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Socio-Demographic Determinants of Access to Housing Assistance Programs Post-Winter Storm Uri and Major Flooding: A Case Study of Lake Charles, Louisiana

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ABSTRACT

This study explores the determinants of access to housing assistance and funding allocations from two key disaster recovery programs—Individual Housing Program Funding (IHPF) and Housing Assistance Program Funding (HAPF)—for residents of Lake Charles, Louisiana, following flood-related disasters. The study followed a quantitative exploratory research. With the help of logistic and multiple regression models, the analysis examines the influence of variables such as homeowner insurance, flood insurance, primary residence status, low-to-moderate-income status, and the extent of flood damage on access to housing assistance and the amount of funding received. The findings indicate that homeowner and flood insurance coverage, as well as the degree of flood damage, are significant predictors of access to housing assistance and the amount of funding allocated, with insured residents and those in flood-impacted areas receiving higher amounts. Conversely, primary residence status and low-to-moderate-income status were found to have minimal impact on funding allocation. The study suggests that the current disaster recovery funding models may inadequately address the needs of lower-income and uninsured households. Based on these findings, the study recommends policy adjustments, including enhancing support for low-income residents, providing assistance to uninsured households, implementing a tiered funding structure, and strengthening flood resilience efforts in vulnerable areas. These recommendations aim to improve the equity and effectiveness of disaster recovery funding, ensuring more comprehensive support for affected communities.

Keywords: Lake Charles, LA, Natural Disaster, Disaster Recovery, Winter Storm, Flooding, FEMA, Socio-demographic, Socially Vulnerable Population, Disparities, Assistance, and Programs

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INTRODUCTION

Natural disasters, including severe storms and flooding, have devastating impacts on communities, particularly those that are socially vulnerable. These events often exacerbate existing inequalities, creating significant barriers to recovery for disadvantaged populations. In February 2021, Winter Storm Uri unleashed unprecedented cold weather, causing widespread destruction across the United States. The storm resulted in power outages for over 10 million people and caused an estimated $195 billion in damages, making it one of the costliest disasters in U.S. history (NOAA, 2022). Among the most severely affected areas was Lake Charles, Louisiana, a community already grappling with the effects of prior natural disasters. Compounding the challenges, the region also endured major flooding later that year, further exposing vulnerabilities in its housing infrastructure and emergency response systems.

Historically, socio-demographic factors such as income, insurance coverage, and housing tenure have been critical determinants of disaster recovery outcomes. Research has consistently shown that low-income households, renters, and uninsured residents face disproportionate hardships in accessing recovery resources (Fothergill & Peek, 2004). These disparities are particularly pronounced in disaster-prone regions like Lake Charles, where the socio-economic profile of the community intersects with high exposure to climate-related risks. For example, data from the United Way ALICE (Asset Limited, Income Constrained, Employed) project

indicates that 43% of households in Lake Charles fall below the ALICE threshold, signifying their limited financial capacity to withstand and recover from disasters (United Way, 2021).

Lake Charles has endured a tumultuous history of natural disasters. Between 2005 and 2020, the region experienced four major hurricanes: Rita, Ike, Laura, and Delta. Each of these events inflicted severe damage, with Hurricane Laura alone causing over $19 billion in insured losses (Insurance Information Institute, 2021). Despite repeated exposure to such events, significant gaps persist in disaster recovery frameworks. A study by McDonnell et al. (2019) highlighted that low- and moderate-income households often lack access to essential recovery resources due to systemic barriers, including insufficient insurance coverage and rigid eligibility criteria for federal aid.

The inequities in eligibility and access to housing assistance programs became particularly evident following Winter Storm Uri. Programs designed to provide equitable recovery often fall short due to stringent requirements, limited outreach, and bureaucratic inefficiencies. Data from the Federal Emergency Management Agency (FEMA) reveals that in 2021, nearly 40% of disaster aid applications were denied, with low-income and minority households disproportionately affected (FEMA, 2022). These barriers are exacerbated by factors such as inadequate documentation, the lack of homeowners or flood insurance, and complex application processes. This study seeks to address these critical gaps by examining the socio-demographic determinants of access to housing assistance programs in the aftermath of Winter Storm Uri and major flooding in Lake Charles. Specifically, it explores how factors such as insurance status, income levels, and the extent of property damage influence eligibility and participation in recovery programs. Understanding these dynamics is essential for designing more inclusive and equitable disaster recovery policies.

