)	158.00 (.20)	155.88 (.20)	156.20 (.21)	.000	.000
Weight (kg)	60.93 (.38)	61.14 (.39)	60.33 (.44)	60.50 (.46)	.338	.275
Body mass index (kg/m ²)	24.27 (.14)	24.38 (.14)	24.77 (.16)	24.72 (.17)	.057	.132
Waist circumference (cm)	86.00 (.34)	86.32 (.34)	86.41 (.39)	86.37 (.40)	.806	.969
Hip circumference (cm)	95.94 (.26)	96.10 (.26)	94.47 (.30)	94.50 (.31)	.000	.000
Waist-to-hip ratio	.89 (.00)	.89 (.00)	.91 (.00)	.91 (.00)	.000	.000
Systolic blood pressure (mmHg)	120.52 (.53)	121.18 (.55)	119.10 (.61)	119.02 (.63)	.007	.007
Diastolic blood pressure (mmHg)	80.40 (.35)	80.67 (.36)	79.96 (.41)	80.09 (.43)	.144	.274
C-reactive protein (mg/L)	1.68 (.10)	1.69 (.10)	1.90 (.12)	1.91 (.12)	.19	.06
Apolipoprotein B (mg/dL)	33.24 (.53)	33.34 (.53)	24.40 (.46)	23.94 (.46)	.000	.000

NOTE: T-tests for continuous variables and z-tests for categorical variables were conducted using multilinear regression models to calculate *p*-values indicating if migrant and non-migrant groups were statistically different from each another for each predictor and for both weighted and unweighted analyses, controlling for age and sex.

STRENGTHS AND LIMITATIONS

HoPES is one of the few longitudinal studies of migration and health that has enrolled participants starting from a pre-migration baseline phase in one country (Philippines) and followed them into a post-migration period in another (U.S.). Other known studies have followed migrants from Mexico to the U.S. and migrants from Russia and Ukraine to Israel.[31-34] Our study has the added feature of following a migrant cohort across continents from Asia to North America. Conventional understandings of immigrant health have relied principally on data collected after migration, for example the National Latino and Asian American Study (U.S.)[35] and the Research on Obesity and Diabetes among African Migrants project (Germany, Netherlands, United Kingdom; and Ghana allowing for comparison to non-migrants in the country of origin).[26] The New Immigrant Study does follow prospectively a cohort of adult and child immigrants in the U.S., but also captures only post-migration data.[36] Importantly, these and other studies like them offer valuable insights about the a range of health status outcomes and experiences of immigrants, including disparities in health relative to populations native to the destination country. While findings from these studies provide the basis for attending to the health needs of immigrant communities that bear disproportionate burdens of illness, this established body of literature warrants a more expansive view of immigrant health. Notably, prospective examination of health inclusive of the pre-migration period can provide a more complete picture of transitions in health throughout the dynamic nature of migration.

As mentioned above, the demographic profile of our migrant cohort is very similar to that of the recent immigrant Filipino population in the U.S., per the 2011-2013 American Community Survey. A group of non-migrants (similar in age, gender, and education) in the country of origin is enrolled, which other studies of migration and health have not included, providing opportunities for comparative data analyses. For migrants, having started from a pre-migration baseline, data represent health status and life experiences prior to migration. Data, for both migrants and non-migrants, include objective, biological measures of health status, in addition to

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3 self-report responses that, to our knowledge, have not been collected in other longitudinal
4 studies of migration. The collection and frozen banking of DBS creates future opportunities for
5 laboratory analyses of emerging and yet to be developed assays. Also, meticulous efforts were
6 undertaken to assure linguistic and cultural appropriateness of survey instruments, including
7 data obtained through a food frequency questionnaire tailored to Filipino foods and diet.
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9 Additionally, for each participant, residential address is collected at each follow-up wave,
10 allowing for geocoding and analyses integrating geographical information system data.
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18 Due to the nature of the study, the non-migrants are purposefully not representative of
19 the general population of the Philippines. This was due to our aim to evaluate the effect of
20 migration as a “treatment.” Similar to a randomized clinical trial, it is desirable to have the two
21 cohorts similar on key characteristics at baseline. Thus, our objective for the non-migrant cohort
22 was to enroll a group similar in characteristics (age, gender, education) to the migrant cohort,
23 which would then render the non-migrant sample not representative of the general population.
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25 While the overall sample sizes for each cohort are sufficiently large for our study purposes, it
26 may be limiting for analyses focused on specific sub-groups (e.g., only women with less than a
27 high school education).
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37 Another potential weakness relates to participation rates and potential for sampling bias.
38 Comparing participants to eligible non-participants, per Table 1, a few demographic differences
39 were statistically significant. For example, migrant participants were older than migrants who
40 were eligible but did not participate; non-migrant participants tended to be more educated than
41 non-migrants who were eligible but did not participate; and for both migrant and non-migrant
42 cohorts, there were more females among participants than among eligible non-participants.
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50 With any cohort study, attrition is a concern, particularly when participants are in a state
51 of geographic movement across countries (migrants) and, likely, within country (migrants after
52 arriving in the U.S. and non-migrants in the Philippines). It is possible, over the course of the
53 study, that migrant participants may return to the Philippines or re-locate to other countries for
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3 periods of time and that non-migrant participants may become migrants themselves (whether to
4 the U.S. or elsewhere). While this poses additional challenges, if such cases emerge and are
5 retained, their data can yield potentially interesting, unanticipated findings about continued
6 migration transitions. Because we currently report only on the baseline stage of this study,
7 retention rates and mobility patterns over the course of the study have yet to unfold. Strategies
8 to promote retention have been implemented, such as phone calls, a newsletter, social media,
9 and birthday greetings. Also, we intentionally over sampled to account for attrition. Lastly, our
10 study does not include a third cohort group of U.S. born Filipinos, which would have provided
11 another comparison group to more fully examine the immigrant health paradox.
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22 **COLLABORATION**

