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Two Sides of the Coin of Puerto Rican Migration: Depopulation in Puerto Rico and the Redefinition of the Diaspora

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ABSTRACT

Puerto Rican migration caught nationwide attention after Hurricane Maria impacted the island. It was a culmination of more than a decade of economic stagnation that led to Puerto Rico's declining population while stateside Puerto Ricans experienced a population growth. This study examines the impact of post-Hurricane Maria on the Puerto Rican exodus and Puerto Rican diaspora in the U.S. mainland. The purpose of this paper is to measure post-Hurricane Maria exodus and how settlement patterns have reinforced dispersion in the diaspora. The findings from this study shed light on the migration estimations using the School Enrollment Migration Index (SEMI) relative to other migration data sources and dispersed settlement patterns of Puerto Rican migrants data from the Federal Emergency Management Agency (FEMA) and Department of Education(s). More importantly, I argue that existing data sources on Puerto Rican migration are not sufficient to estimate Puerto Rican migration, especially during a time when migration estimates were immediately needed to determine where the migrants relocated to within the U.S. mainland post-Hurricane Maria and the dispersion of Puerto Rican settlement has been magnified as a result of post-Hurricane Maria migrants. [Keywords: Puerto Rico, Migration, Puerto Rican Diaspora, Hurricane Maria, Settlement Patterns, Student Enrollment Migration Index (SEMI)]

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INTRODUCTION

In the last decade, we have witnessed the resurgence of the Puerto Rican population in the United States through the lens of scholarship, politics, and within U.S. local communities. Recent Puerto Rican migration, driven by two major historical events in Puerto Rico—the 2006 onset of the economic crisis and Hurricane Maria in 2017—give a contemporary view of the fast-paced socioeconomic and demographic effects it has had on both Puerto Rico and receiving states in the U.S. mainland. The increasing geographic dispersion among stateside Puerto Ricans has intensified by the incoming Puerto Rican newcomers during both migration waves, especially after Hurricane Maria in September 2017. Puerto Rican migration today continues to be driven by Puerto Rico's lack of employment opportunities; however, as shown in recent events like Hurricanes Irma and Maria in September 2017, migration has been driven by environmental forces as well.

In this article, I introduce an alternative indicator to measure migration known as "Student Enrollment Migration Index" or SEMI. SEMI is a migration index that can be used in the short-term to estimate out-migration from Puerto Rico to the U.S. mainland while other traditional migration sources such as the Department of Transportation (net movement of passengers), Puerto Rico's Department of Health (Vital Health statistics), and U.S. Census Bureau (American Community Survey and Puerto Rican Community Survey) are otherwise unavailable for months. Hurricane Maria redefined Puerto Rican migration in the 21st century and data collection approaches. Thus, SEMI can be used in the interim and can meet the demands from policymakers and other stakeholders with readily usable and reliable data. I argue that SEMI can be used as an alternative measure to estimate Puerto Rican migration without waiting for estimates for months at a time. Secondly, I argue that the magnitude of the recent migration surpassed previous migration waves in a short period of time and how it has not stopped relative to other Puerto Rican migration periods. Lastly, I argue how post-Hurricane Maria reinforced dispersed settlement patterns beyond states of traditional settlement in the diaspora. My analysis is guided by the following questions: 1. How does post-Hurricane Maria exodus compare with that of previous migration waves? 2. How does SEMI compare to other traditional migration data sources? and 3. Where did post-Hurricane Maria migrants relocate? The organization of this paper is as follows: (1) a brief overview of Puerto Rican migration literature between 1940s and present day; (2) the alternative data and methodology to assess post-Hurricane Maria Puerto Rican migration; and (3) discuss settlement patterns of present-day migration from Puerto Rico to stateside and the implications for Puerto Rico.

PUERTO RICAN MIGRATION LITERATURE

The dominant explanation for Puerto Rican migration is that it is driven by the economic ties between the U.S. mainland and Puerto Rico. This perspective explains the structural forces behind Puerto Rico and the U.S. mainland's economies for prior migration waves, and it continues to explain the Puerto Rican population movement

under the 2006 economic crisis migration wave. On the other hand, the recent 2017 post-Hurricane Maria migration wave, coupled with the effects of the 2006 economic crisis period, produced a new wave of migrants in terms of cohort's magnitude and dispersed settlement patterns. Research on Puerto Rican migration from the island to the U.S. mainland is well documented by various demographers, sociologists, and other social scientists, and it can be traced back as far as the 20th century (Godoy et al. 2003).

Economic Migration

Puerto Rico's economy has become more integrated into the U.S. economy over the years. In addition, economic and social policies promoted migration between the U.S. and Puerto Rico (Centro de Estudios Puertorriqueños 1979; Maldonado 1979; Enchautegui 1993; Whalen 2001; Meléndez 2015). The cyclical economic upturns and downturns between the U.S. mainland and Puerto Rico that impacted the migratory flows has been well documented (Macisco 1968; Centro de Estudios Puertorriqueños 1979; Enchautegui and Freeman 2005). In other words, when Puerto Rico's economic conditions worsens, it produces a wave of out-migration of Puerto Rican migrants and when the U.S. mainland's economy worsens, up to the last decade, there was a return migration from the stateside U.S. to Puerto Rico (Whalen 2005).

Puerto Rico's population continues to be a source of labor for the U.S. labor market; thus, selective characteristics of the Puerto Rican migrants and their settlement patterns also changed overtime (Meléndez 1994; Meléndez and Visser 2011). For example, during the Great Migration period (1940s–1950s), a surplus of unemployed low-skilled laborers was a main problem and migration to the U.S. mainland's agriculture and factory jobs was a way to alleviate Puerto Rico's unemployment. This cohort's settlement patterns were mostly described as concentrated communities throughout the Northeast and Midwest urban areas, and parts of the western coastal states, such as Hawaii and California (Macisco 1968; Maldonado 1979; López 2005; Delgado 2005).

Past social and economic policies such as Operation Bootstrap, the Migration Division's contract labor programs, and the recruitment of men and women in the military and factories during post-World War II era, are examples of policies that has led many Puerto Ricans to migrate to and from the island and the U.S. Furthermore, extending U.S. citizenship to Puerto Ricans through the 1917 Jones Act facilitated migration without legal barriers. Existing Puerto Rican communities throughout the mainland—especially in traditional states of settlement such as states in the Northeast region, parts of the Midwest, and West (specifically Hawaii and California)—was initiated by contract labor programs in the stateside agricultural and other industries that provided job opportunities that other groups declined (Maldonado 1979; Whalen and Hernandez 2001; Enchautegui 1993). Maldonado (1979) argued the origins of communities beyond New York City as a result of agriculture and industrial labor migration from Puerto Rico to areas like Buffalo, New York (upstate), Pennsylvania, Ohio, Indiana, Wisconsin, and California. Puerto Rican migration today continues to be economically driven due to a weak economy island

with lack of job opportunities and economic mobility (Meléndez and Visser 2011; Birson and Meléndez 2014).