By focusing on Lake Charles, this research contributes to the broader discourse on resilience and recovery for communities at the intersection of socio-economic disadvantage and climate vulnerability. As disasters become more frequent and severe due to climate change, addressing these inequities is not only a moral imperative but also a practical necessity for building sustainable and resilient communities. Towards this end, it is an undeniable fact that this research underscores the urgent need for a comprehensive examination of the socio-demographic barriers to housing assistance. The findings aim to provide evidence-based recommendations for policymakers, ensuring that recovery programs effectively serve those most in need and foster a more equitable approach to disaster recovery.

LITERATURE REVIEW

About the City of Lake Charles, Louisiana

Lake Charles, Louisiana, is a vibrant city located along the banks of the Calcasieu River, serving as the parish seat of Calcasieu Parish. Known as the "Festival Capital of Louisiana," Lake Charles hosts over 100 festivals annually, celebrating its rich culture, music, and cuisine. The city also boasts a significant port connected to the Gulf of Mexico, contributing to its strategic importance. Additionally, it is renowned for its attractions, including gambling venues, rhythm and blues music, and exceptional local dishes, making it a hub for tourism and entertainment (Citytowninfo.com, 2023).

In 2021, Lake Charles had a population of 83,400, with a median age of 35.6 years and a median household income of $49,913. From 2020 to 2021, the city experienced a 7.21% population increase, growing from 77,832 to 83,444 residents, alongside an 11.5% rise in median household income, which grew from $44,785 to $49,913 (DataUSA.io, 2023). The five largest ethnic groups in the city are Black or African American (Non-Hispanic) at 46.2%, White (Non-Hispanic) at 45%, Two or More Races (Non-Hispanic) at 2.48%, Asian (Non-Hispanic) at 2.25%, and White (Hispanic) at 1.92% (DataUSA.io, 2023).

Lake Charles also serves as the educational hub for southwest Louisiana and boasts a diverse economic base. According to the U.S. Bureau of Labor Statistics (2022), the city's largest job-creating sectors include healthcare, education, construction, petrochemicals, accommodation and food services, arts, entertainment, recreation, and social assistance. Figure 1 presents a regional map of Lake Charles, Louisiana, and its surrounding areas, offering a geographical perspective on the city's location and significance.

Figure 1

Regional Map of Lake Charles, Louisiana, and surrounding areas

Source: VisitLakeCharles.org

Disaster Relief and Emergency Assistance

The Robert T. Stafford Disaster Relief and Emergency Assistance Act, enacted in 1988, enables the Federal government to assist state and local governments and their citizens during disasters beyond their capacity to handle. The Act establishes procedures for Presidential declarations of disasters, outlining the nature and extent of Federal aid and eligibility criteria. FEMA coordinates disaster response efforts under the Department of Homeland Security (FEMA, 2023). Governors of affected states are responsible for requesting Presidential declarations, which can extend to states, territories, and eligible entities like the Marshall Islands and Micronesia. Federal programs are activated upon declaration to aid in response and recovery efforts based on assessed needs (FEMA, 2023). FEMA's assistance under the Stafford Act is categorized into Individual Assistance for households, Public Assistance for infrastructure and emergency services, and Hazard Mitigation Assistance to reduce future disaster impacts. The type of aid deployed depends on the disaster's characteristics and assessed damage, guiding FEMA's tailored response (FEMA, 2023).

Types of Natural Disaster Occurrences in South-West Louisiana

The US government distributes billions of dollars in recovery assistance each year to communities impacted by flood disasters. With recent increases in the frequency and severity of coastal storms and inland flooding in states such as Louisiana and New Jersey (Reidmiller et al., 2017), these costs are rising rapidly. In fact, in January 2021, Louisiana was approved for more than $1 billion in federal disaster assistance, long-term disaster loans, and flood insurance claims since Hurricane Laura made landfall in late August and Hurricane Delta in mid-October (FEMA, 2021). The expanding scope of flood disasters is a matter of special concern for socially vulnerable populations since research shows they bear a disproportionate burden of negative consequences (Tate et al., 2021). In response to the need for intervention, on January 20, 2021, the White House issued Executive Order 13986 on advancing racial equity and support for underserved communities through the Federal Government, aiming to enact comprehensive policy adjustments that promote the fair allocation of resources to marginalized areas. Empirical findings of how flood recovery and disaster assistance vary across

affected populations are salient to support this direction. Unfortunately, such findings are not readily available to obtain (Wilson et al., 2021).

