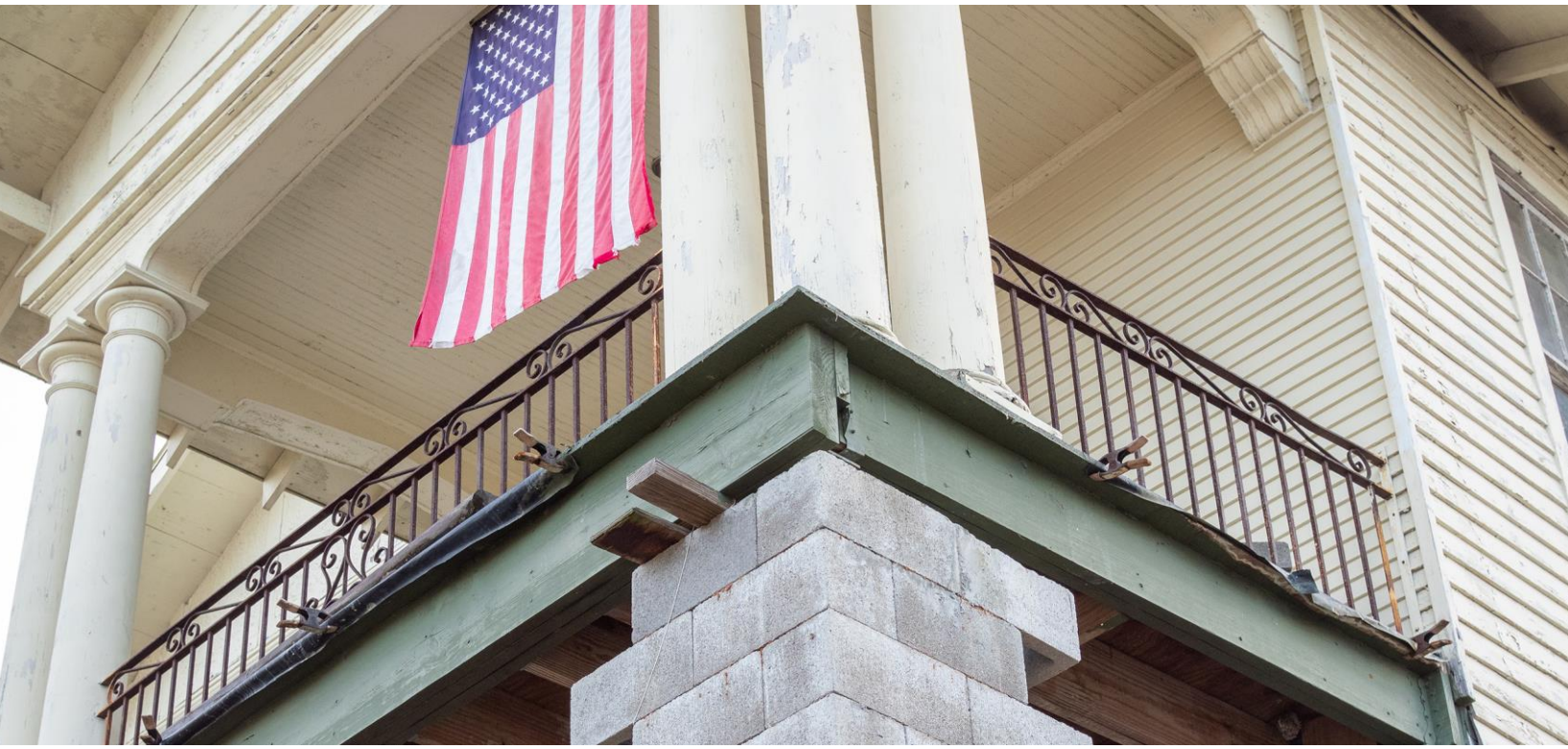

RESEARCH REPORT

Housing Resilience in Greater New Orleans

Perceptions of and Home Adaptations to Climate Hazards in Post-Katrina Louisiana

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Executive Summary

Housing is a first line of defense. Particularly for households that are vulnerable to environmental shocks and not equipped to recover from them, the home is the primary physical barrier, financial asset, and neighborhood stabilizer. Housing resilience—homes' and households' capacity to withstand, adapt, and thrive in the face of acute and chronic hazards—is untenable where quality, fair, and affordable housing is in jeopardy.

Few places in the United States know the harmful realities of environmental shocks as well as the greater New Orleans region over the last century. With the effects of the socioeconomic legacy from pre-Civil War slavery and international trade and tourism on its persistent residential discrimination and income disparity running parallel to its environmental history of severe flooding, cataclysmic hurricanes, and human-altered geology, the region became one of the proverbial canaries in the coal mine of climate change's effects in this country. Set in the Gulf Coast region and within the state of Louisiana's political and cultural context, the area includes seven central parishes with varying demographic and hazard profiles centered around Orleans Parish and the city of New Orleans. In 2005, Hurricane Katrina and its aftermath exposed this region's stark inequities in damages, public responses, and recover rates to the entire nation. Greater New Orleans consequently received the largest federal infusion of postdisaster[1] aid and investment in protective infrastructure in US history.

Yet, questions about individual communities' and households' resilience to these global phenomena remain unanswered: does historic segregation determine households' physical exposures to climate hazards as much as their social, economic, and political vulnerability to the damage that hazards wreak? How effective are the regional infrastructure interventions and development plans that ostensibly protect individuals and their properties situated near them? Do information asymmetries exist between policymakers and households about risk, and do these vary by demographic group? How diffuse and equitable are the current interventions meant to reduce housing risks such as property information, insurance, and durable construction techniques?

These questions have remained open not only for this specific Gulf Coast region, but for the broader scholarly and policy communities seeking to mediate increasing exposures to climate change's effects with hardening economic inequality. Consequently, a team of researchers and community-based partners embarked on an exploration of the region's housing resilience—defined as the set of personal activities and public- and private-sector interventions intended to reduce the effects of environmental

shocks for current homes and that are made possible through household decisions and community capacities about current housing.

We focus on six key resilience dimensions selected because of their dominance among policy responses and the currently available private-sector products designed to help reduce housing risk. These include interventions at the community-level, including (1) the regional infrastructure designed to protect whole residential communities, and (2) the involvement of households in those decisions and other public plans for their communities. These are followed by findings on interventions taken by individual agents—that is homeowners—including: (3) individual households' perceptions of home hazards, (4) the source and use of information on home risks, (5) property and hazard insurance, and (6) physical mitigation actions that households can take to protect their homes. Other interventions could foreseeably be employed such as changes in land uses for current residential communities or whole-community relocation. Analysis of the overall state as well as the equitable distribution of benefits of the interventions related to the six resilience dimensions that are currently available provides insights into their possible improvement as well as the feasibility of other interventions.

Along with several spatial and property-level datasets including property assessment records, federal flood insurance maps, and national demographic profiles, the study relies on a one-of-a-kind regionally representative survey of homebuyers within a decade span (2008–2018) after the flurry of planning, infrastructure investment, and property law change in the years immediately after Hurricane Katrina. Dozens of interviews with civil- and public-sector partners provided qualitative insights into community- and policymaker-level decisions. Analyses of these data advance our understanding of which, whose, how, and whether homes are prepared and protected in a world of increasing hazards.

Findings

Overall, the take-up and use of interventions related to the six resilience dimensions varied widely, often along the traditional lines of social, economic, and environmental disparities known to have played out across great New Orleans' history. But the adoption, effectiveness, and outcomes of these nuanced resilience interventions do not rise to the challenge and urgency of the climate risks that area homes and their occupants face. For historically vulnerable groups in greater New Orleans, especially, the diffusion and persistent limitations of the interventions pose challenges for shared regional resilience.

We highlight the key findings based on the study activities around six themes.

Infrastructure Protections

The types of physical infrastructure projects governments can invest in include levees, seawalls, dams, and floodgates as well as improved wetlands and "green" infrastructure, which can protect land that is currently exposed. Protective infrastructure measure could provide nearby buildings, homes, and other constructions and economic activities a measurable reduction in risk or, in some cases, the expectation that the risk has been minimized. Defining the size and specifications of that infrastructure, then, should determine the properties, places, and people protected.

The greater New Orleans region faced several infrastructure failures during Hurricane Katrina. The activities since Katrina can shed light on how physical infrastructure projects and their protections are planned to reduce individual households' exposures. Exposure is the degree to which an individual home is likely to be technically subjected to a hazard phenomenon such as a flood—and how that exposure descriptively overlays on common indicators of vulnerability—or, the capacity of a household and its home to minimize or recover from damages. Vulnerability is the cumulative set of preexisting conditions such as housing quality and tenure, financial assets, political power, and community bonds that determine the magnitude of a hazard's effects for an exposed home. The team reviewed the history of infrastructure investments in the greater New Orleans region and looked at exposure to flood zones for demographic groups in two key time frames: the years immediately after Hurricane Katrina (2005–2009) and the most recent timeframe of the study (2013–2017). Analysis at these two timeframes provide a sense of how demographic and mobility changes have altered the populations in places that have faced changing infrastructure protections.

- In contrast to the conventional wisdom that often conflates exposure with vulnerability, the study found that there were few clear and consistent demographic (race and ethnicity, income, and education) and housing-related (tenure) patterns of who and what has been protected in the region. Across the greater New Orleans region, white non-Hispanic residents faced significantly less exposure to flood zones immediately after Katrina. This was especially notable in Orleans, Jefferson, and St. Tammany parishes. In contrast, across the greater New Orleans region immediately after Katrina, Asian and Pacific Islander, Black non-Hispanic, and Hispanic households all had statistically significant higher exposure to flood zones.
- In the more recent time period (2013–2017) across the greater New Orleans region, Asian and Pacific Islander and Hispanic residents were still facing significantly high rates of exposure to flood zones; Black non-Hispanic residents were less exposed to flood risk areas; and white non-Hispanic resides were at more risk. However, in Orleans and St. Tammany parishes, Black non-

Hispanic residents were facing higher exposure to flood zones while their white non-Hispanic counterparts were facing less exposure.

- The research team explored similar analysis for income, housing tenure, and education. By 2009, those with the lowest incomes faced the highest exposure to flood zones and therefore were at the highest risk compared to higher income households. Renters were less exposed to flood risk by 2009, with owners, especially in Plaquemines, having high exposure to flood zones. The most educated were also significantly less exposed to flood risk by 2009.
- Massive investments in infrastructure, the improved quantification of exposure due to climate change's future effects, the changing accuracy of institutional tools such as flood exposure maps, and the population and demographic shifts in the region since Katrina have all contributed to an evolving landscape of exposures. However, infrastructure can only reduce physical exposures to hazards, not the underlying social, economic, and political disparities that drive households' vulnerability to hazards. The ability of low-income households and those facing other disadvantages to prepare for and recover from even minor environmental shocks continues to be minimal at best. When viewed in aggregate across a region as large as the seven-parish area in this study, many individual household vulnerabilities remain regardless of physical exposure. This remains the fundamental equity challenge for infrastructure—defining the spatial scale of intervention such that the protective benefits to individual homes are distributed fairly.

Community Engagement

Many community organizers and advocates argue that effective and authentic community engagement can ensure that large infrastructure projects and local jurisdictions' development patterns are equitable. The challenges of procedural equity are many, including resident representativeness, clarity in communications, and effectiveness of participatory processes in shaping decisions. Post-Katrina southeastern Louisiana—especially greater New Orleans—received an influx of investment for infrastructure and development, with several mega-project scopes and numerous formal planning efforts. As such, it became a site of experimentation in engagement and participation. The research team reviewed the regional and local environmental planning and hazard mitigation project processes within the seven-parish area for the decade after Katrina, identifying planning leaders' interactions with affected communities, including initial outreach, feedback gathering and integration, and community groups' perceptions of the overall process. Efforts included periodic hazard, housing, and development plans as well as those developed solely for Katrina recovery.

- Most of the engagement practices associated with municipal, parish, and state-level plans or infrastructure projects were deemed superficial by the local community organizers participating in this study, including those supported with federal funds. Ineffective ways of communicating scientific and engineering details, nonrepresentative and waning attendance by underserved groups, predetermined outcomes, and an unfair reliance on undersupported community groups and advocates marked almost all efforts despite well-publicized intentions. The notable exceptions included the LA SAFE across the State of Lousiana and the City of New Orleans' Housing NOLA, for which residents and community groups reported to be engaging, deliberate, and effective at shaping final decisions.
- Many post-Katrina plans and projects were one-time interventions for recovery in a postdisaster context. Dissatisfaction with the quality of these plans' engagement efforts ran high. Over time, these multiple efforts and their engagement with residents led to increasing concern about consistency and continuity, resulting in participant fatigue and frustration.
- Community groups noted that many of the periodic and administratively required plans that intended to present information more consistently and to be a regular and expected conduit for residents and civil organizations produced even more deeply unsatisfactory community engagement than the onetime plans. Parish and state hazard-mitigation plans or recovery action plans submitted to state and federal authorities (e.g., the Federal Emergency Management Agency or the US Department of Housing and Urban Development) fell into this group of planning processes perceived by local groups as perfunctory and only filling statutory community engagement requirements. In virtually each case during the study period, some community groups and organizers found the engagement activities related to these plans to be ineffective; at times, these engagement activities were unknown to these groups.

Risk Perception

The growing body of scientific evidence about regional exposures to environment and climate-related hazards and the scale of investments in planning and infrastructure to mitigate these hazards do not necessarily align with individual perceptions of their household's and communities' risks. Some individuals may feel sufficiently protected by governmental interventions and invest less of their own resources in mitigating against risks to their households, homes, and possessions. Others may perceive risks more acutely and pay foradditional individual protections. The majority of people, however, do not consider their general risk perceptions when choosing a home because they lack resources or information about risk to the property.

The perception of risk is a critical cognitive link between the public-sector interventions to protect whole communities and the individual decisions and expenditures to protect the homes within those communities. Differences in risk perceptions and worldviews are mediated by race, income, housing quality, and previous experience with hazards. The research team analyzed responses to a range of questions in the homeowner survey related to risk perception and beliefs to determine whether and how the effects of these difference manifest. We share four key findings:

- Households of color, people with lower incomes, and people with lower educational attainment are significantly more likely to exhibit heightened perceptions of future hazard risks to their homes than their white non-Hispanic, higher income, and higher educated counterparts. Households of color were nearly twice as likely to perceive hazard risks, making race and ethnicity the greatest predictor of risk perception. Previous experience with home damage from a hazard is also significantly associated with a heightened perception of risk.
- Even though some households are more likely to exhibit higher risk perceptions about floods and related hazards, the research team found no difference in the extent to which these groups consider such risks in making home purchase or acquisition choices. This discrepancy indicates disparities in risk mitigation action among households of color, people with lower incomes, and people with lower educational attainment—all groups of people who are underserved and already vulnerable and who often have fewer resources to translate their perceptions into material housing decisions.
- A home's location in a flood zone is statistically significant contributor to its household's risk perception, but to mixed effect: homeowners in flood zones are 56 percent more likely to exhibit heightened perceptions of risk around future flooding but 43 percent less likely to have considered risks in home choice decisions. This apparent discrepancy may be explained by homeowners being inadequately informed about risks during the purchase process and unable to choose alternative housing units because of resource constraints. An increase in the number of information sources homeowners use to stay informed about risk has a small but statistically significant positive effect on risk consideration in home decisions.
- Environmental attitudes are significant predictors of both risk perception and consideration of flood risks when choosing a home. For example, belief in climate change and frequency of thinking about flood risks are the strongest among all predictors in influencing risk perceptions about home choice (60 and 58 percent more likely, respectively). Respondents who expressed belief in climate change were also significantly more likely to exhibit heightened risk perception around future flooding and related hazards (38 percent).

Risk Information

The extent to which households have control over protecting their homes is partially influenced by the quantity and quality of information they can access. No federal law requires hazard risk disclosures in home purchases, despite 74 percent of Americans supporting such a requirement.[2] In the risk perception study, the research team found that having more sources of information increases the odds that people consider flood risks when making a home purchase or acquisition decision, thoughonly slightly. In the case of housing, the transmission of information by home inspectors, real estate agents, insurance companies, and various other sources occurs at key transaction points, such as the time of home search, home sale disclosures and mortgage underwriting, home insurance shopping, tax assessments, and discretionary home inspections.

Without regulation, the information sources about hazard risk are vast and the accuracy of that information can vary even within the same type of source. It is not known what sources of information about hazard risk people use to make decisions around actions for home protections and how this might vary by household characteristics. The research team analyzed data from respondents in the homeowner survey about risk information sources received during home selection and afterward.

