

Research Article

# Who Gets Emergency Housing Relief? An Analysis of FEMA Individual Assistance Data Following Hurricane María

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## ABSTRACT

In the months following Hurricane María's devastation of Puerto Rico, numerous press outlets and advocacy groups documented how Puerto Rico's experience with housing repair and reconstruction programs was rife with complaints and inconsistencies regarding approval of applications and denial of support, especially amongst vulnerable communities. These problems are not unique to Puerto Rico and have been constantly raised by numerous communities in the United States that have endured disasters. This paper contributes to the critical task of revealing and examining post disaster damages and reconstruction trends through a detailed examination of housing damages and benefits received through the Federal Emergency Management Agency's (FEMA) Individual Assistance (IA) Program. Our inquiry provides detailed insights regarding housing and personal property damages, and receipt of FEMA assistance following Hurricane María. It also shows which municipalities were most affected and have the greatest housing needs. The analysis presented demonstrates that, at the aggregate level, poor or geographically vulnerable households were not likely to be underserved. Nonetheless, poor households are left with a greater burden in the form of pending housing needs after aid relief has been allocated, thus rendering them more vulnerable to being displaced. Furthermore, households that lacked clear tenure status were unable to access IA aid due to administrative and procedural burdens.

Keywords: Hurricane María; Puerto Rico; FEMA; vulnerable populations; post disaster reconstruction; post disaster planning

## INTRODUCTION AND BACKGROUND

Hurricane María left an unprecedented trail of destruction in its wake, especially in Puerto Rico, where punishing 155 miles-per-hour (mph) winds—with wind gusts reaching 210 mph—crossed the island from its southeast to northeast ends. In the weeks after it hit the island, early reports estimating total damages began to surface placing the figure anywhere between \$20 billion and \$95 billion. Official federal governments estimates prepared by the National Oceanic and Atmospheric Administration (NOAA) placed the figure for damages in the US Virgin Islands and Puerto Rico at \$90 billion—with a margin of error of +/- \$25 billion— which represents roughly 104% of the island's Gross National Income for 2016. Beyond these broad damage assessments, detailed figures and analyses regarding who has been served by federal and local government programs designed to provide disaster relief have been hard to come by, especially for the public at large. Access to public data detailing areas that were hardest hit and communities assisted, or left behind, is fundamentally important for post disaster planning and advocacy efforts. In post disaster contexts, planners, policymakers and other public officials require detailed information and analyses that allow them to

prepare recovery assessments, draw up reconstruction scenarios, prepare recovery plans and execute needed projects (Olshansky 2006; Johnson & Olshansky 2016). The same is true for local organizations that provide much needed services and support for affected communities and at times end up addressing many of the gaps that governmental entities are unable to fill.

The Small Business Administration's (SBA) Disaster Loans program and the Federal Emergency Management Agency's (FEMA) Individual Assistance (IA) Program are the primary sources of federal post disaster assistance during the emergency management stages that follow a natural hazard event. They provide crucial assistance during the very early stages of the post disaster process, and help families and individuals with critical repairs before the launch of major housing reconstruction programs that are typically implemented months or years—as is the case in Puerto Rico—after the disaster event. Given that the IA program only covers basic needs and repairs in the initial months after a disaster, the bulk of post disaster reconstruction efforts are funded through several federal sources, including FEMA's Public Assistance (PA) and Hazard Mitigation Grant Programs (HMGP), and Community Development Block Grants assigned by the US Department of Housing and Urban Development (HUD)—for disaster recovery (CDBG-DR) and mitigation (CDBG-MIT) projects. As of January 2022, the US federal government had allocated over \$65 billion to cover reconstruction expenses in Puerto Rico related to Hurricanes Irma and María. Nonetheless, over four years after both disasters, only \$19.2 billion have been outlaid for ongoing disaster recovery projects, and 2,490 housing units have been repaired or rebuilt through reconstruction programs<sup>1</sup>. Despite the vast amounts of funds that are expected to be invested in the island in the years to come, FEMA's IA program has been the most important source of housing aid and assistance in the initial years of Puerto Rico's post disaster reconstruction process.

Numerous press outlets, advocacy groups and academic inquiries (García 2021) have documented how Puerto Rico's experience with FEMA's IA Program following Hurricane María was rife with complaints and inconsistencies regarding approval of applications and denial of support, amongst others<sup>2</sup>. These problems are not unique to Puerto Rico and have been raised by numerous

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<sup>1</sup> Data regarding funds allocated, obligated and outlaid by the federal government for disaster recovery purposes can be accessed via: <https://recovery.fema.gov/state-profiles>. Information on housing units repaired or rebuilt through local reconstruction programs was obtained through the Puerto Rico Department of Housing transparency portal for the Repair, Reconstruction and Relocation (R3) Program (see: <https://cdbgd-dr.pr.gov/en/transparency-portal/transparency-reports/housing-reports/r3-dashboard/>)

<sup>2</sup>. Numerous journalistic inquiries and watchdog groups highlighted the discrepancies and stream of denials, see: Andrés Viglucci, "They Lost Homes in Hurricane María, But Didn't Have Deeds. FEMA Rejected Their Claims," Miami Herald. <https://www.miamiherald.com/news/nation-world/national/article217935625.html>. (Accessed March 23, 2020); Rebecca Banuchi, "Llueven las denegatorias de asistencia por parte de FEMA en Puerto Rico," Centro de Periodismo Investigativo. February 5, 2018, <http://periodismoinvestigativo.com/2018/02/llueven-las-denegatorias-de-asistencia-por-parte-de-fema-en-puerto-rico/> (Accessed March 23, 2020); Greg Allen, "U.S. Handled Puerto Rico Hurricane Aftermath Badly, Says Refugee Group," NPR. December 18, 2017, <https://www.npr.org/sections/thetwo->

communities in the United States. In fact, questions of how FEMA decides which applicants are eligible to receive housing assistance and how much aid is provided are at the heart of two federal court cases<sup>3</sup> that highlight the opaque nature of how FEMA determines applicant eligibility, and the wide discretion exercised by field workers who make key decisions. More recently, FEMA has acknowledged that despite their mandate to treat disaster victims equitably, programs like IA have disproportionately benefited wealthier and white households over low income and minority populations<sup>4</sup>.

In light of the claims made, important queries for post disaster reconstruction planning arise: how were program eligibility criteria applied in Puerto Rico? And, were key populations, including renters, poor households and those without secure tenure or located in geographically vulnerable areas unattended or underserved? By analyzing a unique dataset and closely examining eligibility and other administrative determinations of the IA Program, we shed light on which applicants were aided and identify which factors or criteria determine the probability of receiving assistance. As part of this exercise, we also examine if housing needs were equitably addressed by placing attention on whether poor households and those located in what are locally known as "Special Communities"<sup>5</sup> were unfavorably served. Furthermore, our analysis provides detailed insights regarding housing and personal property damages, and which municipalities were most affected. These exercises contribute to a select literature that attempts to understand how federal post disaster aid is disbursed and if the sociodemographic characteristics of places determine access to residential assistance following disasters. We chose to examine FEMA's IA program, and no other federal recovery programs (e.g. CDBG-DR and SBA loans) for the following reasons: (1) our focus is on post disaster housing needs in

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[way/2017/12/18/571781560/u-s-handled-puerto-rico-hurricane-aftermath-badly-says-refugee-group](https://www.washingtonpost.com/news/energy-environment/wp/2017/12/18/571781560/u-s-handled-puerto-rico-hurricane-aftermath-badly-says-refugee-group/) (Accessed March 23, 2020).

<sup>3</sup> See *La Union Del Pueblo Entero v. FEMA*, 2017 U.S. Dist. LEXIS 146014 (United States District Court for the Southern District of Texas, Brownsville Division February 15, 2017 Filed), and *Barbosa v. United States Dept't of Homeland Sec.*, 263 F. Supp. 3d 207, 2017 U.S. Dist. LEXIS 106990, 2017 WL 2958606 (United States District Court for the District of Columbia July 11, 2017, Filed).

<sup>4</sup> See Rebecca Hersher, "Why FEMA Aid is Unavailable to Many Who Need It The Most," NPR, June 29, 2021, <https://www.npr.org/2021/06/29/1004347023/why-fema-aid-is-unavailable-to-many-who-need-it-the-most> (Accessed January 17, 2022); Christopher Flavelle, "FEMA Says It's Still Working to Fix Racial Disparities in Disaster Aid," *The New York Times*. October 27, 2021, <https://www.nytimes.com/2021/10/27/climate/fema-aid-racial-disparities.html> (Accessed January 17, 2022).

<sup>5</sup> Special Communities are government-designated areas, as part of a state-led, island-wide community development effort that started in 2001, that identify low-income communities that also have inadequate infrastructure and whose households live in precarious conditions. Law 1 of 2001 of the Government of Puerto Rico, defines Special Communities as those geographical areas where a large share of the population suffers from high illiteracy or school dropout rates, lives under the poverty level, or is unemployed, a large share of households are headed by single parents, and there is a long history of environmental and health concerns. These communities exhibit mixed homeownership patterns, but many households still lack legal title for their land.

the emergency response stage—which precedes long-term recovery—since it is clear that an inadequate response during this period can render households vulnerable to displacement during the transition to prolonged reconstruction; and (2) given Puerto Rico’s high poverty levels, less than ten percent (10%) of affected households in the island were eligible for SBA loans, while less than five percent (5%) of households living in floodplains are insured by the National Flood Insurance Program (NFIP) (Puerto Rico Department of Housing, 2019).