Types and Implementation of FEMA Assistance Programs

Federal disaster recovery for individual households is anchored by four primary programs: the National Flood Insurance Program (NFIP), the Individual Assistance (IA) Program administered by the Federal Emergency Management Agency (FEMA), the Small Business Administration (SBA) Disaster Loan Program, and the Community Development Block Grant Disaster Recovery (CDBG-DR) Program from the Department of Housing and Urban Development (HUD) (Wilson et al., 2021). These initiatives, collectively referred to as the Disaster Recovery Safety Net, differ in scope, eligibility criteria, funding limits, and implementation timelines, yet form an integrated framework for recovery assistance (Emrich et al., 2020). *(Refer to Table 1)*

Table 1

Federal Programs Providing Direct Support to Households and Individuals

Program	Triggering mechanism	Scope	Eligibility
NFIP	Flood event impacting an insured person	Flood insurance for properties with significant flood risk	Homeowners or renters in NFIP eligible communities
FEMA IA	Presidential disaster declaration	Financial and/or direct assistance to eligible individuals and households with disaster expenses not met through insurance or other means	Direct losses to occupied housing exceeding insurance and other disaster assistance received
SBA Disaster Loan Program	Presidential disaster declaration for individual assistance	Loans for repair and replacement of physical assets damaged in a	(1) Disaster related losses; (2) Satisfactory credit; (3) Repayment ability

Source: Wilson et al. (2021)

Disaster recovery in the U.S. involves a shared responsibility among federal, state, and local governments. However, when disasters exceed the capacity of state and local agencies, federal intervention becomes necessary.

The Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (42 U.S.C. §§ 5121-5206) established a systematic process for requesting and granting a Presidential disaster declaration. The Stafford Act outlines the types of federal assistance available, eligibility requirements, and procedures for access. FEMA, as part of the Emergency Preparedness and Response Directorate under the Department of Homeland Security, coordinates federal response and recovery efforts (FEMA, 2023). Under Section 401 of the Stafford Act, state governors (or equivalents in U.S. territories and eligible nations like the Marshall Islands) must formally request Presidential disaster declarations. Upon such declarations, FEMA activates relevant assistance programs based on the disaster's scope and assessed needs.

Types of Federal Disaster Aid

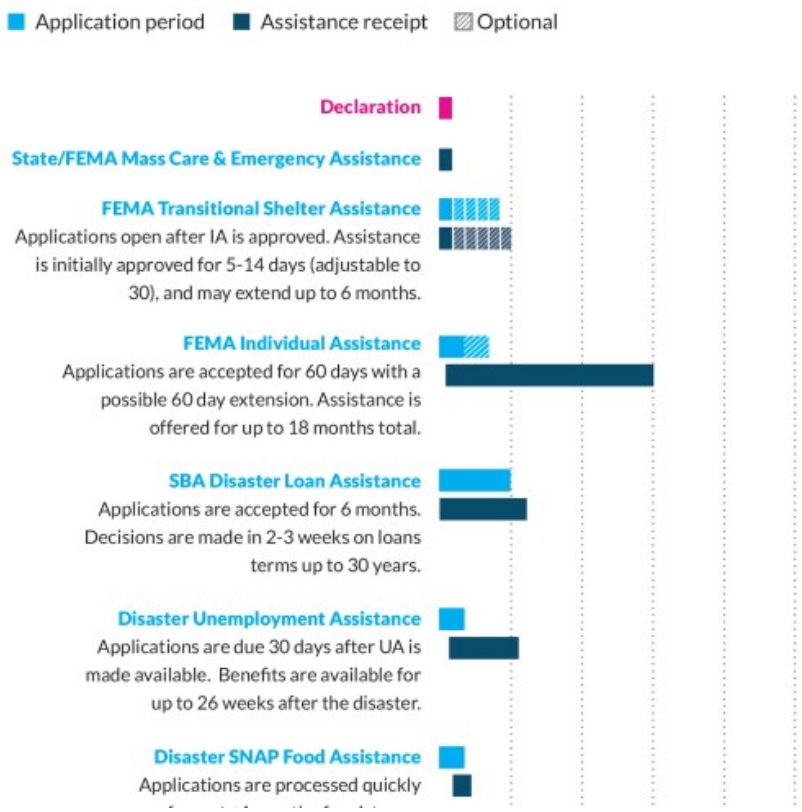
FEMA disaster aid is categorized into three primary types: *Individual Assistance (IA)**:*** Direct support for households and individuals to address immediate needs, reconstruction, and recovery. *Public Assistance (PA)**:*** Support for public agencies and certain private nonprofits to restore or replace public infrastructure and services, ensuring community functionality post-disaster. *Hazard Mitigation Assistance (HMA)**:*** Funding for projects aimed at reducing future disaster risks to public and private property. Not all disasters trigger all three forms of aid; activation depends on damage assessments and disaster-specific requirements (FEMA, 2023).

