SEPTEMBER 20, 2018 MARKED A YEAR since hurricane Maria wrought havoc on the island of Puerto Rico. Though the media has reported the crisis in a myriad of ways—for better or worse—our intention here is to provide a timeline of the major occurrences in the aftermath, a meta-analysis of the media’s coverage of the disaster, and an updated account of the exodus of people. The island continues to suffer from a tenuous electric grid, ruined infrastructure, and financial bankruptcy a year after the hurricane; the increase in migratory numbers reflects the limitations that many continue to face on the island. More importantly, the island’s population continues to decline, and as a result, many schools have been closed, small businesses experienced financial losses, and death rates exceeded birth rates for the first time in history.

As per George Washington University’s study released on August 28, 2018, the most recent official death toll numbers to an astounding 2,975 the deadliest event in more than one hundred years. Hurricane Maria represents many firsts in U.S. history: the longest sustained domestic air mission of food and water response, the largest disaster commodity distribution commission, the most expansive sea-bridge operation of federal disaster aid, and the biggest disaster generator installation mission. In addition, Maria constitutes one of the largest disaster medical response and housing operations in U.S. history.

For our analysis of media response, we have gathered topics covered by US online news sources and compared the frequencies of certain key words used by reporters on a monthly scale. The Word Cloud datasets visually convey these trends over the past year, by way of Media Cloud, an open-source platform for media analysis. The exodus section details new migration estimates, taking into account alternative data, namely Puerto Rico’s Department of Education and the U.S. Census Bureau’s American Community Survey (ACS), as compared to traditional methodologies and sources used to render migration estimates by other research institutes in the recent past.

The closures of the public school system for months in the wake of the storms further exacerbated the massive drainage of population already in force prior to the cyclone, due to what is now considered over a decade recession. The humanitarian crisis in the aftermath of Hurricane has led to over 160,000 people to leave the island for the states. Ranked from highest to moderate in migrants preference are: Florida, Pennsylvania, Texas, New York, New Jersey, Massachusetts, Connecticut, Ohio, California, and Illinois. Given the uncertain nature of the island’s economy, we can expect the continuation of Puerto Rican migration to the states, and, by implication, a changing experience for stateside Puerto Ricans. This report marks this important turning point and is divided into three sections: timeline, media analysis, and exodus.
I. TIMELINE

The most salient events and media headlines provided here highlight to understand where the island currently stand relative to one year ago. This section focuses on the impact of the hurricane, emergency disaster relief, death toll counts, and recovery efforts. Among some of the unanswered questions:

- What is the actual death count? The first official estimate was that 64 people lost their lives. Yet, according to the latest independent study by George Washington University estimated 2,975 deaths, six months post-Maria.

- Why was the restoration of basic energy and portable water services delayed for so long? A year ago, the publicly-owned electric power company in Puerto Rico announced that power was restored to the entire island.

- What will be the long-term economic impact of Hurricane Maria? Preliminary estimates are of up to 20% decline in economic activity, with up to a cumulative $100 billion in lost economic output.

II. MEDIA ANALYSIS

For our analysis of media response, we have gathered topics covered by US online news sources and compared motifs on a month-to-month scale. This section analyzed how Hurricane Maria related topics covered on national news changed between October 2017 through September 2018. Hurricane Maria did not initially receive as much press coverage from the U.S. media as previous Hurricanes Harvey or Irma did, for a variety of possible reasons. In all, this section shows a general overview of the prevailing topics discussed in U.S. news relating to Puerto Rico.

This report was produced by the following Centro staff:

Kathya Severino and Damayra I. Figueroa curated the Time Line section of the report; Kathya Severino is the author of the Media Analysis section; Jennifer Hinojosa, Nashia Roman and Edwin Melendez are the authors of the Post-Maria Massive Exodus section; Chris Yong-Garcia was the graphic art designer; and, Carlos Vargas-Ramos served as editor.

Join Centro’s Puerto Rican Nation
http://centropr.nationbuilder.com/

Centro is creating an online community to strengthen the network of stateside Puerto Rican communities. Our nation will connect organizations across the country who are working to address Puerto Rico’s economic and humanitarian crisis.

Why join? The Center for Puerto Rican Studies is the only academic research institute solely devoted to the interdisciplinary study of the Puerto Rican experience in the United States. When you join us, you tap into a network of individuals and organizations across the United States and Puerto Rico with the shared interest of linking data and scholarship to policy and social action. You’ll be subscribed to our Voices newsletter, featuring the latest news affecting our community and interesting profiles of members of our diaspora. You will also receive invitations to special events.
III. POST-MARIA MASSIVE EXODUS

One year since Hurricane Maria made landfall in Puerto Rico on September 20, 2017, nearly 160,000 residents of the island have relocated to the United States. This exodus represents one of the most significant movements of Puerto Ricans to the U.S. mainland in the island’s history in terms of both volume and duration. The new emigration estimates — of 159,415 with an upper bound confidence interval of 176,603 — is as high as the net migration estimates in the previous two years combined (144,801). However, measuring population movement in real time, especially after a natural disaster like Hurricane Maria, continues to be a major undertaking that presents various methodological challenges. The need for migration estimates drew attention in states that experienced an influx of Hurricane Maria evacuees, which included both states of traditional Puerto Rican settlement as well as those in which Puerto Rican settlement is relatively recent.