Previous US-focused studies that examine eligibility and disbursement of federal post disaster assistance demonstrate persistent patterns. Analyses centered on the political dynamics of aid disbursement indicate that federal support for post disaster relief is not necessarily contingent on the level of damages, and that politics play an important role (Kamel & Loukaitou-Sideris 2004; Platt 1999; May 1985). As a result, places that are politically important to the President and localities with representatives on key congressional committees tend to receive more aid (Reeves 2011; Garret & Sobel 2003; Downton & Pielke 2001). With regards to the disbursement of federal assistance to families and individuals, the evidence indicates that people with lower socioeconomic status suffer greater damages due to their pre-disaster housing conditions, and have a harder time receiving aid after a disaster (Grube et.al. 2018; Fothergill & Peek 2004; Peacock and Girard 1997). Overall, groups who are marginalized from social and political life, including women, non-citizen migrants, the poor, minorities and older and young populations tend to be at a disadvantage with regards to post disaster recovery opportunities, register relatively higher losses—proportional to their pre-disaster economic situation—and pay relatively more to recover (Kamel and Loukaitou-Sideris 2004; Girard and Peacock 1997; Bolin and Stanford 1991; Bolin and Bolton 1986).

A handful of studies that examine disbursement of federal funds using ZIP Code-level data demonstrate that for FEMA aid: a large proportion of applications are denied (for diverse reasons), aid is less likely in higher income areas, average grants tend to be modest in amount, and that a higher concentration of owner-occupied homes increases aid levels in affected areas (Kousky 2013). Similarly, damages are a significant determinant of aid allocation. Zip codes where total damages are higher, tend to receive a higher proportion of federal assistance (Loukaitou-Sideris and Kamel 2004). Similarly, areas with a high concentration of multifamily and rental housing, where minorities and socially marginalized populations tend to reside, had less access to federal disaster assistance. With regards to race and the foreign born, Loukaitou-Sideris and Kamel (2004), who looked at residential assistance after the Northridge earthquake, find that zip codes with a high concentration of African Americans are associated with higher levels of FEMA housing assistance, but places with high concentrations of Hispanics and Spanish-speaking households register lower damage assessments and less assistance. Grube et. al. (2017) examine federal assistance following Hurricane Sandy and find that higher concentrations of foreign born tend to decrease total assistance. Although some studies examine a combination of federal programs (including several FEMA funding streams and SBA loans, predominantly) the trends point to the notion that certain populations tend to be at a

disadvantage due to the design and administrative rules that govern them, which disproportionately favor native or naturalized applicants, homeowners, single family homes and financially secure households.

Our study contributes to ongoing-debates regarding the allocation of post disaster assistance and provides an important point of departure for future studies focused on recovery prospects. Furthermore, the data provided by FEMA on housing registrants for the IA program, which provides applicant-level information, allows for a more precise analysis of the determinants of aid allocation. Moreover, the post Hurricane María experience in Puerto Rico is an interesting case that can provide further insights into a still budding literature for several reasons. First, Puerto Rico exhibits considerable topographic and land use diversity. Over 60 percent of the territory is comprised of mountainous terrain, close to 800 surface water currents crisscross the island, and urban growth has proceeded in a sprawled fashion since the 1950s. This persistent development pattern has taken over valuable agricultural lands, and led to residential constructions in high risk, coastal and mountainous areas (Gould et. al. 2017). Second, there are significant variations with regards to human settlement typologies. Almost one fourth of all developed lands are low density developments (Junta de Planificación 2015), and recent estimates indicate that half of the island's housing stock has been built "informally"—without the assistance of engineers or architects, lacking proper building permits or property titles (Puerto Rico Department of Housing 2019). Enforcing standard building practices has been a longstanding issue in Puerto Rico, even though the island has clear design and construction standards and highly regulated engineering and architecture professions. At the same time, the island has implemented numerous versions of the "parcelas" program, a housing, land and titling provision effort that dates back to the 1940s (Marvel, 2008) and continues to this day using CDBG-DR funds (Puerto Rico Department of Housing, 2019). Despite these efforts, tenure security is still a major problem in Puerto Rico. The high levels of informality, with regards to both construction and titling, has left a very large portion of households in a vulnerable situation, similar to numerous other places in the Global South and some communities in the United States, such as the "colonias" in southern Texas. Third, Puerto Rico is a highly unequal society, which increases the deleterious post disaster consequences of those at the bottom of the economic distribution (Ahearn & Galea 2006). In 2018, the island's Gini coefficient stood at 0.542, registering the highest level of inequality when compared to the rest of the United States (Guzman 2019). Contrary to trends in Latin America, where, for the most part, inequality is decreasing, Puerto Rico has seen rising levels of inequality since 2005 (Instituto de Estadísticas 2016).

## FEMA ASSISTANCE FOR INDIVIDUALS AND HOUSEHOLDS<sup>6</sup>

After a major disaster declaration, FEMA provides aid through three main programs: Individual Assistance (IA), Public Assistance (PA) and the Hazard Mitigation Grant Program (HMGP). Through IA, FEMA can assist survivors via numerous schemes, including the Individuals and Households Program (IHP), which offers financial assistance and direct services to disaster victims who are underinsured or uninsured. Under the IHP, individuals can receive housing assistance (HA) and other needs assistance (ONA), based on the type of damage, access to resources and other factors. Eligibility criteria for each program varies, but generally all applicants must fulfil the following:

1. Must be a US citizen, non-citizen national, or qualified alien.
2. FEMA must be able to verify their identity.
3. Insurance payouts, or other forms of disaster assistance received, must not meet disaster-caused needs.
4. Necessary expenses and serious needs must be directly caused by a declared disaster.
5. The dwelling is an owner-occupied primary residence (under certain conditions, renters are also covered).

Eligible individuals with housing damage may apply for assistance that improves the standard of habitability to a reasonable level. Financial assistance may come in three main forms: (1) rental assistance (for alternative lodging), (2) repair assistance and (3) replacement assistance (for destroyed, owner-occupied primary residences). Rental assistance consists of funding for applicant homeowners or renters to rent housing temporarily when they are displaced from their primary residence as a result of a disaster and are awarded according to HUD's fair market rent (FMR) thresholds. Repair assistance provides funding to applicants to repair owner-occupied primary residence, utilities, and residential infrastructure. Replacement assistance makes funding available to owner applicants whose primary residences were destroyed as a result of a disaster and may be applied toward purchasing a new permanent residence. The award disbursed through each type of assistance will count towards the IHP financial assistance maximum award, but each individual award cannot exceed this limit<sup>7</sup>.

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<sup>6</sup>. Most of the information on the Individuals and Households Program outlined in this section was obtained from the Individuals and Households Program Unified Guidance (IHPUG), which applies to disasters occurring between September 30, 2016 and February 28, 2019, [https://www.fema.gov/media-library-data/1483567080828-1201b6eebf9fbbd7c8a070fddb308971/FEMAIHPUG\\_CoverEdit\\_December2016.pdf](https://www.fema.gov/media-library-data/1483567080828-1201b6eebf9fbbd7c8a070fddb308971/FEMAIHPUG_CoverEdit_December2016.pdf) (Accessed March 23, 2020).

<sup>7</sup>. According to the Stafford Act, which provides the legal framework for federal post disaster aid disbursement, the maximum amount of aid an individual can receive is capped. This amount is adjusted annually. The maximum amount of total monetary assistance provided by the IA program in Puerto Rico for Hurricanes

In all three cases, FEMA must verify losses and damages, collect information and verify pertinent documents to determine if applicants meet specific eligibility requirements for each kind of assistance. Losses and damages can be verified through different methods, but the standard is an onsite inspection<sup>8</sup>. Although FEMA provides guidelines regarding covered damages and eligibility thresholds, inspectors exercise some discretion in documenting losses and damages<sup>9</sup>. Moreover, as Martín (2019) has argued, numerous opportunities arise for incomplete and inaccurate assessments given inconsistencies in the quality of inspection teams. This was evidenced in Puerto Rico following Hurricane María, where journalistic investigations documented irregularities in how inspectors were trained by the companies contracted to perform these key tasks<sup>10</sup>. It must be noted that inspectors do not determine applicant eligibility—this is FEMA’s responsibility. Although public documentation from the agency does not provide ample details, internal reports suggest that eligibility is determined through the application of both automated and manual business rules through FEMA’s National Emergency Management Information System- Individual Assistance (NEMIS-IA)<sup>11</sup>.

Once an eligibility decision is made, FEMA communicates this information to the applicant, as well as details regarding the kinds of assistance they are eligible or ineligible to receive. In addition, FEMA also provides information on the amount of assistance received and the proper use of funds and how to document their use. If assistance is denied, FEMA explains the reasons and applicants have the opportunity to appeal within 60 days of the eligibility determination. Decisions regarding appeals are usually answered within 90 days, and that determination is considered final. Despite the straightforward appearance of IHP rules and regulations, a post disaster assessment of the program’s performance following the 2017-2018 disaster season carried out by the federal United States Government Accountability Office (GAO) (2020), showed that survivors and local emergency management personnel faced numerous challenges in understanding rules and procedures, information sharing, coordinating efforts with FEMA and thus accessing much needed aid.