Challenges in Federal Assistance Implementation

While these programs provide critical support, limitations exist in their availability and execution: *Funding and Accessibility*: Programs like HUD's CDBG-DR rely on specific Congressional appropriations, often reserved for severe disasters, leading to delays and inconsistencies (Ratcliffe et al., 2019). For instance, rental aid through the Disaster Housing Assistance Program was funded after Hurricanes Katrina and Sandy but not after Hurricanes Harvey and Maria. *Disparities in Aid*: Certain programs historically favor specific groups, such as HUD prioritizing homeowners over renters. However, recent trends show increased attention to renters' needs (Ratcliffe et al., 2019). *High Rejection Rates*: FEMA denies a significant proportion of Individual Assistance applications. After the 2017 disasters (e.g., Hurricanes Harvey, Irma, Maria), two-thirds of IA applications were rejected (Martín & Teles, 2018). *Mismatched Timelines*: Short-term programs (e.g., temporary shelter and unemployment aid) typically last six months, while state and local governments may take years to launch long-term recovery programs like CDBG-DR, leaving affected families waiting years for comprehensive aid (Ratcliffe et al., 2019). *(See Figure 2)*

Figure 2

Federal Disaster Assistance Programs Prioritize Immediate Needs



Source: Ratcliffe, C., Congdon, W. J., et. al., (2019). Insult to Injury. Urban Institute.

Challenges in Recovery Assistance

Disaster recovery assistance in the United States often exacerbates pre-existing inequalities, particularly for marginalized communities. Key barriers include eligibility restrictions, procedural complexities, and inadequate support for vulnerable populations. Post-disaster aid frequently fails to meet the needs of socially vulnerable groups, slowing recovery and deepening inequities (American Flood Coalition, 2020; Mickelson et al., 2019). Disparities are shaped by factors such as socioeconomic conditions, governance quality, and resource access (Emrich, 2022).

FEMA Processes and Limitations

Federal assistance begins with FEMA registration, which assesses damages and eligibility. Aid programs, such as the Individuals and Households Program (IHP), offer limited relief. For instance, after Hurricane Harvey, the average recipient received $7,446, far below the maximum possible amount (Billings et al., 2019). Low-income applicants face additional hurdles, including complex forms, inadequate documentation, and lack of transportation or communication resources (Sloan & Fowler, 2015). FEMA's approval rates have steadily declined, and rejection reasons such as insufficient damage or documentation disproportionately affect low-income households (Adams, 2018).

Inequities in Recovery:

Recovery efforts often fail to account for procedural and distributive justice. Socially vulnerable groups—such as minorities, female-headed households, and low-income renters—experience slower recoveries, longer displacements, and insufficient support (Emrich et al., 2019). Federal programs prioritize property owners, neglecting renters and urban dwellers (Peacock et al., 2014). Communities with fewer resources struggle to navigate bureaucratic processes and secure aid, often leaving them unprepared and underfunded (Comfort et al., 2010).

Structural and Governance Barriers

Securing public infrastructure aid depends on local governance capacity, coordination, and communication. Counties with limited administrative resources are at a disadvantage, despite often having the greatest need for federal funding (Peacock et al., 2012). Relationships between community members, institutional actors, and governance systems play a critical role in accessing aid, but procedural complexities frequently hinder these processes. Disaster recovery assistance in the U.S. disproportionately disadvantages vulnerable populations due to structural and procedural inequities. Addressing these disparities requires embedding justice principles in policy design, improving accessibility, and prioritizing aid for socially vulnerable communities.

METHOD AND MATERIALS

This study employs an exploratory quantitative research design, focusing on two recent storm events that impacted Lake Charles, Louisiana, in 2021. According to De Vaus (2006), exploratory research is appropriate when a problem is not clearly defined, when no prior studies exist on the subject, or when the range of potential outcomes is unknown to scholars and policymakers. This aligns with the context of the two major storms that affected Lake Charles. De Vaus (2006) further notes that exploratory research can utilize quantitative, qualitative, or mixed-method approaches. In this case, the study adopts a quantitative approach, analyzing secondary data sourced from FEMA through the St. Bernard Project (SBP).

The study investigates predictors of access to FEMA disaster assistance funding among socially vulnerable populations following the two disaster events: Winter Storm Uri in 2020 and the major flooding in Lake Charles in 2021. The secondary data, drawn from FEMA's 2021 disaster datasets, provides detailed information on the allocation of assistance, encompassing financial aid, housing support, and infrastructure investments. These datasets categorize assistance recipients by socio-demographic variables, including income levels, housing types, age groups, and zip codes.