- This section presents findings from a new alternative methodology, known as the ‘School Enrollment Migration Index’ (SEMI), to estimate the emigration from Puerto Rico to the United States using a combination of school enrollment data from Puerto Rico’s Department of Education and U.S. Census Bureau’s American Community Survey (ACS).
- The findings from the FEMA data show that Puerto Ricans have dispersed throughout the U.S. to a large extent following existing population settlement, showing recent migration flows to the Northeast and to the U.S. south in particular.
- Puerto Rico’s Department of Education closed 265 public schools throughout the Island, more so in the rural areas than urban areas; and showed a student population loss of 39,444, from 346,096 students in 2017-2018 school year to 306,652 students in 2018-2019 school year.

All in all, one-year since Hurricane Maria swept through Puerto Rico, the post-Hurricane Maria exodus continues to change the prevailing narrative of Puerto Rican migration. To the island, the migration exodus reinforces a pattern of depopulation that has induced austerity and the decline in government services and employment, the closing of schools, increased poverty among the most disadvantaged such as families with children and the elderly, among other unfolding consequences of sudden population losses. Those that relocate have the challenge of finding jobs, housing, medical services, and schools. This recent exodus represents one of the most significant historical movements of Puerto Ricans to the U.S. in terms of both volume and duration.

1Source: 2016 and 2017 American Community Survey (1-year estimates)
2For further reading, see introduction of The Almanac of Puerto Ricans in the United States, Centro Press, 2016.
SEPTEMBER 20 Hurricane Maria makes landfall at 6:15 am as category 4, with sustained winds blowing at 145 mph and peaking at 155 mph as it made landfall. The northwest trajectory of the storm assured that the entire island would be affected. Heavy rainfall occurs throughout the territory, peaking at 37.9 in (962.7 mm) in Caguas, according to the National Weather Service. Maria has been the worst storm to hit Puerto Rico since San Felipe Segundo in 1928.

SEPTEMBER 21 President Trump issues a state of emergency for Puerto Rico. The entire electrical grid is shut down and rain continues to pour in the mountains. Airports and ports are closed, and 95% of the cellphone systems cease to work. The Fiscal Oversight and Management Board (FOMB) authorizes Governor Rosselló to reallocate up to $1 billion for emergency response.

SEPTEMBER 25 FEMA administrator Brock Long arrives to Puerto Rico to assess some of the damages.

SEPTEMBER 28 Centro de Periodismo Investigativo starts to question the official death toll numbers. At the time, only 16 deaths were certified as hurricane related.

President Trump waives the Jones Act for 10 days, never to be renewed. The Pentagon appoints US Army Lt. Gen. Jeffrey Buchanan, Commander of USNORTHCOM’s Joint Force Land Component Command, to serve as the Department of Defense’s primary liaison to FEMA.

OCTOBER 3 President Trump visits Puerto Rico for the first time after Hurricane Maria made landfall. He meets with Governor Ricardo Rosselló and other elected officials in addition to visiting some communities in Guaynabo.

OCTOBER 6 Vice President Mike Pence visits Puerto Rico and the U.S. Virgin Islands. He is accompanied by the interim Secretary of Health, Don Wright, and the Secretary of Transportation, Elaine Chao.

OCTOBER 12 The U.S. House of Representatives passes a $36.5 billion disaster relief supplemental package. On October 23, 2017, the US Senate voted in favor of the disaster relief bill and was later signed by the President.

OCTOBER 18 More reports question the death toll in Puerto Rico. According to journalists from Vox the death toll could be closer to 450 substantially more than the official count of 48 deaths.

OCTOBER 20 One month after hurricane Maria hit Puerto Rico 83% of residents and businesses are without electricity. Bloomberg Politics reports that one-in-three residents lacked running water, half of cellular towers work. The official death toll is 49, while 76 people are still missing.

OCTOBER 25 Brock Long arrives to Puerto Rico to assess some of the damages.

OCTOBER 29 Governor Rosselló orders the cancellation of a $300 million contract awarded to Whitefish Energy Holdings.

OCTOBER 30 FEMA activates the Transitional Sheltering Program (TSA), which allows residents of Puerto Rico displaced by Hurricanes Irma and Maria to be granted access to temporary housing across the states. The Commonwealth of Puerto Rico elects to participate in alternative procedures for all large project funding for Public Assistance (PA) Categories C-G, pursuant to section 428 of the Stafford Act, for permanent work following Hurricane Maria. Procedures were published in April 2018.

DECEMBER 7 A report released by The Center for Investigative Journalism tallies the death toll related to hurricane Maria close to a 1,000.

DECEMBER 20 Ninety days after Hurricane Maria, more than 9,600 disaster victims are being temporarily housed in Puerto Rico and across 38 U.S. states.

59 FATALITIES TO DATE

55 OFFICIAL FATALITIES, BUT 400+ UNDER INVESTIGATION; CLOSE TO 900 CREMATED CADAVERS AFTER MARIA

AFTER 2 MONTHS, NOVEMBER 14, 2017

- Electricity < 18% generation
- Running water < 80%
- Gas stations < 80%
- 69 Shelters, 2,942 people
- Cell phones antennas 54% towers 76%

38 DAYS AFTER, OCTOBER 28, 2017

- Electricity < 25%
- Running water < 75%
- Cell phones antennas 24%, towers 40%
- Gas stations < 80%
- 87 Shelters, 3,897 people
- 74 suspected cases of leptospirosis, a bacterial infection spread through the urine of infected animals.
JANUARY 18 Connecticut had requested a two-week extension of the TSA program on January 11, which was approved days later. On January 17, however, 36 families were declared ineligible due to a change to eligibility requirements based on new criteria provided by the Puerto Rican government. The families were abruptly notified the next day, which was publicized by several media outlets. 12 of the 36 families were able to provide additional information that allowed them to remain eligible for the TSA program. The remaining 24 families were removed from TSA upon their homes in Puerto Rico having been deemed habitable, with functioning utilities.