- Based on our survey analysis, the most commonly relied-upon sources of information about hazard risk during home selection are inspector reports, verbal communications from real estate agents, documentation from the seller (including disclosure statements), and property records or zoning maps. At the time of the survey, the sources residents tended to consult after home purchase for information about hazard risk were local or national media, state or national government sources, the internet, and friends and family.
- A wide range of sources about a home's hazard risks are consulted by homebuyers including formal property disclosure statements. Yet almost half (46 percent) of homebuyers did not consult disclosure statements much or at all. This is particularly surprising given the fact that the State of Louisiana's flood disclosure laws are viewed as a gold standard by national advocates (Snyder and Kulesza 2020).
- We found notable differences in information sources by income and house price. Higher-income households (those with annual incomes of $90,000 or more) and households that bought their homes at a higher value ($200,000 or more) used key formal information, including inspection reports, disclosure statements, real estate agent information, and property records, to some or a great extant at significantly higher rates than their lower-income counterparts: higher-income households referenced inspection reports at 7.7 percentage points higher than

lower-income households, property records at 13.4 percentage points, and required disclosure statements at 4.8 percentage points higher. Although the state of Louisiana requires sellers to disclose details related to the nature and frequency of flooding, flood insurance requirements, past repairs, and details regarding the type and amount of federal disaster aid previous owners received,[3] many lower-income households did not use these information sources at all at the time of home purchase: 38.9 percent of lower-income households did not reference disclosures compared to 23.2 percent of higher-income ones.

- The rates of use of disclosure statements across racial/ethnic groups and flood zone location of purchased homes were generally similar. Only two information sources were significantly associated with differences in use between homeowners living in and out of flood zones: inspection reports—or verbal notice from the inspector during home purchase—and verbal information from the seller or previous owner.
- Nearly one in five households in an official flood zone designated by the Federal Emergency Management Agency (FEMA) reported not receiving any information about their home's flood-risk status during their home selection. Receiving risk information does not necessarily translate into making decisions or taking action to mitigate that risk.
- The most common actions people chose to take to reduce risk to their home, based on the information about their home's risk they had received prior to home purchase or acquisition, were roof strengthening; protecting mechanical and electrical equipment, including moving it to a higher location; and storm shutter installation. These actions were also the least financially costly of the listed actions.

Property Insurance

The most common vehicle for protecting one's home from potential risk is insurance (Kousky and French 2022). It is also among the most contentious vehicles given current state and national debates regarding the availability and cost of property insurance in response to growing actuarial risks. Appropriate property insurance is required of all mortgage lenders and many local governments. In greater New Orleans, most homeowners have standard retail homeowner's insurance, additional state wind insurance, and federal National Flood Insurance Program policies. The research team explored how households shop for insurance, how familiar they are with their insurance policies, and the overall quality of their coverage. The research team also sought to explore whether and how demographic

differences factored into disparities in (1) insurance policies' coverage, (2) insurance pricing, and (3) treatment in response to a claim and overall satisfaction with the insurance provider.

- Homeowners with higher household incomes ($90,000 or more) are almost six times more likely to be covered for hurricane or windstorm losses compared to those with lower incomes (less than $90,000). Higher-income households are also more than twice as likely to have coverage for all perils or losses aside from listed exclusions compared to households with lower incomes, controlling for other factors including home purchase price. Race/ethnicity did not appear as a significant factor in insurance coverage. As expected, homeowners residing in a flood zone are nearly five times more likely to have an insurance policy that covers flood damages.
- A starker picture emerges for annual insurance pricing. Higher-income households have better coverage limits for their homeowner's insurance policies than lower-income households ($27,001 more), though they pay more ($289) for it. Meanwhile, households of color report paying $255 less for their homeowner's insurance annually than white households but have a coverage limit that is $41,111 lower. The gains that white households reap (the equivalent of gaining $93 in coverage for every additional $1 spent on premiums) compared to losses that households of color experience (the equivalent of losing $161 in coverage for every $1 spent less on premiums) are not proportional.
- Only one notable significant association is present between households' socioeconomic characteristics and flood insurance premiums: home purchase price has a significantly negative relationship with flood insurance premiums. This relationship is contrary to the expectation that a premium would increase as the value of a home and its corresponding replacement cost increases—confirming that the National Flood Insurance Program likely subsidized premiums for certain households at the time of study and before the program's recent reforms. However, as expected, the pricing of flood insurance confirms that flood insurance generally followed actuarial risk: homeowners located in a flood zone paid $433 more for their annual flood insurance premium on average than homeowners located outside of the flood zone.
- The level of service in response to a claim received by homeowners from their insurers varied by race/ethnicity and income. Across all study models, household income is positively associated with the timing and satisfaction with claims processing. Higher-income homeowners ($90,000 or more) are significantly more likely to face a shorter claim processing time and are nearly three times more likely to have higher levels of satisfaction with the claims process. When it comes to satisfaction with their claims process and their insurance company overall,

however, race/ethnicity is a primary predictor: households of color are 59 percent less likely to be satisfied with their claims process and 34 percent less likely to be satisfied with their current insurance company compared to white households. Being located in an urban area, having a higher credit score, shopping more frequently for insurance, and having completed a home mitigation action also factor into level-of-service outcomes—either claim time, claim process satisfaction, or insurance company satisfaction.

Home Mitigation

After Katrina, many opportunities arose for households to physically retrofit their homes for future hazards both with recovery assistance and from new public incentives. Technical knowledge about elevating homes above the likely flood height, strengthening roofs and exterior envelopes, moving electrical and mechanical equipment, landscaping including bioswales, and other floodproofing techniques proliferated in research laboratories. Home mitigation typically requires more resources and effort than household preparedness activities, such as having evacuation plans and emergency provisions. Federal recovery programs including Louisiana's post-Katrina Community Development Block Grants for Disaster Recovery from the US Department of Housing and Urban Development and FEMA's Flood Mitigation Assistance often mandated that home mitigation techniques be integrated into postdisaster rebuilding, and numerous state and local governments and private insurers incentivize the voluntary adoption of these techniques through reduced tax assessments and preferrable insurance terms.

The success of federal programs is likely predicated on the ability of households to feel comfortable with these retrofits, afford the costs of their construction, and apply for these programs. According to our analysis, the costs of mitigation techniques continue to be dominant barriers. The research team explored whether physical property retrofits differed across household types through analysis of survey responses to questions on hazard preparedness and mitigation activities.

- Despite the growth of home mitigation services, service providers, and financial incentives, home mitigation techniques remain largely untapped in the region. Even among recent homebuyers with high levels of perceived current risks and concerns about future risks, there is minimal uptake of these retrofit options when they are not required from postdisaster aid programs or other programs. Challenges for wider awareness and adoption identified by state and local stakeholders include inconsistency in the quality of a specific mitigation installation or construction, which leads households' distrust of its effectiveness; overly restrictive and

prescriptive program requirements and bureaucracies; conflicting technical standards between incentive programs; confusing or ineffective marketing; and longstanding inequities in mitigation programs' delivery of services for low-income households.

- Quantitative analysis finds that only two factors influenced preparedness actions: age and the number of information sources about risks. Older heads of households and people who rely on more sources of information regarding potential risks to their home from future hazards were more likely to have taken a greater number of preparedness actions.
- Non-Hispanic white households were more likely to report being able to pay for future mitigation action than households of color. But, when it came to taking mitigation actions, race or ethnicity was not a significant predictor. Having undertaken preparedness activities is also not a predictor of mitigation action. In fact, the only significant predictor of taking any mitigation action is the household's self-reported ability to pay. With each increase in the dollar range of a household's ability to pay, the odds of having taken at least one mitigation action increases by over fifty percent.

Policy Recommendations

Housing matters, especially for households' health and financial outcomes after hazards and the social and economic soundness of the communities in which the homes lie. However, federal and state policies have focused solely on monetized property damages rather than these more fundamental outcomes. This research's findings, then, lead to two general policy recommendations:

1. Policymakers must support affordable and physically durable housing construction and retrofitting through regulatory tools and financial incentives.
2. Disaster and emergency policies need to be more community centered and have household-focused implementation strategies.

Housing continues to be overlooked as the physical and social infrastructure that it is. Based on the study findings, the research team believes that affordable and resilient housing development needs to be supported financially through federal and state appropriations, with more stringent regulations about how nonresilient homes are financed, and with improved formula and competitive grant programs that foster better state and local policies to ensure that sufficient resources are diverted to house the most vulnerable households in resilient housing. The research team believes both affordability and higher housing quality are possible, although further research and development

funding could also explore cost-effective housing-resilience strategies beyond the few analyzed in this project.

The US could have better disaster and emergency polices that are community centered and that have household-focused implementation. This means federal and state disaster-related agencies should support community decisionmaking processes and planning directly rather than having perfunctory engagement processes . The agencies should encourage local jurisdictions with shared hazard risks to work collaboratively and coordinate housing stocks. Further, federal and state officials should provide at least as many resources for decentralized housing-specific mitigation actions as for large defensive infrastructure. The research team's additional recommendations are listed below:

- Clear state- and county-/parish-level policy opportunities exist to improve infrastructure decisionmaking so that it is transparent, consistent across regions, and better coordinated with individual housing stocks. Increasingly rigorous building codes for new construction, land use planning, laws that prevent further exposures, and mandated building retrofits should be assessed against new infrastructure protections where possible.
- Public-sector agencies and the consultants could develop better community engagement strategies that center communities rather than the infrastructure project or land plan being promoted are also in order. These include timelines, communications tools, and partnerships with local community groups. This holds particularly true for periodic planning and decisionmaking processes, and for decisions involving property acquisition and relocation.
- Public agencies should counter disinformation with tailored education. This could ensure that households with perceptions of risk that reflect scientific, engineering, and economic measures of that same risk have the capacity to act in moments of housing decisions, such as newly formed households who are first-time homebuyers in high-risk areas.
- Officials running information programs could provide all housing populations with appropriate and accessible information disclosures —including groups such as renters, residents of assisted housing, people experiencing homelessness who do not have legal agency of their home's quality, and low-income and historically segregated households that have limited choices in their home locations.
- Public and private roles within the housing profession could provide consistent information to consumers and their agents on homes' risk exposures, and the housing professions could require these roles to do so. Real estate agents, listing services, inspectors, appraisers, property assessors, remodelers, developers, and mortgage and equity lenders could use similar exposure

terminology and data when integrating exposure information into current tools such as property disclosure statements, multiple listing services, and construction permits.

- State and national policymakers could consider property hazard insurance as a public service, akin to health insurance, with an appropriate level of assistance for low-income households, actuarially sound pricing, and coverage that is easy to understand and manage for homeowners and that encourages further mitigation. There is also a public-sector role in monitoring claims treatment and disparities for different populations, particularly for the state insurance commissions but also for the US Department of Treasury's Federal Insurance Office. Given the federal government's current funding role in both insurance and recovery, this consideration is warranted.
- Increasing federal and state funding for mitigation assistance for low-income homeowners in order to assist with cost and incentive the appropriate insurance coverage could help keep those owners in their homes for longer and at less exposure. Tying insurance with mitigation or property buyouts is more readily conducted by a single entitle such as a public insurer, but private insurer programs, such as the Insurance Institute for Business & Home Safety's Fortified program[4] that recently launched in Louisiana, could also lead to more equitable protections.
- Researchers could pursue more interdisciplinary research on housing mitigation and resilience that links physical exposures and interventions with economic and behavioral insight. This could reduce the costs of strategies while improving the efficiency and effectiveness of the programs that support those strategies..

Scholarship

Research on housing and community climate adaptation intersects with hazard scholarship for many reasons. Increasingly severe and frequent disasters' residential damages and losses are the most acute manifestation of climate change's effects. Global warming's chronic effects on residential communities such as slow-onset sea-level rise, extended heatwaves, and drought, however, are less investigated in the disaster scholarship though these have just as many implications for homes. Disaster studies' past emphasis on postdisaster recovery contrasts with climate adaptation's growing focus on preparation and mitigation. Consequently, because housing matters in both acute and chronic event scenarios, additional research on the physical quality of housing and their location before events, and the resource capacity of households to understand their home risks and solutions for mitigating them, be involved in the public decisions about infrastructure and land use that involve their homes, and to insure and mitigate their homes is needed as the first overarching recommendation for future research agendas.

Homes' hazard exposures and households' hazard vulnerability need to be studied in additional contexts, including beyond this project's focus on greater New Orleans.

The research team will continue to analyze the rich data collected as part of this project across all the studies, but further work is needed. This work must involve all disciplines and scholarly fields, starting with the science of actual risk at the granular level to include hazards such as climate change effects that are harder to spatially define. The call for additional research extends to engineering, sociological, and geographic study of the linkage between infrastructure protections of communities and the individual resilience of houses and households in those communities—and the distribution of protections across them. Psychological and behavioral experiments with communication engagement in different contexts, risk perceptions related to concepts of the home, property, and wellbeing are also in order. Economic and policy analysis of insurance coverage, pricing, and treatment must be expanded, as do studies from urban planning, building sciences, design, and construction of better—that is, more durable and hazard resistant—homes and home retrofits. The need for multidisciplinary research holds especially true of rental units, since they are variably maintained, and their occupants typically have little say over their capital improvement.

More work needs to be done to ensure that all houses and households are resilient to environmental shocks. Understanding how current and future risks can be equitably distributed requires assessing how individual homes and households' actions fit into the larger public common. This report sheds light on some of the current strategies for accomplishing that end.

Housing Resilience in Greater New Orleans

Housing is a platform for numerous life outcomes, from households' health and financial wealth to their participation in the surrounding community's culture, their region's economy, and in the governments that in turn collectively help define the quality, quantity, and value of those homes. The physical and monetary performance of homes in relation to threats like environmental hazards and climate shocks is no different.

Homes can protect occupants from the elements, or homes can expose them in ways that are exacerbated in times of both severe disaster events—such as hurricanes, tornadoes, and wildfires—or more chronic ones—such as heatwaves and frequent floods. A home also may provide a range of financial benefits for households as an asset for homeowners and a stable residence for jobseekers, children, and the elderly. Both benefits are jeopardized when disasters or shocks occur.

Consequently, the desire to bolster this fundamental component of human physical protections has been an ongoing thread in history. In the United States, efforts to insure future losses preceded the nation's founding: Benjamin Franklin's Philadelphia Contributionship for the Insurance of Houses from Loss by Fire was formed in 1752 as the first large-scale property insurer. Major urban conflagrations in the next two centuries led to the modern day, privately sold homeowner's insurance policy, the authority of states to regulate insurance, and the creation of public insurers such as the National Flood Insurance Program (NFIP) by the mid-twentieth century.

Another home protection method came after independence with the creation of the US Army Corps of Engineers, tasked with constructing and managing all manner of riverine, harbor, and coastal protective infrastructure including levees and seawall (Shallat 2010). The increased funding of protective infrastructure by state, municipal, and other subnational governments over the twentieth century further secured their role in managing land development and ownership as well (Martín 2021). Hurricanes Andrew and Katrina brought needed attention to the physical means and methods of regulating new home construction and retrofitting existing homes. By the turn of the recent century, every state also mandated property disclosure requirements upon home sellers and their agents to ensure that risks were transparent and conveyed to buyers.

Despite a long history of attempted interventions to protect homes, only a few strategies have been scaled to do so.

Defining Housing Resilience

The inequitable effects of disasters on housing have a long history of study (Comerio 1997; Zhang and Peacock 2009; Peacock, Morrow, and Gladwin 2012; Peek, Morrissey, and Marlatt 2011; Blakely 2012; Graham 2012; Green and Olshansky 2012; Lowe 2012; Gotham 2014). Much of the field has focused on the efficacy and efficiency of housing interventions in postdisaster scenarios.[5] Scholarship has centered on disasters' effects on housing but not always housing's capacity to withstand, adapt, and thrive in the face of disaster—that is, ***housing resilience***. Despite its multiple and occasionally conflicting definitions, resilience arose as both a scholarly and policy topic in the aftermath of milestone disaster events (Van Zandt et al. 2012). The stark inequities in damages, public responses, and recovery rates after Hurricanes Katrina in 2005, Sandy in 2012, and Harvey and Maria as well as the Thomas Fire in 2017 begged for a reconsideration of traditional disaster cycles and equitable treatment for survivors (Saadian et al. 2020).

