

## Specific Aims

The combined effects of declining fertility and increasing longevity have accelerated population aging in different parts of the world. A parallel process of massive levels of family change is combining with such population aging to reshape health and well-being in older adulthood. The rapid and ongoing changes in family formation processes (retreats from marriage, increased divorce, and greater levels of childlessness) over the past half century, coupled with related demographic changes like lower fertility and higher longevity, mean that ever larger cohorts of people will enter older adulthood without the dense family networks that have traditionally been a mainstay of older adult social support in many contexts.

Puerto Rico presents a particular case that simultaneously sheds light on the challenges faced by many aging societies with increasingly sparse family networks and highlights special circumstances faced only in certain contexts. Puerto Rico, as in many migrant sending societies and subnational regions in the world, is aging more quickly and facing pressures on its family networks because of outmigration. Puerto Rico's massive outmigration of young adults in the last decade has doubled the percentage of older adults on the island from 11% to 21% <sup>1</sup>. Puerto Rico has lost 14% of the total population in a decade, mostly young professionals, and children <sup>2,3</sup>. Though an increasing number of studies have demonstrated important links between a lack of available kin and health in a variety of global contexts <sup>4-7</sup>, no one has assessed the prevalence, predictors, or consequences of this phenomenon in Puerto Rico. At the onset of the current migration wave, approximately 33% of Puerto Rican older adults reported living alone <sup>8</sup>, but, at this time no study has identified the pathways a lack of available kin among Puerto Rican older adults nor how kin migration is affecting familial composition. This is a major gap in the knowledge about Puerto Rican older adults' kinlessness and well-being, but it also underscores the challenges for understanding kinlessness in other high-migration contexts.

As such, the goals of the proposed project are to describe the adult family structures in Puerto Rico compared to other countries in the world and assess how such family structures relate to older adults' health and well-being, with a particular emphasis on the role migration might play in altering kin-health linkages. We argue that these features of the Puerto Rican case, especially its ongoing and impending demographic changes, are of sufficient breadth and scope that they deserve to be studied in comparison to contemporary cross-national data.

**Aim 1: Examine contemporary diversity in older adult family structures in Puerto Rico in comparison to other countries in the world.** We will characterize the size and prevalence of various definitions of kinless subpopulations and how these vary within Puerto Rico and between other countries. We will examine variation in pathways to kinlessness, such as childlessness vs. child mortality.

**Aim 2: Estimate the prevalence of kinlessness in Puerto Rico considering adult-child migration.** We will estimate the prevalence of kinlessness by distinguishing between structural and functional kinlessness. We will use adult-child migration as the pathway to functional kinlessness in Puerto Rico.

**Aim 3: Estimate the association between kinlessness and health among older adults in Puerto Rico in comparison to other countries in the world.** We will estimate the association between kinlessness and self-rated health, chronic conditions, depression, and functional difficulties.

**Aim 4: Estimate the association between kinlessness and health among older adults in Puerto Rico distinguishing by kinlessness pathways.** Estimate the association between kinlessness and health accounting for adult-child migration as a type of kinlessness (functional).