JANUARY 25 According to several reports, 3,894 survivors remain in Puerto Rico and across 42 states via the TSA program. This is a 40% decrease in enrollment from a December 20 report. A subsequent report by the New York Times states that 1,500 survivors resided in Florida, as well as more than 800 in Puerto Rico.

FEBRUARY 1 The U.S. Department of Housing and Urban Development (HUD) awards $1.5 billion to attend the reconstruction of damaged housing and local businesses in Puerto Rico. This will be through HUD’s Community Development Block Grant-Disaster Recovery (CDBG-DR) program.

FEBRUARY 5 Governor Rosselló announces the implementation of charter schools and school vouchers in the public school system of Puerto Rico.

FEBRUARY 9 President Trump signs into law a third disaster recovery package.

MARCH 2ND More than $200 million dollars’ worth of materials expected to arrive in Puerto Rico in March to help the U.S. Army Corps of Engineers hit its 95% power restoration goal at the end of March. The goal is not met.

JANUARY 31 Governor Ricardo Rosselló submits a request for FEMA to activate the Direct Lease Housing Program, “which could pay up to 18 months of rent for qualifying families displaced by Hurricane María”. It is only activated for those residing in Puerto Rico.

MARCH 20, 2018

FEBRUARY 11 An explosion and fire at a power substation caused a blackout in parts of northern Puerto Rico. Puerto Rico’s Electric Power Authority (PREPA) said on Twitter that 400 megawatts of power generation had been lost. The fire was caused by a mechanical failure and impacted sections of San Juan, Trujillo Alto, Guaynabo, Carolina, Caguas, and Juncos.

FEBRUARY 14 According to the New York Times, about 200 households have been informed that their eligibility for the TSA program would expire on this date, including 79 families in Florida.

FEBRUARY 22 Governor Rosselló announces that the government will delegate an independent investigation on the death toll, led by Carlos Santos-Burgoa, director of the Global Health Policy Program at GWU’s Milken Institute School of Public Health.

AFTER 5 MONTHS, FEBRUARY 20, 2018

• Suicides rates escalate
• Electricity: 100,000’s still without
• February 21st - 85.64% (1,261,513) customers energized; 14.36% (211,487) left to be energized
• Running water lacking in country-side where pumps lack energy
• Thousands of homeless have moved in with family
• Sharp increase in crimes, homicides
APRIL 18
An island-wide blackout struck Puerto Rico, plunging the island back into darkness, more than seven months after Hurricane Maria demolished its fragile power grid.

APRIL 18

MAY 10
The Government of Puerto Rico released its draft Action Plan for the first CDBG-DR grant, open for public comment. The Action Plan states that the funds will focus on housing and economic recovery while Puerto Rico works with FEMA to finalize the program field guidance to participate in FEMA’s Public Assistance alternative procedures for all large project funding.

MAY 11
FEMA reports a total of 357,492 damaged homes caused by Hurricane Maria; 94 percent of these damaged homes belonged to homeowners and 6 percent pertained to home renters. Overall about 23 percent of the island’s housing stock was affected by Hurricane Maria.

MAY 15
Five months after Governor Rossello’s initial request, FEMA denies a request to activate HUD’s Disaster Housing Assistance Program (DHAP) for survivors of Hurricane Maria. FEMA cites high operating costs and the availability of other housing programs and CDBG-DR funds as a reason for denying the request. DHAP, funded by FEMA and administered by HUD, provides longer-term housing assistance and case management services to help low income disaster survivors rebuild their lives.

MAY 22
HUD announces $2.6 billion in annual funding to housing authorities in all 50 states, the District of Columbia, Guam, Puerto Rico and the U.S. Virgin Islands through the Capital Fund program. The Puerto Rico Public Housing Administration was awarded $151.5 million from these funds. These are meant to be used to help public housing authorities develop, repair, renovate and/or modernize their properties.

MAY 25
The submission period for public comments to the CDBG-DR Action Plan ends.

MAY 29
A new Harvard study published in the New England Journal of Medicine estimates that 4,645 deaths can be linked to the hurricane and its immediate aftermath, making the storm far deadlier than previously thought.

JUNE 14
Centro releases a report titled “The Housing Crisis in Puerto Rico and the Impact of Hurricane Maria”. This report established that Puerto Rico may have more than 300,000 vacant housing units.

JUNE 29
FEMA, HUD and PR Department of Housing issue a report on housing damage titled “Housing Damage Assessment and Recovery Strategies Report”. The report classifies the ten most impacted communities by total number of damaged housing units as San Juan, Bayamón, Caguas, Ponce, Toa Baja, Carolina, Arecibo, Humacao, Canóvanas, Guaynabo. However, when considering the number of damaged housing units as a percent of total units within a specific market, the 10 most impacted areas are found to be smaller communities such as Culebra, Vieques, Comerío, Canovanas, Guayama, Toa Alta, Utuado, Cayey.
A federal judge extended until August an order preventing the eviction of hundreds of Puerto Rican families who fled the hurricane-ravaged island in 2017 and have been living in hotels and motels across the United States.

News correspondent David Begnaud reports on donated food sent to Puerto Rico in the aftermath of Hurricane Maria that was left to rot in a parking lot of a government facility. Additionally, about 10 containers filled with non-perishable supplies sat at the government facility for 11 months.

The government-owned electric power company in Puerto Rico announces that it officially restored power to the entire island — almost a year after the power grid was severely impacted by Hurricane Maria.