Post War II (late 1940s to 1960s)

Economically, Puerto Rico underwent rapid structural changes during the Great Migration period. Puerto Rican migration increased after the Second World War as a result of high unemployment rates heavily influenced by the decline of the sugar industry. For example, in the early phase, the island's transitioned from rural to an industry-based economy and displaced many farm workers, especially in the island's rural *municipios*. Studies documented how such labor force migrated to the island's large metropolitan areas and/or the U.S. mainland to meet the demands for both skilled and semi-skilled laborers (Centro de Estudios Puertorriqueños 1979; Whalen and Vázquez-Hernández 2005; Godoy et al. 2003). According to various studies, the first wave of migrants contained both unskilled and semi-skilled workers (Centro de Estudios Puertorriqueños 1979; Maldonado 1979; Perloff 1975; Mills et al. 1950; Fitzpatrick 1968). The economic ties between the U.S. and Puerto Rico reinforced migration to the extent of creating policies and relocation hubs for incoming Puerto Rican migrants (Whalen and Vázquez-Hernández 2005). Labor recruitments and chain migration also contributed to the rapid increase of the Puerto Rican population in the United States. Puerto Ricans were the first significant group to migrate into the U.S. mainland by air travel. It also important to note, previous small waves of Puerto Rican migration established communities within New York City and during the first major wave, these enclaves functioned as a destination point for many incoming Puerto Ricans. Furthermore, the enclaves provided a sense of community and social network for new Puerto Rican migrants. Lastly, chain migration also maintained a steady flow of Puerto Rican migrants to New York City because of family and friends already living.

In 1947, the Migration Division of the Department of Labor of Puerto Rico played a pivotal role in Puerto Rican settlement patterns throughout New York State as well as other areas of highly concentrated Puerto Rican communities. It was established by the U.S. and Puerto Rican governments to provide Puerto Ricans with job opportunities, vocational skills, and to prepare them to compete in the U.S. labor market (21 Puerto Rican Women Here as Domestics 1948a). Its first U.S. mainland office opened in New York City in 1947. The Migration Division fostered Puerto Ricans to find jobs in the service, factory-related industries, and agricultural industry (upstate New York). The Migration Division also functioned as way mobilize and distribute incoming Puerto Ricans throughout the U.S. mainland.

Migration flows during the Great Migration period was at its highest after World War II, between 1946 and 1964, due to labor force demand in the U.S. mainland (Whalen 2005). However, measuring migration during this period produced an array of estimates due to inconsistency and unreliable data sources (Godoy et al. 2003; Fitzpatrick 1968). Sandis (1970) work referenced the inadequacies of using

the 1960 decennial data from the U.S. Census Bureau to characterize Puerto Rican migrants during the Great Migration.

Migration flowed toward the Northeast, mainly to New York City. In terms of settlement patterns, Puerto Ricans were concentrated in the Northeast and Midwest region's central city areas. However, once deindustrialization took place in United States, many Puerto Ricans have either permanently returned back to Puerto Rico or made repeated migration(s) to and from Puerto Rico and the U.S. mainland.

Circular Migration (1970s–2000s)

Repeated migration to and from Puerto Rico and the U.S. mainland, known as circular migration of the Puerto Rican population, took place between the 1970s and 2000s. Various scholars define circular migration differently, in terms of length-of-stay both on the island and the U.S. mainland, number of trips between the states, and characteristics of the migrants (Godoy et al. 2003; Duany 2002). The circular migration period was a time when Puerto Ricans were viewed as a very mobile community because of the back-and-forth movement for economic opportunities, such as seeking jobs, in either Puerto Rico or the U.S. mainland (Duany 2002; Enchautegui 1993). In other words, migration was driven by economic forces. Puerto Ricans who left the island during the 1970s and 2000s were migrating in search of better economic opportunities. On the other hand, some scholars found that return migrants composed of Puerto Rican individuals and/or households migrated to the U.S. mainland during the Great Migration and were economically displaced due to the replacement of service-related jobs by industrial jobs in the central cities (Enchautegui 1993). For example, for Puerto Rican communities in New York City, the 1970s and 1980s were the most difficult decades, which resulted an economically distraught labor market. Puerto Ricans were among the poorest. "Among Hispanics, between 1970 and 1985 Puerto Ricans experienced a sharp deterioration in economic well-being while Mexicans experienced the modest, and Cubans substantial, improvement in economic status" (Tienda 1989). Employment demands were no longer needed in both unskilled and uneducated workers, especially in New York City's industrial sectors, as well as other urban areas (Barnes 2002).

The unprecedented growth of the stateside Puerto Rican population fueled by both natural increase and migration from Puerto Rico and migration to Florida was a recurring theme across studies examining Puerto Rican migration between 2006 and 2016.

Economic Crisis Migration (2006 through 2016)

Since 2006, the island has experienced the largest GDP decline in history. The economic crisis negatively affected both private and public sectors and population,

ultimately leading many individuals and families to leave the island for the U.S. mainland in increasingly large numbers. On the other hand, the United States faced its own economic downturn attributed to the housing market crash in 2008.

In the context of Puerto Rican migration during the economic crisis period, scholars have pointed out two types of migration patterns: (1) migration from Puerto Rico and (2) interstate migration among mainland Puerto Ricans, mainly to the sunbelt states (Concepción Torres 2008; Meléndez and Visser 2011; Meléndez and Birson 2014; García-Ellín 2014; Franqui-Rivera 2014; Silver 2017; Silver and Vélez 2017; Mora et al. 2018). The unprecedented growth of the stateside Puerto Rican population fueled by both natural increase and migration from Puerto Rico and migration to Florida was a recurring theme across studies examining Puerto Rican migration between 2006 and 2016.

García-Ellín (2014) discussed the internal migration of stateside Puerto Rican out of states of traditional settlement like in the Northeast and Midwest to states of new areas of settlement such as the U.S. South between 2001 and 2011. The author used aggregated data from Integrated Public Use Microdata Series (IPUMS) from the U.S. Census Bureau's American Community Survey (ACS), one-year samples. He found that state-to-state migration among Puerto Ricans contributed to the growth of the Puerto Rican population in the South, especially in Florida (García-Ellín 2014). Franqui-Rivera (2014) described military bases and service in the armed forces contributed to the Puerto Rican population growth in states of new settlements beyond traditional states. Both island-born and stateside born Puerto Ricans in the armed forces contributed to the diaspora of the Puerto Rican communities throughout the U.S. mainland, especially in the southern states as a result of becoming familiar with the area after completing initial training the U.S. mainland (Franqui-Rivera 2014; Silver 2010).

Silver and Vélez (2017) found that Puerto Rican settlement to central Florida occurred prior to the "economic crisis period" and were composed of Puerto Ricans from the Great Migration period, mainly from the Northeast and Midwest. Puerto Rico's economic crisis was also a major factor for Puerto Ricans from Puerto Rico to relocate to central Florida with the help of family and friends through social network ties.

Puerto Rican migration among mainland Puerto Ricans and from the island created the newly expanded diaspora communities, throughout the U.S. south and occurred during the economic crisis, in other words, migration from Puerto Rico and interstate migration from Puerto Ricans from other mainland states. Furthermore, Silver (2014) discussed the rising Puerto Rican population in the U.S. South, especially in states like: Georgia, Mississippi, North Carolina, South Carolina, and Tennessee (Silver 2014). Furthermore, the characteristics of both island-born and stateside born Puerto Ricans moving to the U.S. South differs by showing higher educational attainment and higher-paying occupational opportunities (Silver 2014).