## **Project Narrative**

### **Introduction and Background**

Psychosocial determinants of health are a major public health issue around the world because they are directly and indirectly associated with several health outcomes. Recent meta-analytic reviews have demonstrated the unprecedented impact of psychosocial factors like social isolation, social cohesion, and social support on many health outcomes regardless of age. Evidence from the United States suggests that the impact of psychosocial factors and health is even stronger in vulnerable populations, especially older adults, and Hispanics<sup>9</sup>. Furthermore, these social resources are mediated by familial composition, kinlessness, place of residence, and many other social network characteristics specific to the individual<sup>10-14</sup>. Older adults in Puerto Rico, with its high levels of outmigration and below-replacement fertility levels, are experiencing higher levels of kinlessness, social isolation, and reduction of social support resources. A recent study using data from the Puerto Rico Elderly: Health Conditions (PREHCO) study showed that having children in another country (migrant children) is associated with poorer mental health and a higher prevalence of disability among older adults. This proposed study will follow up on these findings by characterizing the size and prevalence of various definitions of kinless subpopulations, considering adult-child migration as a unique component of functional kinlessness, and how these psychosocial determinants affect the health and well-being of older adults in Puerto Rico. PREHCO contains a family and friends' roster that collects information on socio-demographic data on all children (alive or dead), spouses, and close friends. This roster can be coded, harmonized, and compared against definitions of structural kinlessness (having no living family members of different types) used in the 17 studies analyzed in the parent grant<sup>5</sup>, but it also crucially contains information on the migrant status of each family member that will enable us to add substantial understanding of how migration in this society influences patterns of functional kinlessness (i.e., being without kin who could provide direct support because they are too far apart). These analyses will allow examination of the role of family structures and social dynamics on various physical and mental health outcomes among older adults in Puerto Rico and to compare it with other countries. This work will expand the parent grant's scope by considering new pathways to kinlessness, specifically adult-child migration, and its association with the health and well-being of older adults in Puerto Rico and countries around the world. These analyses will provide key data to develop health policies and community interventions aimed to reduce the impact of kinlessness on older adults' health and well-being in Puerto Rico.

### **Relationship with Parent Grant**

The proposed training and research plan are highly relevant to and expand upon the research goals and objectives of the parent project and will ultimately contribute to our knowledge on the role of kinlessness, and its association with health for older adults. The activities outlined in this supplement are consistent with the guiding hypotheses of the parent project, namely to incorporate Puerto Rico into a cross-national estimation of contemporary diversity in older adults' family structure, with attention to how the dynamics in Puerto Rico compare/contrast with other countries of the world (as discussed below, Puerto Rico is a U.S. territory with a substantial degree of autonomy and a unique cultural heritage). This proposal addresses a knowledge gap on the role of kinlessness and the pathways through which this phenomenon emerges (i.e., lack of children, child mortality, and adult-child migration), particularly in the context of unrestricted working-age outmigration that has affected Puerto Rico since the early 2000s. Further, this study adds substantial information about within-country heterogeneity in the United States, one of the largest national populations in the parent grant, by considering specific features of one of the most numerous Hispanic subgroups. Although the parent project proposes to estimate contemporary family structures, the examination of kinlessness and health, and project kinlessness, no studies to-date have pursued this type of analysis including Puerto Rico. Conclusions from this supplement will highlight the particularities of a U.S. territory that exists with some form of autonomy where outmigration to the US mainland is unrestricted, something that has resulted in a population decline of 14% since 2000 and accelerated population aging (Santos-Lozada, et. al. 2020). As an outcome, we will provide new insights into the similarities and contrasts of Puerto Rico with other nations of the world.

## **Approach and Methods**

The research proposed in this supplement will incorporate a cross-sectional design with complex sampling data collected in Puerto Rico to the numerous datasets already harmonized in the parent grant R01AG060949<sup>5</sup>. PREHCO consists of a representative sample of 4,291 older adults collected in Puerto Rico in 2002-2003 (Wave 1) with a follow-up wave in 2006-2007 (Wave 2).

### **Aim 1: Examine contemporary diversity in older adult family structures in Puerto Rico compared to other countries in the world.**

We will characterize the size and prevalence of various definitions of kinless subpopulations and how these vary within Puerto Rico and between other countries. We will first document national differences in the prevalence of kinless older adults according to several definitions of kinlessness (e.g., lacking a spouse/partner and children; having none of the following types: spouse/partner, children, parents, or siblings, etc.). We will examine variation in pathways to kinlessness, such as childlessness vs. child mortality.

**Aim 2: Estimate the prevalence of kinlessness in Puerto Rico considering adult-child migration.** We will estimate the prevalence of kinlessness by distinguishing between structural and functional kinlessness. We will use the previous definitions of kinlessness as the pathways to structural kinlessness and adult-child migration as the pathway to functional kinlessness in Puerto Rico. We will also consider the combination of both definitions in the analysis. Distinguishing between these two concepts will add a new perspective to the parent grant on how we study kinlessness among older adults in Puerto Rico.