Puerto Rico’s governor updated the island’s official death toll for victims of Hurricane Maria on Tuesday, hours after independent researchers from George Washington University released a study estimating the hurricane caused 2,975 deaths in the six months following the storm.

Hundreds of Puerto Ricans who have been living in motels and hotels on the mainland as part of FEMA’s temporary housing aid after Hurricane Maria have to check out on Sept. 14, a federal judge ruled on August 30th.


The Rio Piedras Campus of the University of Puerto Rico will direct a new center for the in-depth study of renewable energy through a $3.9 million Partnerships for Research and Education in Materials (PREM) grant from the National Science Foundation.

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• The largest disaster generator installation mission in the United States, with generators still installed at critical facilities today;
• One of the largest disaster medical response missions in U.S. history; and
• One of largest disaster housing missions in U.S. history
• Only 855 schools remain open on the island
• Hurricane Maria was the third-costliest storm in U.S. history (source: rollingstone)

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HOW THE U.S. MEDIA COVERED PUERTO RICO

National News coverage regarding Hurricane Maria and the devastation it caused in Puerto Rico was heavily criticized following the immediate impact of the storm. A study done by FiveThirtyEight’s Dhrumil Mehta released on September 28, 2017 found that “compared to the other natural disasters of the past few weeks, Hurricane Maria has been relatively ignored.”

This section provides an overview of national news coverage related to Puerto Rico over the last year. This report does not represent an in-depth analysis of the media’s discourse in regards to Puerto Rico and Hurricane Maria but shows a general overview of the prevailing topics discussed in US news. Hurricane Maria did not initially receive as much press coverage as previous Hurricanes Harvey or Irma did, for a variety of possible reasons. The section highlights this news coverage by examining news articles published on top US news coverage on these topics as a percent of overall coverage.

The lack of initial press coverage could be due to various factors. Hurricane fatigue is likely to have contributed to diminished interest in covering Puerto Rico. Hurricane Maria was preceded by Irma and Harvey, which affected Florida and Texas, respectively. However, national news coverage increased following controversial comments made by President Trump on Twitter. This pattern can be seen in figure 1, which looks at a sample of top US online news sites and the percentage of coverage each subject received. The unequal coverage of Hurricane Maria vs Hurricane Harvey in Texas and Hurricane Irma in Florida during the initial recovery stage is still a source of discomfort for many. The media serves an important role in disaster relief efforts. Media coverage of conditions following natural disasters provide oversight over the effectiveness of relief efforts, supplies information and directions to the affected public and maintains public interest, which helps stimulate volunteerism and donations.

Figure 1 Percentage of US News Coverage Related to 2017 Hurricanes.

1 https://fivethirtyeight.com/features/the-media-really-has-neglected-puerto-rico/
TOPICS COVERED BY US ONLINE NEWS SOURCES

Using Media Cloud, an open source tool jointly created by MIT Center for Civic Media and the Berkman Klein Center for Internet & Society at Harvard University and qualitative software, we analyzed how topics covered on national news changed throughout the year. This does not represent an in-depth or exhaustive analysis on the media’s discourse on Puerto Rico and Hurricane Maria, but shows a general overview of the prevailing topics discussed in US news relating to Puerto Rico.

PUERTO RICO IN US MEDIA THROUGHOUT THE YEAR

News articles related to Puerto Rico consistently bring up Trump both in relation to the overall federal response and particularly his comments on Twitter. The death toll, PREPA (the electric utility) and lack of power, the debt, and references to Puerto Ricans citizenship status were popular topics mentioned in news articles throughout the year.

OCTOBER 2017

During these initial months the discussion centers around electricity, infrastructure and mentions of the island’s economic crisis predating the storm. Lack of action from Congress, FEMA’s response, and comparisons to Florida and Texas are prevalent. The word “American” begins to pop up consistently during news stories related to Puerto Rico. This could be in response to news articles in late September 2017 reporting on a poll by the Morning Consult that found that only 54 percent of Americans know that people born in Puerto Rico are U.S. citizens. This trend continues in news stories related to Hurricane Maria. The use of the word American in this context increases as recovery efforts progress.
A lot of coverage in March relates to baseball and the Caribbean series rather than recovery and reconstruction efforts on the island. News focuses on the reemerging topic of the debt, oversight and corruption, PREPA & Whitefish, and cryptocurrency. The economy and tax is often mentioned alongside crypto-currency and blockchains. This is due to many articles discussing the arrival of many high net-worth individuals or those involved in crypto moving to the island to avoid taxes. It was in March that the Puerto Rican Government announced the creation of an advisory council to attract blockchain businesses to the island. Migration to the US mainland is also mentioned in news stories.

A study by a group of independent researchers from Harvard T.H. Chan School of Public Health and other institutions is released. The death toll and Puerto Rican evacuees in Florida are heavily discussed in news articles. FEMA and Florida appear frequently in relation to the impending end of the TSA programs and the amount of displaced Puerto Ricans still residing in the mainland. News articles point out that power restoration is still not complete. References to Puerto Rico’s political status increase.
HURRICANE MARIA’S IMPACT

Hurricane Maria struck Puerto Rico as a category 4 storm. The island experienced widespread flooding (blue shades on map) with waist-deep water levels in some areas. Storm surge and flash flooding trapped thousands of residents. Despite evacuation of at-risk areas to shelters, 64 deaths were reported, but ongoing investigations suggest that over a thousand people may have died as a direct consequence of the storm. Strong winds destroyed homes and caused massive devastation and complete power grid destruction. FEMA claims illustrate in the map the extent and concentration of the damage caused by the storm.
METHODOLOGY

Using Media Cloud we used the explorer tool to query the “U.S. Top Online News 2017” collection of news websites. This collection is comprised of top news websites of the year by August 2017 in the United States, according to data from comScore, Activate and Alexa. This includes 31 media sources:


US News Coverage Related to 2017 Hurricanes

The table represents the percent of coverage each subject received on a given date on popular US online news. Subjects queried were “Hurricane Harvey and Texas”, “Hurricane Irma & Florida” and “Hurricane Maria and Puerto Rico”. This compares the queried topic to the amount of stories posted by those sources that day.