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Irma and María is \$33,300. See Federal Register, Vol. 81, No. 197, p. 70431, <https://www.govinfo.gov/content/pkg/FR-2016-10-12/pdf/2016-24626.pdf> (Accessed June 24, 2020).

<sup>8</sup>. Inspections may also allow FEMA to determine residence ownership (Ibid., 54)

<sup>9</sup>. This insight was obtained through informal interviews we conducted with several individuals who worked as field inspectors for the IA Program following Hurricane María.

<sup>10</sup> See Rebecca Banuchi, “Llueven las denegatorias de asistencia por parte de FEMA en Puerto Rico,” Centro de Periodismo Investigativo. February 5, 2018, <http://periodismoinvestigativo.com/2018/02/llueven-las-denegatorias-de-asistencia-por-parte-de-fema-en-puerto-rico/> (Accessed March 23, 2020)

<sup>11</sup>. See “Privacy Impact Assessment for the Individual Assistance (IA) Program” DHS/FEMA/PIA-049, January 11, 2018, <https://www.dhs.gov/sites/default/files/publications/privacy-pia-fema-049-ia-january2018.pdf> (Accessed March 23, 2020).

## DATA AND GENERAL PATTERNS

The data used was provided by FEMA through the OpenFEMA web platform<sup>12</sup>. The dataset contains applicant-level information for the Individuals and Households Program (IHP) and is compiled from the National Emergency Management Information System, which is used to process all IA cases. The raw dataset, which is an important addition to FEMA's data products, includes information for multiple large disasters, but only those cases pertaining to Hurricane María in Puerto Rico were used.

To prepare the data for analysis, two issues needed to be addressed: (1) duplicate cases and (2) inconsistencies in identifying the municipality where each household was located. When removing duplicate observations from the data we abstained from removing those that could not be unequivocally deemed as duplicates<sup>13</sup>. Regarding the location of each IA applicant household, many of the entries in the FEMA dataset contain spelling errors and misspecified locations at the municipal level. To remedy this, we used the US Census block group field included in the dataset to match the county identifier with a specific municipality<sup>14</sup>. After removing duplicate records and correctly identifying municipal locations, the dataset yielded 1,066,288 observations<sup>15</sup>. Each record corresponds to an applicant household.

The median household size of all FEMA IA applications is 2.16 persons, which amounts to 2.304 million persons in applicant households. Median gross income for applicant households was \$13,056, and 49.89% of applicant households reported incomes below the federal poverty line. With regards to tenure, 69.08% of applicant households were owner occupied and 30.02% of applications were submitted by renters—0.60% of households were registered as "unknown". After grouping multiple residence type categories recorded in the FEMA data, our estimates show that 78% of applicants resided in single family homes, while 21.45% resided in multifamily or other type of dwelling.

**Error! Reference source not found.** compares these summary figures with the 2017, 5-year Census estimates for Puerto Rico. As can be observed, median income and median household size for FEMA

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<sup>12</sup>. The dataset used is the "Individual Assistance Housing Registrants Large Disasters -V1". This file can be found at: <https://www.fema.gov/api/open/v1/IndividualAssistanceHousingRegistrantsLargeDisasters.csv>

<sup>13</sup>. The difficulty lies in that the data are not personally identifiable and do not come with a unique identifier for each IA application. Also, observations where FEMA did not conduct an inspection do not have complete data and geographic location specificity is limited. This makes it hard to differentiate duplicates across different IA applications which were registered in the same census block and were not inspected. For these reasons, only duplicates for inspected and assisted applicants that shared identical entries across all variables were removed.

<sup>14</sup>. We used the unique Census block group identifier to tie it to its corresponding Federal Information Processing System (FIPS) code to determine the correct municipality for each observation.

<sup>15</sup>. A total of 73,202 observations pertaining to Hurricane María in Puerto Rico were removed from the original dataset.

IA applicants is noticeably lower than those reported by the Census Bureau. This could partly be due to the fact that the IA program is focused on aiding under or uninsured households who tend to have lower incomes than households with home insurance coverage. Nonetheless, this does not necessarily mean that wealthier households that were affected by Hurricane María are underrepresented in the IA dataset. Considering homeowners' insurance as a proxy for wealthier households, data from the Puerto Rico Office of the Commissioner of Financial Institutions show that around 199,928 households in the island filed residential property claims associated with Hurricane María, and 133,601 received payouts from private homeowners' insurance companies<sup>16</sup>. According to FEMA's IA data, around 160,000 applicant households had homeowners' insurance, which represents 80% of the total households that received private insurance payouts. Given the widespread destruction caused by Hurricane María, over 66% of the population is estimated to live in applicant households.

Table 1: Comparison between FEMA IA Data and Census Figures in Puerto Rico

	FEMA IA	2017 PRCS
Population	2,303,442	3,468,963
Housing Units	1,066,288	1,222,606
Mean Household Size	2.16	2.81
Median Household Income	\$13,056.00	\$19,775.00
Percent Under Poverty Line	49.89%	44.90%
Percent Owner Occupied	69.08%	68.50%
Percent Renter Occupied	30.32%	31.50%
Percent Single Family Units	78.55%	81.43%
Percent Multi-Family Units	15.41%	18.37%
Percent Mobile Home or Other	6.04%	0.20%

Source: OpenFEMA; US Census Bureau- Puerto Rico Community Survey (PRCS)

For the most part, FEMA determines damages and losses through onsite inspections although alternate methods, in cases where onsite visits are unfeasible, are also employed. Nonetheless, the submission of an IA application does not ensure that an inspection will follow. According to the FEMA IA data for Hurricane María in Puerto Rico, only 67% (715,145) of applicant households were inspected. The data does not provide any indication of why 33% of applicant households were not inspected. Official FEMA documents indicate that applications are reviewed to determine if an inspection order is issued. If the applicant has no insurance or their coverage is insufficient to meet their need, FEMA issues an inspection to verify damages. Nonetheless, the Puerto Rico IA data indicates that close to 285,542 applications were not issued an inspection order despite not having either homeowners or flood insurance. According to FEMA, there are numerous reasons why

<sup>16</sup> The data from the Office of the Commissioner of Insurance was provided upon the researchers' request. The summary report's date is June 30, 2021.

inspections are not issued or completed, including: incomplete applications, applicant is insured or the application was withdrawn, amongst many others.

According to the IA data, over 420,000 households were determined by FEMA to have suffered some type of residential or personal property damage, and the average damage per affected and inspected household amounted to \$3,835 dollars. The number of damaged applicant households represents 35% of all occupied housing units in Puerto Rico in 2017. Housing damages are classified along four main categories: roof damage, flood damage, foundation damage and destroyed households. However, it should be noted that these categories do not cover the entirety of possible damages identified by field inspectors. For example, broken windows, damaged doors or fallen fences might be recorded by a field inspector, but would not be classified under the aforementioned damage categories.

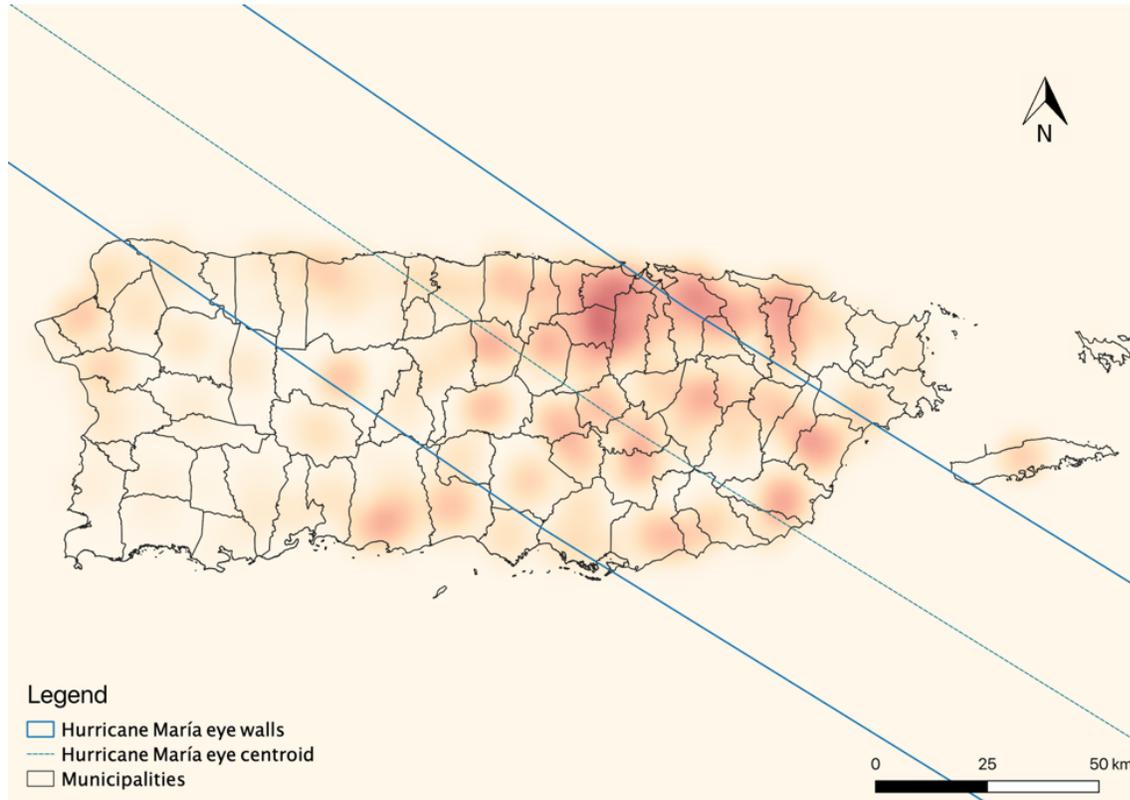
Table 2 provides detailed figures regarding the number of applications that were inspected and determined to have suffered some type of housing damage. As the data indicates, roof damage was the most prevalent kind of structural harm that affected residential units in Puerto Rico. Figure 1 presents a map that depicts the distribution of total housing damage across municipalities in the island. As the map shows, municipalities that were in the path of the eye and walls of the hurricane, specifically those in the southeast and northeast of the island, had higher estimated damages.