**Aim 3: Estimate the association between kinlessness and health among older adults in Puerto Rico in comparison to other countries in the world.** In this analysis we will examine associations between kinlessness and health, with specific attention to loneliness and social isolation mechanisms. Furthermore, we will examine variation in pathways to kinlessness (e.g. childlessness, child mortality, etc.) and its association with self-rated health, depression, chronic conditions, and disability.

**Aim 4: Estimate the association between kinlessness and health among older adults in Puerto Rico distinguishing by kinlessness pathways.** First, in this analysis we will estimate the association between kinlessness and health adjusting by adult-child migration. Second, we will incorporate adult-child migration as a third definition of kinlessness separate from the structural kinlessness. Third, we will also consider a variation in pathways to kinlessness including a combination of definitions (e.g., migrant children/child mortality vs. migrant children vs. child mortality vs childlessness) and its association with self-rated health, depression, chronic conditions, and disability.

### **Puerto Rico Elderly Health Conditions (PREHCO)**

The Puerto Rico Elderly: Health Conditions study, is a longitudinal survey of the noninstitutionalized population of Puerto Rico aged 60 and over and their surviving spouses. It has two waves. The sample is a multistage, stratified sample of the noninstitutionalized older adult population residing in Puerto Rico, with oversamples of regions heavily populated by people of African descent and individuals over age 80<sup>15</sup>. Data was collected through face-to-face interviews with older adults, including those with cognitive limitations who required the presence of a proxy, and their spouses, regardless of age. More than 20,600 households were visited in 233 sample sections. A total of 4,291 target interviews were conducted from May 2002 to May 2003. Only 4.7% of the overall sample refused to participate, and the survey response rate was 93.9%. A second wave was conducted during 2006-2007, with an attrition of 400 participants, which is equivalent to 9.3%. The survey instrument included modules on demographic characteristics, health status and conditions, family structure, migration status, economic status, cognitive and functional performance, income and assets, health insurance and use of health services, intergenerational transfers, housing, anthropometric measurements, and physical performance. PREHCO uses

sampling weights to represent the total population over 60 years old in Puerto Rico at the time of the study. Sampling weights will be incorporated in the analysis to ensure results are representative of the older adult population in Puerto Rico.

## **Exposures and Determinants**

**Family Structure:** PREHCO and the 17 Health and Retirement Survey sister studies around the world used in the parent grant collect data on familial composition through a family roster. These rosters collect data on all children (alive or dead), spouses, and close friends. For the proposed study we will use these rosters to estimate three kinless definitions. The first definition, kinless 1, includes those who have neither a spouse/partner nor living children. The second definition, kinless 2, includes those who have none of the following living kin: spouse/partner, children, siblings, or parents. A third definition, kinless 3, that includes those who have no children residing in the country of origin. This third definition will allow us to explore migration as a factor that influences kinlessness. The first two definitions encompass a structural form of kinlessness, where the individuals do not have living family members. The third definition considers a functional kinlessness, where individuals may have a living kin, but they are in different countries, reducing the likelihood of this family members providing support for daily activities. Furthermore, we will examine the relative prevalence of other characteristics of family networks, examining siblings, grandchildren, stepchildren, and step-grandchildren, as well as more distant kin in the surveys with these measures. In addition, we will develop measures of the overall size of family networks among older adults and will compare these across contexts.

**Self-Rated Health:** Data on Self-rated health was collected at both PREHCO waves. Self-rated health is a widely available, reliable, and valid measure of individual subjective health status. Decades of empirical research from numerous studies have indicated that self-rated health is highly predictive of older adult mortality in diverse contexts thus is an area of interest for the proposed study <sup>16</sup>. Self-rated health is being studied in the parent grant.