Post-Maria Migration (2017–present)

On September 20, 2017, category 4 Hurricane Maria entered through Yabucoa, in the

southeastern region of the island with wind speeds of up to 155 mph, and diagonally reached to the northwest region, Arecibo, with wind speeds of 115 mph. Damages related to flooding, structural, and electrical destroyed numerous homes, schools, businesses, and hospitals throughout the island. More importantly, Hurricane Irma, a category 5 hurricane, also passed north of Puerto Rico, two weeks prior Hurricane Maria leaving many without power and causing flash flooding (Johnson et al. 2017). Both storms, especially Hurricane Maria, induced one of the largest out-migration from Puerto Rico to the U.S. mainland in a short period of time. The magnitude of the post-Hurricane Maria migration has never been seen in Puerto Rico's history.

Environmental migration, coupled with the effects of the economic crisis and slow recovery/humanitarian aid, were push factors for relocation to the U.S. mainland. Puerto Rican migration during this period was heavily documented by news media outlets and mainly revolved around migration estimate (the number of Puerto Ricans who fled Puerto Rico) and the states that received the most migrants, as a result of the storm. Unlike prior Puerto Rican migration waves, assessing Puerto Rican migration during Hurricane Maria period differed due to lack data availability at a short period of time. Immediately following Hurricane Maria devastation in Puerto Rico, migration data was needed among public officials and government agencies to prepare housing, educational, economic, and medical needs for incoming evacuees to their states. However, local government and public agencies were not prepared for the magnitude of the incoming evacuees to their home state(s) and failed to take notice of an already existing and continuous Puerto Rican migration happening prior to the September 2017 hurricanes (both Maria and Irma). As a result, data related to incoming post-Hurricane Maria migrants were essential to understand and grasp the incoming new residents to their communities. As a result, alternative techniques and non-traditional migration sources were used to measure the magnitude of post-Hurricane Maria migration. Such alternative methods included tracking smartphone data usage and using non-traditional migration sources like student enrollment data reported by Department of Education that received displaced students from Puerto Rico.

A New York-based tech company developed a technology collecting a mobile phone data of the number of individuals who moved from Puerto Rico to the U.S. mainland and vice versa, between October 2017 and February 2018. Teralytics estimated about 407,465 Puerto Ricans relocated from Puerto Rico to the United States in a span of five months. However, during the same time period, the company analyzed a return migration of 359,813 individuals. Based on these numbers, the estimated net migration would be 47,652, probably an undercount when compared to other available data. To begin with, the data refer to owners of mobile phones who activated their accounts when traveling stateside. By implication the estimate excludes individuals that do not own a mobile phone or activated their account because of roaming costs or other considerations. Findings from this study concluded Florida followed by New York, Texas and Pennsylvania were among the top four states for Puerto Ricans relocating immediately following Hurricane Maria. According to the

tech company, mobile data may become a new way to track human migration, especially after a natural disaster strikes an area, like Puerto Rico. A major concern in collecting such information is privacy among the mobile device users. As some view this as an invasion of their privacy especially data related to location.

We are calling this new alternative methodology the School Enrollment Migration Index (SEMI)....

Puerto Rico's Financial Oversight and Management Board (FOMB) played a role in providing post-Hurricane Maria estimates. FOMB's January 2018 New Fiscal Plan adopted Lyman Stone's population projection of a 7.7 percent population decline in 2018 (Government of Puerto Rico 2018). However, various revisions were made and the recent October 2018 'New Fiscal Plan' reported a population decline of 5.1 percent, with an estimated total population of about 3.16 million inhabitants in the island in 2018. Recent U.S. Census population data estimates Puerto Rico's population to be 3.19 million in 2018, between July 1, 2017, and July 1, 2018 (U.S. Census Bureau 2018a).

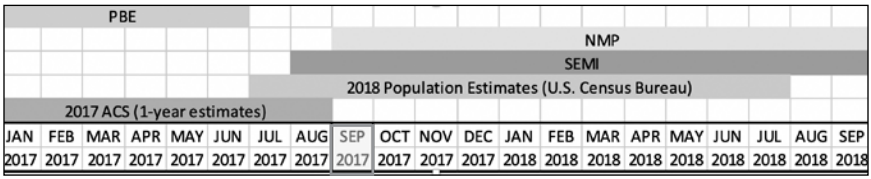
Lastly, CUNY Hunter College's Center for Puerto Rican Studies (Centro) released four reports related to migration estimate and settlement pattern trends among the displaced Puerto Rican migrants. The first two reports estimated Puerto Rican migration post-Hurricane Maria utilizing previous migration patterns based on data from the U.S. Census Bureau's American Community Survey/Puerto Rican Community Survey and student enrollment data of school districts in the United States that received displaced students from Puerto Rico by the selected state's Department of Education (Meléndez and Hinojosa 2017; Hinojosa, Román and Meléndez 2017; Hinojosa, Meléndez and Román 2018; Hinojosa and Meléndez 2018). The most recent Centro report (2018), released one year after Hurricane Maria, presented a new alternative methodology to estimate Puerto Rican migration using a combination of school enrollment data from Puerto Rico's Department of Education and the U.S. Census Bureau's American Community Survey (ACS) data. We are calling this new alternative methodology the School Enrollment Migration Index (SEMI) (Hinojosa and Meléndez 2018). This is further explained in the data and methods section.

METHOD AND DATA

Data Sources

Reliable data sources to estimate Puerto Rican migration is a topic that continues to be debated and unavoidable among scholars today. Similar to other studies estimating population movement to and from Puerto Rico, I use micro-level data from the 2006 and 2017 Puerto Rican Community Survey and American Community survey (one-year estimates) conducted by the U.S. Census Bureau. Both datasets allow the

Figure 1. Post-Hurricane Maria Data Sources and Availability, January 2017 to September 2018



extrapolation of Puerto Rican migrants who currently live on the mainland and those who migrated from Puerto Rico one year ago from the non-moving Puerto Rican population (Godoy et al. 2003; García-Ellín 2014; Birson and Meléndez 2014; Meléndez and Visser 2011; Birson 2014; Franqui-Rivera 2014). In addition to using the U.S. Census Bureau's American Community Survey, I also rely on student enrollment data from Puerto Rico's Department of Education and data from Federal Emergency Management Agency's (FEMA) change of address database.

Prior estimates of the magnitude of the population movement between Puerto Rico and the United States post-Hurricane Maria have been based on the net movement of passenger, mobile telephone data (Echenique and Melgar 2018), or projections based on recent migration trends from Puerto Rico to the U.S. Immediately following the storm, alternative data sources were not available to measure the magnitude of the net migration. Generally, social scientists—such as demographers, sociologists and economists—have relied on a few methods and data sources to estimate Puerto Rican migration. These are:[1]

1. Demographic balancing equation (PBE),[2] using data from the Puerto Rico Department of Health and the U.S. Census Bureau Population Estimates.
2. Net Movement of Passengers (NMP), using data from the U.S. Bureau of Transportation Statistics.
3. Place of residence the prior year using data from the American Community Survey (ACS) of the U.S. Bureau of the Census.