Despite these moves forward, homes continue to be damaged by environmental hazards and households' wealth continue to suffer as a consequence. More urbanization and higher land and property values only partially explain this continued stain. Local governments have encouraged residential land development in places and in ways that have set the resulting home occupants in harm's way while the frequency and severity of harm has increased due to global climate change (Hino et al. 2023). Existing housing is built to older standards of performance and with entirely outdated perceptions of risks. These homes make up most of any region's housing stock and are more likely to house lower-income households than their newer, ostensibly higher performing homes. Older homes are financed, insured, and most importantly, occupied—but their risks largely overlooked (Hino and Burke 2021). Yet, homebuyers', homeowners', and renters' responses to these exposures remain unclear. The housing industry—including builders and remodelers, appraisers, realtors, and lenders—and public-sector housing institutions—from local planners and building officials to national mortgage enterprises and housing assistance programs—have often exacerbated this ambiguity, creating a patchwork of rules and local specifications that have obscured information about a home's past and future risks of hazard damage as much as the home's current ability to endure a hazard.

National climate policy has not helped clarify the responses to housing's climate exposure, particularly since climate policy has neither been social nor environmental. It is disaster driven. Severe disaster has been the primary spur for reconsidering housing risks—though this attention primarily results in rebuilding of housing in the same disaster-hit locations and often onto the same socio-economic context as before the disaster hit. The underlying social and economic vulnerability across households and the investment disparities across communities persist. Public resources such as the

Federal Emergency Management Agency's (FEMA) Individual Assistance and HUD's (HUD) Community Development Block Grants for Disaster Recovery (CDBG-DR) largely come after disasters have damaged houses and destroyed occupants' livelihoods and lives (Bolin and Stanford 1991; Quarantelli 1995; Comerio 1998; Olshansky, Hopkins, and Johnson 2012; Peacock et al. 2014; Martín et al. 2019).

Until very recently, mitigation and preparation have only received an occasional infusion of federal and state funds and, even then, have tended to focus on larger-scale infrastructure that may protect residential communities rather than address individual homes or households such as in FEMA's Flood Mitigation Assistance and Building Resilient Infrastructure and Communities and HUD's Community Development Block Grants for Mitigation (CDBG-MIT). Property buyouts or repair requirements also tend to occur after losses have occurred (Spader and Turnham 2014; Greer and Brokopp Binder 2017; Weber and Moore 2019; Martín 2022). Public hazard insurance options—from the NFIP to state wind insurance pools—are among the few policy interventions beyond modest mitigation programs (Kousky and Kunreuther 2014; Kousky 2018; Kousky et al. 2020).

Ultimately, mitigation and preparation investments are often out of reach for low-income and hard-to-serve households, and do not address the myriad of chronic environmental hazards that US housing faces. They also do not align well with each other. Without changes in property insurance policy aligned with funding for physical mitigation at both the regional and household levels and reforms in postdisaster assistance, more exposures will go unmitigated, and the likelihood will increase that vulnerable households—property owners and renters alike—will presume that their homes and communities can simply be rebuilt after the inevitable disasters and resulting losses. The reckoning emphasized predisaster preparedness and mitigation but also sought a more encompassing vision beyond disaster management itself. Increased attention to the need for adapting to climate change's effects gave further support to this vision. This vision also functions at different spatial scales; for housing, for example, individual households and have certain agency in determining their homes' outcomes but this agency is inherently connected to their surrounding community (which defines social bonds and neighborhood assets), municipality (that dictates land and housing markets), states (which regulate housing, insurance, and disaster activities), and nation (with financial and knowledge resources).

The resilience concept integrates key risk terminology, much of which is used in this report (IPCC 2022). Risk is the potential for a hazard event to occur. Exposure—that is, the physical presence of homes in places that are likely to experience hazards, often measured in terms of their monetized value—is qualitatively different from vulnerability (IPCC 2012). Vulnerability is the cumulative set of preexisting conditions such as housing quality and tenure, financial assets, political power, and

community bonds that determine the magnitude of a hazard's effects for an exposed home (Cutter, Boruff, and Shirley 2003; Fothergill and Peek 2004; Bullard and Wright 2012). As such, a house could be exposed to a hazard, but its occupying household may not necessarily be vulnerable. Numerous historical legacies and contemporary practices define how various stakeholders contribute to exposure and vulnerability, but the groups do not equally share the burden of the homes' risks.

Conceptual Framework

Several household-level climate adaptation and disaster mitigation recommendations have focused on either emergency shelter or housing's risk for national financial systems (Maxwell et al. 2018). However, the long range of effects on homes and households far exceeds those concerns. Housing design and construction directly define a family's protection during a disaster and ability to recover after. The costs of housing and hazard-related housing supports, such as property insurance, are typically prohibitive if not burdensome. The amount of information about a home's risks for disaster is typically minimal. Public funds that are used ostensibly to mitigate communities from hazard risks are paltry, and their disbursement can be mired in bureaucracy. The participation of poor and vulnerable families in discussions where decisions are made about their own homes and neighborhoods is constrained for reasons due to their own capacity and public procedure.

If housing conditions are significant factors for both household exposures and vulnerabilities, housing improvements should be a vehicle for resilience. Yet, little is known about how households reduce their exposure or vulnerability through which combination of tools and services, and whether the access and quality of those tools and services are equitable. The challenges presented in current policy and practice and the omission of past research spurred the series of studies that compose this project, the synthesis of whose findings are presented in this report. As such, the research team sought to: (1) identify key, measurable strategies for housing resilience assessed for homes at varying risk levels and different household types to serve as the basis of our research questions; (2) select a region to conduct the work not only where housing resilience is a social and environmental priority among local advocates but also where the resilience strategies are likely to be among the most sophisticated and diffused because of its history; and (3) collect and analyze a range of data sourced from both consistently maintained databases as well as the voices of local residents and organizations.

Themes and Research Questions

The scholarly and professional literature from hazard management, housing, and climate adaptation surveyed above identify six dimensions that either inform housing resilience or are direct tools or services that shape it and in which households can participate: infrastructure protections, community engagement, risk perception, risk information, property insurance, and home mitigation.

INFRASTRUCTURE PROTECTIONS

Most studies of public works have focused either on their engineering performance or their costs (American Society of Civil Engineers 2007; Ayyub and Kearney 2012; US Army Corps of Engineers 2019). Few studies look at the specific populations that are implicated in or surrounding those project boundaries' protections (Rinaldi, Peerenboom, and Kelly 2001; Junod et al. 2021). Following Katrina, over 160 miles of levees have been constructed, repaired, or upgraded (Plyer, Shrinath, and Mack 2015). For example, the Greater New Orleans Hurricane and Storm Damage Risk Reduction System alone has received almost $15 billion in funds for a massive new surge barrier, pumping stations, and new canal closure structures certified to protect New Orleans to the "100-year" level. Guided by master planning processes going back to 2012, Louisiana's Coastal Protection and Restoration Authority included flood risk reduction and coastal restoration as engineering options estimated at $50 billion, which could have repercussions for whether housing remains intact, is to be elevated, or is removed .[6] This is particularly critical for New Orleans' suburbs that lie outside of the system's protections which are now predicted to have stronger storm surge than originally projected.

If regional infrastructure and similar large-scale public works are intended to protect entire communities, the residents that fall within its designed protection boundaries may not be the most vulnerable. In fact, because vulnerable households tend to live in undervalued housing, they may be less likely to meet the cost-benefit thresholds for intervention. However, protective infrastructure has been the most resourced hazard mitigation and community resilience channel in US history. Consequently, the research team poses the general question: do geographic disparities in the level of infrastructure protection from hazard risks exist in the greater New Orleans area that mirror household-level demographic, housing, or economic differences?

COMMUNITY ENGAGEMENT

With the rise of municipal resilience plans and related climate plans, questions about equity persist that echo those documented in environment justice scholarship (Bullard and Wright 2009). The inclusion of a diversity of voices—especially voices from the most vulnerable populations—in urban and regional

planning efforts has become a particular focus of activists and scholars. Many scholars have looked at the engagement processes associated with urban and development plans and their predicted outcomes (Bulkeley and Mol 2003; Berke and Smith 2009; Biedrzycki and Koltun 2012).

Places such as the New Orleans metropolitan area and Southeastern Louisiana planned heavily in the post-Katrina era. Plans include the city's Resilience Strategy and they were accompanied by federal support totaling $233 million from HUD's National Disaster Resilience Competition. These works come after years of fragmented urban planning efforts as the city produced its 2010 Master Plan and Comprehensive Zoning Ordinance (Collins 2015). During this time, community activists began posing questions about equity in plan participation, particularly considering the region's changing profile.

The planning process is another critical channel for housing resilience offering the opportunity for individual households to engage in public decisions about infrastructure and land development. Consequently, the research team asks: have the community engagement activities of infrastructure, city, and regional planning efforts in post-Katrina greater New Orleans successfully incorporated perspectives representative of the diversity of households and their housing and environmental conditions? Do perceptions of these efforts vary by demographic groups, housing types, and flood risks?

RISK PERCEPTION

Actuarial measures of risk—such as whether one has flood insurance or whether a home is in a flood plain—are vital indicators of potential vulnerability to a hazard event, but actuarial measures alone do not provide a complete picture of hazard risk nor are they uniformly understood (Tierney 1999). In fact, variation in risk perceptions and responses are strongly influenced by social position (e.g., race, income, and gender), past experiences, worldviews, and individual-level biases (Thomas et al. 2009).

Comprehensive analyses of risk landscapes must include public risk perceptions and their influence on related behaviors. Risk perceptions can affect public health and safety as well as social and policy outcomes. Housing risk is no different (Lindell and Hwang 2008). Consequently, the research team asks: do populations exposed to the same scientifically quantified risk perceive that risk variably? Do these differences shape housing decisions, from home search, through purchase, and to insurance, mitigation, and maintenance activities and behaviors?

RISK INFORMATION

Many studies look at the impact of hazard risks on housing valuation but few have looked at whether and how buyers, renters, or occupants are made aware of hazard risks and how they understand the risks (Bin and Kruse 2006; Ewing, Kruse, and Wang 2007). Existing work suggests that awareness and

disclosure programs are implemented differently and have different outcomes across groups (Lindell and Prater 2000; Zhang, Hwang, and Lindell 2010). If risk perceptions vary, do the actions taken by groups after exposure to information vary as well? The communication of hazard risks and exposures, such as those associated with a home's location and physical quality or relevant regulatory requirements, should in theory be delivered through channels that are accessible to diverse populations before, during, and after hazard events (Mileti 1999; McNutt 2013). Information access and legibility clearly vary in different housing markets.

Real estate disclosure requirements are set by state government and, in the case of the State of Louisiana, include: history of flooding, flood zone classification and date of classification, flood insurance policy details, elevation construction, and damage history.[7] Louisiana has no rental disclosure requirements beyond those required federally for lead-based paint.[8] Long-term home occupants also have no preexisting risk information sources except possibly if a mortgage lender requires flood insurance. Thus, information for most residents is likely constrained, but disproportionately so for some households. The research team asks: do vulnerable groups receive different amounts and quality of information about the risks associated with a home when purchasing? Do they act differently on that information?

PROPERTY INSURANCE

Insurance policies and premiums are generally based on actuarial measures risk. However, this has not been the case for general property insurance like homeowners' policies or for hazard insurance (Kunreuther, Pauly, and McMorrow 2013; Kousky 2018). Test programs suggest that possible racial disparities existed decades ago but have since diminished (Wissoker, Zimmerman, and Galster 1997; Galster 2006; Regan 2007). Disparities by financial status appear to be more pronounced today (Avraham 2017). Studies suggest having flood insurance in pre-Katrina New Orleans varies by demographic characteristics (Bates and Green 2009). Following Katrina, several insurers cancelled policies, forcing the state's insurer-of-last-resort to expand unsustainably (Klein 2009).[9] Smaller insurance carriers entered the market due partially to state incentives, resulting in increased policy stringency and premium rates. These rates loosely reflect property values though other factors are also likely at play, such as policyholders' financial capacity—a permitted characteristic in Louisiana insurance quoting.

Homeowner and hazard insurance is arguably the most used hazard mitigation tool for housing in the US and, therefore, a critical housing resilience strategy (Kunreuther and Michel-Kerjan 2009; Warner et al. 2009). Consequently, the research team asks: do homebuyers believe they are purchasing

an appropriate amount of insurance? Do vulnerable groups receive different insurance policies and premium rates and are they treated differently in claims transactions?

HOME MITIGATION

Publicly funded programs to mitigate individual homes' potential damages through physical interventions are often provided along with private insurer incentives (Godschalk et al. 1999; Lindell 2019).[10] This results in actions like elevations, water diversion or waterproofing retrofits, roof and exterior envelope hardening, and landscaping that can reduce hazard effects (Roaf, Crichton, and Nicol 2009). The primary federal source of funds for mitigation programs are FEMA's Hazard Mitigation Grant programs, including Flood Mitigation Assistance that can be used to buy out or elevate repetitive loss properties.

Beyond FEMA, Louisiana also offers state tax deductions for code-compliant retrofits, along with a few sales tax exclusions.[11] Private premium reductions for code-compliant construction make a final incentive. Insurers are required by state law to offer these reductions, though anecdotes suggest that most available incentives go unclaimed or underutilized. Given preliminary knowledge about the demographic composition of households that choose to take up mitigation programs nationally, the team asks: how does information about disaster mitigation programs reach different residents of occupied homes? Do programs' use rates differ as a consequence?

The research team believes that these six dimensions provide a comprehensive overview of housing resilience's challenges and opportunities. The selection of a project site in which the team can conduct the six studies proposed then is another critical research design decision not just because of the methodological needs associated with the research design but also because of the necessary partnerships and community engagement that would be required to conduct the work. Therefore, the research team conducted an exhaustive historical and sociological review of the likely project site to ensure a deeper understanding of the housing and disaster context and authentically engage with it.

Site Selection and Unit of Analysis

Coastal and low-lying areas such as those in the Gulf are most directly affected by sea level rise, flooding, erosion, and other extreme hazard events. The increasing frequency and severity of these hazards pose risks for urban areas, especially those with poor infrastructure, social services, or those that have older or poor-quality housing. The US National Climate Assessment further specifies how Gulf urban areas are especially at risk to climate change impacts given its population densities and

geography (Carter et al. 2018). For example, New Orleans is the largest exposed city in one of the most vulnerable areas in the Gulf region and among one of the highest globally (Hallegatte et al. 2013).

Like other places in the Gulf and the broader country, homes in the greater New Orleans area are contested terrains.[12] Few places in the US know the harmful realities of environmental shocks as the greater New Orleans region. The Great Mississippi Flood of 1927, a disaster which dislocated 630,000 people from their homes throughout the region, exposed the racial and economic divides in a region with few physical or institutional safeguards from environmental hazard (Barry 2007). The disproportionate effects on poor and African American households were matched in magnitude by the massive infusion of protective public works after the fact through the US Flood Act of 1928.