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24 Researchers wishing to work with HoPES data can contact the co-principal investigators
25 – Gilbert C. Gee, PhD, Professor, UCLA Fielding School of Public Health, 650 Charles E. Young
26 Drive South, Los Angeles, CA 90095-1772, e-mail: gilgee@ucla.edu; and, A.B. de Castro, PhD,
27 MSN/MPH, RN, FAAN, University of Washington School of Nursing, Box 357260, Seattle, WA
28 98195, e-mail: butchdec@uw.edu – to discuss analysis ideas and possible collaborative efforts.
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30 Requests are invited for studies that examine the variety of cross-sectional and longitudinal
31 associations between sociodemographic characteristics, geographical locations (e.g. migration
32 patterns, neighborhood/community factors), stressors, cultural shifts and both subjective and
33 objective measures of health and health behaviors (including and beyond obesity risk related
34 outcomes) that characterize how differential burdens of illness/disease play out in the context of
35 migration and globalization. Also, because DBS are frozen and stored, collaborations involving
36 studies with laboratory analysis of analytes other than CRP and Apolipoprotein B are of interest.
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49 A data user agreement is available for interested researchers to specify a working title of
50 their proposed project; a 1-2 paragraph abstract that articulates a research question,
51 hypotheses, and supporting rationale; a description of the analysis plan, including the specific
52 statistical techniques to be used; the list the specific variables needed for the analysis, including
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3 identifying dependent vs. independent variables, and control variables; and a statement of
4 dissemination plans, including prospective journals and conference meetings where the analysis
5 will be reported. The co-principal investigators will consider the request and determine its
6 approval. The data user agreement also delineates a list of conditions that users must agree to;
7 such as not sharing or distributing the data without prior authorization from the co-principal
8 investigators, using the requested data only according to the proposed use, sharing with the co-
9 principal investigators documentation of new variables of major study constructs, and prompt
10 notification of submissions and acceptances for presentations and publications.
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20 **FURTHER DETAILS**

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22 Ethics review and approval to conduct HoPES were granted by the institutional review
23 boards at the University of California, Los Angeles (U.S.), and the University of San Carlos
24 (Cebu, Philippines).
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31 advance the health of immigrant populations. The co-principal investigators of HoPES are
32 Gilbert C. Gee, PhD, Professor, UCLA Fielding School of Public Health, 650 Charles E. Young
33 Drive South, Los Angeles, CA 90095-1772, e-mail: gilgee@ucla.edu; and, A.B. de Castro, PhD,
34 MSN/MPH, RN, FAAN, University of Washington School of Nursing, Box 357260, Seattle, WA
35 98195, e-mail: butchdec@uw.edu. In addition to the authors, others making important
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3 permissions granted and facilitated by government officials in local municipal jurisdictions to
4 enter communities to recruit and enroll non-migrant participants from community households.
5
6 And, we express our deep appreciation to all of the HoPES participants who generously
7 provided their time and willingness for us to collect data measures. Lastly, we dedicate this
8
9 paper to Eularito A. Tagalog in memory of his truly incomparable friendship and many selfless
10
11 acts to help make this research project a reality.
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15 **CONTRIBUTORSHIP STATEMENT**

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17 Dr. de Castro led the conceptualization and writing of this paper with writing and
18 statistical analysis assistance from Ms. Hing. Drs. Crespi, Gee, Kabamalan, Lee, and Wang
19 collaborated to conceptualize and execute the overall HoPES project; and Ms. Llave managed
20
21 HoPES project operations. All authors assisted with the writing content.
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26 **COMPETING INTERESTS**

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28 None of the authors have a competing interest with regard to the HoPES research
29 project or the publishing of this report.
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37
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39
40 Population Research at the University of California, Los Angeles (P2C-HD041022).
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45 **DATA SHARING STATEMENT**

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47 Inquiries about the questionnaire, data, and accessing data can be directed to the co-
48 principal investigators, Dr. Gilbert C. Gee (gilgee@ucla.edu) and Dr. A.B. de Castro
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