To analyze the data, the study employs logistic regression models to assess eligibility status for two FEMA programs: Housing Assistance and Individual Assistance Programs. Additionally, multiple regression analyses are conducted to identify factors influencing the funding amounts received under these programs. The use of these statistical methods allows for a comprehensive examination of the variables that contribute to disparities in access to disaster aid. The specific statistical models used in the analysis are outlined as follows: (a) *Logistic Regression Models*: Applied to determine the likelihood of eligibility for Housing Assistance and Individual Assistance Programs based on socio-demographic predictors. (b) *Multiple Regression Models*: Used to predict the amount of funding received under each program, with independent variables representing socio-demographic and situational factors. This methodological approach provides insights into the effectiveness of FEMA's disaster assistance programs in addressing the needs of socially vulnerable populations in the aftermath of the two storms.

Logistics Regression Model for FEMA Disaster Eligibility Housing Programs

In this section of the study, two logistic regression analyses were conducted to examine the relationship between socio-demographic factors (i.e., damage by zip codes, applicant age, single guardian-led household, and socio-economic status) of the socially vulnerable population and access to Winter Storm Uri and major flooding assistance initiative in the City of Lake Charles, Louisiana in 2021 by focusing on the "Eligibility Status".

Model 1: The Individual Housing Eligibility Model

$$IHP_i(1,0) = \Lambda\,(\alpha_0 + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \alpha_3 X_{3i} + \alpha_4 X_{4i} + \alpha_5 X_{5i} + \alpha_6 X_{6i} + +u)$$

$Where\ X_1, X_2, \ldots, X_6$ are the socio-demographic factors and socio-economic status of the socially vulnerable populations. IHP represents Individual Housing Program Eligibility (IHP). This type of dependent variable is expressed in the dataset as a dichotomous(1,0) variable indicating whether the applicant is deemed eligible for Individual Housing Program (IHP = 1 or otherwise equal to zero (0); X_1 represents homeowners insurance, X_2 captures the flood insurance, X_3 stands for primary residence, X_4 represents socio-economic status (Low-moderate income), X_5 represents Home flood damage, and X_6 represents applicant by zip codes. Note also that the following: $\alpha_{1\text{-}6}$ are the coefficients of the independent variables, that assists the researcher in capturing the magnitude of the impact of the variables on the dependent variable (i.e., access to disaster assistance by socially vulnerable population in Lake Charles), while u=error-term.

Model 2: The Housing Assistance Model

$$HA_i(1,0) = \Lambda\,(\alpha_0 + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \alpha_3 X_{3i} + \alpha_4 X_{4i} + \alpha_5 X_{5i} + \alpha_6 X_{6i} + u)$$

$Where\ X_1, X_2, \ldots, X_6$ are the socio-demographic factors and socio-economic status of the socially vulnerable populations. HA= Housing Assistance (HA). This type of dependent variable is expressed in the dataset as a dichotomous variable indicating whether the applicant is deemed eligible for Housing Assistance (HA) = 1 or otherwise equal to zero (0). X_1 represents homeowners insurance, X_2 captures the flood insurance, X_3 stands for primary residence, X_4 represents socio-economic status (Low-moderate income), X_5 represents Home flood damage, and X_6 represents damage by zip codes. Note also that the following: $\alpha_{1\text{-}6}$ are the coefficients of the independent variables, that will assist the researcher in capturing the magnitude of the impact of the variables on the dependent variable (i.e., access to disaster assistance by socially vulnerable population in Lake Charles), while u is the error-term. Note also that the following: $\alpha_{1\text{-}6}$ are the coefficients of the independent variables, that assists the researcher in capturing the magnitude of the impact of the variables on the dependent variable (i.e., access to disaster assistance by socially vulnerable population in Lake Charles), while u is the error-term.

Multiple Regression Model for Disaster Eligibility Housing Funding Program

In this section of the study, two multiple regression analyses were conducted to examine the relationship between socio-demographic factors (i.e., applicant by zip codes, applicant age, single guardian-led household, and socio-economic status) of the socially vulnerable population and access to Winter Storm Uri and major flooding assistance initiative in the City of Lake Charles, Louisiana in 2021 by focusing on the "Funding Amount".