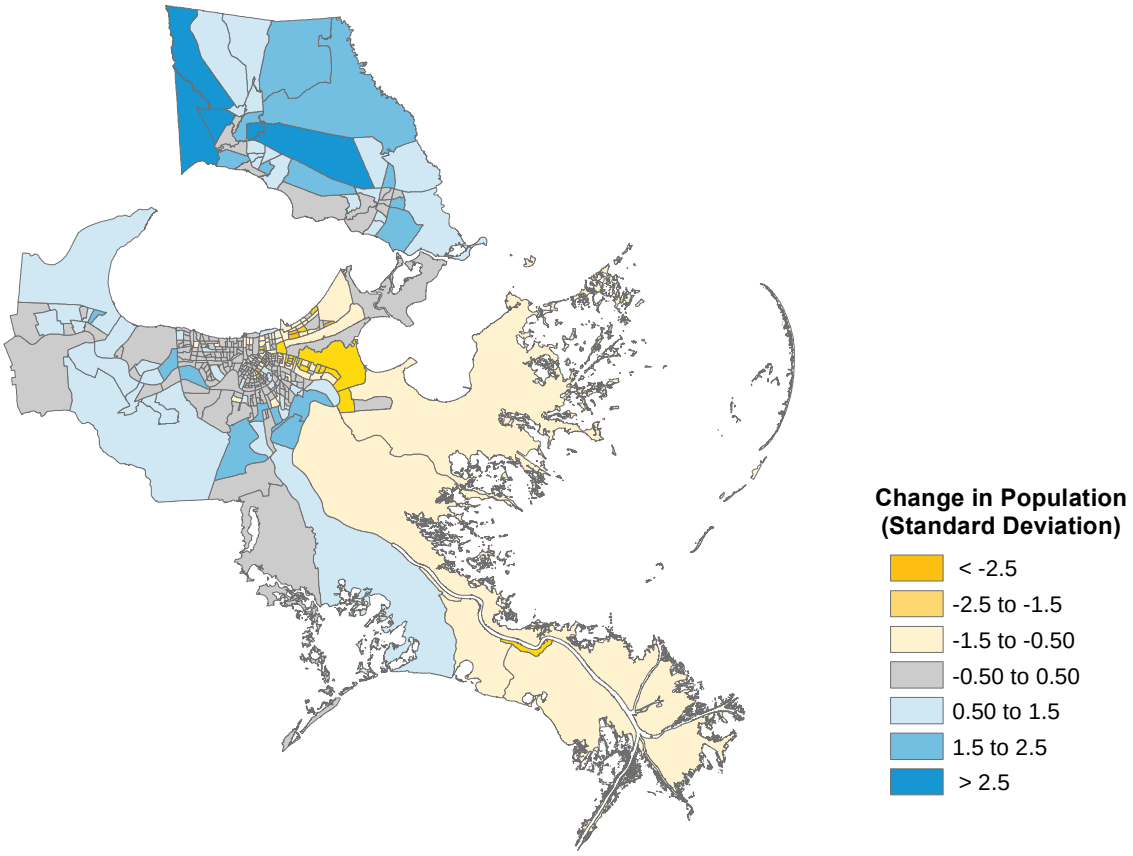
These funds created the system of levees, floodwalls, and riverbanks that were tested and failed almost eighty years later in Hurricane Katrina. After Hurricane Katrina, housing became the literal and figurative site of damage, social debate, and even litigation. In New Orleans alone, 134,000 housing units--70 percent of all occupied units--were damaged (Plyer, Ortiz, and Pettit 2009; Plyer et al. 2009). The notorious "FEMA trailers" housed over 114,000 households until families suffered from formaldehyde exposure (Brinkley 2006; Horne 2008). Six years later, the US Department of Housing and Urban Development and the Louisiana Recovery Authority settled a class action lawsuit brought against the Road Home rebuilding program for discriminating against 1,300 African American homeowners by undervaluing their properties' rebuilding costs. Over 5,000 public housing units in the city have been demolished, reducing choices for low-income families while likely increasing their housing costs. Claims of gentrification have been levied as the city's African American population decreases and racial and ethnic minorities are pushed to the surrounding parishes and beyond (Weber and Peek 2012; Rivlin 2015). Where physical risks lie, then, social and economic vulnerabilities also persist.

Appendix A provides a more detailed social and infrastructure history of greater New Orleans along with a detailed description of the region's demographic profile, but an exploration of the region's current demography and housing affirms its selection for this study. Because the study is concerned with the magnitude and distribution of dimensions of housing resilience, the range of housing types (and the concurrent diversity of households) is the project's primary focus. We first wanted to understand the geographic and quantitative demographic changes in the region between the time directly following Hurricane Katrina, or 2005–2008, when recovery activity was strongest and leading to significant changes in the planning, infrastructure investments, and housing policies (including major changes in home disclosure rules and in the availability and regulation of property insurance) that had been implemented in the following decade, or 2008–2010.

In fact, data from the 2005–2009 and 2013–2017 American Community Survey (ACS) suggest a notable change in the nature of population growth overall for the region during this time (figure 1). As reported by several local sources as well as numerous studies, the movement out of the central urban core of the City of New Orleans to neighboring parishes (especially Jefferson and St. Tammany) has been attributed both to the influx of wealthier households in specific communities within the city as well as to the increasing exposure of property along Gulf parishes including Plaquemines within the metropolitan region as well as Terrebonne and Lafourche further out (Shrinath, Mack, and Plyer 2014). By 2019, the New Orleans metropolitan statistical area had approximately 501,000 occupied units.

FIGURE 1

Change in Number of Households in the Greater New Orleans Region from Post-Katrina to Study Era



Source: ACS 2005—09 and 2013—17 5-year estimates, NHGIS,[13] and WorldMap

Demographically, the New Orleans area is marked by a higher share of Black households than the rest of the nation, and a population composed of a higher proportion of lower-income households (table 1). At the time of this study's research design, these racial and ethnic groups also remained highly

segregated with clusters of Black and Asian populations located in New Orleans proper and Latinos west of the city.

TABLE 1

Households by Race/Ethnicity and Income Group, 2019

Group share of entire New Orleans Metropolitan Statistical Area or national population

	Income Group										
	Total	**Less than $10,000**	**$10,000 to $19,999**	**$20,000 to $29,999**	**$30,000 to $39,999**	**$40,000 to $49,999**	**$50,000 to $59,999**	**$60,000 to $79,999**	**$80,000 to $99,999**	**$100,000 to $119,999**	**$120,000 or more**
New Orleans											
White	54%	4%	4%	4%	5%	5%	3%	8%	6%	4%	11%
Black	36%	8%	4%	4%	5%	3%	2%	4%	2%	1%	2%
Hispanic (any race)	7%	1%	1%	1%	1%	1%	<1%	1%	1%	<1%	1%
Asian	2%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
Mixed race	1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
American Indian	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
Pacific Islander	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
Total	**100%**	**13%**	**8%**	**9%**	**11%**	**9%**	**5%**	**13%**	**9%**	**5%**	**14%**
USA											
White	66%	4%	5%	5%	5%	5%	5%	8%	7%	5%	16%
Black	13%	2%	2%	1%	1%	1%	1%	2%	1%	1%	1%
Hispanic (any race)	14%	1%	1%	1%	2%	1%	1%	2%	1%	1%	2%
Asian	5%	<1%	<1%	<1%	<1%	<1%	<1%	1%	<1%	<1%	2%
Mixed race	1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
American Indian	1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
Pacific Islander	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
Total	**100%**	**8%**	**8%**	**8%**	**8%**	**7%**	**7%**	**12%**	**9%**	**7%**	**21%**

Source: 2019 American Housing Survey.

Notes: New Orleans shares are based on the New Orleans-Metairie, Louisiana Metropolitan Statistical Area as defined by 2013 Office of Management and Budget. Hispanics include all racial groups of Hispanic ethnicity. Other specified racial groups exclude Hispanics. Note that American Housing Survey data are reported her for consistency with later analyses of housing characteristics, though alternatives such as the American Community Survey would provide more precise demographic counts.

Further, most Black and Hispanic households are also renters in the region compared to their white counterparts (table 2). Yet, even among the homeowners, median home purchase prices and home values varied widely by race and ethnicity with Black households experiencing significantly lower home values compared to both other groups in New Orleans and to national rate for Black households. Black households in New Orleans also have higher rates of housing inadequacy but lower capacity for home improvement compared to their local peers, the latter indicator of home improvement rates also being significantly lower than the national rates for all groups. Finally, overall cost burdens are larger for Black households in the region as well, though these are on par with national rates. Notably, home insurance costs are significantly higher for all groups in the New Orleans area compared to the national medians.[14]

TABLE 2

Select Housing Characteristics by Race/Ethnicity in New Orleans and the US, 2019

Share (%) or value ($) by racial/ethnic group

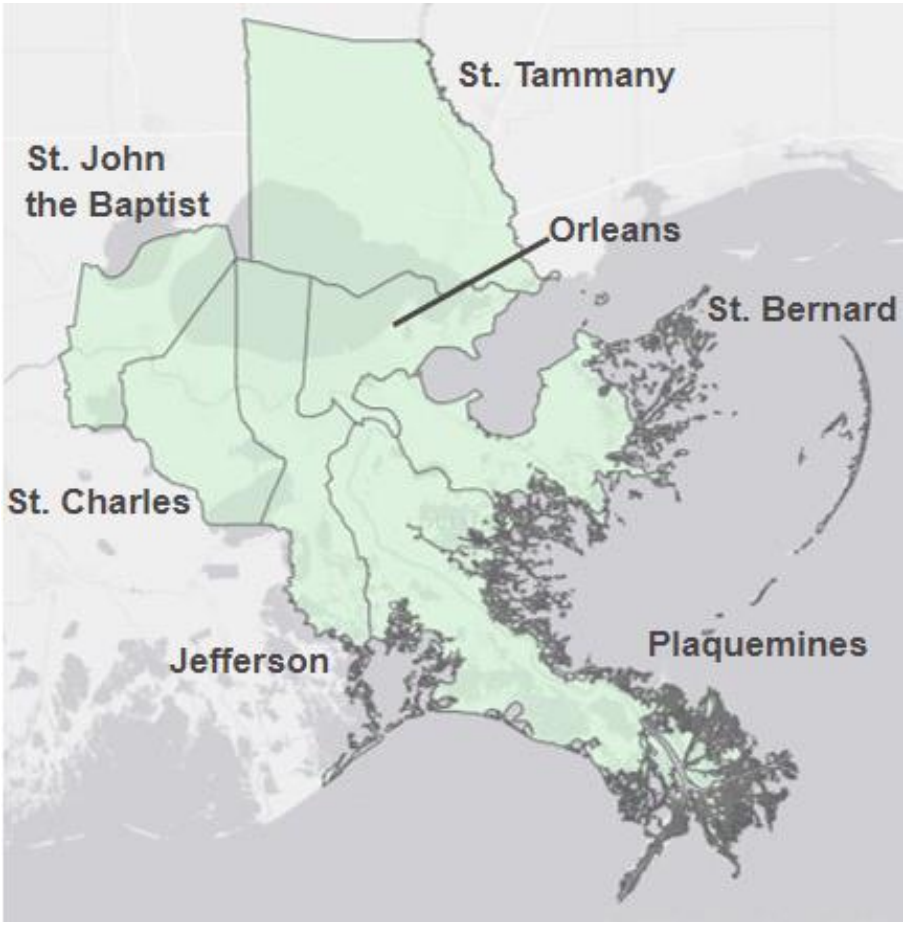
	Total Population	Black	White	Hispanic (any race)
Renter Share of Households				
New Orleans	36.1%	52.4%	22.7%	53.6%
USA	36.0%	56.0%	28.0%	51.7%
Monthly Total Housing Costs as Percent of Household Income				
New Orleans	22%	27%	19%	24%
USA	22%	27%	20%	28%
Median Home Purchase Price				
New Orleans	$140,000	$98,000	$154,000	$115,000
USA	$150,000	$120,000	$150,000	$135,000
Median Home Values				
New Orleans	$200,000	$162,000	$220,000	$180,000
USA	$230,000	$169,000	$230,000	$217,000
Median Monthly Insurance Costs				
New Orleans	$117	$83	$139	$100
USA	$73	$56	$75	$67
Housing Inadequacy				
New Orleans	2.9%	4.7%	1.8%	NA
USA	3.6%	5.2%	3.2%	4.1%
Home Improvement Activity				
New Orleans	43.5%	38.3%	45.7%	45.0%
USA	56.0%	53.1%	57.0%	54.8%

Source: 2019 American Housing Survey.
Notes: Based on the New Orleans-Metairie, Louisiana Metropolitan Statistical Area as defined by 2013 Office of Management and Budget. Hispanics include all racial groups of Hispanic ethnicity. Other specified racial groups exclude Hispanics. Counts of Asian, Pacific Islander, and American Indian and mixed-race households are too small to provide statistical shares or medians for select housing characteristics in the American Housing Survey. Median insurance costs include homeowner and renter insurance. Housing adequacy rates are for moderate inadequacy only as New Orleans samples for severe inadequacy are not available. Home improvement activity is reported for the previous two years.

In short, greater New Orleans presents a unique landscape for this study, and the final site geography is defined as the seven-parish area surrounding the central Orleans Parish (figure 2).

FIGURE 2

Seven-Parish Study Area of Greater New Orleans



Source: Research team mapping of jurisdictional boundaries.

To further refine the likely households of interest, a preliminary analysis of public demographic and housing data as well as discussions with local partners bounded the geographic scope of the work is provided in appendix A. One of the challenges for the study is that prospective or current renters in the State of Louisiana are not required to be provided any disclosures about the units they occupy beyond the federal rules regarding lead-based paint. Consequently, renters are essentially provided with no information about hazard risks and may be unlikely to be able to make informed housing decisions in its absence. As such, the team chose to focus on new homeowners within the 2008–2018 timeframe (that is, after most Katrina recovery funds had been spent and new information and insurance rules were in place) to ensure consistent matching of data to 1). risk perception, 2). information, 3). insurance, and 4).

mitigation activity. For those four studies, the unit of analysis is the household, and the population of recent homeowners is estimated at approximately 140,000 households in the region.

Data Collection and Analysis

The research team relied on existing partnerships to help form the design as well as assist with the primary data collection and identify appropriate secondary data sources.

Partnerships

The first of these activities involved identifying and coordinating with key local partners to refine the research design, assist directly in data collection, and provide guidance on local stakeholders and policymakers. Five organizations played particularly important roles.

- The Greater New Orleans Fair Housing Action Center, now the Louisiana Fair Housing Action Center (LaFHAC), LaFHAC's long and nationally known history of monitoring and finding legal recourse for unfair housing and consumer practices resulted in several landmark cases. Most notable among these was the class action lawsuit brought on behalf of Black households against the State of Louisiana and HUD for the use of pre-Katrina home values as the determinant for home recovery assistance from the State's Road Home program which was resourced with a HUD CDBG-DR grant. Because of its expertise in testing for housing discrimination, LaFHAC became the local data collection clearinghouse for survey respondents. Along with survey recruitment, LaFHAC coordinated print and in-person survey responses and ran a phone hotline.
- Taproot Earth, a New Orleans-based international organization focused on organizing grassroots climate activists, also played a critical research role. During the work, Taproot Earth's leadership and staff were incorporated as the Gulf Coast Center for Law and Policy (GCCLP), a public interest law firm provide disaster and legal assistance to Katrina survivors across the Gulf South. With its knowledge and network of local climate and disaster activists, GCCLP coordinated focus groups early to help design the survey instrument as well as provide guidance to the research team about housing, disaster, and climate concerns from residents.
- Two other groups played a leading role in creating the network of local advocacy groups whose input was essential to the work's community engagement analysis: Louisiana Language Access Coalition and MQVN Community Development Corporation. These organizations coordinated

focus groups with other group leaders for the project and tapped into their resident constituencies to ensure that voices from the greater New Orleans' underserved Latino/a and Vietnamese communities were included along with other groups. They also provided introductions to other civil rights, cultural, and environmental groups for interviews.

- The Data Center, a nonprofit data and analysis resource in Louisiana, provided additional assistance in identifying state and local officials for interviews, and helpful guidance on sampling and data collection strategies.

All five organizations' staff were trained in human subject protections, basic research practices, and the specific topics and dimensions under study in this work. Consequently, they became instrumental parts of the research team and helped design and execute the work.

Data Sources

Three groups of sources were tapped to accomplish all the quantitative and qualitative aspects of the work: public and private secondary databases for parcel transactions, property characteristics, and household demographics; transcripts and recordings from interviews and focus groups of residents, civic leaders, and elected and civil officials; and responses to a survey fielded with a representative sample of buyers of homes in the seven-parish greater New Orleans area. These data are described generally below and referenced in more detail in the respective chapters in which the data were used.

SECONDARY DATA

The research team used American Community Survey (ACS) and American Housing Survey data from the US Census to identify the demographic and housing characteristics of the region, and to set boundaries for the overall study's geographic scope. These public data were also used for later descriptive and regression analyses. FEMA's flood insurance rate maps as they evolved post-Katrina and provided in image form through the Louisiana State University's Flood Maps Portal provided a relatively consistent risk exposure dataset and the most commonly used tool for housing-related policy and institutional requirement, despite known flaws.[15] To acquire granular property-level transaction, ownership, and basic housing characteristic information, the team purchased proprietary parcel-level assessment data from CoreLogic supplemented with First American data for completeness for all relevant residential properties in the designated area. The property data were harnessed early on to create the first survey sampling frame in 2018 and subsequent new frames in 2019. Finally, administrative data regarding household receipt of public mitigation resources were acquired from

FEMA, the State of Louisiana, and the City of New Orleans. All quantitative data were acquired early in the project (2018) with supplements updated as needed through 2020.[16]

INTERVIEWS AND FOCUS GROUPS

Because of the breadth of research themes, the inclusion of qualitative data through in-person and virtual structured interviews and focus groups allowed for a diversity of perspectives about the state of housing resilience from a range of public- and civil-sector participants. These data included interviews and focus groups early in the project (2018) to identify key concepts, contextualize administrative data, and refine research questions, but were also utilized later as primary data for the infrastructure, community engagement, and mitigation studies. Later qualitative collection efforts were also employed to provide data for the community engagement (chapter 2) and home mitigation (chapter 6) studies for which qualitative data were the primary or a critical supplementary source of information.