Table 2: Housing Damages in Puerto Rico

Occupied housing units in Puerto Rico	1,222,606
Homes with damages	423,620
Percent of damaged homes	35%
Aggregate damage	\$1,624,860,341.93
Average home damage	\$3,835.66
Average damage per occupied units	\$1,329.01
Total homes destroyed	4,502
Total homes with flood damage	21,405
Total homes with roof damage	126,994
Total homes with foundation damage	13,411

Source: OpenFEMA; 2017 US Census Bureau- Puerto Rico Community Survey (PRCS)

Figure 1. Heatmap of total household damage, as estimated by FEMA’s Individual Assistance program.



Under the IA program, FEMA provides several types of assistance. Our analysis is focused on the Housing Assistance subprogram which covers damages to residential and personal property—including furniture and essential equipment to meet household needs. Table 3 summarizes how assistance was disbursed.

Table 3: Housing Assistance through the IA Program

Total homes that received monetary housing assistance	206,121
Percent of damaged homes that received assistance	48.65%
Aggregate housing monetary assistance	\$648,986,674.75
Total homes that received Transitional Sheltering Assistance	6,589
Total homes that received rental assistance	133,026
Average rental assistance amount	\$892.78
Total homes that received repair assistance	133,680
Average repair assistance amount	\$3,459.37
Total homes that received home replacement assistance	2,251
Average home replacement assistance	\$29,928.97
Percent of destroyed homes replaced	50%

Source: OpenFEMA

Although over 420,000 of inspected homes were deemed to have suffered some form of damage, less than half (48.7%) were eligible for and received some form of housing assistance for home rental, repair or replacement. Similarly, only 6,589 households took advantage of the Transitional Sheltering Assistance (TSA) program, which provides short-term lodging for disaster survivors who are unable to return to their pre-disaster primary homes. It must be noted that TSA is different from the rental assistance program, which provides owners and renters the opportunity to rent a housing unit (initially for two months, but may be extended) if they have become displaced from their primary home as a result of the disaster.

The two most common forms of housing assistance were rental and repair assistance; over 133,000 applicant households received these benefits. The average repair amount provided by the FEMA IA program was \$3,459, which is \$376 less than the average damage per applicant household determined by FEMA. With regards to home replacement assistance, only 2,251 applications received this benefit, which represents half of FEMA verified destroyed homes. In addition, the average home replacement assistance was \$29,928.

When broken down by tenure status, the distribution of assistance, by program, varies greatly (Table 4). As expected, per program guidelines, repair assistance was overwhelmingly adjudicated for homeowners, but only 18% of these households were recipients. For rental assistance, renters were much more benefited when compared to repair assistance, but only 10% of them received aid from this program. Curiously, a larger share of homeowners (13%) received rental assistance. Finally, replacement assistance was completely allocated for homeowners. Households that were deemed to have “unknown” tenure status were almost completely excluded from these programs. These trends are consistent with the claims made by journalists, grassroots organizations and advocates in Puerto Rico. As explained by Martín (2019, 5) “From disaster damage assessments to final permits on rebuilt homes, there is a chain of data collections, analyses, and decisions that are always complicated, often inconsistently regulated, and likely to leave gaps through which the neediest and underserved disaster-affected households may be slipping”.

Table 4: IHP assistance distribution by tenure status

Tenure status	Any assistance		Rental Assistance		Repair Assistance		Replace Assistance		Total number of applicants
	Applicants that received assistance	Percent total							
Homeowner	172,164	23.37%	99,106	13.46%	133,533	18.13%	2,251	0.31%	736,566
Renter	33,870	10.47%	33,850	10.47%	77	0.02%	0	0.00%	323,347
Unknown	87	1.36%	70	1.10%	70	1.10%	0	0.00%	6,375
<b>Total</b>	<b>206,121</b>	<b>19.33%</b>	<b>133,026</b>	<b>12.48%</b>	<b>133,680</b>	<b>12.54%</b>	<b>2,251</b>	<b>0.21%</b>	<b>1,066,288</b>

Source: OpenFEMA

## MODELS AND RESULTS

Previous studies on federal assistance disbursed during early post disaster periods showed that award allocation is negatively associated with poverty and renter status. These studies, however, looked at award allocations specifically at an aggregate level (either at zip code level or Census tract level). These studies did not show a more granular analysis, nor did they also consider geographic vulnerability to disasters, and neither did they examine possible patterns of exclusion during different stages of the program's administrative sequence. As mentioned above, after the impact of Hurricane María, numerous grassroots organizations and press outlets highlighted that poor households, households without secure land tenure, and those living in geographically vulnerable areas were not likely to receive federal aid. The FEMA IA data allowed us to examine how these factors come into play when determining how relief aid is allocated. Therefore, our strategy attempts to trace outcomes at different stages, as per the published administrative guidelines, to determine if key populations were unattended or excluded by highlighting three important identifiers at the individual household level: poverty, residential tenure status, and geographic vulnerability<sup>17</sup>. It is also worth considering that the different stages of the assessment and approval outcomes reflected in the regressions discussed below are not mechanically sequenced. As the federal court cases mentioned earlier have underscored, eligibility decisions are quite opaque and have raised concerns that FEMA officials employ "secret rules" when evaluating IHP applications.<sup>18</sup> Moreover, many of the informal interviews we conducted revealed that frontline field workers and bureaucrats exercise considerable discretion. This is hardly surprising, especially given the extensive literature on frontline worker discretion in decision making (see Høybye-Mortensen, 2015; Tandler, 1997; Ellis, 2011; Evans, 2010; and Oberfield, 2009). Thus, our models were designed to consider possible deviations from the standard norms and eligibility requirements for the IA program<sup>19</sup>.

We conducted several regression analyses to determine key determinants to post disaster aid for IA applicants. It must be noted that determining who receives aid is a complex undertaking given

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<sup>17</sup> Geographic vulnerability stems from underlying conditions that might exacerbate vulnerability, given the location of the housing unit. Since we included a measure of exposure to the hurricane's trajectory and eye walls, we considered it important to incorporate a proxy measure of neighbourhood infrastructure and housing quality.

<sup>18</sup> See Mose Buchele, "Questions Persist over How FEMA Decides Who Gets Help," KUT 90.5. September 22, 2017, <https://www.kut.org/post/questions-persist-over-how-fema-decides-who-gets-help> (Accessed June 24, 2020)

<sup>19</sup> The data clearly demonstrates numerous deviations from the administrative guidelines. For example, numerous non-primary homes were inspected and some non-inspected homes received monetary assistance from the IA program.

administrative rules, the limitations of the public data provided by FEMA, and perhaps more importantly, the discretion exercised and opaqueness of agency procedures. To gain a better understanding of aid provision, our analyses follow the administrative sequence that FEMA employs when awarding IA funds, specifically: the selection process for field inspection, damage estimates, determination of assistance eligibility, and disbursement of award amount. We also modeled the difference between damage estimates and the amount of assistance disbursed per household, which we labeled as “pending housing need”<sup>20</sup>, as a dependent variable.

We calculated eight regressions for each stage of the assessment and award process, with two distinct models: ordinary least squares (OLS) for continuous dependent variables and logistic regressions for binary dependent variables. We incorporated numerous variables stemming from the IA public dataset and others calculated using US Census and other geographic-level data. These variables allowed us to control for poverty status, tenure status, insurance status, eligibility for SBA loans, residence type, geographic vulnerability, hazard exposure, and damages (See Table 5). We also included municipal-level fixed-effects to account for location-specific invariant factors. Tenure status, insurance status, residence type and damages are already reported in the IA database. Flood and homeowner’s insurance likely proxy for higher-quality housing that conforms to building codes. We used household income and size to determine if each applicant was under or over the US poverty line, using the Census formula for calculating poverty as a reference.