However, these methods are not conducive to estimate Puerto Rican migration in the short term, especially in the aftermath of catastrophic events such as Hurricane Maria. As shown in Figure 1, the estimates produced by these more common measures tend to converge over long periods of times, even though the NMP tends to show more volatility (*i.e.,* wider variation) than the estimates derived from the ACS or the PBE. The main issue with the three available data sources and methods to estimate migratory flows from the island to stateside are their ready availability. The PBE, for instance, relies on population, mortality, and birth data that are typically reported annually for the prior year fiscal year (ending on June 30). Therefore, there is a lag in time capturing current conditions.

Similarly, the ACS data is based on a random survey of the population and the data is published about a year after the end of the year it is collected. The NMP data is an

indirect method to estimate migration and typically would lag about six months after it is collected. Because the duration of travel for a significant portion of passengers tends to be short and traveling is by nature frequently seasonal, NMP is more volatile than other available data and is generally interpreted primarily as an early indicator of migration flows. For example, the latest NMP data available is as of June 2018, therefore, this indicator does not fully capture the total net migration estimate for the entire calendar year 2018 (see Figure 1). These time-lag issues are compounded by the fact that Hurricane Maria struck in Puerto Rico September 20, 2017, and migration data collected by the ACS for the last quarter of 2017 will be combined with the data for the previous eight months of that year, diluting the impact of the storm on migration over the entire twelve-month period, leading to lower estimates. Using data collected from these sources would therefore reduce the actual magnitude of the post-hurricane exodus.

Since Hurricane Maria made landfall in September 2017, data collection and estimate quality for the most recently released 2017 ACS, conducted both in the U.S. and Puerto Rico,[3] do not precisely reflect post-Hurricane Maria actual impact (U.S. Census Bureau 2018b). First, the 2017 ACS population estimates in the United States, which measure household interstate mobility, include households surveyed from January 2017 to December of 2017 (see Figure 1). This survey would include a representative sample of the population arriving from Puerto Rico collected after September 2017 when Hurricane Maria struck Puerto Rico and induced a massive emigration from the island. Yet, according to the U.S. Census Bureau survey protocols, evacuees from Puerto Rico would only be counted as emigrants in the 2017 survey if they had arrived in the U.S. prior to the hurricane's landfall or planned to stay in the U.S. for two or more months. Therefore, population and migration figures reported for 2017 by the U.S. Census Bureau are likely to underestimate actual changes in residence between Puerto Rico and the U.S. in 2017, and by implication total population and migration estimates. The 2017 American Community Survey (one-year estimate) was released on September 2018 and reported Puerto Rico's population as 3,337,177. However, this population count depicts 8.5 months of 2017,[4] due to data collection suspension after the storm (see Figure 1).[5] The latest population estimate, released in December 2018, by the U.S. Census Bureau's Population Estimate, reported a population estimate of 3,195,153 between July 1, 2017, and July 1, 2018. Furthermore, the U.S. Census Bureau states Puerto Rico's population declined by 129,848 people and mostly attributes that decrease to out-migration. On the other hand, migration estimates based on the PBE for the fiscal year that ends on June 30 of 2017 and this excludes the impact of Hurricane Maria from their 2017 estimates.

School Enrollment Migration Index (SEMI)

To measure post-Hurricane Maria migration estimates, I use data from 2017–2018 and 2018–2019 student enrollment count from Puerto Rico's Department of Education and data from the U.S. Census Bureau's 2013–2016 American Community Survey and Puerto Rican Community Survey (one-year estimates). According to

Hinojosa and Meléndez (2018), to estimate the number of migrants from Puerto Rico to the United States Post-Hurricane Maria, they developed an alternative method using student population losses reported by Puerto Rico's Department of Education as a source of data.[6] This new method produces a suitable migration estimate shortly after school enrollment is completed by the Department of Education at the beginning of every semester, thus producing a timely leading indicator of migration flows. The School Enrollment Migration Index (SEMI) is defined as:

> $SEMI = \Delta SE_{0,1} \times (A/C)$,
> where $\Delta SE_{0,1}$ refers to the change in student enrollment between period 0 and 1, and (A/C) is the ratio of the total adult migrant population (19 years and over) and non-school-age children (4 years or less) relative to school-age children (5 to 18 years old).

To establish the "A/C" ratio, the authors calculate the averages for Puerto Rican school-age children and total adult migrants using data from the yearly surveys of the American Community Survey from the U.S. Bureau of the Census between 2013 and 2016 (Hinojosa and Meléndez 2018). This ratio is then used to estimate the total migration that corresponds to the number of children assumed to have relocated stateside. In other words, the data on public school enrollment change from Puerto Rico's Department of Education is extrapolated to estimate the total post-Hurricane Maria exodus from Puerto Rico on a semester basis, at the beginning of the academic year in August, and at the beginning of the calendar year in January. The current estimate of 159,415 and up to 176,603 emigrants (upper bound) from the island was derived by using Puerto Rico's Department of Education's student matriculation loss in public schools between 2017 and 2018 (the academic year when Hurricane Maria made landfall in Puerto Rico) and the present academic year, 2018–2019. Between both academic years, there was a reported public-school student population loss of nearly 40,000 students, from 346,096 students from 2017–2018 to 306,652 students.

Geographical Information Systems (ArcGIS)

Geographical Information Systems are a combination of software modules that provide a toolbox for conducting spatial analysis. To illustrate Puerto Rican relocation post-Hurricane Maria, this paper utilizes one of the functions provided by ArcMap 10.2.2. Data are classified by natural breaks and are portrayed as shaded colors to indicate the spatial distributions of post-Hurricane Maria migrants at various scales within stateside. Requested data from the Federal Emergency Management Agency's (FEMA) change of address database from February 2018 (5 months post-Hurricane Maria) and August 2018 (11 months post-Hurricane Maria) was used to map the settlement patterns of displaced migrants from Puerto Rico who changed their mailing address from Puerto Rico to stateside U.S. (at the county level). Again, due to unavailable data from the U.S. Census Bureau's American Community Survey,

FEMA's change of address dataset is among the first data sources to illustrate relocation patterns. Two sets of maps are illustrated at the county level to analyze post-Hurricane Maria settlement patterns. It is important to note that FEMA data is not a representative sample of the post-Hurricane Maria migration; it only counts households who officially changed their mailing address at the state of relocation from Puerto Rico.

FINDINGS AND ANALYSIS

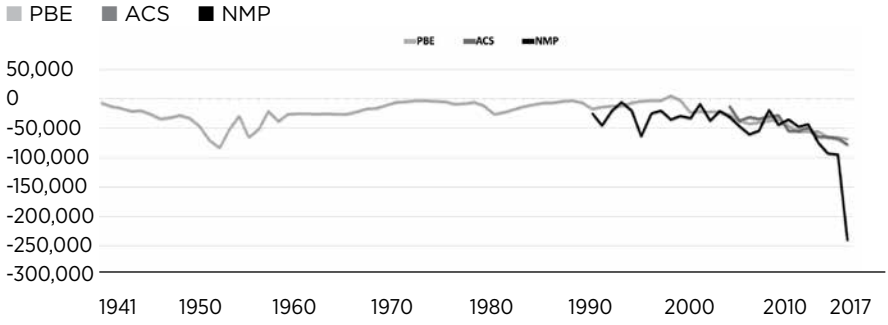
1. *Comparing Migration Exodus from Puerto Rico*

Guiding Question #1. How does post-Hurricane Maria exodus compare with that of previous migration waves?