Model 3: Individual Housing Program Funding Model

$$IHPF_i = \alpha_0 + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \alpha_3 X_{3i} + \alpha_4 X_{4i} + \alpha_5 X_{5i} + \alpha_6 X_{6i} + u$$

$Where\ X_1, X_2, \ldots, X_6$ are the socio-demographic factors and socio-economic status of the socially vulnerable populations. IHPF = Individual Housing Program Funding (IHPF). This type of dependent variable is expressed in the dataset as a numeric variable indicating the funding amount the applicant received for the individual Housing Program (IHP). X_1 represents homeowner's insurance, X_2 captures the flood insurance, X_3 stands for primary residence, X_4 represents socio-economic status (low-moderate income), X_5 represents Home flood damage, and X_6 represents damage by zip codes. Note also that the following: $\alpha_{1\text{-}6}$ are the coefficients of the independent variables, that will assist the researcher in capturing the magnitude of the impact of the variables on the dependent variable (i.e., access to disaster assistance by socially vulnerable population in Lake Charles), while u=error-term. Note also that the following: $\alpha_{1\text{-}6}$ are the coefficients of the independent variables, that assists the researcher in capturing the magnitude of the impact of the variables on the dependent variable (i.e., access to disaster assistance by socially vulnerable population in Lake Charles), while u =error-term

Model 4: Housing Assistance Program Funding Model

$$HAPF_i = \alpha_0 + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \alpha_3 X_{3i} + \alpha_4 X_{4i} + \alpha_5 X_{5i} + \alpha_6 X_{6i} + u$$

$Where\ X_1, X_2, \ldots, X_6$ are the socio-demographic factors and socio-economic status of the socially vulnerable populations. HAPF= Housing Assistance Program Funding (HAPF). This type of dependent variable is expressed in the dataset as a numeric variable indicating the funding amount the applicant received for Housing Assistance Program Funding (HAPF). Where, X_1 represents homeowner's insurance, X_2 captures the flood insurance, X_3 stands for primary residence, X_4 represents socio-economic status (Low-moderate income), X_5 represents Home flood damage, and X_6 represents damage by zip codes. Note also that the following: $\alpha_{1\text{-}6}$ are the coefficients of the independent variables, that assists the researcher in capturing the magnitude of the impact of the variables on the dependent variable (i.e., access to disaster assistance by socially vulnerable population in Lake Charles), while u represents the error-term.

RESULTS AND DISCUSSION

Table 2: Logistic Regression Results for The Individual Housing Eligibility Model

Logistic regression Number of obs = 3,938
LR chi2(6) = 2323.59
Prob > chi2 = 0.0000
Log likelihood = -1368.5776 Pseudo R2 = 0.4591

IHP	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
X1	1.225082	.1461802	1.70	0.089	.9696107	1.547864
X2	.526208	.0816671	-4.14	0.000	.3881965	.7132852
X3	21.49712	21.92887	3.01	0.003	2.911273	158.7368
X4	1.18462	.0907589	2.21	0.027	1.019447	1.376554
X5	48.75386	5.293738	35.80	0.000	39.40804	60.3161
X6	1.000187	.0081468	0.02	0.982	.9843461	1.016282
constant	4.83e-09	2.78e-06	-0.03	0.973	0	.

Table 2 summarizes the results of the Individual Housing Program Eligibility Model. The logistic model was employed to obtain the odds ratios, which indicate the likelihood or change of Individual Housing Eligibility based on homeowner insurance, flood insurance, primary residence, low-middle-income status, flood damage, and the damage zip codes. As for homeowner insurance, results show that residents of Lake Charles who have homeowner insurance are 1.23 more likely to obtain individual housing program eligibility during the

flood compared to other residents who do not have homeowner insurance. The odds ratio related to homeowner insurance is statistically significant at 10% level.

Furthermore, residents of Lake Charles who have flood insurance results are 0.53 more likely to obtain the individual housing eligibility program during the flood compared to other residents who do not have flood insurance. The odds ratio related to homeowner insurance is statistically significant at a 1% level. Data show that residents of Lake Charles who have flood insurance results are 0.53 more likely to obtain the individual housing program eligibility during the flood compared to other residents who have primary residence in Lake Charles and are 21.5 times more likely to be eligible for post-disaster resources compared to those who do not have primary residence in Lake Charles. The odds ratio related to homeowner insurance is statistically significant at a 1% level. Results suggest that that residents of Lake Charles who are in the category of low-moderate-income are 1.18 times more likely to obtain the individual housing eligibility program during the flood compared to other residents who are in the upper income category. The evidence indicates that post-disaster resources are 48.75 times more likely to be devoted in the damage areas compared to areas that were not affected by the natural disaster. The odds ratio related to homeowner insurance is statistically significant at a 1% level.