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<sup>20</sup> We used the term “pending housing needs”, and not “unmet needs” since the latter is an official term used in relation to HUD’s CDBG-DR funds, and refers to those needs that have gone unaddressed after federal and private funds have been disbursed.

Table 5: Housing Assistance through the IA Program

Variable	Variable type	Description
Inspected household	Binary	1 = inspected
Total estimated damage	Continuous	Sum of total estimated damages determined by FEMA
Assistance eligibility	Binary	1 = eligible for assistance
Total monetary assistance	Continuous	Sum of total monetary assistance awarded by FEMA
Pending housing need	Continuous	Difference between total damages and total monetary assistance
Household is under poverty line	Binary	1 = household is under poverty line
Household is a renter	Binary	1 = household is a renter
Household has unknown tenure	Binary	1 = household tenure status is unknown
Household has homeowner insurance	Binary	1 = household has homeowner's insurance
Household has flood insurance	Binary	1 = household has flood insurance
Household is deemed eligible for SBA loans	Binary	1 = household is eligible for SBA Loans
Damaged property is primary residence	Binary	1 = household's damaged property is primary residence
Household lives in multifamily housing	Binary	1 = household lives in multifamily housing
Household lives in mobile or other housing	Binary	1 = household lives in mobile or other type of housing that is not single-family or multifamily
Household lives in a Special Community	Binary	1 = household property is located in a Special Community
Household is located in the hurricane path	Binary	1 = household property is located within Hurricane María's path and eye walls
Household's residence was destroyed	Binary	1 = household property was deemed "destroyed" by FEMA inspectors
Household's residence suffered flood damage	Binary	1 = household property was flooded, as determined by FEMA inspector
Household's residence suffered roof damage	Binary	1 = household property suffered roof damage, as determined by FEMA inspector
Household's residence suffered foundation damage	Binary	2 = household property suffered foundation damage, as determined by FEMA inspector

The US Census block group location of each applicant also allowed us to generate additional geographic variables related to hazard exposure and geographic vulnerability. Using the NOAA hurricane best track<sup>21</sup> GIS files, hazard exposure was determined as a binary variable that identifies if each block group falls within the path and eye walls of Hurricane María<sup>22</sup>, which is the area with the highest probability of winds and rainfall. The eye walls were delimited as buffers, which are represented as polygons in the GIS software. Geographic vulnerability was proxied by determining if each household is located in a Special Community, as identified in the GIS files made available by the Puerto Rico Planning Board. These control for local fixed-effects, external environmental conditions (in the form of the hurricane pathway), and clustered standard errors at the Census Block Group level help reduce possible sources of spatial endogeneity.

Our first regression (Table 6) measured the likelihood that an IA application would be inspected (Regression 1). According to FEMA directives, inspection is a required step for receiving any kind of aid. As per FEMA administrative procedures, households claiming to lack formal property title were almost always inspected to verify tenure status, thus explaining the extremely high odds ratio value for the “unknown tenure status” variable. The regression coefficients indicated that applicants under the poverty line or located within vulnerable communities were more likely to have been inspected. On the other hand, renters and households living in non-single-family units were less likely to be inspected. While homeowner insurance was not a significant determinant of inspection likelihood, having flood insurance would slightly increase the likelihood of inspection. SBA loan eligible applicants were also significantly more likely to be inspected. Considering that both SBA loan eligibility and homeowners’ insurance proxy for wealthier households, the fact that each significantly increase the likelihood of inspection seems counterintuitive and contrary to the FEMA IHP Guidelines. Also, applications submitted for primary residences proved to be one of the most significant factors in determining the likelihood of inspection, although, per FEMA regulations, should have been perfectly collinear in the model, since non-primary residences should not be eligible for funding. Nonetheless, because FEMA verifies applicant documentation and other eligibility requirements through an onsite inspection, it is probable that some non-primary residences were approved for inspection for these reasons. That applicants with flood insurance are more likely to have been inspected may be a function of the coverage thresholds and the level of flood damage suffered by the applicant home. The model, for the most part, accurately predicts inspection determinants based on

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<sup>21</sup> Publicly available data for the best-track estimates for storm events can be accessed in the following National Hurricane Center website: <https://www.nhc.noaa.gov/data/tcr/index.php?season=2017&basin=atl>

<sup>22</sup> The eye diameter of Hurricane María was measured to be approximately 28 nautical miles (or roughly equal to 51 km) right before making landfall in Puerto Rico on September 20, 2017. María’s maximum winds, when its centre crossed the southeast of the island, were near 250 kmh, which is very close to category 5 status. Wind speeds decreased once the system interacted with the landmass, and when the hurricane’s centre left the northwest end of the island, maximum winds were estimated to be 175 kmh. More information here: [https://www.nhc.noaa.gov/data/tcr/AL152017\\_Maria.pdf](https://www.nhc.noaa.gov/data/tcr/AL152017_Maria.pdf)

the conditions of eligibility established in FEMA IHP Guidelines. Households that live in Special Communities or are within Hurricane María's path and eye walls are more likely to be inspected, showing that geographical vulnerability and exposure to hazard were also strongly associated with increased likelihood for inspection.

Table 6: Regression results. Note: Standard errors are clustered at the block group level; \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ ; standard errors in parenthesis.

Regression	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	Inspected household	Total estimated damage	Assistance eligibility	Assistance eligibility	Total monetary assistance	Total monetary assistance	Pending housing need	Pending housing need
Model	Logistic	OLS	Logistic	Logistic	OLS	OLS	OLS	OLS
Inspected household			4.110*** (0.145)	3.788*** (0.125)	100.616*** (3.795)	77.206*** (3.375)		
Household is under poverty line	3.179*** (0.029)	432.444*** (15.285)	2.524*** (0.020)	2.563*** (0.019)	104.581*** (4.905)	105.747*** (4.963)	20.690* (11.530)	34.402*** (11.455)
Household is a renter	0.801*** (0.008)	-1,144.2*** (39.076)	1.110*** (0.012)	1.097*** (0.011)	-338.793*** (8.577)	-342.510*** (8.469)	1240.38*** (406.639)	1,240.78*** (407.168)
Household has unknown tenure	528,608*** (531,786)	-983.601*** (20.677)	0.372*** (0.035)	0.378*** (0.037)	-222.579*** (11.564)	-205.265*** (11.274)	-1741.13*** (596.798)	-1,763.8*** (597.616)
Household has homeowner insurance	0.937*** (0.010)	-907.007*** (19.068)	0.231*** (0.005)	0.224*** (0.004)	-493.571*** (9.021)	-495.496*** (8.608)	479.930*** (12.459)	457.286*** (13.160)
Household has flood insurance	1.028* (0.015)	-306.183*** (25.198)	0.836*** (0.020)	0.824*** (0.021)	-168.692*** (8.706)	-168.427*** (8.896)	180.709*** (20.853)	169.434*** (21.069)
Household is deemed eligible for SBA loans	3.364*** (0.051)	362.576*** (29.842)	1.328*** (0.021)	1.252*** (0.019)	215.974*** (13.191)	199.465*** (13.137)	-73.487*** (16.768)	-65.304*** (16.482)
Damaged property is primary residence	124.469*** (5.595)		20.951*** (1.554)	22.748*** (1.677)	65.025*** (3.888)	90.435*** (4.667)	-3,197.1*** (561.811)	-3,216.8*** (560.959)
Household lives in multifamily housing	0.676*** (0.010)	238.688*** (27.201)	.982 (0.014)	0.96*** (0.012)	53.942*** (3.771)	48.217*** (4.054)	-18.182 (27.694)	-88.069*** (28.582)
Household lives in	0.071***	-1,282.6***	0.496***	0.516***	-74.788***	-65.456***	-8,564.9***	-8,480.7***

<b>Regression</b>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
mobile or other housing	(0.001)	(126.047)	(0.013)	(0.013)	(4.327)	(4.480)	(1,198.497)	(1,183.438)
Household lives in a Special Community	1.212*** (0.042)	172.238*** (42.546)	1.076* (0.028)	1.038*** (0.011)	52.675*** (13.997)	12.713* (7.484)	29.680 (22.542)	18.254 (15.430)
Household is located in the hurricane path	1.424*** (0.038)	315.948*** (27.799)	1.268*** (0.025)		133.163*** (9.295)		18.057 (16.138)	
Household's residence was destroyed		114,937*** (1,158.62)	25.270*** (1.727)	23.611*** (1.690)	19,073.4*** (286.984)	19,018.9*** (282.759)	122,643.*** (459.356)	122,657*** (451.935)
Household's residence suffered flood damage		3,918.74*** (97.618)	14.845*** (0.423)	15.630*** (0.455)	1,458.03*** (32.306)	1,443.65*** (32.083)	304.624*** (18.662)	285.980*** (20.820)
Household's residence suffered roof damage		3,683.84*** (29.641)	7.085*** (0.110)	7.328*** (0.111)	2,768.36*** (23.092)	2,759.85*** (23.182)	331.016*** (8.828)	340.053*** (9.078)
Household's residence suffered foundation damage		635.513*** (52.648)	2.544*** (0.076)	2.409*** (0.072)	728.313*** (46.779)	704.956*** (46.768)	35.329** (17.647)	47.039*** (18.288)
Constant	0.011*** (0.001)	734.284*** (25.081)	0.003*** (0.000)	0.003*** (0.000)	62.728*** (7.545)	262.585*** (28.238)	3,425.52*** (563.240)	3,252.32*** (564.361)
Municipal fixed effects included	No	No	No	Yes	No	Yes	No	Yes
R-squared or pseudo R-squared	0.1574	0.6983	0.2629	0.2723	0.3875	0.3893	0.9575	0.9576
F-statistic or Chi-squared	57,456.17	1,944.03	65,273.73	212,239.38	1,442.74	1,217.53	15,390.41	8,060.21
Observations	1,066,261	715,145	1,066,261	1,066,261	1,066,261	1,066,261	280,272	280,272

There are likely numerous other variables not included in our dataset that are key to determining the likelihood of inspection. The undisclosed guidelines alluded to in federal court proceedings and the discretion exercised by FEMA officials may be among the unknown factors that affect the likelihood of inspection.