Figure 2 presents the net migration estimates between 1941 and 2017 from Puerto Rico to the U.S. mainland derived by using three traditional measures, population balance equation (PBE), U.S. Census data (American Community Survey/Decennial Census) (ACS), and the Net Movement of Passengers (NMP). As noted in the method and data section, these migration indices are not ideal to estimate Puerto Rican migration in short periods of time such as in the aftermath of Hurricane Maria. As shown in Figure 2, the estimates produced by these measures tend to converge over long periods of times (post-1990s), even though the NMP tends to show more volatility (i.e., wider variation) than the estimates derived from the ACS or the PBE.

Table 1 presents results from the four indicators by decades between 1941 and 2018. The results yield 2 main findings. First, SEMI net migration is comparable to that of traditional net migration indicators over the long term. This is especially seen in the recent two migration waves, the 2006 economic crisis (-630,027) and 2017 post-Hurricane Maria (-223,861). For example, SEMI showed a net migration estimate of -630,027 during the economic crisis period (2006 to 2016) while ACS indicated a net migration of -590,433 and -626,011 for PBE (see table 1). However,

Figure 2. Estimated Migration Flows from Puerto Rico to the U.S., 1941-2017



Source: 1941-2017 Department of Health and U.S. Census Bureau Population Estimates; 1991-2016 Bureau of Transportation Statistics; 2005-2017 American Community Survey.

Table 1. Comparing Net Migration Estimates from Puerto Rico to stateside U.S., 1941 through 2018

Year	PBE	ACS	NMP	SEMI
1941-1949	-191,054			
1950-1959	-508,478			
1960-1969	-226,198			
1970-1979	-49,898			
1980-1989	-114,320			
1990-1999	-66,641		-257,557	
2000-2009	-272,381	-144,393	-350,273	-107,715*
2010-2018*	-475,379**	-458,484	-689,009**	-522,312
2006-2016 (Economic crisis)	-626,011	-590,433	-865,497	-630,027
2017-2018 (Post-Hurricane Maria)	-67,500*	-207,169	-239,992*	-223,861

Source: 1941-2017 Department of Health and U.S. Census Bureau Population Estimates; 1991-2018 Bureau of Transportation Statistics; 2005-2018 American Community Survey; 2008-2018 Puerto Rico's Department of Education.
*SEMI net migration estimate is available between 2008 and 2018.
**PBE net migration estimate is not available for 2018, the data reported in this table is for 2017. NMP data does not includes January 2018 through June 2018, the data reported in this table is only for 2017 and 6 months (January 2018 through June 2018) for 2018.

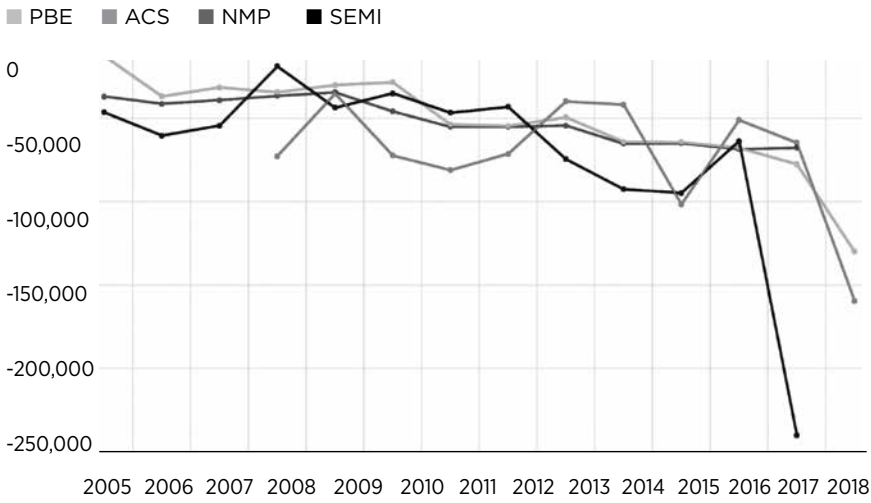
NMP showed higher net migration estimates of -865,497 in the same time period. As previously discussed, NMP net migration(s) tends to be more volatile relative to PBE and ACS. As shown in table 1, Post-Hurricane Maria (2017-2018) net migration yielded higher variations as a result of unavailable data for PBE, since Puerto Rico's Department of Health has not release birth and death rates for 2018 and NMP's data is not available between July 2018 and December 2018. This an example of one of the advantages of using SEMI in the short term until data sources from PBE and NMP become available. In the case of post-Hurricane Maria period (2017-2018), SEMI showed a net migration estimate of -223,861 while ACS net migration estimate was -207,169. On the other hand, net migration estimates for NMP is -239,992 slightly higher relative to ACS and SEMI; however, this is expected to be higher since data for the remaining months of July 2018 through December 2018 is unavailable.

2. *Student Enrollment Migration Index*

Guiding Question #2: How does the 'Student Enrollment Migration Index' (SEMI) compare to other traditional migration data sources?

In Figure 3, I present data derived from our new estimation method for the Puerto Rican pre- and post-disaster relocation to the U.S. mainland relative to other esti-

Figure 3. Estimated Migration Flows from Puerto to the U.S. 2005-2018



Source: 1941-2017 Department of Health and U.S. Census Bureau Population Estimates; 1991-2017 Bureau of Transportation Statistics; 2005-2018 American Community Survey; 2008-2018 Puerto Rico's Department of Education.
Note: NMP latest data available is September 2018 and PBE's vital statistics is unavailable for 2018.

mation methods currently in use. Figure 3 illustrates the net migration estimates between 2005 and 2018 based on observable available data from the U.S. Census Bureau's American Community Survey and the Puerto Rican Community Survey (2005–2018), the U.S. Bureau of Transportation Statistics (2005–2018), and Puerto Rico Department of Health (2005–2017).