Table 3: Logistic Regression Results for The Housing Assistance Model

Logistic regression Number of obs = 3,938
LR chi2(6) = 888.24
Prob > chi2 = 0.0000
Log likelihood = -1481.8593 Pseudo R2 = 0.2306

HA	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
X1	1.267599	.1576888	1.91	0.057	.9933277	1.617599
X2	.7055502	.133417	-1.84	0.065	.4870446	1.022085
X3	9.390168	1.615253	13.02	0.000	6.702759	13.15507
X4	1.223285	.0908614	2.71	0.007	1.057556	1.414986
X5	34.71362	9.274123	13.28	0.000	20.56326	58.60136
X6	1.000966	.0056263	0.17	0.864	.9899992	1.012054
constant	4.37e-31	1.74e-28	-0.18	0.860	0	2.8e+307

Table 3 summarizes the results of the housing assistance Model. The logistic model was employed to obtain the odds ratios, which indicate the likelihood or chances of receiving Housing Assistance based on homeowner insurance, flood insurance, primary residence, low-middle-income status, flood damage, and the damage zip codes. As for homeowner insurance, results that residents of Lake Charles who have homeowner insurance are 1.27 more likely to obtain the housing assistance during the flood compared to other residents who do not have homeowner insurance. The odds ratio related to homeowner insurance is statistically significant at 10% level. Furthermore, residents of Lake Charles who have flood insurance results are 0.71 times more likely to obtain the housing assistance eligibility during the flood compared to other residents who do not have flood insurance. The odds ratio related to homeowner insurance is statistically significant at 10% level. Data show that residents of Lake Charles who have primary residence in Lake Charles are 9.31 times more likely to be eligible to post-disaster resources compared to those who do not have primary residence in Lake Charles. The odds ratio related to homeowner insurance is statistically significant at 1% level. Results suggest that that residents of Lake Charles who are in the category of low-moderate-income are 1.18 times more likely to obtain the housing assistance eligibility during the flood compared to other residents who are in the upper income category. The evidence indicates that post-disaster resources are 48.75 times more likely to be devoted in the damage areas compared to areas that were not affected by the natural disaster. The odds ratio related to homeowner insurance is statistically significant at 1% level.

Table 4: Multiple Regression Results for the Individual Housing Program Funding

```
      Source |       SS       df       MS      Number of obs   =     3,938
-------------+------------------------------   F(6, 3931)      =    420.64
       Model |  2.3977e+10     6  3.9962e+09   Prob > F        =    0.0000
    Residual |  3.7346e+10 3,931  9500445.91   R-squared       =    0.3910
-------------+------------------------------   Adj R-squared   =    0.3901
       Total |  6.1324e+10 3,937  15576221.9   Root MSE        =    3082.3

------------------------------------------------------------------------------
        IHPF |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          X1|   1587.587   121.9127    13.02   0.000     1348.569    1826.605
          X2|  -2943.149   174.1974   -16.90   0.000    -3284.675   -2601.623
          X3|   230.8738   224.0052     1.03   0.303    -208.3036    670.0511
          X4|   213.4722   77.32517     2.76   0.006     61.87102    365.0735
          X5|   4607.848   109.1308    42.22   0.000     4393.889    4821.806
          X6|   10.56089   7.263371     1.45   0.146    -3.679437    24.80122
    constant|  -746391.2   512832.6    -1.46   0.146     -1751834    259051.9
------------------------------------------------------------------------------
```

Table 4 summarizes the results for the individual housing program funding model. The multiple regression model was utilized to obtain the estimated values of homeowner insurance, flood insurance, primary residence, low-middle-income status, flood damage, and the damage zip codes. Results indicate that residents of Lake Charles who have homeowner insurance received $1,587.59 from the individual housing program funding for disaster recovery. The evidence suggests that the impact of homeowner insurance is statistically significant at 1% level. Furthermore, data indicate that Lake Charles residents who pay flood insurance received $2,943.15 from the individual housing program funding for disaster recovery. Based on the statistical analysis, the impact of flood insurance on individual housing program funding is statistically significant at 1% level. It should be noted that individuals with primary residence in Lake Charles receive $230.87 more than those with secondary houses in Lake Charles. The estimated coefficient is not statistically significant at all conventional levels. The low-moderate-income residents of Lake Charles obtain $213.47 more compared to the upper-middle and other high-income individuals. The statistical analysis reveals that the effect of low-moderate-income residents on individual housing program funding for disaster recovery is significant at a 1% level. Relating to the flood damaged areas in Lake Charles, findings indicate that residents in the affected areas gain $4,607.85 on average.