The second regression (2) measured the contribution of numerous variables to the damage estimates verified by FEMA (which include personal and residential property) in US dollars. The results show that if applicants were living under the poverty line, were located in a special community, or were located within the hurricane's path and eye walls, they had greater damage estimates on average, which is somewhat unexpected given that poorer households tend to reside in older, lower quality homes. However, many lower income households in Puerto Rico are likely to reside in higher risk areas, which could partly account for the higher damage estimates. Moreover, applicants with flood or homeowner insurance reported lower levels of damage, while applicants eligible for SBA loans tend to increase estimated damages by \$362, on average, which shows that there's a mixed picture regarding how wealthier households fared. Estimated damages for homeowners, on average, tended to be higher. Multifamily homes tended to have more damages, on average, than those living in single family or other kinds of homes. With regards to types of damages, the analysis demonstrates that roof or flood damages tend to increase the levels of home damage the most (each around \$4,000). Homes with foundation damage observed an average increase of \$635 in damages while destroyed homes reported an increase, on average, of over \$115,000 in damages. This is consistent with the median home price in Puerto Rico, which was calculated at \$111,990 in 2016, according to the US Census Puerto Rico Community survey. The model used in this regression accounted for 70% of the variation observed in total damages, as reflected in its R-squared value.

The third (3) and fourth (4) regressions modeled the likelihood for an applicant to be deemed eligible to receive FEMA assistance. Both models are logistic regressions, with model four (4) controlling for municipal fixed effects. Despite controlling for these fixed effects, results remained consistent. The dependent variable, assistance eligibility, is a binary variable conditioned on the applicants being identified by FEMA to be eligible for at least one of four aid types: rental assistance, repair assistance, home replacement and personal property assistance. Not included in this group is temporary sheltering assistance since over 90% of applicants were deemed eligible to participate in this program despite the fact that less than one percent of eligible applicants made use of this assistance.

Results show that, consistent with FEMA's IHP Guidelines, inspected applicants are four times more likely to be deemed eligible for assistance than non-inspected applicants. Likewise, applications for primary residence increase the likelihood for assistance by a factor of more than twenty, which is also expected but, again, indicates that FEMA did allow exceptions for residences that were not classified as primary. Exposure to damages and destroyed homes also increased the likelihood of assistance eligibility significantly, ranging from a factor of 2.5 (for foundation damage) to a factor of 25 (for destroyed homes). Unknown tenure status and homeowners' insurance, on the other hand, yielded the largest negative effect by decreasing eligibility likelihood by a factor of 2.7 and 4.3, respectively, even after controlling for poverty, geographic vulnerability, exposure to hazard, damages, and municipal fixed effects, which is expected per FEMA guidelines for the insured, and is consistent with claims by grassroots organizations in the case of applicants with titling issues.

The fifth (5) and sixth (6) regressions show how the same variables from regressions three and four (3) and (4) relate to total monetary assistance. Total monetary assistance reflects the total aid awarded by FEMA in the form of rental assistance, repair assistance, and home replacement. Again, as with assistance eligibility, inspected applicants would receive larger amounts of assistance than non-inspected households— which seems intuitive but should have been perfectly collinear if program guidelines were strictly followed. Poverty, geographic vulnerability, and exposure to hazards also significantly increased the average monetary assistance awarded to households (although geographic vulnerability is significant at the 90% confidence interval). Monetary assistance awards were larger for homeowners than for renters and households with unknown tenure, further showcasing how tenure insecurity increases the likelihood of ineligibility. At the same time, households living in multifamily units received, on average, an increase between \$48 and \$54 in monetary assistance, which is unusual since single family units are more prone to suffer from roof and foundation damage—the costliest types of damages according to the data. Having flood insurance could reduce monetary assistance by an average of \$168 dollars, while having homeowner’s insurance reduced assistance awards by more than \$490 dollars on average. These last findings are well in line with FEMA IA guidelines.

Households that suffered foundation damage received an average increase of more than \$700 in their total award. Households that suffered roof damage saw increases in awards of more than \$2,700, while those that suffered flooding would receive increases in assistance of more than \$1,400. Destroyed homes received an average increase of \$19,000 in total monetary assistance, still well below the maximum award of \$33,300 designated by FEMA.

It should be noted that our empirical focus in models 5 and 6 is to assess the likelihood and the differences in award allocation for households with differing characteristics to receive any form of assistance that could potentially address their needs, as established in verified damage estimates. When focusing on the programs separately, however, the data show similar trends to the ones in the regressions shown. For example, a larger share of homeowners were deemed eligible for rental assistance when compared to renters (Table 4). Also, homeowners received higher rental assistance payments on average (\$911) when compared to renters (\$838).

Regressions seven (7) and eight (8) model the relationship between pending housing need and the same variables as in regressions three (3) and four (4), excluding field inspection. Our results show that pending housing needs are significantly lower for households with unknown tenure, those that experienced damages in their primary residence, and those that live in multifamily housing and mobile or other types of non-single-family housing. Being a renter increases pending housing needs by more than \$1,240 on average, which is consistent with previous results and FEMA guidelines. Households with homeowner’s insurance or flood insurance also saw significant increases in their

pending housing need, although this is expected given that the underlying assumption is that their respective insurance policies would cover their damages. Households that suffered flood damage or roof damage increased their pending housing need by an average of more than \$300, while households with destroyed homes saw an average increase in pending housing need of more than \$120,000.

Particularly notable is the relationship between pending housing needs and poverty, geographical vulnerability, and exposure to hazards. While exposure to hazards does not have a significant effect over pending housing needs, and neither does geographical vulnerability after controlling for municipal fixed effects, households living under the poverty line saw an average increase in pending housing need of between \$20 and \$34, even after controlling for damages and municipal fixed effects. The policy concern that arises with this last finding is that households living under poverty are less likely to receive other forms of immediate relief aid (such as SBA loans) and are left waiting for more long-term reconstruction funding, such as the Community Development Block Grant - Disaster Recovery (CDBG-DR) funds administered by the Department of Housing and Urban Development (HUD). Thus, poor households are left with a greater burden in the form of pending housing needs, while they are left in a temporal limbo between funding disbursements of different federal programs, making them more susceptible to displacement.

Interestingly, regressions seven (7) and eight (8) have the largest predictive ability among all the models in our study with an r-squared greater than 0.95.

To corroborate the main findings in the previous regressions, we also performed a series of inverse probability weighted regressions (IPWR) to determine the average treatment effect (ATE) of the poverty and special community variables, using the same dependent variables. For the binary dependent variables, we used a probit model as the outcome and treatment model, while non-binary dependent variables were regressed using a linear model for the outcome model and probit for the treatment model. The table below (Table 6) shows the results, where the average marginal effect (AME) of the original regressions is compared to the ATE of the IPWR. These models do not include municipal-level fixed-effects, but were also regressed using the other independent variables from Table 5. These results are consistent with those detailed above, where the magnitude, direction and statistical significance hold close proximity to those of the IPWR.

Table 7: IPWR and original regression comparison results. Note: Standard errors are clustered at the block group level; \*p<0.1; \*\*p<0.05; \*\*\*p<0.01; standard errors in parenthesis; "N/A" indicates that the model could not converge to a solution.

Regression	Original	IPW	Original	IPW	Original	IPW	Original	IPW	Original	IPW
<b>Dependent variable</b>	Inspected household	Inspected household	Total estimated damage	Total estimated damage	Assistance eligibility	Assistance eligibility	Total monetary assistance	Total monetary assistance	Pending housing need	Pending housing need
<b>Treatment model</b>	N/A	Probit	N/A	Probit	N/A	Probit	N/A	Probit	N/A	Probit
<b>Outcome model</b>	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Household is under poverty line	0.215*** (0.002)	0.182*** (0.001)	432.444*** (15.285)	451.848*** (18.244)	0.141*** (0.002)	0.167*** (0.002)	104.581*** (4.905)	127.837*** (5.520)	20.690* (11.530)	19.790 (12.273)
Household lives in a Special Community	0.033*** (0.010)	0.024** (0.009)	172.238*** (42.546)	159.101*** (37.323)	0.012*** (0.004)	0.014*** (0.005)	52.675*** (13.997)	49.862*** (12.685)	29.680 (22.542)	25.601 (19.335)

## CONCLUDING THOUGHTS

Our research provides a point of departure for a deeper understanding regarding access and distribution of disaster relief assistance for housing needs through FEMA’s IA Program. The analysis presented demonstrates that, at the aggregate level, households were not likely to be excluded from receiving emergency aid based on poverty status and geographic vulnerability. In fact, poor and/or vulnerable applicants were more likely to have been inspected and receive increased monetary assistance.