Based on school enrollment data from the Commonwealth of Puerto Rico Department of Education, we estimated a net migration of 159,415 with an upper bound of 176,603 from Puerto Rico to the U.S. mainland in the year since Hurricane Maria made landfall in Puerto Rico. Figure 3 presents SEMI net migration results compared to the other migration indices. SEMI's net migration results relative to the other indices (PBE, ACS, and NMP) produced higher, lower, and/or similar migration estimates between 2008 and 2018. For example, in 2008 SEMI's (-72,575) net migration estimate was higher relative to PBE (-36,349), ACS (-49,194), and NMP (-18,569). As shown in Figure 3, SEMI (-39,563) net migration estimates was somewhat similar to that of other indices (PBE was -34,158; ACS was -29,966; and NMP was -43,460) in 2009. However, between 2010 and 2012 SEMI showed higher net migration estimates relative to other indices. In 2013, SEMI (-39,563) showed similar net migration estimates to that of ACS (-49,194) but lower than PBE (-54,259) and NMP (-74,339). However, SEMI (-41,684), showed net migration estimates that fell between PBE (-65,089), ACS (-64,073), and NMP (-92,310) estimates. In 2015, PBE (-65,089) and ACS (-64,238) showed compa-

rable net migration estimates, while SEMI (-101,575) and NMP (-94,735) had higher outflows. Overall, SEMI (-50,835) showed lower net migration estimates relative to PBE (-68,262), ACS (-67,480), and NMP (-63,508) in 2016. In 2017, ACS reported a net migration estimate of -77,321 while PBE (-67,500) and SEMI (-64,446) showed comparable rates. Again, the 2017 ACS does not account post-Hurricane Maria impacts due to lack of current data availability. However, NMP net migration estimated a total of -239,992, and this accounts more outflow than return migration. SEMI, on the other hand, includes the change of student enrollment in Puerto Rico's Department of Education from 2016 and 2017 academic school year. Lastly, one year after Hurricane-Maria SEMI was able to provide an up to date net migration estimate of -159,415 and this is comparable to the recently released U.S. Census Bureau's out-migration of -129,848. SEMI's release was in September 2018 (Hinojosa and Meléndez 2018), three months prior to U.S. Census Bureau's 2018 Population Estimates.

Lastly, one year after Hurricane Maria SEMI's net migration estimates a total of -159,415 while ACS preliminary population decline estimated a loss of -239,848 between July 1, 2017, and July 1, 2018. Recently released 2018 data from the U.S. Census Bureau estimates a decline of Puerto Rico's population of 129,848 (mostly attributed to out-migration) between July 1 2017, and July 1, 2018, while SEMI measures out-migration between August 2017 and September 2018. As shown in Figure 3, SEMI and ACS out-migration measurements is somewhat close; however, it is important to note the timing is different by two months (SEMI includes August and September of 2018 while U.S. Census Bureau's population estimates includes does not include August and September of 2018). On the other hand, NMP and PBE data is not available to calculate migration estimates for 2018. Using SEMI as an indicator for a short period of time while other data sources become available is an example of migration indicator that can quickly calculate migration estimates from Puerto Rico. As shown in this analysis, SEMI can be used an indicator of migration from Puerto Rico to the U.S. mainland in the short term while other migration sources become available. Using SEMI can provide policymakers and stakeholders with reliable and readily available net migration estimate from Puerto Rico to the U.S. mainland for short-term decision-making in both Puerto Rico and the destination states where migrants are relocating.

3. *Post-Hurricane Maria Dispersion*

Guiding Question #3: Where did post-Hurricane Maria migrants relocate?

Puerto Rican migration from Puerto Rico due to the recently post-Hurricane Maria exodus has reinforced dispersion in the Puerto Rican diaspora in the United States through the growth or formation of new communities in both old and new areas of settlement. The Puerto Rican population in the United States continues to grow and disperse throughout the U.S., particularly in the southern region. The combination of Puerto Rico's declining economy, which led many Puerto Ricans to flee the island for better economic opportunities in the U.S. mainland, the internal migration of

Table 2. Post-Hurricane Maria Relocation by Regions in February 2018 and August 2018

Region	PBE	ACS	NMP	SEMI
Northeast	26,905	37%	7,641	37%
South	38,300	53%	10,968	53%
Midwest	6,116	8%	1,389	7%
West	1,200	2%	554	3%
Total	**72,521**	**100%**	**20,552**	**100%**

Source: 2017 U.S. Census Bureau, American Community Survey (1-year estimates) and FEMA.

Puerto Ricans from the Northeast and Midwest to the southern states, and general population growth have all resulted in a changing geography for Puerto Ricans in the United States. Thus, new areas of settlement across new and traditional states by the 2006 economic crisis cohort, served as resettlement gateways to post-Hurricane Maria migrants, especially in the southern and northeast regions.

Prior to Hurricane Maria, between 2000 and 2016, notable Puerto Rican population growth was apparent in the following states: North Carolina, Texas, Georgia, Virginia, and Florida, all of which are located in the U.S. South. Puerto Rican population growth was also seen in Pennsylvania and Ohio, both states of traditional settlements for Puerto Ricans. On the other hand, Puerto Rican population declined in the following states: New York, New Jersey, Illinois, and California. Lastly, Puerto Ricans in Connecticut and Massachusetts showed no population growth or decline, instead the population remained steady between 2000 and 2017. However, both states are expected to show population growth as a result of migrants from the 2017 post-Hurricane Maria exodus. The top 15 destination states for Puerto Rican migrants from Puerto Rico during the economic crisis (2006–2017) were: Florida, Pennsylvania, New York, Texas, Massachusetts, New Jersey, Connecticut, Ohio, Georgia, North Carolina, Virginia, Illinois, Michigan, South Carolina, and California. Such states included both traditional (New York, California, Massachusetts, New Jersey, Connecticut, Ohio, Illinois, and Pennsylvania) and new states of settlement (Texas, Georgia, North Carolina, Virginia, Michigan, and South Carolina).

Table 2 shows requested data of FEMA's change of address claims from February 2018 (5 months after post-Hurricane Maria) and August 2018 (11 months post-Hurricane Maria), and settlement location from the 2017 American Community Survey (1-year estimate) at the regional level (U.S. Department of Homeland Security 2018). This data was further used to map the settlement patterns of displaced evacuees from Puerto Rico to the U.S. mainland (see Figure 4). Overall, post-Hurricane Maria migrants showed dispersed settlement patterns throughout the continental U.S., especially in states of traditional settlement and in states in the southern region. As shown in table 2, five months post-Hurricane Maria, a total of 19,271 households from Puerto

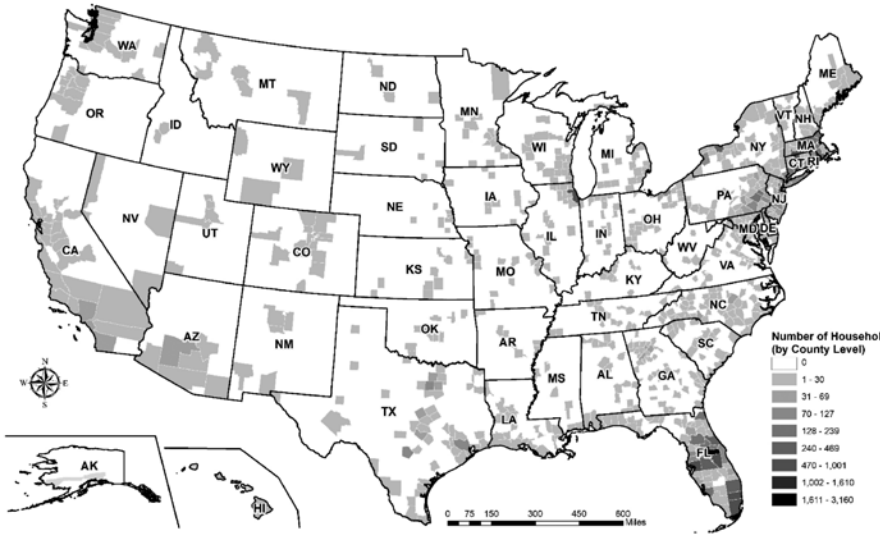
Table 3. Post-Hurricane Maria Relocation by Top 15 States in February 2018 and August 2018 (FEMA's Change of Address)