Each study and its respective data collection efforts relied on semistructured interview or focus group guides, all of which included informed consent scripts, that were reviewed and approved by Urban Institute's Institutional Review Board (IRB). Respondents were either identified from program or organizational materials such as websites or organization charts, or directly by the local research partners as described further for chapter 2. All potential and recruited informants were guaranteed confidentiality and nonattribution in public reports. Interviews and focus groups were primarily conducted in-person, but a few phone interviews and virtual interviews (approximately 14-16) were scheduled depending on the respondents' logistical or scheduling availability; eight final interviews and one focus group were conducted virtually in spring 2020 because of the COVID-19 restrictions.

About 70 interviews and 9 focus groups were conducted for the entire work across all six studies. Transcripts were produced from contemporaneous notes and audio recordings and subsequently redacted after preliminary coding. For the information collected early in the project, key themes were identified from the coded transcripts and other associated documents to inform either the research design directly (e.g., constructs for which quantitative secondary data would need to be collected and integrated into analysis) or for additional data collection efforts (such as the survey instrument utilized for four of the studies or the additional focus group and interview guides used for the community engagement and hazard mitigation studies). All recruitment methods, consent procedures, structured protocols, and data security precautions were approved by the IRB.

SURVEY

Prior to embarking on the project, the research team noted the paucity of nonproprietary data and accessible proprietary data on property insurance (Schwarcz 2011).[17] Further, other data collection would be needed to match insurance information with the policyholder's risk perception, risk information sources and knowledge, and mitigation behaviors and resources. These omissions held true even in places where extensive hazard research is ostensibly conducted like New Orleans. Consequently, the team designed a major survey instrument to answer our research questions around these four dimensions of housing resilience with a goal of fielding it with a large sample of recent homebuyers (the home occupants with the most agency in and recent memory of housing decisions) representative of the seven-parish area.

From prior experience as well as partner discussions, the researchers were conscious of challenges that would be faced in implementing a survey in post-Katrina greater New Orleans. First among these is the fact that some residents may still experience trauma from Katrina or subsequent hazards (Cordasco et al. 2007). The region has also had significant population change since Katrina, potentially complicating respondent identification and biasing the sample (Plyer, Shrinath, and Mack 2015). Remaining residents that are able to participate have also been subjects of research ad nauseum since Katrina (Ruscher 2006). They may also not be prepared for the questions due to general popular difficulty in understanding concepts and terms in areas like property insurance (Bucks and Pence 2006; Masterson et al. 2014). Methodologically, there have also been few past instruments on these subjects which we could model.

Instrument

The survey instrument was developed with much care through a combination of literature and practice review (including established instruments from related studies) and a series of focus groups with residents meeting eligibility requirements. Questions on risk, insurance, and mitigation were especially inspired by the former: one set of literature on post-Katrina or post-Harvey studies that highlighted specific gaps in hazard response and preparedness presented opportunities for questions to be included in the instrument (Kunreuther 2006; Zhang, Hwang, and Lindell 2010). Other literature influenced questions about hurricane risk and insurance more broadly (King 2005; Lindell and Hwang 2008; O'Neill et al. 2016; Brody et al. 2017; Kousky and Michel-Kerjan 2017).

The team modeled the phrasing of questions after established and validated survey instruments:

- Survey of Gulf Coast Households' Responses to Floods[18]

- 2002 Environmental Amenities and Dis-amenities in Harris County (Hwang 2003)
- 2003, 2005, 2006, 2009, and 2017 Public Attitude Monitors[19]
- Demographic questions were modeled after the ACS, and thresholds for categories were a merging of existing ACS categories and thresholds based on the local characteristics of the greater New Orleans population.

The final order of questions and design of the survey instrument was finalized in consultation with the Urban Institute's Survey Methods team as well as methodological reference sources (Dillman, Smyth, and Christian 2014). Once designed, we first tested the survey instrument among research partner staff to help ensure the terminology used would resonate with local residents. For example, we learned that duplexes in New Orleans are locally referred to as doubles, and we therefore included that terminology in our eligibility questions. The team conducted eight of the focus groups described above exclusively with homeowners to understand whether and how readily respondents could access their insurance policy information and their familiarity with their insurance policies' coverage. This was important to know because it allowed us to feel comfortable asking detailed questions about policies and in the cover letter to request that the respondent retrieve their policy information, and led us to limit response options to definitive claims about their insurance policies (though with the option of skipping in the event that they could not answer a question about a specific coverage or other policy term). At the end of the survey, we asked if and how respondents consulted their insurance information to gage the reliability of reported information.

Ultimately, the final survey instrument consisted of a clear screener, five main sections, and the incentive offering. The screener started with an introduction and consent to participate, followed by eligibility questions. The eligibility questions ensured the respondent lived in the study area, lived in an eligible type of home (i.e., single family detached or attached house, a unit in a double or duplex, a unit in a multifamily building), had acquired the home in 2008 or later, and was age 18 or older.

The main survey sections paralleled each of the four project studies along with a set of broad demographic questions: homeownership and the home (e.g., home purchase price and considerations); risk information and perception (i.e., whether they thought a hazard might hit); home and hazard insurance information; risk actions (both preparedness and mitigation actions in preparation for hazards); and homeowner information (or demographics). The survey concluded with some added questions about how best to receive the incentive. Overall, the survey contains 6 eligibility questions, and approximately 70 substantive questions. Appendix B provides the final instrument.

Sample

The survey's target respondents were residents in a seven-parish area who purchased their homes within the prior 10 years as of January 2018. Only owners who live in a single family detached or attached house, a unit in a double or duplex, or a unit in a multifamily building were included. We aimed for an initial sample of 2,123 recent homeowners that are representative by parish and flood zone, assuming a fifty percent response rate. To accomplish this, we use data on all registered land parcels in the seven-parish area purchased from CoreLogic. Records that were viable for sample selection included parcels that are owner-occupied and among the following land use types: residential, townhouse/rowhouse, apartment, duplex, quadruplex, SFR (single family residence), and triplex. Because Louisiana is a nondisclosure state, the CoreLogic data that derive from these public records included substantial missing data, such as high rates of missing purchase date information. We purchased supplementary data from First American Data Tree to fill these gaps in purchase years (a critical eligibility variable).

Despite that, missing rates remained high and were not consistent across parishes or flood zones. To limit sample bias, we examined the rate of missing purchase dates by parish and flood zone and re-sampled accordingly, leading to a second sample size of 6,017 based on the number of completes needed to meet a revised goal of 850 respondents at the ten percent response rate that we had seen in the initial and subsequent experiment samples. The second sample was also fielded differently as described below.

Implementation

Knowing that this population is hard to survey, the research team took a variety of measures during survey implementation in hopes of securing a high response rate. We first administered the survey in multiple modes: phone, online, hardcopy, and in-person (the last being tested, found ineffective, and ultimately not pursued). The first respondents were notified of each mode at the survey launched in December 2018.

All mailed materials were marked with LaFHAC logos, robocalls and text messages were recorded with the voice of the LaFHAC Executive Director and local phone numbers, and staff at LAFHAC were trained by Urban Institute staff on how to answer the hotline as well as how to administer the survey by phone. Outreach was staggered, with and initial postcard invitation, which contained information to take the survey online or by phone, followed by call/text outreach, then a hard copy survey was mailed, followed by a postcard, another round of call/text outreach, and a second mailing of the survey and a final postcard. LAFHAC posted information about the survey on their website, including an image of the

postcard and survey instrument on the site to further legitimize the survey effort. All eligible participants were offered a $50 Amazon gift card as an incentive to take the survey.

Four months following the initial postcard, in April 2019, the research team initiated a door-knocking pilot in Orleans Parish and later in St. Charles Parish. While offered, in-person door-knocking teams made up of LAFHAC staff were provided with paper surveys, tablets to fill out the survey online, printed gift cards, and door-hangers to notify residents who did not answer. Because these additional efforts did not result in substantial gains in response rates, alternatives were pursued. In December 2019, to team revised the sample and implemented an outreach experiment in through February 2020. Based on the experiments, the team implemented an additional sample using only an intro letter followed by a postcard reminder and the full survey only and fielded this sample through June of 2020.[20]

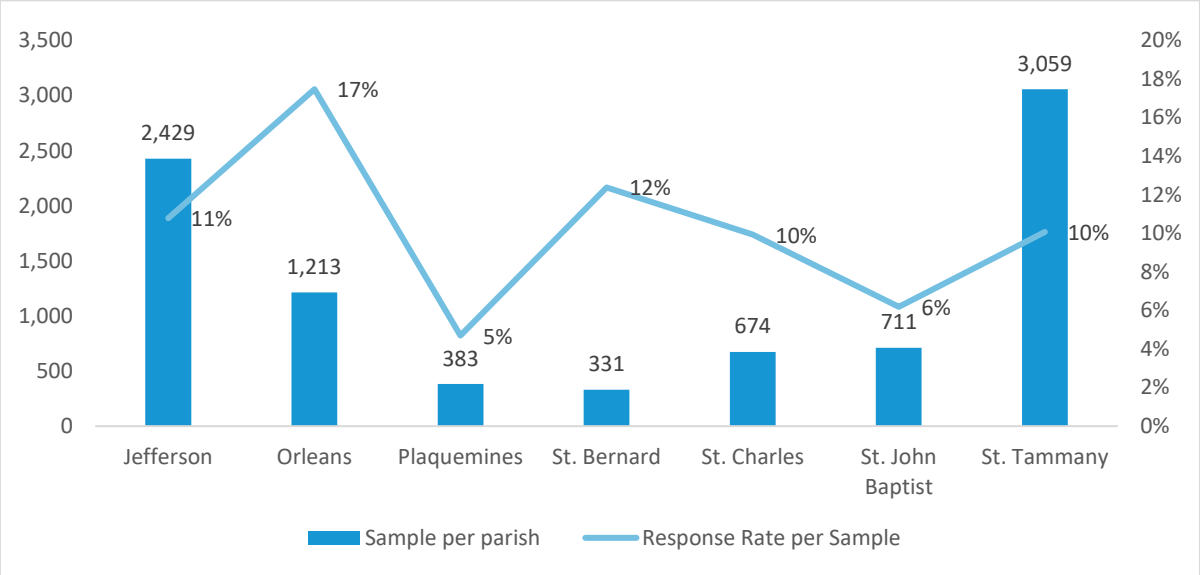
By the collection's end in June 2020 and after the 21-month period of fielding, 952 respondents had successfully completed the survey. It is important to note that the second wave of outreach and data collection was conducted almost entirely during the COVID-19 pandemic.

Response Rates and Weights

We received an overall response rate of 11 percent across all samples.[21] When looking at the sample released by parish and the responses received, some parishes responded at a higher rate than others (figure 3). Orleans parish has the highest response rate per the number of households sampled (18 percent), followed by St. Bernard (12 percent) and Jefferson parish (11 percent) In looking at the share of all responses (N=952) received by parish, the largest share of responses came from the largest parishes, with St. Tammany parish representing about a third (32 percent) of responses, followed by Jefferson (28 percent) and Orleans (22 percent) parishes. Further, 34 percent of respondents lived in a FEMA-designated flood zone (figure 4), variably distributed across the parishes.

FIGURE 3

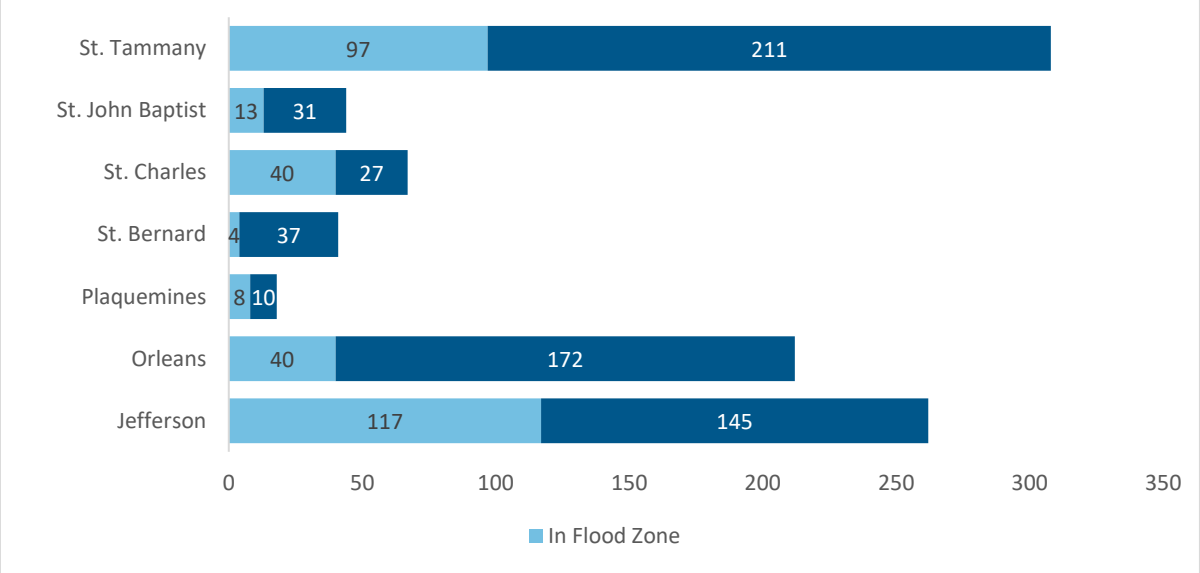
Survey Response Rates and Sample Sizes



Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020.

FIGURE 4

Number of Survey Responses by Parish and Flood Zone



Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020.

Most respondents completed the survey online (68 percent) and a third (32 percent) completed the survey on paper and returned it by mail in the prestamped return envelope we provided them . Few respondents (less than 1 percent) completed the survey by phone.

Finally, because the initial a sample of homeowners was based on homeowner location and purchase year from CoreLogic datarather than household demographics like education, income, race, and ethnicity of the homeowner, we constructed survey weights to be representative of each parish's population. The most critical characteristics we want to align our sample to are race, ethnicity, income, and education of the population within each parish, and whether they reside in or out of a flood zone. We determine the intended population using the 2010 American Community Survey microdata for recent homeowners for the seven parishes in our study. Calculated survey weights were applied to all regressions as pweights in Stata.

Data Cleaning

After the data collection period ended, we underwent a rigorous data cleaning process. This involved addressing missing or inconsistent responses, as well as forming new response categories for analysis. For the former task, the team rectified two challenges. The first were redundant responses provided by respondents on the paper survey that did not follow skip guidance (the online survey had automated skip programming). As a result, multiple respondents that used paper surveys answered some question subsets that were contradictory or nonsensical based upon their earlier answers. The survey team reviewed responses individually and cleaned the dataset for consistency based on respondents' earlier answers. Where no clear decision could be made, a small portion of responses were dropped.

Further, as with all survey designs that do not have mandatory response controls, participants were able to skip questions they chose not to answer, resulting in some missing data. This limited the sample size for some analyses. All questions with open text or "other" options were individually analyzed and, if deemed necessary, recoded to an existing or new survey response category. We took special care to analyze responses to the question on race as they were key to many of the analyses detailed in this report but response counts for each racial or ethnic group were variable. Outliers to all numerical questions were analyzed for plausibility. Some outliers were identified for survey responses where respondents reported dollar values, namely for the reported home insurance premiums, flood insurance premiums, coverage limits, and deductibles. Outliers were removed when they were well above the variable mean and median, well beyond the range of most observations. Outliers for credit score—that is, anything outside 350 to 850—were also set to missing. We occasionally used secondary data to fill in information needed in our analyses, such as for home prices (using Zillow property value estimates) and more accurate flood zone maps.

The second cleaning effort involved re-defining categories of responses due to response size limitations. Multiple sociodemographic variables were collapsed into binary measures, which limited

the examination of some demographic sub-groups, including variation across populations of color and income groups. The collapsed variable categories were consistent across risk perception, insurance, and mitigation models, but the limitations to analysis from this collapsing are further described below. Likewise, multiple items were identified as conceptually acceptable to use for the same predictive construct, but cell counts for some items precluded the use of each measure in respective model designs, so some variables were not possible to include in each model.