Our analysis does not disprove the numerous discrepancies in the way FEMA inspectors and officers determined eligibility, damages and awards, especially for households lacking clear property titles, as expressed in numerous journalistic inquiries. In fact, we found that tenure status matters, and is a major factor to determine the likelihood that an applicant household can access FEMA IA funds. Applicants with “unknown” tenure status and renters fare significantly worse off than homeowners, with regards to the eligibility and receipt of relief aid, even after controlling for socioeconomic, geographic and other key variables. Although the situation with renters is not surprising, given program rules and designs, lacking clear tenure status should not limit applicants from receiving aid. In fact, FEMA had administrative provisions to deal with these cases<sup>23</sup>. Nonetheless, legal advocates

<sup>23</sup> According to the Individuals and Households Program Unified Guidance (IHPUG): “If the listed documentation is unavailable, as a last resort, FEMA may accept a written statement from the applicant indicating how long they lived in the disaster-damaged residence prior to the Presidential disaster declaration. The statement must also include an explanation of the circumstances that prevent standard occupancy verification (e.g., insular areas, islands, tribal lands)” (Ibid., 16).

and support organizations in Puerto Rico had to battle the agency to ensure that these provisions were followed<sup>24</sup>. While some applicants lacking clear tenure status were able to successfully appeal their denial of aid, the vast majority were either unable to file an appeal or were denied assistance (United States Government Accountability Office 2020). These lessons should inform future policy and procedural improvements.

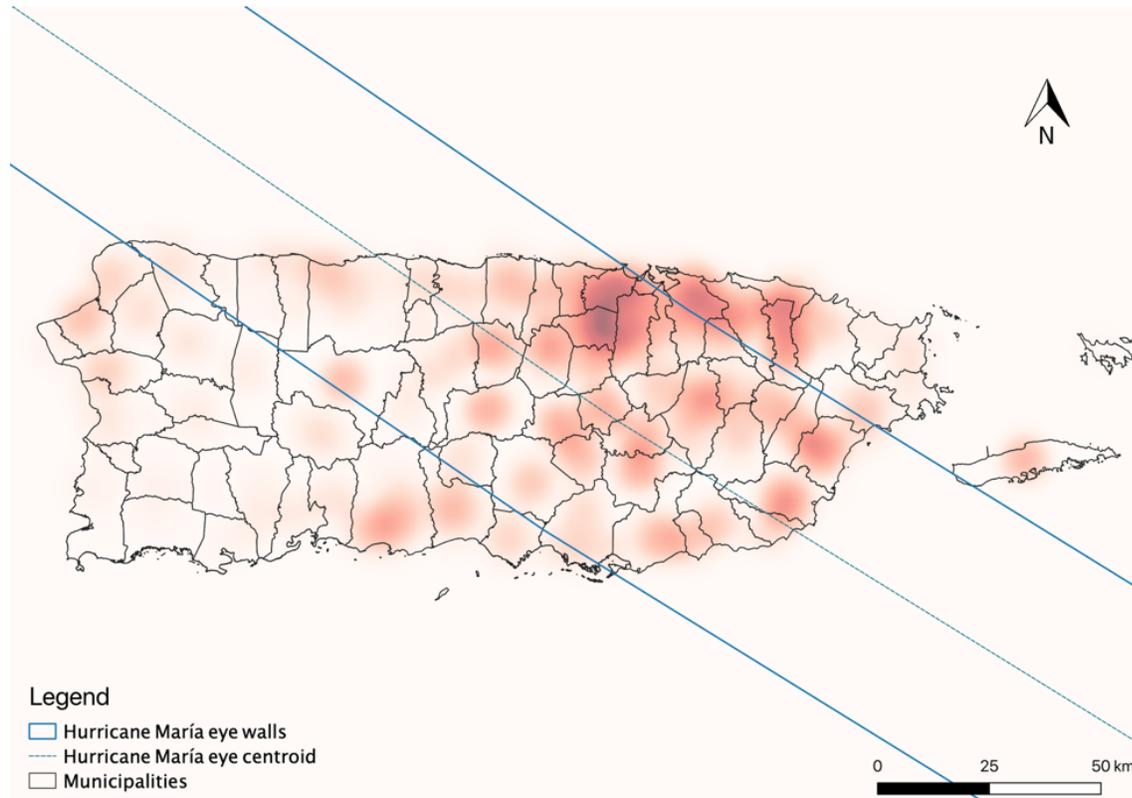
As prior studies have shown, damages were a significant determinant to receive assistance (Loukaitou-Sideris and Kamel 2004). Households whose homes were destroyed stood to receive the largest amounts, followed by roof and flood damage. This does not mean that all inspected households with damages received assistance—less than half of inspected units did. According to housing inspectors and officers we interviewed informally, and prior claims made in federal court cases (Rivera, 2019), a high level of administrative discretion and arbitrariness in determining eligibility affect the disbursement of aid. Indeed, this has been a consistent claim from other federal government agencies (United States Government Accountability Office, 2020) and multiple advocacy groups (Mickelson et al., 2020). This is still a topic that still merits further research.

Beyond providing a window into how housing assistance was provided through the IA program in Puerto Rico, we believe this data can be used to devise important reconstruction monitoring tools. The damage hotspots presented in Figure 1 provide a starting point for identifying areas that should be prioritized in post disaster planning and hazard mitigation efforts—while also considering that damages were undercounted given the number of homes that were not inspected. Furthermore, by examining the concentration of “pending housing needs” (see Figure 2)—the difference between housing damages to assistance provided by FEMA for repair or replacement of homes—we can also begin to pinpoint places that require focused attention to ensure that the limited amounts of funds that are available to repair or build new homes go to the places and people that need them the most.

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<sup>24</sup> See “Additional Options Available for Applicants to Verify Home Ownership”, FEMA, August 17, 2018, <https://www.fema.gov/news-release/20200220/opciones-adicionales-disponibles-para-que-los-solicitantes-comprueben-la>

Figure 2. Heatmap of total household pending housing need, as estimated from FEMA's Individual Assistance program.



Moreover, we hope that the analysis helps advance a series of conversations regarding the sequencing, coordination and expediency of federal aid programs following large disasters. Program designs and post disaster planning efforts should consider that poor households tend to be left with larger pending housing needs right after a major event, which can increase the probability that these already vulnerable populations will either remain in unfit housing units until reconstruction programs are devised and deployed, or will have to relocate from their communities. Although FEMA has begun to undertake much needed reforms that will hopefully address some of the issues we raised, thanks to the adoption of the 2018 Disaster Recovery Reform Act (DRRA), coordination between federal agencies and local governments—to shorten the time gaps between the emergency response and reconstruction phases—needs to be substantially improved. Furthermore, concrete efforts must be made, at all levels of government, to identify and address the housing needs of poor applicants with large pending housing needs.

With regards to FEMA policies and procedures related to tenure issues, the agency has recently taken steps to address denials of aid related to lack of evidence proving applicants' homeownership. According to the new guidelines, applicants without clear title living on inherited land can self-certify that they are rightful owners and the agency will also admit letters from local officials and repair bills

as proof<sup>25</sup>. While these important administrative changes signal a positive way forward, it will still require that local disaster management agencies, watchdog organizations and advocacy groups monitor its effective implementation. Furthermore, this fundamental change in policy needs to be adopted by other federal and local agencies to ensure that households previously classified as having “unknown” tenure status are adequately served throughout all stages of the disaster recovery process. FEMA should also work diligently to adopt the recommendations raised in 2020 by the GAO regarding its IHP. Priority should be given to recommendations related to the improvement of award notification letters—to clearly indicate that an ineligible determination does not mean that participants cannot continue to pursue assistance, and providing additional information to applicants regarding eligibility determinations—and the need for enhanced training and guidance for internal staff, local officials and other recovery partners regarding the functioning of IHP. Attention should also be given to monitoring housing inspections on-the-ground and ensuring that private contractors adequately and consistently train those deployed to carry out this important task.

As climate change worsens, and climate-related disasters become increasingly frequent and intense, it is important to find and implement the necessary measures to reduce the transition between housing response and recovery after a disaster, as a means to reduce the likelihood of population displacement (Levine, Esnard & Sapat, 2007). Policy and administrative fixes in this direction could go a long way towards making disaster recovery and reconstruction a more just and equitable process.

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<sup>25</sup> See “FEMA Makes Changes to Individual Assistance Policies to Advance Equity for Disaster Survivors,” Federal Emergency Management Agency (FEMA). Press release HQ-21-193, September 2, 2021, <https://www.fema.gov/press-release/20210902/fema-makes-changes-individual-assistance-policies-advance-equity-disaster> (Accessed January 24, 2022).