Rank		2017 ACS (1-year estimate)	%	Rank		August 2018 FEMA (Households)	%
1	Florida	21,762	30%	1	Florida	8,873	43%
2	Pennsylvania	7,558	10%	2	New York	2,111	10%
3	Massachusetts	5,414	7%	3	Massachusetts	1,765	9%
4	Texas	4,938	7%	4	Pennsylvania	1,449	7%
5	Connecticut	4,507	6%	5	Connecticut	1,220	6%
6	New York	4,346	6%	6	New Jersey	925	5%
7	New Jersey	3,795	5%	7	Texas	761	4%
8	Ohio	2,187	3%	8	Illinois	665	3%
9	Maryland	1,956	3%	9	Georgia	283	1%
10	Georgia	1,933	3%	10	Ohio	267	1%
11	North Carolina	1,866	3%	11	North Carolina	249	!%
12	Illinois	1,712	2%	12	California	238	1%
13	Virginia	1,168	2%	13	Virginia	166	1%
14	New Hampshire	838	1%	14	Maryland	161	1%
15	California	817	1%	15	Wisconsin	144	1%
	Other States	7,724	11%		Other States	1,275	6%
	Total	**72,521**	**100%**		**Total**	**20,552**	**100%**

Source: 2017 U.S. Census Bureau, American Community Survey (1-year estimates) and FEMA.

Rico changed their home address from Puerto Rico to the U.S. mainland and this figure slightly increased to 20,552 households in August 2018, 11 months post-Hurricane Maria. Table 2 also shows the distribution of incoming Puerto Ricans from Puerto Rico using the 2017 American Community Survey, whereby more than half (53%) settled in the south followed by 37 percent in the northeast, 8 percent in the Midwest, and 2 percent in the west. Regionally, five months after Hurricane Maria, more than half (56%) of the evacuees who changed their home address relocated to the South, followed by 35 percent in the Northeast, 7 percent in the Midwest, and 3 percent in the West (see table 2). FEMA's change of address claims shows similar relocation patterns at the regional level to that of Puerto Rican migrants reported by the 2017 American Community Survey (1-year estimate). For example, the 2017 ACS reported at least 37 percent of the Puerto Rican migrants relocated to the Northeast, however, immediately following the storm, FEMA claims showed that at least 35 percent relocated to the same region 5 months post-Hurricane Maria and then slightly increased to 37 percent, 11 months after the storm. Relocation patterns to the south was also

Figure 4. Evacuees by Households as of August 2018 (Change of Mailing Address)



Source: FEMA as of August 2018.
Note: This data reflects self-reported data on any survivor's current mailing address in CONUS. Addresses often change without letting FEMA know, and many survivors may have returned home, or since moved to CONUS, without this data set being updated. Many or most of these addresses have not changed since they first registered with FEMA. Many survivors may have a mailing address with a friend or relative and many not actually moved to CONUS.

similar amongst the 2017 ACS (37%) Puerto Rican migrants and FEMA claims (56% in February 2018 and 53% in August 2018) as well, as both data sources showed more than half relocated to that particular region (see table 2). However, 11 months post-Hurricane Maria, with the exception of the West (7%) and Midwest (3%), the south declined from 56 percent to 53 percent, while the northeast increased from 35% to 37% between February 2018 and August 2018.

Table 3 shows the top 15 states with the most evacuees who changed their mailing address from Puerto Rico to the relocated state and data from the 2017 American Community Survey (1-year estimate). Six states from the south followed by five from the northeast, and four states from the Midwest were the top 15 states most evacuees relocated to (see table 3). Overall, Puerto Rican migration reported by the 2017 ACS showed that the majority of the migrants relocated to Florida (30%) followed by Pennsylvania (10%), Massachusetts (7%), Texas (7%), Connecticut (6%), New York (6%), New Jersey (5%), Ohio (3%), Maryland (3%), and Georgia (3%). FEMA claims revealed similar trends in terms of relocating in states reported by the 2017 ACS, in other words, post-Hurricane Maria evacuees (reported by FEMA claims) relocated in states of traditional and new

settlements. Secondly, evacuees reported by FEMA claims who relocated in states of traditional settlement tended to disperse outside central city areas (see figure 4).

According to the 2017 ACS, 30 percent of the Puerto Rican migrants from Puerto Rico relocated to Florida (see table 2), however, during post-Hurricane Maria period, 45 percent of the FEMA claims (8,611 households) relocated to Florida in February 2018 and this slightly decreased (in terms of percent distribution) to 43 percent (8,873 households) in August 2018. This shows Puerto Rican migration to Florida was further exacerbated due to Hurricane Maria. The following Northeastern states such as New York (2,943 in February 2018 and 2,111 in August 2018), Massachusetts (1,501 in February 2018 and 1,765 in August 2018), Pennsylvania (1,296 in February 2018 and 1,449 in August 2018), Connecticut (1,014 in February 2018 and 1,220 in August 2018), and New Jersey (855 in February 2018 and 925 in August 2018).

All in all, settlement relocation and patterns during post-Hurricane Maria period also showed dispersion throughout the U.S. mainland. The FEMA relocation data is an indicator of the dispersion of the Puerto Rican exodus throughout the U.S. As shown in Figures 4 and 5, Florida and other U.S. southern states continue to receive a majority of the Puerto Rican migrants. Yet, traditional states of settlements, such as New York, Pennsylvania, Massachusetts, Connecticut, Illinois, Ohio, and California, are currently experiencing population growth as well, and more importantly dispersed settlement patterns within their respective states when compared to existing Puerto Rican settlements.

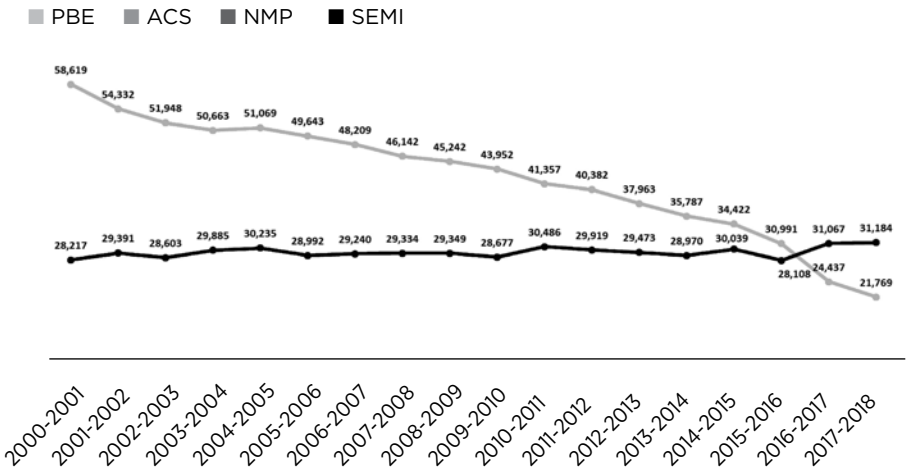
Interestingly, in traditional states like New York, post-Hurricane Maria households also showed dispersed settlement patterns in upstate New York besides the New York City region. School enrollment data also show this trend, particularly in New York State, whereby Puerto Rican school-age children showed higher enrollment rates in New York State's upstate region than in school districts located in New York City (Meléndez and Hinojosa 2017). Pennsylvania is another example, whereby the city of Philadelphia was once a large Puerto Rican settlement (Whalen 2001). However, as shown in Figure 4, post-Hurricane Maria showed dispersed settlement patterns, especially in counties outside of the city of Philadelphia. Overall, Puerto Rican evacuees, as measured by those who changed their FEMA-claims address from Puerto Rico to stateside U.S. continue to show patterns of dispersion throughout the continental U.S., a pattern evident in states of traditional settlements as well as in states of new settlement.