The final, weighted survey responses are provided publicly through the Urban Institute Data Catalog.[22]

Analysis

For qualitative data derived from interviews and focus groups, transcripts were produced from contemporaneous notes and audio recordings and were coded using NVivo analytical software to identify key themes. For quantitative data, analytical techniques common across studies is provided below, with study-specific methods described within those sections.

DATA AND VARIABLES

Three of the six studies use a series of cross-tabulations as well as linear regressions, logistic (logit) regressions, and ordered logistic (ologit) regressions to model associations between individuals and geographic characteristics with risk perception, insurance status, and mitigation activity. A set of relevant predictors and controls were identified for each topic area drawing from insurance, risk perception, mitigation, disaster, and environmental social science literatures. Theoretical models were specified before any individual relationships between variables were assessed using the study dataset.

The survey weights were applied to all regressions as pweights in Stata. Stratification was also specified using the seven parish codes for the models, though we do not report any differences by strata. Tables throughout the report present unweighted sample sizes with weighted percentages. All sociodemographic variables in models except for age and home purchase price were binary due to sampling limitations. A few variables had too many categories to have sufficient sample across groups. In addition, increased standard errors result when the data is weighted since some respondents were overrepresented or underrepresented. Restricting variables to two categories helped minimize standard errors. To ensure rigor of the models and compensate for some assumed bias, we applied robust standard errors.

All statistical models include sociodemographic variables such as race/ethnicity as well as education level, employment status, age, and gender. Locational indicators such as being in or out of the flood zone are also included in all models. The insurance models included variables that are specific to the sector. For risk and mitigation models, predictors were selected for environmental attitude, prior experience with hazards and issue salience, and efficacy and capacity. Availability of data also played a role in variable selection. Findings related to model variables are included in later chapters.

The team applied listwise deletion in the models, such that respondents with any missing values among the specified variables were deleted from the analysis. As such, if a variable that was originally specified in the theoretical models had a high missing rate, it would be left out of the final models to maintain enough statistical power for the analysis. Variables were assessed for missingness and outliers prior to running regressions via descriptive statistics. For example, the age of a home was identified as variable that may be associated with multiple insurance outcome variables, but it was dropped because its missing rate was close to two thirds. Several outliers were identified in the insurance models which used responses reported as dollar values. Outliers were removed when they were well above the variable mean and median, or well beyond the range of most observations.

MODEL DIAGNOSTICS

Prior to running models, crosstabulation analyses of predictors with outcome variables were run to check for two-way significances using the Wald Chi-Square test. Significance levels were recorded for all bivariates in each model. The crosstabulations were also used to check for cell counts given that limited cell counts in categories limit their used and sometimes necessitated collapsing them. Versions of variables the with satisfactory cell counts for analysis were used. Tests for multicollinearity were also run to assess correlation among independent variables. Variance Inflation Factors (VIFs) were calculated for each set of independent variables and none exceeded 10, indicating multicollinearity was not a concern for any model.

Models were assessed for fit using the Wald Chi-Square statistic and p-value for logit and ologit models and a Deviance Chi-Square test was recoded for linear models. These statistics confirmed that models as a whole were statistically significant. The AIC and BIC were also recorded for each model and traced across iterations of models to confirm best model fit.[23] In the risk perception models, pairwise comparisons were estimated for categorical variables to check for significances. A Brant Test for proportionality was used for regressions with ordinal category outcomes to check that the proportional odds assumption was not violated, and results were satisfactory across all relevant variables.

MODEL STRUCTURES

Regressions were run using Stata in each of the insurance, risk perception, and mitigation studies. Many of the models contain the same or similar predictor variables for the purposes of cross-comparison. Further, the insurance and risk perception analyses use nested regression approaches. Nested or hierarchical regressions are beneficial for examining the effects of theoretically related measures because they allow for the exploration of changes in explained variance with the addition of theoretically-or- analytically-related blocks of predictor variables (Williams 2006). Structures for models in the three studies relying on regression models are summarized here:

- Risk perception: Two risk models are presented, the first related to risk perception and the second related to risk action. The ologit models were run as nested models to observe the change in model fit and variable relationships as additional thematically grouped variables were added to the model. The three thematic nests were i) sociodemographic and locational variable; ii) environmental attitude, prior experience, and issue salience variable; and iii) information and efficacy / capacity predictors. Iterations of the models were saved to compare Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) of increasingly specific models to test for improved fit.
- Property insurance: Three insurance coverage, three insurance pricing, and three level of service models were run as nested models such that the first model iteration included only the primary variable of interest (race/ethnicity and household incomes), controlling for location within a flood zone. The second iteration of the models contained additional relevant sociodemographic and other control variables. While all the pricing models were linear regressions, insurance coverage and level of service models were a mixture of logit and ologit.
- Mitigation: Mitigation and preparedness models were run including all relevant variables. The preparedness model was a Poisson regression with a count variable as the outcome variable. The mitigation model was a logistic regression with a binary variable as the outcome variable.

The best fit models are displayed in the findings sections.

REPORTING

Regression results are reported for all three studies in a series of tables that include coefficients (e.g., log-odds, odds ratios, incident rate ratios) and standard errors for each corresponding independent variable. Significances are marked by the following critical value cut-offs: * p<.1; **p<.05; ***p<.01. In addition, model fit is reported with model Chi-Square and its significance, AIC, BIC, and log-likelihoods. For ologit and logit models, the discussion of results relies primarily on odds ratios for interpretation

and conclusions. For linear regression models, results are reported on variable coefficients for interpretation.

LIMITATIONS

There are several limitations that should be considered when interpreting study findings. Most of the concerns with the quantitative findings stem from the survey data and, secondarily, the quality of secondary data sources such as the FEMA flood maps. The study team encountered research constraints associated with response rates, representativeness, sample size, variable specification, and data recency and availability regarding the survey data and their analysis. The study team exhaustively implemented several survey fielding best practices for the purposes of increasing both representativeness and response rates, including pilot testing, deploying multiple survey modalities, offering participation incentives, fielding multiple survey waves, and incorporating follow-up reminders (Dillman, Smyth, and Christian 2014).

Even so, the study's overall 11 percent response rate—although in line with declining response rates in social science survey trends in recent years—is fairly low, and presented challenges associated with nonresponse bias and sample representativeness (Stedman et al. 2019). Although response rates varied across parishes and the team addressed many identified challenges with survey weighting, limitations remained for race/ethnicity and income data for the overall sample that necessitated collapsing these demographic categories.

For example, simple bivariate race and ethnicity comparisons were possible for non-Hispanic Black, Hispanic, and non-Hispanic white populations across many outcomes of interest, but the representativeness and sample size of different households of color in the overall weighted sample was still inadequate for most of the multivariate regression modelling used in the study. As such, comparisons between non-Hispanic white populations and all populations of color were often necessary, resulting in limited evidence about housing resilience for different sub-populations of households of color.

A similar challenge presented with the specification of the study's household income variable and overrepresentation of higher income households in survey responses. In the survey, household income options were presented in $10,000 increments up to $90,000, with "$90,000 or higher" as the highest response category. This resulted in a higher than anticipated number of responses in the "$90,000 or higher" range. The study team also observed lower than anticipated responses in ranges below $90,000, such that counts in respective sub-categories were too low to analyze statistically. This required the study team to collapse the income variable into two categories for all analyses: less than $90,000

household income or greater than $90,000 household income. As a result, the survey team was not able to test differences between middle-income households and high income and very high-income households, or test for differences in responses between lower-middle income and low-income households. Thus, assessments of observed income effects are limited.

Survey responses about past insurance claims presented both specification and data recency challenges. Of the overall sample, approximately one third of respondents reported having filed a home insurance claim in the past, and two thirds of respondents left questions about past home insurance claims blank. We interpreted the lack of response on these questions to mean respondents had never filed a home insurance claim. The relatively small subset of the overall sample that did report a past claim presented sample size limitations for complex multivariate regression analyses. Further, the specification of the past insurance claim questions also allowed respondents to discuss any home insurance claim they may have filed in the past, including cases that may not have been associated with their current residence or that may have occurred many years in the past. Because of this, the study team was unable to assess both time and geographic contexts of home insurance claims in analyses.

More broadly, it is possible that recruited households with very positive or very negative experiences with insurance purchase or claims were potentially more likely to respond. Further, respondents who are more likely to perceive greater risk, have access related information, and acted upon their understanding of risks may also be more likely to have responded to our survey. Consequently, the responses may not be representative of the views in the region even though responses to the questions on risk perception show a diversity of views. Concerns about selection bias by demography were tempered by weighting, though these could also be surfacing in the responses.

Beyond the survey, another challenge was encountered with the recency of FEMA flood data. Because FEMA flood zone calculations were based on historical data, the maps used for analysis in this report do not incorporate more recent increased risk due to current levels of subsidence or climate change-related changes in flood frequency or severity, and because of this, we have low confidence that the FEMA data available at the time of this study adequately captures contemporary flood risk and exposures.[24] New FEMA flood map and insurance data were available for 2017, the most recently available period at the time of survey fielding. Since that time, even more updated maps have come online from FEMA due to changes in its overall risk rating assessments as well. Since respondent households may not have been familiar with FEMA flood information beyond the point of their own home purchase between 2008 and 2018, the presence of this updated information may not have informed their survey responses. However, analyses in which the study team categorized their actual exposure based on the FEMA flood risk maps at the time would need to be reconsidered.

With regard to the qualitative components of the work, several common limitations apply. In most cases, qualitative data collection was primarily used for research design purposes such as the development of the survey instrument or to document current mitigation programs. With sufficient triangulation as well as cross-waking with scholarship and public documents, their effect was mitigated or negligible. For the community engagement study, however, qualitative data were central.

As noted in more detail in chapter 2, the inability of the study team to acquire robust documentation of planning efforts' community engagement processes introduces the potential for the respondents in our interviews and focus groups to influence the depictions more strongly, resulted in less rigorous analysis. Conversely, though discussion protocols were structured, vetted, and piloted and all staff involved have undergone qualitative research methods training, the protocols were partially open-ended and allowed for the introduction of research biases. Potentially, interviewers surfaced or repeated topics because of a preconception of their importance, resulting in respondents commenting on the topic where they may have otherwise not. To counter this potential, all interviews and focus groups were conducted with at least two and, in some cases, up to four researchers where appropriate from a human subject's perspective thereby limiting the introduction of any one researcher's bias.

Two other limitations related to the study's context are also notable. First, all components of the project were completed at the onset of the COVID-19 pandemic resulting not only in substantial delays in data collection and analysis that could have affected the researchers' ability to produce this report, but also in the timeliness of the subsequent findings. For example, as described in more detail in chapter5, FEMA has moved forward with new maps and NFIP premium pricing schema and several private insurance carriers have chosen to pause policy issuance in Louisiana in the timeframe since the final survey data were collected. Collecting and analyzing data in such a dynamic context is generally time-consuming but leads to recommendations that are no longer relevant or, in cases like NFIP pricing, accurate.

Similarly, the study team cautions about the generalizability of the findings in this study beyond the case of greater New Orleans. The site was selected, and its social and environmental histories and housing conditions exhaustively documented, because of the concern of it being the proverbial canary in the coal mine. There are clearly local social and political contexts that are unique to this place as described in this report, and this context is critical to our study. Consequently, we do not purport to directly generalize findings to other housing and environmental contexts. However, given the similarities in the private, public, and civil-sector institutions and policies serving other US regions especially the Gulf Coast, we believe that replicating these studies is possible and would contribute further insights into the limitations of this study.

1. Infrastructure Protections

The repair and improvement of greater New Orleans' hurricane protection infrastructure beginning in 2006 represents a massive investment in the public commons. As with all protective infrastructure, the distribution and method of the protections that this infrastructure collectively apportions is not value neutral. Debate over how to prioritize who and where to protect is ongoing, with some stakeholders seeking to minimize potential overall economic losses, while others argue for prioritizing vulnerable individuals and communities. Vulnerability is the cumulative set of preexisting conditions such as housing quality and tenure, financial assets, political power, and community bonds that determine the magnitude of a hazard's effects for an exposed home. The vulnerabilities of particular groups and their places of residence, that is, the social, geographic, and environmental inequities that make some people and places face greater potential for loss from natural and man-made hazards, must be taken into account when examining the effectiveness of a set of protective infrastructure such as exists in metropolitan New Orleans.

Protective infrastructure for a region is a key channel for building resilience for the land within the infrastructure's protective boundaries on which the homes exist. This chapter examines the relationship between the geography of flood risk and the residential locations of vulnerable populations in greater New Orleans from the aftermath of Hurricane Katrina to the present to provide insight into whether, and to what degree, the new protections have reduced exposure to hurricane-related damages for vulnerable populations. This work explores the degree to which nonwhite, low-income, lower-education, and renter households are disproportionately exposed to flood risks among other demographic, housing, and community characteristics, and how this exposure changes because of the complex changes in the region's post-Katrina demographics, staged protective infrastructure, and exposure to climate change's effects.

Background

The period following Hurricane Katrina saw drastic changes in southern Louisiana. The displacement of over 50 percent of the population of Orleans parish alone (including almost two thirds of the Black population) resulted from the subsequent flooding and consequent strains to the economic, health, and social infrastructure. These hardships were exacerbated by the well-documented failures of national and local relief and recovery systems in the areas of temporary shelter and permanent housing. Many of those who left were unable or chose not to return, especially among the Black population that had dispersed throughout the Southeastern United States and beyond (Fussell 2015). Barriers to returning

included a lack of economic stability and long waits for often-insufficient assistance for repairing or rebuilding housing. For those who stayed in the region, some left the core city and resettled in growing suburban communities (Sastry and Gregory 2014).

Subsequently, the region attracted new residents who often looked different from the previous makeup of the city: the newer residents of New Orleans were whiter, better educated, and wealthier. In addition, the region saw a smaller but significant growth in the Latinx population, many of whom were attracted by employment opportunities in reconstruction and physical infrastructure improvement (Gotham and Campanella 2011). This unprecedented demographic shift upended historical geographic class and race boundaries.

Environmental, hydrological, geological, and climatological factors also continue to shape the post-Katrina landscape. Potential increases in storm severity and frequency mean that current and planned protections may not provide the intended protection, and areas that appear to be at relatively low risk may see increased exposure. The Intergovernmental Panel on Climate Change estimates that a likely 1.5-degree centigrade increase in global temperatures will lead to coastal areas experiencing a .43-.85-meter sea-level rise by 2100 (IPCC 2022). This rise will be seen more substantially in southern Louisiana: as a result of heavy industrial use and extensive modifications of waterways and coastal marshes, the area has and will continue to see coastal land losses of over 2,000 square miles since 1934 as a result of subsidence from industrial land use and manipulation of water flows, and increased frequency of high-destruction rain and flood events (Lall et al. 2018).

This dynamic compounds with a legacy of environmental degradation in the region that has already resulted in higher risk exposure for vulnerable Gulf communities. Two parishes included in this project—St. Charles and St. John the Baptist—fall within Cancer Alley.[25] This stretch of the Mississippi River between New Orleans and Baton Rouge has seen construction of over 30 petrochemical plants since the 1970s, which have resulted in increased atmospheric carcinogens determined by the EPA at levels determined to be above acceptable risk (University Network for Human Rights 2019). One analysis of the presence of air toxins using data from 2005 found that, while cancer risk is elevated for all in the area, low-income census tracts have a cumulative risk 12 percent higher than high-income, and tracts with high concentrations of African American households saw 16 percent higher cumulative risk than white-dominant tracts (James, Jia, and Kedia 2012). Further, studies from the 1990s showed that children in census tracts with higher presence of soil-based heavy metals were on average 75 percent black, contrast to 50 percent for lower-level tracts (Mielke et al. 1999).

In addition to the demographic and environmental shifts, massive investment has been and continues to be made in protective infrastructure across the region since Hurricane Katrina, including: historic canals and levies have been repaired; new coastal reconstruction efforts incorporate green protections, such as marsh reconstruction; an increase in new alternatives to shift from a traditional concept of protection—removing all water from developed areas—to more contemporary concepts of living with and among water; and improvements to physical interventions such as repaired dykes, seawalls, marshes, and raingardens, which provide protections against chronic environmental changes, like sea level rise and soil erosion, and reduce the severity and damage of future storm events. Regional public works and community-scale infrastructure changes have and will continue to alter the geography and demography of protection across the region.

Understanding the current geography of natural and manipulated exposure, risk, and vulnerability is an arduous but necessary task for developing long-term equitable plans and policies toward resilience, climate change, and social equity in the region. This chapter explores how to understand the changing geographies of risk exposure and social vulnerability across the region.