**Depression:** Depressive symptoms in PREHCO were assessed using a short form of the Geriatric Depression Scale (GDS-SF)<sup>17</sup>. The GDS-SF is a 15-item assessment that measures self-rated symptoms of depression. The GDS-SF has a maximum score of 15 points; higher scores are indicative of more severe depressive symptoms. Studies have indicated that the GDS is a promising screen for detecting depression in older adults. GDS-SF has been compared to other well-known depression scales like the Center for Epidemiological Studies-Depression Scale (CES-D), the Hamilton Rating Scale for Depression, and the Depression Adjective Checklist. Because lack of emotional and instrumental support, mainly provided by family members, have been associated with depression, this is an important area of research. Depressive symptoms are studied in the parent grant as measured with the CES-D scale, and we will make comparisons between PREHCO and the parent grants studies as appropriate.

**Chronic Conditions:** Participants in PREHCO were asked whether they have ever been told that they have major health conditions such as diabetes, cancer, high blood pressure, arthritis, liver problems, asthma, HIV/AIDS, and others. Not all chronic conditions were asked about in each of the surveys examined, but several appear in nearly every survey (e.g., diabetes). As these are clear indicators of aspects of physical health, they are an important area of inquiry. These chronic conditions are studied in the parent grant.

**Difficulties and Limitations:** PREHCO includes self-reports of difficulties carrying out different activities, including the Activities of Daily Living (ADLs), Instrumental Activities of Daily Living (IADLs), and Functional Limitations (FLs). These measures capture whether respondents report difficulty carrying out different tasks like walking across a room, dressing, bathing, eating, etc. (ADLs); using the telephone, managing money, taking medications, shopping, etc. (IADLs); climbing several flights of stairs, jogging a mile, getting up from chairs, stooping or crouching, etc. (FL). Because family members provide most of the support to older adults with disabilities, whether older adults without kin have particularly high levels of disability and functional limitations is an important area of research <sup>18</sup>. Similar measures of difficulties and limitations are studied in the parent grant.

## **Theoretical Framework**

### **Third Demographic Transition: Demographic Metabolism and Easterlin Hypothesis**

The theoretical framework that guides this research unites population changes in fertility, marriage, health, mortality, and aging under a comprehensive theory that extends the first and second demographic transitions to examine how changes in family networks might be considered a third demographic transition. The proposed third demographic transition theoretical framework builds upon two additional existing theoretical frameworks grounded in population dynamics. The first is the theory of “demographic metabolism,” which addresses the changing nature of aggregate features of a population through the replacement of individuals with certain characteristics by individuals with other characteristics <sup>19,20</sup>. The proposed project extends this idea to examine how kinship networks are an important dimension of studying and predicting social change driven by population dynamics. The second theoretical framework on which our work will build is that of Easterlin hypothesis <sup>21</sup>. The parent project sees the Easterlin hypothesis, we see that the relative sizes of different cohorts and the characteristics of those cohorts might affect the demographic behavior of other cohorts. In the umbrella of this project, we plan to examine how characteristics and changes in kinship ties among the older population in a society may affect the fertility decisions of younger members of society, especially younger kin.

### **Analytic Sequence**

Over the course of the supplement, Mr. Matos-Moreno will have advanced readings on kinlessness, family structures, parental well-being, and health disparities. His work to complete Aim 1, will be guided by the Demographic Metabolism and Easterlin Hypothesis frameworks. He will characterize the size and prevalence of various definitions of kinless subpopulations and how these vary in Puerto Rico compared to other countries in the world. For comparison across contexts, he will harmonize PREHCO dataset and merge it with the cross-national dataset that has been produced as part of the parent grant to create a master dataset. To complete Aim 2, Mr. Matos-Moreno will leverage information from the family roster to distinguish between structural kinlessness (not having family members alive) and functional kinlessness (children living outside of the country). PREHCO’s family roster includes information about each son/daughter and the time they have been away from Puerto Rico. With this information, he will explore the extent to which the Puerto Rico’s older adult population could be considered kinless due to the migration of the migration of their adult offspring. For Aim 3, Mr. Matos-Moreno will study the association between kinlessness and health among older adults in Puerto Rico and compare it with other countries in the world for: self-rated health, chronic conditions, depression, and functional difficulties. To complete Aim 4, Mr. Matos-Moreno will estimate the association between kinlessness and health among older adults in Puerto Rico but differentiating by structural and functional kinlessness.