Table 5: Multiple Regression Results for the Housing Assistance Program Funding (HAPF)

```
      Source |       SS       df       MS      Number of obs   =     3,938
-------------+------------------------------   F(6, 3931)      =    374.28
       Model |  1.6428e+10     6  2.7379e+09   Prob > F        =    0.0000
    Residual |  2.8756e+10 3,931  7315137.54   R-squared       =    0.3636
-------------+------------------------------   Adj R-squared   =    0.3626
       Total |  4.5183e+10 3,937    11476620   Root MSE        =    2704.7

------------------------------------------------------------------------------
         HAA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          X1 |   1779.808   106.9765    16.64   0.000     1570.073    1989.542
          X2 |  -2509.251   152.8555   -16.42   0.000    -2808.935   -2209.568
          X3 |   243.6401    196.561     1.24   0.215    -141.731    629.0112
          X4 |   28.85704   67.85161     0.43   0.671    -104.1706    161.8847
          X5 |   3531.409   95.7605    36.88   0.000     3343.664    3719.154
          X6 |   7.230109   6.373492     1.13   0.257    -5.265554    19.72577
```

Table 5 summarizes the results of the housing assistance program funding model. The multiple regression model was utilized to obtain the estimated values of homeowner insurance, flood insurance, primary residence, low-moderate-income status, flood damage, and the damage zip codes. Results indicate that residents of Lake Charles who have homeowner insurance received $1,779.81 from the housing assistance program

funding for the disaster recovery. The evidence suggests that the impact of homeowner insurance is statistically significant at a 1% level. Furthermore, data indicates that Lake Charles residents who pay flood insurance received $2,509.25 from the housing assistance program funding for the disaster recovery. Based on the statistical analysis, the impact of flood insurance on housing assistance program funding is statistically significant at a 1% level. It should be noted that individuals who have primary residence in Lake Charles receive $230.87 more compared to those who have secondary houses in Lake Charles. The estimated coefficient is not statistically significant at all conventional levels. The low-moderate-income residents of Lake Charles obtain $243.64 more compared to the upper-middle and other high-income individuals. The statistical analysis reveals that the effect of low-moderate-income residents on housing assistance program funding for disaster recovery is significant at a 1% level. Relating to the flood damaged areas in Lake Charles, findings indicate that residents in the affected areas gain $3,531.41 on average. The statistical analysis reveals that the effect of flood damaged areas residents on housing assistance program funding for the disaster recovery is significant at a1% level.

CONCLUSION AND POLICY RECOMMENDATIONS

This study examined the factors influencing funding allocations from two key disaster recovery programs—the Individual Housing Program Funding (IHPF) and the Housing Assistance Program Funding (HAPF)—for residents in Lake Charles. The analysis revealed that homeowner insurance, flood insurance, and the extent of flood damage had significant positive impacts on the amount of funding received by residents. Specifically, residents with homeowner or flood insurance coverage were allocated more funding, as were those residing in flood-damaged areas. On the other hand, low-to-moderate-income status and primary residence status did not have a significant impact on funding allocation. The findings suggest that the current disaster recovery funding models emphasize compensation for insured individuals and those directly affected by flood damage, but may not adequately account for socioeconomic factors. The underlisted recommendations aim to create a more equitable and comprehensive disaster recovery framework that considers both the insurance status and socioeconomic vulnerabilities of residents, while also reinforcing flood resilience. Based on the study's findings from the FEMA dataset analysis, the study recommends the following policies and strategies to help ensure equitable access to disaster assistance.

- *Enhance Support for Low- to Moderate-Income Residents*: Given that low- to moderate-income status did not show a statistically significant impact on funding allocations, future policies should prioritize increasing funding for lower-income households in disaster recovery programs. Targeted financial assistance or subsidies for homeowners with lower incomes, especially those without comprehensive insurance, could help mitigate the disparities in recovery efforts.
- *Increase Funding for Non-Insured Households:* The findings highlight that individuals with homeowner and flood insurance received significantly more funding. Policymakers should consider implementing programs that provide assistance to uninsured or underinsured residents. This could include offering low-interest loans, grants, or insurance subsidies to households that cannot afford to pay for adequate insurance coverage, particularly in disaster-prone areas.
- *Introduce a Tiered Funding Structure Based on Income and Flood Damage Severity*: A more nuanced, tiered funding approach that accounts for both the severity of flood damage and household income levels could ensure a more equitable distribution of recovery funds. This structure could provide greater support to those who have faced the most severe damage, while also incorporating additional assistance for those with limited financial resources, regardless of their insurance status.
- *Strengthen Flood Resilience Initiatives in Vulnerable Areas*: The study shows that flood damage significantly impacts funding allocation, underscoring the need for increased investment in flood resilience and mitigation efforts in vulnerable areas. Policymakers should focus on strengthening flood prevention infrastructure, implementing flood risk mapping, and offering incentives for flood-resistant housing construction. Additionally, long-term strategies that reduce the risk of flood damage could help decrease future reliance on disaster recovery funding, making the process more sustainable.

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