4. *Post-Maria Demographic Impacts*

Demographic Trends

Demographically, the 2006 post-economic crisis exodus and 2017 post-Hurricane Maria exodus, caused an accelerated depopulation in Puerto Rico. Between 2000 and 2005, the population in Puerto Rico was slightly higher or equal to stateside Puerto Ricans. By 2006, stateside Puerto Ricans outnumbered the Puerto Rican population in Puerto Rico, and this demographic trend continues today. In addition to migration, mortality and fertility is also linked to Puerto Rico's depopulation. As

Figure 5. Death and Births in Puerto Rico, 2000-2017



Source: Estadisticas Vitals de Puerto Rico 2000-2016, Department of Health.

shown in Figure 6, the number of births in Puerto Rico declined by half (-52%) from 58,619 in 2000 to 30,991 in 2016. The low number of births in Puerto Rico can be in part attributed to (higher educational attainment among Puerto Rican females). As shown in Figure 6, death rates and birth rates are at almost equilibrium in 2016 and as a result natural growth is not expected to occur in Puerto Rico (Macarrón Larumbe 2014). However, the number of deaths outpaced the number deaths in 2017 and 2018. Puerto Rico's population is expected to further decline as a result of high number of deaths and migration exodus after Hurricane Maria.

Education System

Puerto Rico's Department of Education also faced challenges from the island's post-economic crisis and post-Hurricane Maria, by forcing many school districts to close or merge their schools as a result of the declining student population in their classrooms and government budget cuts. A total of 265 public schools or 24 percent are closed and 855 schools remained open in the 2018–2019 academic year. The majority of school closures were disproportionately located in the island's rural areas (65%) relative to urban areas (35%). According to Puerto Rico's Department of Education, 306,652 students matriculated in pre-kindergarten to 12th grade (prek-12) public schools in the 2018–2019 academic school year, a percent change of -2 percent compared to February 2018 (319,750 matriculated students), six months after Hurricane Maria struck the island. However, between 2007–2008 and 2018–2019 academic school years, student enrollment showed a percent change -40 percent, from 526,565 to 313,724 students. Student enrollment declines is a

result of households with children migrating to the U.S. mainland and lower fertility rates, however, the intensity of family migration increased post-Hurricane Maria. This resulted to rapid population declines in *municipios* throughout the island. According to Puerto Rico's Department of Education, between 2018 and 2022, or post-Hurricane Maria, a total of 305 public schools will be closed due to lower student enrollments, which is predicted to decline by 9 percent and government budget cutbacks (López Alicea 2018).

School enrollment declines is mainly attributed to migration, as children are more likely to accompany their parents and/or family members. After the economic crisis period, Puerto Rico's student enrollment declined from 544,076 in 2006 to 319,422 in 2017, a difference of 224,654 of students or a decline of 41 percent. According to Puerto Rico's Department of Education, student enrollment is expected to further decline to 291,846 by 2022 as a result of the post-Hurricane Maria exodus.

In addition to school closures and lower student enrollment, Puerto Rico's public-school teachers and other school administration support staff were also affected by both migration waves. In 2006, there were 40,514 public school teachers and in 2017 it was estimated to decline to 20,915 teachers. However, it is estimated by 2022 there will be a slight increase of 24,776 public school teachers in Puerto Rico. In all, Puerto Rico's education system, which includes both students and teachers/staff, were heavily affected by both the 2006 economic crisis and post-hurricane exodus.

SUMMARY AND CONCLUSIONS

Hurricane Maria has shown the need for timely and reliable data source for policymakers and stakeholders in Puerto Rico and in the U.S. mainland. This paper shows that existing data sources on Puerto Rican migration did not provide such timely needed data due to the unavailability of commonly used data sources. Using the Student Enrollment Migration Index (SEMI) in the short term is superior relative to other migration indices (PBE, NMP, and ACS) in the short-term due to its reliability and availability.

As the number of Puerto Ricans continue to grow in the U.S. mainland, Puerto Rico is depopulating. Puerto Rico's depopulation, initially spurred by the 2006 post-economic crisis exodus combined with lower fertility rates and higher mortality rates, will further have an economic and social impact on Puerto Rico. Puerto Rican population growth in the U.S. mainland is seen beyond states of traditional settlement and this was especially seen amongst post-Hurricane Maria evacuees using FEMA change of address data for two time periods, five months after the storm (February 2018) and 11 months (August 2018).

The implications of the post-Hurricane Maria exodus for Puerto Rico included rapid population declines as a barrier to economic development, exacerbation of school closing, and increased number of vacant housing units. All in all, the magnitude of Puerto Rican migration and the current impacts Puerto Rico is facing is a complex story that has not been seen or experienced in prior migration waves. Economic crisis and post-Hurricane Maria, an accelerated exodus, makes recovery more difficult in Puerto Rico.

NOTES

[1] An additional data source, the Survey of Travelers (or Encuesta Sobre Información del Viajero, in Spanish) was conducted by the Puerto Rico Planning Board (PRPB) from 1982 to the 1988, 1991 to 2002, and 2005–2007. The main objective of the PRPB survey was to collect information about the volume and characteristics of travelers from Puerto Rico to the U.S. The so-called "ramp" survey was based on a sample drawn from all the commercial flights leaving or entering Puerto Rico from the Luis Muñoz Marín International Airport in San Juan, and subsequently from the Rafael Hernández airport in Aguadilla. This study was discontinued for lack of funding.

[2] Demographic balancing equation is defined as P2= P1 + (B – D) + (I – E)], where P2=the number of individuals in a population at time 1; P1= the number of individuals in that population at some later time 2; B= the number of births in the period from time 1 to time 2; D= the number of deaths from time 1 to time 2; I= the number of people entering as immigrants; and E= the number of people leaving as emigrants.

[3] The Puerto Rico Community Survey (PRCS) is an island wide a customized version of the American Community Survey (ACS) designed to provide data every year for Puerto Rico communities.

[4] Data collection took place between January 2017 and mid-September 2017.

[5] The 2017 American Community Survey (1-year estimates) data released on September 13, 2018 used the same total population count (3,337,177) as estimated by the 2017 Population Estimates for Puerto Rico. This does not reflect post-Hurricane Maria population in Puerto Rico (3,337,177) due to data collection postponement as a result of Hurricanes Irma and Maria in September 2017. For further information, see U.S. Census Bureau (2018b).

[6] This data is available at the beginning of each semester and thus offers the opportunity to estimate an early indicator of emigration to the U.S.

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