### **Timeline**

Aims	Period: May 1, 2021, to April 31, 2023			
	Summer/Fall 2021	Winter/Summer 2022	Fall 2022	Winter/Spring 2023
<b>Aim 1: Examine contemporary diversity in older adult family structures in Puerto Rico in comparison to other countries in the world.</b>	Exposure to science readings with emphasis on kinlessness around the world readings Identify sources and pathways of kinlessness in Puerto Rico. Complete application for access to the data from the parent grant and incorporate PREHCO data for the analyses proposed in Aim 1.	Characterize the size and prevalence of kinless subpopulations. Evaluate the relationship between kinless definitions and health outcomes.		

<b>Aim 2: Estimate the prevalence of kinlessness in Puerto Rico considering adult-child migration.</b>	Migration and parental health readings. Identify sociodemographic characteristics among kin in data from PREHCO and parent grant.	Estimate the prevalence of adult-child migration in Puerto Rico  Estimate the prevalence of kinlessness in Puerto Rico differentiating between structural and functional kinlessness.		
<b>Aim 3: Estimate the association between kinlessness and health among older adults in Puerto Rico in comparison to other countries in the world.</b>		Readings on kinlessness and health. Participate in the Mini-Medical School for Social Scientists (RAND)	Readings on kinlessness and health. Estimate the association between kinlessness and health among older adults in Puerto Rico and compare this association with the other countries in the world.	
<b>Aim 4: Estimate the association between kinlessness and health among older adults in Puerto Rico distinguishing by kinlessness pathways, and compare to other countries in the world</b>				Estimate the association between kinlessness and health distinguishing between structural and functional kinlessness Compare these association with those found in other countries in the world.
<b>Expected outcomes</b>	1 review manuscript	Aim 1 completed 1 manuscript of aim 1	Aim 2 completed Aim 3 completed 2 manuscripts	Aim3-4 completed 1 manuscript 1 grant (K99) submitted

Over the course of the supplement Mr. Matos-Moreno will have access to ongoing training opportunities at the Pennsylvania State University through the Demography and Applied Demography Programs. Namely, he will be encouraged to complete/audit the following sequence: (1) Introduction to Demography, (2) Demographic Techniques. He will also participate in activities sponsored by the Population Research Institute (PRI) at the Pennsylvania State University. Within PRI, Mr. Matos-Moreno will participate in the: National Symposium on Family Issues, the De Jong Lecture in Social Demography, Clifford Clogg Memorial Lecture Series, the Graduate Student Methodology Workshops, and the Brown Bad Series. In addition, Mr. Matos-Moreno will be encouraged to join one or more of the Working Groups at PRI. Of relevance for the proposed supplement are the activities carried through the following Working groups: Family Demography, Population Health and Grant Writing. Mr. Matos-Moreno will attend annual meetings of the: Gerontological Society of America (GSA), and Population Association of America (PAA).

### **Future Research**

The proposed research will close the gaps in familial composition, kinlessness and health among older adults in Puerto Rico and portray how Puerto Rico compares to other countries. It will also answer important questions about how migration can impact prevalence of functional kinlessness and potentially moderate the relationships between kinlessness and health. This project will serve as the foundation for future studies focused on psychosocial factors, familial composition, and adult-child migration among older adults in Puerto Rico. Furthermore, this project expands the analyses conducted as part of the parent grant by incorporating adult-child migration as a potential pathway to kinlessness within national contexts. Further studies should incorporate the effect of population migration and the socio-environmental context on the health and well-being of older adults in Puerto Rico and other countries with elevated levels of outmigration.