AUGUST & SEPTEMBER 2018

The discussion continues to focus on the death toll with the release of the George Washington University study which reported an estimate of 2,975 deaths following Hurricane Maria. The death toll, Trump’s tweets, and Puerto Ricans residing in Florida are mentioned much more than any other topic. The debt crisis and bankruptcy are not discussed as frequently. Mentions of displaced Puerto Ricans in Florida often reference the upcoming midterm election as well. Articles discussing hurricane-related deaths or the death toll and Trump’s response are the main focus following Trump’s tweets on September 14.

Word Clouds

Word cloud analysis is based on a random sample of 1000 stories that focused on Puerto Rico. This dataset was cleaned up and words were merged that appeared with alternate spelling or issues (due to orthographical accents in Spanish that are oft misinterpreted by computer coding). Words with the same word stem were merged when appropriate. Connector words (la, de, of) were eliminated. Numbers were eliminated in favor of more representative words. Software for qualitative analysis was used for further analysis using Centro’s database of Puerto Rico News related to Hurricane Maria and recovery efforts.
POST-HURRICANE MARIA MASSIVE EXODUS: ONE-YEAR AFTER

The final section of the report is devoted to comparing the massive Post-Hurricane Maria exodus and how it has redefined the Puerto Rican diaspora. The section begins offering a new estimate of the Puerto Rican post-disaster relocation by introducing a new alternative methodology, known as the ‘School Enrollment Migration Index’ (SEMI). This new methodology is then compared with traditional methodologies used to estimate past migration patterns that have used the net movement of passengers (NMP), the Population Balance Equation (PBE), or the American Community Survey (ACS). Based on SEMI estimate, one year since Hurricane Maria made landfall, we estimate that 159,415 and up to 176,603 people may have left since Hurricane Maria struck. This estimate is as high as the net-migration flow in the previous two years combined (144,801).1 The final section discusses the impact on the Puerto Rican diaspora in the U.S. and in Puerto Rico.

DATA SOURCES AND AVAILABILITY

Prior estimates of the magnitude of the population movement between Puerto Rico and the United States post-Hurricane Maria continue to be based on the net movement of passenger, mobile telephone data,2 or projections based on recent migration trends from Puerto Rico to the U.S. Immediately following the storm, alternative

Figure 1. Estimated Migration Flows from Puerto Rico to the U.S., 1941–2016


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1 Source: 2016 and 2017 American Community Survey (1-year estimates)
data sources were not available to measure the magnitude of the net migration. Generally, social scientists — such as demographers, sociologists and economists — rely on a few methods and data sources to estimate Puerto Rican migration. These are:

1. **Demographic balancing equation** (PBE), 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. **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 Hurricane Maria. As shown in Figure 1, the estimates produced by these 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 is their ready availability. The PBE 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 between twelve and eighteen months 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. 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 migration 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 recently released 2017 ACS conducted both in the U.S. and Puerto Rico do not precisely reflect post-Hurricane Maria actual impact at present. First, the U.S. Census Bureau's 2017 Population Estimates for Puerto Rico is a population count as of July 2017, two months prior to Hurricane Maria. Thus, by implication the migration estimates based on the PBE for the fiscal year that ends on June 30 of 2017 would exclude the impact of Hurricane Maria. Second, the 2017 ACS population estimates in the United States, which measure household interstate mobility, include households surveyed from January to December of 2017. This survey would include a representative sample of the population in 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 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. Furthermore, the U.S. Census Bureau will not release the results of the 2018 American Community Survey, which should reflect demographic, social, and economic profile of Puerto Rico post-Hurricane Maria, until September 2019.

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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 \[ P_2 = P_1 + (B - D) + (I - E), \] where \( P_2 \) is the number of individuals in a population at time 2; \( P_1 \) is the number of individuals in that population at some later time 2; \( B \) is the number of births in the period from time 1 to time 2; \( D \) is the number of deaths from time 1 to time 2; \( I \) is the number of people entering as immigrants; and \( E \) is 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 Refer to https://www.census.gov/programs-surveys/acs/technical-documentation/user-notes/2018-02.html

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 both Hurricane Irma and Maria in September 2017. For further information, refer to: https://www.census.gov/programs-surveys/acs/technical-documentation/user-notes/2018-02.html
OTHER MIGRATION ESTIMATES

Teralytics: Mobile Data

A New York based tech company developed a mobility technology with 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 5 months (October 2017-February 2018). However, during the same time period, they 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 refers to owners of mobile phones who activated their accounts when traveling stateside, and the NMP, the data captures travelers and it is affected by the impact of the storm and the holiday seasons. According to their findings, Florida, New York, Texas, Pennsylvania were among the top 4 states Puerto Ricans relocated post-Maria.