Demography and Vulnerability

Flood protection in and around New Orleans has never been race-neutral. Early settlements in the region were segregated between those wealthy white households that benefitted from the natural high ground along the Mississippi while free black, mixed race, and poor white families were relegated to the malaria-prone, flood prone, *banlieues* (Campanella 2016). While the enslaved population typically lived in the enslaver's high-ground estates, their free descendants were rarely able to stay in those neighborhoods. Present-day racial divisions have mirrored these early trends as the metropolitan area and overall region remain segregated; within the central city and parish of New Orleans, white residents occupy higher ground, while Black and other populations remained in low-lying areas where flooding has been more severe and frequent (Bullard and Wright 2012). In parishes outside of Orleans, however, flood exposures and risks of future exposures by racial and income groups are more variable.

Flood exposure challenges for vulnerable populations within metropolitan New Orleans have been compounded by direct and indirect exclusion from social, legal, and economic supports. These exclusions historically led to some immigrant groups such as Italian and Irish families living in flood-prone areas, but by the second half of the 20th century, low-income and Black households bore the brunt of the exposure to floods (Colten 2006). Practices such as real estate and insurance redlining, employment discrimination, and a long-term federal focus on providing funding for middle-class

homeowners to rebuild following flood events have kept low-income and low-education households and communities of color from moving to wealthier neighborhoods or improving housing conditions and neighborhood amenities where they were. Financial assistance for reconstructing housing following Katrina also led to increasing disparities (Green and Olshansky 2012). The disparity in resources available for renters, coupled with the fact that only 40 percent of affordable damaged rental units were projected to be repaired or replaced with recovery assistance in 2008, left displaced renters "critically vulnerable" (Rose, Clark, and Duval-Diop 2008).

These patterns may have contributed to the dramatic demographic shifts the region has seen since August 2005. Many Black households have been unable to return because of the economic burden of rebuilding, as well as new legal barriers and a lack of governmental or private financial assistance. The lower rate of return for Black households to New Orleans appears to be a result of the higher levels of housing destruction in neighborhoods with high concentrations of Black households and the financing gaps of the Road Home Program described above (Green, Kouassi, and Mambo 2013). New populations have moved into the central Orleans Parish, fundamentally changing the character of some neighborhoods. table 3 provides changes in household counts over the post-Katrina era. A full detailing of changes in additional demographic characteristics is available in appendix A.

TABLE 3

Race/Ethnicity and Housing Tenure Counts in Jefferson and Orleans Parishes, and the Greater New Orleans Region after Katrina (2005–2009) and during Study (2013–2017) (in thousands or %)

		Race/Ethnicity				Poverty	Housing Tenure	
		Asian/ Pacific Islander	Black	Hispanic (all races)	White	(%)*	Own	Rent
Jefferson	2005–2009	4,645	35,779	12,420	113,681	10.1%	105,083	55,027
	2013–2017	5,579	41,879	19,213	113,284	12.6%	104,407	64,379
	Count Change	592	6,100	6,793	-397	--	-676	9,352
	Percent Change	20%	17%	55%	0%	2.5%	-1%	17%
Orleans	2005–2009	2,256	63,905	3,948	45,337	19.0%	58,276	55,659
	2013–2017	3,357	86,451	8,201	60,647	19.3%	72,892	82,003
	Change	1,101	22,546	4,253	15,310	--	14,616	26,344
	Percent Change	49%	35%	108%	34%	0.3%	25%	47%
Greater New Orleans Region	2005–2009	8,329	123,633	21,119	269,162	11.7%	272,115	140,385
	2013–2017	10,866	155,513	34,257	290,257	13.5%	291,694	181,236
	Change	2,537	31,880	13,138	21,095	--	19,579	40,851
	Percent Change	31%	26%	62%	8%	2.2%	7%	29%

Source: 2005–2009 and 2013–2017 ACS 5-year estimates
Note: Post-Katrina values represent counts from 2005–2009 ACS 5-year estimates; Study period values represent counts from 2013–2017 ACS 5-year estimates. Race groups are all non-Hispanic. Poverty measurement is percentage whose income in the previous 12 months is below the poverty level.

Despite these shifts, severe inequities in vulnerability remain. Black households at all income and education levels face housing discrimination, which limits their choice of residential location. Renters in any neighborhood still face higher rates of housing insecurity and, on average, lower home quality than homeowners. Low-income households remain limited to more affordable areas which remain more likely to have higher exposure to severe flooding, and to have poorer access to economic, health, and cultural resources.

Environmental Exposures

In addition to social vulnerabilities, metropolitan New Orleans exposure to loss from disasters like Katrina is exacerbated by long-term environmental degradation resulting from resource exploitation. Natural resources in the greater New Orleans region, which have been critical to the region's economic and cultural development, have been degraded by years of human intervention to control waterways, and to exploit natural oil and gas. The Mississippi Delta is home to some of the largest wetlands in the country, with this land type making up 63 percent of Louisiana's coastal area (Ko et al. 2004).

If left to their natural processes, these wetlands would continue to deposit fresh water and sediments that make up the underlying land around the Mississippi River and the original foundations of New Orleans. However, human interventions mean these wetlands have been deteriorating at a faster rate than if left to natural processes. Three activities related to oil and gas exploration and extraction have had significant hydrological and geological effects in the delta region, including: the construction of artificial canals and levees that disrupt natural hydrologic processes such as sediment production; spilled oil and industrial wastewater that harm nearby vegetation and marine life; and the pumping or removing of water during extraction that can lead to air pockets being formed in the soil, which then oxidizes the soil and allows other particles to fill in those cavities, creating soil subsidence.

Groundwater withdrawal has been a known driver of subsidence throughout metropolitan New Orleans, but it is particularly noticeable around oil refineries and chemical plants (Jones et al. 2016). Since the 1930s between 30 and 90 percent of the 2,000 miles of coastal wetlands have been lost due to oil and gas extraction.[26] Most refineries are located along the coast or slightly inland along the Mississippi River.[27] Oil producers use canals to access well sites and pipelines to transport oil inland. This land use change accelerated saltwater intrusion inland which in turn increased erosion and wetland

degradation. Ten thousand miles of privately-owned oil canals laid throughout the Mississippi River Delta increased the natural processes of wetland degradation in the mid–20th century, causing the land in many places to sink by half an inch a year, and discharging and dumping drilling byproducts such as brine, killing plants and animals and contaminating soils for years until regulated in 1985.[28] According to the Gulf Restoration Network, the oil and gas industry and its associated infrastructure is responsible for 36 to 89 percent of Louisiana's historical wetlands loss.[29]

Protective Infrastructure

While some experts argue that the current damage to the coastal lands is irreversible, there are still ways that developers and local government officials can slow the speed of subsidence and improve local hydrology via bioswales, rain gardens, and retention ponds. Yet, the history of infrastructure investments to protect the region have not made these alternatives easy.

The history of infrastructure designed to protect residents and property against arguably the greatest perceived environmental threat, flooding, has resulted in particularly complex stew of governmental actors and systems today. Today we have a mix of interrelated infrastructure—from the massive public works constructed in Katrina's aftermath, to the variably maintained parish and municipal interventions like levees and stormwater pumps, and even neighborhood and property-level alterations like rain gardens and bioswales.

Flood protection projects in the region can be thought of on three scales: regional, local, and community-level. The largest of these, regional protections, often include large-scale coastal reconstruction, as well as major infrastructure at key intersections such as river and canal outflows. Local projects are typically constrained to a single Parish or municipality or may provide shared protection for more than one local government jurisdiction. Projects of this scale often include canals or specific site marsh development. Community-level projects typically target a neighborhood or defined geographic area smaller than a city or parish. Projects at this scale are the most diverse in form and include expanded green infrastructure and flood protections built into community assets such as complete streets, rain gardens, and reinforcing targeted portions of levies.

While these scales are a useful conceptual framework, in reality the boundaries between the levels can blur, as many community-level projects function as components of local and regional infrastructure. For example, a community wetland may be coordinated at a local level and receive parish funding as a park development but may also be a part of a region-wide wetland restoration project designed to slow storm surges and hurricane winds. A complex ecosystem of plans means that any given project may

include local, regional, state, and national decisionmakers and stakeholders, and that comprehensive planning efforts do not reside in a single document, nor are they controlled by a single decisionmaking body.

To provide some level of a comprehensive description of the current state of protections across the region, however, the remainder of this section provides an overview of the flood infrastructure at each of these levels that has been developed or conceived since Hurricane Katrina. The summary of current infrastructure in planning, construction, or commissioning phases presented below is the result of a systematic scan of federal, regional, and local planning documents. Where possible, we have included the funding level and target population, and have indicated where local and community-level projects are part of larger efforts. While we have attempted to be comprehensive, it is likely that some efforts, especially at the community level, have not been captured here. In addition, the information provided on funding and funders may not reflect the complete web of stakeholders and local resources.

REGIONAL SCALE

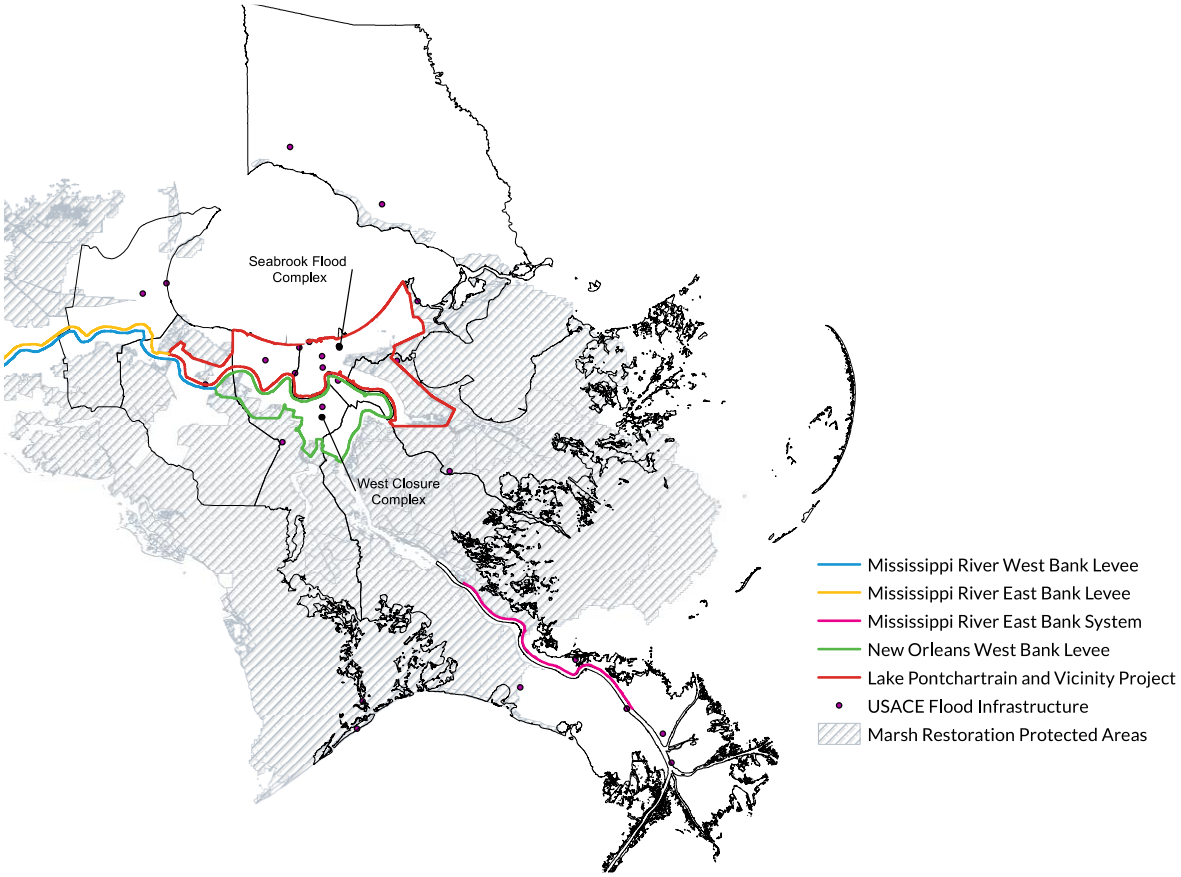
Large regional barriers are most commonly built to protect from a 100-year flood, or a flood with a one percent chance of occurring in any given year, as this is the level of protection needed to qualify for the NFIP.[30] However, some infrastructure projects built to this standard are at risk of not offering adequate protection as soon as 2023 as climate change brings sea-level rise and more intense hurricanes and storms.[31] Experts note that the 100-year flood calculation almost certainly underestimates the true risk of flooding, as it is by definition based on historic flood records, which we know do not reflect our current or near-future reality (Highfield, Norman, and Brody 2013). Recent discourse notes that USACE has the authority to improve current protections to the 300 or 500-year protection levels, USACE leadership has expressed that the largest factor in constructing improved flood protections is the cost, which would add millions to the $3.2 billion levee improvement project currently planned.[32]

Consequently, the first line of defense for storm surge and flood protection are coastal restoration projects along the Gulf of Mexico. The state is working to combat the 2,000 square miles of wetlands lost with restoration efforts (figure 5).[33] Coastal reconstruction projects leverage the ability of natural ecosystems including wetlands to slow the speed of hurricanes and diminish their intensity before they reach densely populated areas inland. The Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), authorized by congress in 1990, is the main piece of federal legislation enabling coastal restoration in Louisiana. The program has an 85 percent federal and 15 percent state cost share and has directed almost $2 billion in funding to date. CWPPRA is managed by the State of Louisiana and five federal agencies: The U. S. Environmental Protection Agency, US Fish and Wildlife Service, the Natural

Resources Conservation Service, the National Marine Fisheries Service and the US Army Corps of Engineers.[34] Projects include barrier island restoration, water and sediment diversion to allow freshwater into wetland areas, and marsh creation.

FIGURE 5

Partial Flood Infrastructure Map for the Greater New Orleans Region



Source: Data from the National Levee Database, USACE Geospatial Open Data, and WorldMap

In 2010, the State of Louisiana placed large sand berms in the Gulf of Mexico to defend coastal marshes from the BP Deepwater Horizon oil spill. The following year, CPRA reincorporated these existing defenses into permanent berms to protect marshes and to create long-term shields against storm surges and ecosystem degradation. CPRA completed the $350 million project in 2014 with funding from BP as part of their legal settlement.[35] Additionally, funding from the oil spill settlements supported the Cheniere Ronquille Barrier Island Restoration project, which involved the creation of a barrier chain between the Barataria Basin and the Gulf of Mexico. The Louisiana Restoration Authority (LRA) completed the $35 million project in 2017.[36] In September 2020, the Louisiana Trustee

Implementation Group, an oversight body of state and federal agencies managing the distribution of BP settlement money from the oil spill, approved $215 million for two restoration projects: The $100 million Spanish Pass Ridge and Marsh Restoration, which will build almost 1,800 acres of march and ridge habitat restoration, and the Lake Borgne Marsh Creation, which will reestablish the bay rim and intertidal marsh habitat of the Pontchartrain Basin.[37]

Additional coastal restoration projects include the Golden Triangle Marsh Creation, the Biloxi Marsh Living Shoreline Project, and the Caminada Headland Back Barrier Marsh. Funded with an estimated $50 million from the State of Louisiana, the Golden Marsh Creation project is currently in the planning phase and seeks to counteract saltwater intrusion and erosion caused by the construction of the Mississippi River Gulf Outlet that runs from Orleans Parish through St. Bernard Parish to the Gulf of Mexico.[38] Similarly, the CWPPRA-funded Biloxi Marsh Living Shoreline Project is in the engineering and design phase. The major work of this project is a living oyster reef shoreline, which will be sited in St. Bernard Parish, but primarily protect New Orleans.[39] Another marsh development project, the Caminada Headland Back Barrier Marsh, will protect coastal Jefferson and Lafourche Parishes through the creation of a back-barrier marsh (a salt marsh behind a barrier island). With an estimated cost of $42.1 million, the CWPPRA Task Force approved this project in 2014 and is scheduled to complete it in 2021.[40]

Further inland, the Gulf Intracoastal Waterway - West Closure Complex offers protection for residents on the west bank of the Mississippi River in Orleans, Jefferson, and Plaquemines Parishes.[41] The West Closure Complex is located half a mile south of the Algiers and Harvey canals on the Gulf Intercoastal Waterway and allows the two canals to serve as the detention basin for rainwater draining from the parishes. A facet of the larger Hurricane and Storm Damage Risk Reduction System (HSDRRS) by the USACE, the West Closure Complex received $14 Billion in funding from Congress following Hurricane Katrina. HSDRRS consists of 350 miles of levees and floodwalls, 73 nonfederal pumping stations, 3 canal closure structures with pumps, and 4 gated outlets across the region.[42] Completed in 2018, the system spans five parishes in our study area: Orleans, Jefferson, St. Bernard, St. Charles, and Plaquemines.