## References

1. World Population Prospects 2019. Online Edition; 2019.
2. Santos-Lozada AR, Kaneshiro M, McCarter C, Marazzi-Santiago M. Puerto Rico exodus: long-term economic headwinds prove stronger than Hurricane Maria. *Popul Environ*. 2020;42(1):43-56.
3. U.S.CensusBureau. Population Estimates, 2019 Puerto Rico Community Survey 5-year estimates. In:2019.
4. Newmyer L, Verdery AM, Margolis R, Pessin L. Measuring Older Adult Loneliness Across Countries. *The Journals of Gerontology: Series B*. 2020.
5. Verdery AM, Margolis R, Zhou Z, Chai X, Rittirong J. Kinlessness Around the World. *The Journals of Gerontology: Series B*. 2018;74(8):1394-1405.
6. Patterson SE, Margolis R, Verdery AM. Family embeddedness and older adult mortality in the United States. *Population studies*. 2020;74(3):415-435.
7. Zhou Z, Verdery AM, Margolis R. No Spouse, No Son, No Daughter, No Kin in Contemporary China: Prevalence, Correlates, and Differences in Economic Support. *The Journals of Gerontology: Series B*. 2019;74(8):1453-1462.
8. Rodríguez RF, Figueroa JR, Negrón RR. *Puerto Rico 2000-2010: Mas alla del Censo / Beyond the Census*. Createspace Independent Pub; 2012.
9. Holt-Lunstad J, Smith TB, Baker M, Harris T, Stephenson D. Loneliness and social isolation as risk factors for mortality: a meta-analytic review. *Perspect Psychol Sci*. 2015;10(2):227-237.
10. Mariana TG, Wallis EA, Irina LGT, Luis MF. Harmonizing Beliefs With Realities: Social Support Among Older Puerto Ricans With Disabilities. *SAGE Open*. 2017;7(2):2158244017715337.
11. Perez LG, Arredondo EM, McKenzie TL, Holguin M, Elder JP, Ayala GX. Neighborhood Social Cohesion and Depressive Symptoms Among Latinos: Does Use of Community Resources for Physical Activity Matter? *J Phys Act Health*. 2015;12(10):1361-1368.
12. Unsar S, Dindar I, Kurt S. Activities of daily living, quality of life, social support and depression levels of elderly individuals in Turkish society. *J Pak Med Assoc*. 2015;65(6):642-646.
13. Chang J, Chen C-N, Alegria M. *Contextualizing Social Support: Pathways to Help Seeking in Latinos, Asian Americans, and Whites*. Vol 332014.
14. Su D, Wen M, Markides KS. Is self-rated health comparable between non-Hispanic whites and Hispanics? Evidence from the health and retirement study. *J Gerontol B Psychol Sci Soc Sci*. 2013;68(4):622-632.
15. Palloni A, Dávila AL, Sanchez-Ayendez M. Puerto Rican Elderly: Health Conditions (PREHCO) Project, 2002-2003, 2006-2007. In: Inter-university Consortium for Political and Social Research [distributor]; 2013.
16. Jylhä M. What is self-rated health and why does it predict mortality? Towards a unified conceptual model. *Soc Sci Med*. 2009;69(3):307-316.
17. Sheikh JI, Yesavage JA. Geriatric Depression Scale (GDS): Recent evidence and development of a shorter version. *Clinical Gerontologist: The Journal of Aging and Mental Health*. 1986;5(1-2):165-173.
18. Wolff JL, Kasper JD. Caregivers of Frail Elders: Updating a National Profile. *The Gerontologist*. 2006;46(3):344-356.
19. Lutz W. Demographic Metabolism: A Predictive Theory of Socioeconomic Change. *Population and Development Review*. 2013;38:283-301.
20. Lutz W, Kc S. Global Human Capital: Integrating Education and Population. *Science*. 2011;333(6042):587.
21. Easterlin RA. *Birth & Fortune: The Impact of Numbers on Personal Welfare*. Basic Books; 1987.