Financial Oversight and Management Board (FOMB)

In November 2017, Lyman Stone, an economist and migration blogger, created population simulation scenarios based on movement of passengers—the NMP data. In January 2018, he estimated net-migration of 135,000 fled from Puerto Rico between September 2017 and January 2018 due to Hurricane Maria and Irma. This figure is similar to an estimates based on statewide increases of school enrollment, (Hinojosa & Melendez, 2018). The New Fiscal Plan (September 2018) by the Financial Oversight and Management Board (FOMB) cited Stone’s demographic projections, which concludes that by 2018 fiscal year, Puerto Rico’s population will decline by -5.05%, leaving a total population of about 3.2 million in the Island. However, by fiscal year 2023, FOMB expects the population to further decline to 2.9 million.

NEW MIGRATION ESTIMATE: SCHOOL ENROLLMENT MIGRATION INDEX (SEMI)

This section presents findings from our new estimation method for the Puerto Rican pre- and post-disaster relocation to the U.S. mainland relative to other estimation methods currently in use. Figure 1 illustrates the net migration estimates between 2005 and 2017 based on observable available data from the U.S. Census Bureau’s American Community Survey and the Puerto Rican Community Survey (2005 to 2017), the U.S. Bureau of Transportation Statistics (2005-2018), and Puerto Rico Department of Health (2005-2017). The present report introduces school enrollment data as an indicator of migration from Puerto Rico to the U.S. Based on school enrollment data from the Commonwealth of Puerto Rico Department of Education, we estimate that 159,415 (and up to 176,603) Puerto Ricans relocated to the United States in the year since Hurricane Maria made landfall in Puerto Rico.

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9 For past and current FOMB reports see: http://www.aafaf.pr.gov/other-documents.html#fiscalplanspin / https://www.youtube.com/watch?v=NGojss1s4hE
As shown in Figure 2, prior estimates of the magnitude of this exodus were based on movement of passengers or projections based on recent migration trends from Puerto Rico to the U.S. Our migration estimates parallel to some extent the NMP downward (negative) migration trend observed in the number of passengers exiting the island relative to those who arrive, a trend that indicates that the exodus from the island continues over time in the aftermath of the cyclones. The blue shaded trend line represents our school enrollment migration (SEMI) estimates compared to net migration estimates from PBE (red line), NMP (purple), and ACS (green line) (see Figure 2). Overall, similarly to the NMP (purple line), our SEMI estimate (blue line) shows volatility, at times over- or under-estimating migration figures relative to the ACS and PBE. As shown in Figure 2, between 2005 and 2017, both PBE and ACS data showed similar net migration trends throughout the years. The 2017 ACS net migration estimates were obtained using Table 07204 (for both ACS and PRCS). These estimates show the net migration estimates in 2017 were higher than in the past years, with more people leaving the Island than settling in it.

According to the 2017 ACS and the PRCS, 97,488 migrants from Puerto Rico relocated throughout the U.S. and 20,167 returned to Puerto Rico for a net migration of -77,321 people. This is an increase in emigration from the prior three years when net migration from Puerto Rico reached an average of 65,000 people. However, this indicator underestimates the actual net migration, as some families and individuals who relocated to the U.S. post-Hurricane Maria were probably not counted as movers if surveyed between late-September 2017 and December 2017. Furthermore, this may not consider families who relocated to hotels sponsored by FEMA’s Transitional Shelter Assistance program or stayed with relatives or friends. The NMP trend also showed significant volatility at times higher or lower net migration estimates relative to ACS and PBE.

In 2017, the net movement of passengers (NMP) estimate was the highest it has ever been in the past 12 years, with a net migration of -239,992, reflecting the impact of Hurricane Maria. To better ascertain the impact of Hurricane Maria, we use available NMP monthly data from a year prior, from August 2016 to August 2017, and from September 2018 until March 2018. Figure 3 depicts NMP data for both pre- and post-Maria periods. As shown in figure 3, the net movement of passengers increased from -82,106 the twelve months prior to Hurricane Maria to -131,960 during the six months after Hurricane Maria.

School enrollment estimates between 2008 and 2017 show a similar trajectory, though with high volatility of net migration estimates from Puerto Rico to the U.S. relative to the PBE, ACS, and NMP. For 2008, for example, our school enrollment estimate (-72,575) overestimates the migration flow relative to PBE (-36,349) and ACS (-34,128). However, the NMP figures (-18,569) underestimate the flow in the same year. During the same year (2008), student population loss in Puerto Rico’s public schools was the third highest in a 10-year span.10 In 2009, the school

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10 Between 2007-2008 and 2008-2009 school year, Puerto Rico’s public school student enrollment declined from 526,565 to 503,635 students, a loss of -22,930. This was the third highest student loss between 2007 and 2019 school years.
enrollment migration estimate (-35,140) showed similar migration patterns compared PBE estimates to (-34,158) and ACS estimates (-29,966), while the NMP (-43,460) exhibited a higher net migration estimate. Between 2010 and 2012, school enrollment migration estimates showed higher estimates relative to other three measures. In 2013 and 2014, school enrollment estimates (-39,563 for 2013 and -41,684 in 2014) were within similar ranges as the PBE (-54,259 for 2013 and -65,089 for 2014) and the ACS (-49,194 for 2013 and -64,073 for 2014), but much lower compared to NMP (-74,339 for 2013 and -92,310 for 2014). In 2015, ACS (-64,238) and PBE (-64,757) showed similar estimates; however, PBE (-94,735) and our school enrollment estimate (-101,575) overestimated the emigration. Moreover, in that same year, Puerto Rico’s experienced the second highest loss of student population (-32,931) between the previous school year (2014) and 2015. Therefore, the school enrollment migration estimate is able to capture such significant change, and as a result shows a comparable estimate to the NMP (-94,735). In 2016, our school enrollment estimate (-50,853) showed a lower migration estimate relative to PBE (-68,262), ACS (-67,480), and NMP (-63,508). Relative to PBE and ACS, the 2017 annual NMP total captures the months of October, November, and December immediately following Hurricane Maria, and as a result, migration estimate for the calendar year spiked to -239,992,11 whereas ACS and PBE annual data do not reflect post-Hurricane Maria migration flow. Yet, school enrollment based on August 2017 data yields an indicator (-64,446) that approximates ACS (-77,321) and PBE (-67,500) migration estimates for 2017.