## REFERENCES

- Ahern, J., & Galea, S. (2006). Social context and depression after a disaster: the role of income inequality. *Journal of Epidemiology & Community Health*, 60(9), 766–770.
- Banuchi, R. (2018, February 5). Llueven las denegatorias de asistencia por parte de FEMA en Puerto Rico. Centro de Periodismo Investigativo. Retrieved from <http://periodismoinvestigativo.com/2018/02/llueven-las-denegatorias-de-asistencia-por-parte-de-fema-en-puerto-rico/>
- Bolin, R., & Bolton, P. (1986). *Race, Religion, and Ethnicity in Disaster Recovery*. Boulder, CO: Institute of Behavioral Science, University of Colorado.
- Bolin, R. & Stanford, L. (1991). Shelter, Housing and Recovery: A Comparison of U.S. Disasters. *Disasters*, 15(1), 24-34.
- Collins, T. (2009). The production of unequal risk in a hazardscape: An explanatory frame applied to disaster at the U.S. Mexico border. *Geoforum*, 40, 589-601.
- Collins, T. (2010). Marginalization, facilitation, and the production of unequal risk: The 2006 Paso del Norte floods. *Antipode*, 42, 258-288.
- De Jesús Salamán, A. (2018, May 20). 8 meses viviendo una pesadilla gracias a FEMA. NotiCel. Retrieved from <https://www.noticel.com/huracanes/8-meses-viviendo-una-pesadilla-gracias-a-fema/742961659>
- Downton, M. W., & Pielke Jr, R. A. (2001). Discretion without accountability: Politics, flood damage, and climate. *Natural Hazards Review*, 2(4), 157–166.
- Ellis, K. (2011). 'Street-level bureaucracy revisited: the changing face of frontline discretion in adult social care in England. *Social Policy & Administration*, 45(3), 221-244.
- Evans, T. (2010). Professionals, managers and discretion: Critiquing street-level bureaucracy. *The British Journal of Social Work*, 41(2), 368-386.
- Fothergill, A., & Peek, L. A. (2004). Poverty and Disasters in the United States: A Review of Recent Sociological Findings. *Natural Hazards*, 32(1), 89–110.
- García, Ivis. (2021). Deemed Ineligible: Reasons Homeowners in Puerto Rico Were Denied Aid After Hurricane María. *Housing Policy Debate*, DOI: 10.1080/10511482.2021.1890633.
- Garrett, T. A., & Sobel, R. S. (2003). The political economy of FEMA disaster payments. *Economic Inquiry*, 41(3), 496–509.
- Girard, C., & Peacock, W. G. (1997). Ethnicity and Segregation: Post Hurricane Relocation. In W. G. Peacock, B. H. Morrow, & H. Galdwin (Eds.), *Hurricane Andrew: Ethnicity, Gender and the Sociology of Disasters*, 191-205. New York: Routledge.
- Gotham, K.F. (2014). Racialization and Rescaling: Post-Katrina Rebuilding and the Louisiana Road Home Program. *International Journal of Urban and Regional Research*, 38.3, 773-790.
- Gould, W. A., Wadsworth, F. H., Quiñones, M., Fain, S. J., & Álvarez-Berrios, N. L. (2017). Land Use, Conservation, Forestry, and Agriculture in Puerto Rico. *Forests*, 8(7), 242.

- Green, T.F., & Olshansky, R.B., (2012). Rebuilding housing in New Orleans: the Road Home Program after the Hurricane Katrina disaster, *Housing Policy Debate*, 22(1), 75-99.
- Grube, L. E., Fike, R., & Storr, V. H. (2018). Navigating Disaster: An Empirical Study of Federal Assistance Following Hurricane Sandy. *Eastern Economic Journal*, 44(4), 576–593.
- Guzman, G. G. (2019). Household Income: 2018 (No. ACSBR/18-01). Retrieved from US Census Bureau website:  
<https://www.census.gov/content/dam/Census/library/publications/2019/acs/acsbr18-01.pdf>
- Høybye-Mortensen, M. (2015). Decision-making tools and their influence on caseworkers' room for discretion. *The British Journal of Social Work*, 45(2), 600-615.
- Instituto de Estadísticas de Puerto Rico. (2018). Informe sobre Desarrollo Humano de Puerto Rico, 2016 (IDH-PR). San Juan, PR.
- Johnson, L. A., & Olshansky, R. B. (2016). *After Great Disasters: How Six Countries Managed Community Recovery*. Cambridge, MA: Lincoln Institute of Land Policy..
- Junta de Planificación, Gobierno de Puerto Rico. (2015). Plan de Uso de Terrenos: Guías de Ordenación del Territorio (PUT). Retrieved from  
[https://jp.pr.gov/Portals/0/Plan%20de%20Usos%20de%20Terrenos/Memorial/Memorial%20PUT%20\(para%20busqueda\).pdf?ver=2017-05-10-161155-587](https://jp.pr.gov/Portals/0/Plan%20de%20Usos%20de%20Terrenos/Memorial/Memorial%20PUT%20(para%20busqueda).pdf?ver=2017-05-10-161155-587)
- Kamel, N., & Loukaitou-Sideris, A. (2004). Residential Assistance and Recovery Following the Northridge Earthquake. *Urban Studies*, 41(3), 533–562. Retrieved from /z-wcorg/.
- Kousky, C. (2013). Facts about FEMA Household Disaster Aid: Examining the 2008 Floods and Tornadoes in Missouri. *Weather, Climate, and Society*, 5(4), 332–344.
- Levine, J. N., Esnard, A. M., & Sapat, A. (2007). Population displacement and housing dilemmas due to catastrophic disasters. *Journal of planning literature*, 22(1), 3-15.
- Martín, C. (2019). Understanding US Housing Data in Relation to the 2017 Disasters. *Natural Hazards Review*, 20(3), 04019007.
- Marvel, L. F. (2008). Listen to What They Say: Planning and Community Development in Puerto Rico. La Editorial Universidad de Puerto Rico.
- May, P. J. (1985). *Recovering from Catastrophes: Federal Disaster Relief Policy and Politics*. Westport, CN: Greenwood Press.
- Mickelson, S. S., Patton, N., Gordon, A., & Ramler, D. (2020). *Fixing America's Broken Housing Recovery System - Part One: Barriers to a Complete and Equitable Recovery*. National Low Income Housing Coalition. Retrieved from:  
[https://www.urbanwaterslearningnetwork.org/wp-content/uploads/2020/08/Fixing-Americas-Broken-Disaster-Housing-Recovery-System\\_P1.pdf](https://www.urbanwaterslearningnetwork.org/wp-content/uploads/2020/08/Fixing-Americas-Broken-Disaster-Housing-Recovery-System_P1.pdf)
- Oberfield, Z. W. (2009). Rule following and discretion at government's frontlines: Continuity and change during organization socialization. *Journal of Public Administration Research and Theory*, 20(4), 735-755.

- Olshansky, R. B. (2006). Planning After Hurricane Katrina. *Journal of the American Planning Association*, 72(2), 147–153.
- Peacock, W. G. & Girard, C. (1997). Ethnic and Racial Inequalities in Hurricane Damage and Insurance Settlements. In W. G. Peacock, B. H. Morrow, & H. Galdwin (Eds.), *Hurricane Andrew: Ethnicity, Gender and the Sociology of Disasters*, 171-190. New York: Routledge.
- Peacock, W.G., Van Zandt, S., Zhang, Y. et.al. (2014). Inequities in Long-Term Housing Recovery After Disasters. *Journal of the American Planning Association*, 80(4), 356-371.
- Platt, R. H. (1999). *Disasters and Democracy: The Politics of Extreme Natural Events*. Washington, D.C.: Island Press.
- Puerto Rico Department of Housing. (2019). Puerto Rico Disaster Recovery Action Plan for the Use of CDBG-DR Funds in Response to 2017 Hurricanes Irma and María (Action Plan Amendment Two). Retrieved from [https://www.cdbg-dr.pr.gov/wp-content/uploads/2019/08/PRDOH\\_AmendmentTwo\\_Non-SubstantialAmendment\\_EFFECTIVE082319.pdf](https://www.cdbg-dr.pr.gov/wp-content/uploads/2019/08/PRDOH_AmendmentTwo_Non-SubstantialAmendment_EFFECTIVE082319.pdf)
- Reeves, A. (2011). Political disaster: Unilateral powers, electoral incentives, and presidential disaster declarations. *The Journal of Politics*, 73(4), 1142–1151.
- Rivera, D. Z. (2019). *Fighting FEMA: Urban Informality and Disaster Response in Rio Grande Valley Colonias*. Lincoln Institute of Land Policy. Retrieved from: [https://static1.squarespace.com/static/5ef136bc13a8bb5431930a56/t/5f2b1a84192a5f71ea6e556e/1596660365421/2019\\_descriptive\\_fighting\\_fema\\_rivera.pdf](https://static1.squarespace.com/static/5ef136bc13a8bb5431930a56/t/5f2b1a84192a5f71ea6e556e/1596660365421/2019_descriptive_fighting_fema_rivera.pdf)
- Tendler, J. (1997). *Good government in the tropics*. Johns Hopkins University Press.
- United States General Accountability Office. (2020). Additional Actions Needed to Strengthen FEMA's Individuals and Households Program. GAO-20-503. Retrieved from: <https://www.gao.gov/assets/710/709775.pdf>



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