To date, the Net Movement of Passengers (NMP) provided by the U.S. Department of Transportation, is the only indicator (compared to ACS and PBE) reflecting post-Hurricane Maria migration flows. However, this indicator does not reflect relatively permanent or long stay migration patterns, such as the PBE and ACS. As shown in Figure 4, one year (August 2016 to August 2017) before Hurricane Maria made landfall, NMP estimated an outflow of -82,106 from Puerto Rico to the U.S., and within this same time period, our SEMI estimate shows -64,446, with an upper bound of -81,634, emigrants relocated to stateside. During the period post-Hurricane Maria from September 2017 to March 2018 (six-month post-Hurricane Maria), NMP reported an outflow of -131,960 while school enrollment migration estimate indicates an outflow of -104,741, with an upper bound estimates of -121,929. In comparison, the school enrollment indicator for one-year post-Hurricane Maria estimate is -159,415 islanders relocating stateside, with an upper bound of -176,603. In all, our revised school enrollment estimates can be used as an indicator for migration estimates post-Hurricane Maria for both time periods and six months and one-year post Hurricane Maria).

As shown in figure 2, the -239,000 migration estimate from the NMP aggregates January 2017 through December 2017 net movement. The impact of Hurricane Maria heightened the outflows between September 2017 through November 2017, pulling the net movement to such a high volume (see figure 4). For example, as illustrated in Graphic 3, the NMP jumped from -18,689 in August 2017 (one-

11 January 2017 through December 2017 are the months NMP includes for the annual migration estimates of -239,992 for 2017.
month prior to Hurricane Maria) to -99,197 in October 2017 (one-month post-Hurricane Maria). This spike is reflective in the NMP annual average in 2017 (-239,992, as depicted in figure 2). However, between December 2017 through March 2018, the NMP estimate shows a return migration spike (more so in January, February, and March of 2018), and this is attributed to the holiday season. As shown in the previous year, between November 2016 and February 2017, there was a similar return migration spike shown, however, not as prominent as the month’s holiday period during post-Hurricane Maria (see figure 4).

**IMPACT ON THE DIASPORA**

**Dispersion**

According to data provided by FEMA, a total of 20,582 households as of August 2018 provided by FEMA. relative to 19,271 households reported in February 2018, had changed their mailing address since they first registered with FEMA, and relocated to the U.S. mainland as a result of Hurricane Maria and Irma. The FEMA relocation data is an indicator of the dispersion of the Puerto Rican exodus throughout the United States. As shown in Figure 7.1 and 7.2, 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, and as importantly experiencing dispersed settlement patterns within their respective states when compared to existing Puerto Rican settlement. One year later, post-Hurricane Maria Puerto Rican migrants continue to relocate in areas beyond central cities of traditional states of settlement. 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 & Hinojosa, 2017).

Regionally, more than half of post-Hurricane Maria Puerto Rican migrants relocated in the South (53%), followed by 37% in the Northeast, 7% in Midwest, and 3% in West (see figure 6.1). However, relative to five months post-Maria (February 2018), the northeast region showed 2 percentage points increase from 35% to 37% and the south showed a decline by 2 percentage points, from 55% to 53%. In terms of proportions, the Midwest (7%) and Western (3%) regions did not show any change between February 2018 and August 2018.

At the state level, Florida (8,873) received the most Puerto Rican evacuees, followed by New York (2,111), Massachusetts (1,765), Pennsylvania (1,149), Connecticut (1,449), New Jersey (925), Texas (761), Illinois (665), Georgia (283), and Ohio (267). In terms of absolute change between February 2018 and August 2018, Massachusetts (+264) followed by Florida (+262), Connecticut (+206), New York (+168), Pennsylvania (+153), New Jersey (+70), Texas (+53), Ohio (+49), Illinois (+24), and Wisconsin (+23) showed the largest increase of evacuees from Puerto Rico who changed their mailing addresses between February 2018 and August 2018. While, Virginia (-85), Arkansas (-12) and Maryland (-8) showed slight declines.

Overall, Puerto Rican evacuees, especially among those who changed their address from Puerto Rico to stateside U.S. continue to show patterns of dispersion throughout the continental U.S. This is especially evident in states of traditional settlements as well as in states of new settlement.
Map 6.2 Evacuees by Households as of February 2018 (Change of Mailing Address)  

Figure 6.3 Change of Evacuees by Households between February 2018 to August 2018 (Change of Mailing Address)

Map 7.1 FEMA Evacuees in Florida as of February 2018 (Change of Mailing Address)

Map 7.2 Change of Evacuees by Household between February 2018 to August 2018 in Florida (Change of Mailing Address)
Hartford Study Report

In our October 2017 report, Connecticut was among the top 10 states to become a preferred relocation state for incoming Puerto Rican evacuees. Friends and families, as well as non-profit organizations, hosted incoming Puerto Rican evacuees, especially to areas like Hartford, Connecticut. As a result, on behalf of the Hartford Foundation for Public Giving (Hartford Foundation), CUNY Hunter’s Center for Puerto Rican Studies (CENTRO) and University of Connecticut’s El Instituto collaborated to respond to a proposal request for a brief survey on the impact on the Hartford region of post-disaster displacement. Overall, micro to macro impacts were seen among: (1) families opening their homes to displaced friends or relatives from Puerto Rico, (2) displaced individuals/families from Puerto Rico, and (3) government authorities (state level).

Overall findings from the survey showed that about 25% of the Puerto Rican respondents opened their homes to displaced Puerto Rican evacuees, this included friends and/or relatives. Interestingly, at the time of the survey, respondents expected more displaced relatives or families to relocate or remain in their homes for months or years. On the macro level, the influx of displaced Puerto Rican evacuees was in need of state assistance, ranging from housing needs, food, and healthcare needs, food, and healthcare needs. A major takeaway from this study is the extent of unmet social and economic needs, both the Puerto Rican evacuees and Puerto Rican residents, faced in the state, especially in Hartford. A second major takeaway, the impact of Hurricane Maria not only affected Puerto Rico but it also altered the lives of many receiving stateside families/friends who opened their homes to incoming evacuees.

IMPACTS ON PUERTO RICO

School Closures

A total of 265 public schools or 24% 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, 313,724 (306,652 matriculated students), six months after Hurricane Maria struck the Island. However, between 2007-2008 and 2018-2019 academic school years, school enrollment showed a percent change -42%, from 526,565 to 306,652 students.


Source: U.S. Census Bureau, 2010 U.S. Decennial and 2017 Population Estimates; Puerto Rico’s Department of Education; FEMA
From a geographic perspective, school closures disproportionately took place in Puerto Rico’s rural areas (65%) than urban areas (35%). On the other hand, schools that remained opened were mainly located in urban areas (59%) compared to rural areas (41%). Overall, closed schools were largely on buildings containing elementary schools and elementary/middle schools and to a lesser extent on buildings with middle schools only, high schools only, and elementary/middle/high schools. School closure/open criteria are not clear from Puerto Rico’s Department of Education data, other than building not suitable to resume classes caused by either Hurricane Irma and Maria. Regionally, 46 schools were closed in Mayaguez followed by 43 schools in Caguas, 40 schools in Ponce, 35 schools in Humacao, 34 schools in Arecibo, 34 schools in Bayamon, and 33 schools in San Juan.

CONCLUSIONS

One year later, based on student enrollment and FEMA data, post-Hurricane Maria migrants generally followed the distribution and predication derived from the average of the last four years of settlement from Puerto Rico. In other words, post-Hurricane Maria Puerto Rican migrants relocated to states where migrants had been settling prior to the storms. Overall, data from FEMA still confirm that Puerto Rican evacuees continue to settle in almost every state and every region of the country. As discussed by Hinojosa and Vargas-Ramos (2017), between 2000 and 2014, the Puerto Rican population showed notable population growth in the U.S. south, particularly, in North Carolina, Texas, Georgia, Virginia, and Florida, while states like Pennsylvania and Ohio, were among the only traditional states of settlement to show population growth. However, one-year since Hurricane Maria made landfall, such traditional states that were deemed as declining Puerto Rican communities are showing growth today. In the recently released 2017 American Community Survey, Florida, New York, and Massachusetts were among the top 10 states to show the highest change between 2016 and 2017.

Lastly, this narrative of Puerto Rican population growth and declines has changed as a result of Hurricane Maria exodus. Puerto Rican newcomers during the 2017 post-Hurricane Maria wave continue to settle in every state and region of the country. While “circular” migration and the migration associated with the economic crisis narratives help Puerto Rican scholars interpret and describe prior periods of the Puerto Rican migration to the United States, the “post-Hurricane Maria exodus” phenomenon and its concomitant “depopulation” of the island are circumstances that call for a deeper understanding of this still unfolding historical moment.

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Rebuild Puerto Rico

Hurricane Maria, a devastating Category 4 hurricane, caused billions of dollars in damages to Puerto Rico and left 3.4 million island residents without power, potable water, and telecommunications. Recovery is estimated to take years. Centro has launched Rebuild Puerto Rico, an online information clearinghouse for the stateside Puerto Rican community and other allies to support disaster relief and recovery efforts. A Puerto Rico Recovery & Reconstruction newsletter highlighting new content on the online platform will be issued weekly and as needed.

Hurricane Maria devastated Puerto Rico at a time of great financial difficulty for the island and its residents, leaving behind widespread destruction and a humanitarian crisis. Stay up to date with recent events related to recovery and reconstruction efforts in Puerto Rico.

You can help by donating directly to charities in Puerto Rico that are leading the effort to mitigate the humanitarian crisis. The website contains a list of charities and local initiatives with direct access to the victims of these hurricanes.

Puerto Rican community leaders and elected officials in the diaspora are calling for a renewed effort to assist Puerto Rico with disaster relief and recovery. Many have responded to this call to action and have planned events in support of relief efforts.

This natural disaster will undoubtedly dictate the upcoming policy agenda for the island. It is imperative that we maintain public awareness for disaster relief efforts and engagement, not just in the emergency phase but also during recovery and reconstruction.

Several federal, state, local, and private sector programs are available for those affected by a natural disaster. This page contains a collection of important resources and agencies that can help you during this difficult time.

Connect with people and organizations that provide a service or work with the Puerto Rican community stateside and in Puerto Rico.

Through two interactive maps find information related to pre and post-Maria conditions in Puerto Rico and the Puerto Rican solidarity movement in the United States.

Find information about collaboration opportunities or request for support from organizations that are working on the rebuilding of Puerto Rico.