Immediately after Katrina, the state of Louisiana established the Southeast Louisiana Flood Protection Authority in 2006. The Flood Protection Authority sets policies and manages the HSDRRS that includes seven major flood protection operations throughout Orleans, St. Bernard, and Jefferson parishes, across which they are responsible 192 miles of floodwalls and levees, 3,350 acres of levee turf and 244 land-based floodgates (table 4).

TABLE 4

Components of the Hurricane and Storm Damage Risk Reduction System (HSDRRS) Managed by the Southeast Louisiana Flood Protection Authority (counts or measure)

Infrastructure Component	East Jefferson Levee District	Orleans Levee District	St. Bernard Parishes	Total
Permanent Canal Closures and Pumps	0	3	0	3
Levee/Floodwall (miles)	28	107	57	192
Levee Turn Maintenance Area (acres)	730	1400	1400	3530
Flood Gates (land based)	12	200	32	244
Navigable Floodgates	0	6	2	8
Drainage Canals (miles)	0	0	56	56
Drainage Pump Stations	0	0	8	8

Note: Table adapted from Flood Protection Authority-East.[43]

On the north end of the region, the Seabrook Flood Complex, located in Orleans Parish at the confluence of Lake Pontchartrain and the Inner Harbor Navigation Canal (IHNC), protects New Orleans from storm surge that can enter the Industrial Canal from Lake Pontchartrain. On the opposite end of the IHNC, at the eastern edge of the metropolitan area, is the Lake Borgne Surge Barrier that protects New Orleans East, the Ninth Ward, and St. Bernard Parish, which are some of the most vulnerable areas in the region from storm surge entering from Lake Borgne and the Gulf. The construction of both structures began in 2009 and are complete and fully operational. These projects are particularly crucial because they protect the pathways that were the primary sources of flooding entering New Orleans during Hurricane Katrina. Both projects fall within the larger Lake Pontchartrain and Vicinity Project which protects St. Charles, Orleans, St. Bernard, and Jefferson parishes through levees and floodwalls that defend against 100-year storm surge levels. This project, priced at about $3 billion, involves rehabilitating and constructing 150 miles of levees and structures on the east bank of the Mississippi River.

On the west end of New Orleans, the West Shore Lake Pontchartrain Levee was in planning phase at study time. The levee will be situated on the east bank of the Mississippi River in St. Charles and St. John the Baptist Parishes, as well as St. James Parish, which is not in our study area. St. Charles and St. John the Baptist Parishes have differing demographic profiles, with the former a majority whiteand wealthy population, and the latter a majority Black and slightly less wealthy parish.[13] Included in the

project are 18 miles of levees, pumping stations, drainage structures, and utility relocations. Congress approved $760 million in federal funds in 2018, with a 35 percent state cost share.[44]

These infrastructure projects protect the perimeter of metropolitan New Orleans, while a series of smaller infrastructure projects that fall within the Southeastern Louisiana Urban Flood Control Program (SELA) protect the interior of the city and the adjacent parishes. This includes the ethnically and racially diverse urban core of New Orleans and inner Jefferson Parish, as well as St. Tammany Parish, which remains predominantly white and suburban, but has seen increasing diversity and density since Katrina. These three parishes are also the most highly educated in our region.[45]

ELA projects are managed by the Sewerage and Water Board of New Orleans and the US Army Corps of Engineers. The principal goal of SELA is to improve the drainage system of canals and pumping stations in the region. The project received initial funding in 1997, but, in the aftermath of Katrina, Congress passed the Flood Control and Coastal Emergency Third Supplemental Appropriation, providing the program with a $224 million in federal funding. Due to the scale of SELA infrastructure projects, congress appropriated an additional $1.3 Billion in 2008 with a 65 percent federal/35 percent local cost share.[46] The projects in SELA aim to provide protection for 10-year rainfall events, with 16 projects in total, all of which are slated to be substantially complete by 2021. The program has completed thirteen flood protection projects, with three projects currently underway, throughout Orleans, Jefferson, and St. Tammany Parishes. The 16 projects are drainage pump stations or canals.

While all the above projects are either complete or near completion, our search uncovered several major projects that have been suspended for variety of reasons ranging from environmental impact concerns, limited funding, and political pushback. One example is the Donaldsonville to the Gulf project, a levee that would have provided protection for parts of Ascension, Assumption, Jefferson, Lafourche, Orleans, Plaquemines, St. James, St. John the Baptist, St. Charles Parishes. This project was cancelled in 2012 because the USACE did not believe that it was economically feasible to fund the $10 million project. The cancelation was met with frustration from residents who felt they were left vulnerable to flood damage and often receive water in their communities diverted by other flood infrastructure projects further upstream.[47]

PARISH AND MUNICIPAL SCALE

Local projects are intended to improve the protection of a specific jurisdiction, or in some cases two jurisdictions when addressing shared features such as canals that cross the parish lines. They differ from the regional-scale projects in that they are not intended to improve safety outside their parishes, although they may be part of a larger protection plan. The projects we observed are typically related to

installing or improving flood protections such as pumping stations, canals, and levees and portions of green infrastructure such as marsh creation.

Our review of local flood protection plans showed that funding for local projects frequently comes from state or federal sources, such as CWPPRA, HSDRRS, HMGP, and Coastal Impact Assistance Program (CIAP). The CWPPRA legislation helped to fund 14 of the local-level projects in our analysis, with each of those projects being parish- or multiparish-level projects. Most of these were marsh creation projects, such as the Sediment Containment System for Marsh Creation Demonstration in St. Charles Parish where CWPPRA provided over $2 million toward marsh creation. HSDRRS is another common source of funding for parish-level projects, although it usually funds larger-scale, region-wide projects. The projects funded through HSDRRS typically relate to pump stations, drainage canals, levees, and other structures that aim to protect larger geographical areas, such as one or more full parishes. The CIAP provides federal grant funds to oil-producing states for coastal conservation, protection, and restoration projects. CIAP has funded 10 of the projects in our analysis, with contributions ranging from around $300,000 to $60 million.

With a funding range of this size, CIAP has developed some of the smaller and larger scaled projects in our analysis. For example, CIAP funded the Orleans Land Bridge SP and Marsh Creation, a $30 million project that was completed in 2013 and created 8.7 miles of marsh and land along the northwestern shoreline of Lake Borgne and aims to prevent marsh loss and protect Bayou Sauvage National Wildlife Refuge, the nation's largest urban wildlife refuge[4849]. CIAP also funded the $355, 780 Shoreline Protection Emergency Restoration that was completed in the same year and involved the installation of 14,000 plants along 1.4 miles of shoreline that was impacted by the Deepwater Horizon Spill in Bay Jimmy (Plaquemines parish) to re-establish vegetation in the area.[50]

COMMUNITY AND PROPERTY SCALE

Many of the community-scale projects we reviewed are street-level enhancements that aim to address flooding concerns in current populated areas, previously vacant areas, or low population areas that present opportunities for growth. These projects typically have two goals: to target areas that experience severe flooding regardless of the size of a storm, and to enhance the local economy by improving home values, beautifying the community, and creating more livable spaces. As such, these projects incorporate protective infrastructure measures within neighborhood redevelopment projects that target specific community needs. In addition to the planning and material efficiency of combining uses, this also serves to incorporate flood protections into the broader community design, allowing them to work in alignment with community and environmental needs.

Hazard mitigation plans tend to detail many such community-level projects that combine flood protections and beautification efforts. The Saint Roch Streetscape Improvements project, for example, is a 2015 Orleans Parish Hazard Mitigation Plan project that has two main goals listed in the project description: 1) to provide better drainage ditches as the neighborhood suffers from flooding quite often, regardless of the size of a storm and 2) to beautify the area, with more organized street parking, additional plants and shading, and overall new and improved aesthetics.[51] The project area consists of 26 city blocks that make up the area of the St. Roch neighborhood in New Orleans. Because the neighborhood suffers from chronic flooding, even from relatively small storms the City of New Orleans, along with FEMA and USACE, developed the estimated $7.5 million project to address these flood-related issues (City of New Orleans 2019).

Likewise, The Gentilly Resilience District is a combination of 12 projects and programs that will reduce flood risk, improve energy reliability, and encourage neighborhood revitalization.[52] The $141 million NDRC-funded project located in the Gentilly neighborhood in New Orleans and features projects ranging from a water garden to recreational green spaces, and will provide communities with much needed flood infrastructure. For instance, through the Mirabeau Water Garden: Phase I the city will redevelop a vacant plot of land to serve as a recreational and educational park, but also to help address flood concerns in the surrounding community by absorbing water that would otherwise burden the city's pumps and canals. The Mirabeau Water Garden is the flagship project of the Gentilly Resilience District, as described by architecture and planning firm Waggoner and Ball, and will be "one of the largest urban wetlands in the country and a campus for water research."[53] Additional projects include Pontilly Neighborhood Stormwater Network and the Blue and Green Corridors, both of which will provide improved stormwater management infrastructure to be able to handle the excess water that the current system cannot handle. Other projects, such as the St. Bernard Neighborhood Campus and the Milne Playground Resilience project, will provide subsurface stormwater management to existing recreational spaces as well as add recreational spaces where the community can host events. Each of these projects is expected to be completed by November 2021.

The *LA SAFE Our Land and Water: A Regional Approach to Adaption* also details community-level projects across Jefferson, Plaquemines, St. John the Baptist, and St. Tammany Parishes in our study area, as well as Lafourche and Terrebonne Parishes. Specifically, in our scan we noted 21 planned community-level projects that fall within our study area. The structure of the LA SAFE plan is different from the hazard mitigation plans in that the LA SAFE projects are largely conceptual; the goal for each parish is to identify funding streams and lead actors/organizations, the latter of which is tasked to choose at least one project from the list of proposed projects to fund. LA SAFE usually pledges funding

to each project included, ranging from contributing to funding partnerships to covering the entire proposed budget. By 2018, each of the four LA SAFE parishes in our study area identified a project to fund, with completion scheduled for 2022: Jefferson chose the Gretna Resilience District Kickstart; Plaquemines chose the Plaquemines Harbor of Refuge; St. John the Baptist chose the Airline and Main Complete Streets; and St. Tammany chose Safe Haven Blue-Green Campus and Trails.[54]

As with the regional projects, there are several community-level projects, specifically LA SAFE projects, that remain conceptual and have yet to be funded. These remaining projects fall into three categories: mixed-use housing developments, community centers and parks, and green infrastructure additions to existing buildings. The first category of projects are mixed-use housing developments with flood infrastructure components. These seek to take advantage of low-density housing areas that are also assessed as low flood risk. We uncovered 3 proposed developments of this kind under LA SAFE: 1) The Red Star Yeast Building Redevelopment (Belle Chasse, Plaquemines Parish)2) A mixed-use housing development in downtown LaPlace and Garyville (St. John the Baptist Parish) and 3) a Mixed-use housing development in Westwego (Jefferson Parish). Each of the projects would engage a private developer and add approximately 30 additional units to be reserved for households making 20%, 30%, or 50% of the area median income. Green infrastructure includes pervious parking to retain stormwater on-site. Development costs range from $10 million to $15 million, of which LA SAFE will contribute up to $6 million.

The second category, community center and parks projects, have a slightly lower proposed budget, ranging from $5 million to just under $14 million. We identified five proposed park sites, namely 1) Belle Chasse Wetland Park in Belle Chasse (Plaquemines Parish), 2) Bayou Liberty Park in Slidell (St. Tammany Parish), 3) Dubourg Canal Park in LaPlace (St. John the Baptist Parish), 4) Covington Green Block in Covington (St. Tammany Parish), and 5) Airline and Roosevelt Linear Parks along Airline Drive and Roosevelt Boulevard (Jefferson Parish). Except for Bayou Liberty Park, each of the projects aims to add features to these existing parks to make them more efficient at stormwater retention, as well as create more recreational amenities for the community. Dubourg Canal Park, for example, would expand water storage onto an adjacent plot of land, construct an improved canal with enhanced drainage capacity, add detention ponds to address existing drainage issues, and include bike paths and outdoor space for a neighboring senior citizen living facility. Likewise, planners for Bayou Liberty Park, propose transforming an existing 48-acre plot of land that is currently not a park into a community gathering space equipped with similar infrastructure and community-oriented features.

Lastly, the proposed green infrastructure additions to existing buildings are being offered as a way to improve or maintain structures' architectural integrity by adding storm drainage features or

additional stormwater management facilities. Generally, these types of modifications are the least costly of these three project types, with the budgets ranging from $3-$5 million. St. John the Baptist Parish has three project types: 1) LaPlace Multimodal Transit Station in LaPlace; 2) Historic/Cultural Districts and Green Streets that spans the districts of Garyville, Reserve, Edgar, and LaPlace; and 3) Edgar Community Center and Shelter in Edgar. In some cases, such as with the proposed Edgar Community Center and Shelter, the proposed project is a new community building that incorporates green infrastructure features. The community center would be designed with rain gardens, on-site stormwater management facilities, and bioswales, while also providing those who care to use the facilities with office/meeting spaces, indoor/outdoor event spaces, and a commercial kitchen.

Study Overview

All these recent infrastructure projects described above were designed to reduce hazard exposures for the region's populations. However, to review changes in whether and how different groups have been protected since then, we review the changes in demography and flood risks at two points: 1) immediately after Hurricane Katrina (2005–2008); and 2) the most recent snapshot at the time of the study (in this case, 2013–2017). The study utilizes publicly available demographic data from the ACS to determine changes in exposure to key vulnerability characteristics at the block group level, and overlay these maps at the two times onto the corresponding FEMA's Flood Insurance Rate Maps (FIRMs) enforced at the same times.

Data

The research team consciously sought to use the most consistent and most utilized datasets to identify property-level characteristics and hazard risks. The decision to use US Census bureau depictions of demographic, income, and related household information was straightforward, but the choice to use FEMA's defined FIRMs was less so.[55] Though there are other sources of flood risk available that are more accurate, timely, and certainly more attuned to future risk, the reliance on FIRMs for this study is a conscious one. FIRMs establish the requirement for federal flood insurance which, in turn, is supported by mortgage lenders and other housing and public works institutions and regulations. FIRMs are almost the most popularly understood tool for assessing a property's flood risk (as echoed in our findings under the Information study). Consequently, we chose to use FIRMs-identified risk values and their practical categories to measure individual residential properties' existence within or outside of flood zones.

We identified data sources and conflict in their geographic unit for analysis. The appropriate geographic scale was tested to ensure it was possible to get as close to parcel-level analysis as possible while maintaining accuracy. Although parcel-level analysis would be ideal, demographic data are rarely available at this level, and even where possible, FEMA flood zones do not follow parcel boundaries, meaning they often cut through individual parcels. In addition, we do not believe that FEMA's flood zone boundaries are reliable as exact measures of flood risk. In alluvial delta regions like greater New Orleans where elevation changes can be measured in half an inch, the flood risk of a house just inside a flood zone can be only nominally higher than its neighbor, just outside the zone. Moreover, as FEMA flood zone calculations are based on historical data, they do not incorporate increased risk due to current levels of subsidence or climate-related changes in flood frequency or severity. By aggregating to a larger geography, and examining trends across a large region, we were able to approximate what areas have greater risk of flooding without identifying which households are inside or outside the flood zones.

Using ACS 5-year composite data, we compared residents' characteristics at the block group level. We determined that block groups would be the most suitable geographic scale for analysis because they are the smallest geographic unit where demographic data are available for our time periods of interest. This came with some drawbacks, as ACS estimates for block groups are known to have high margins of error. However, the geographic scale of census tracts (the next largest standard unit of analysis) were too large to be meaningful, given the demographic diversity of the area, and the variation in flood zones. We sought to counter this by testing our data using the coefficients of variation as described above and selecting the variables with the highest levels of accuracy. Each block group typically includes between 600 and 3,000 people and, as such, offers a glimpse of the demographic makeup of small communities and neighborhood subsections.[56] By calculating basic measures of demographic factors that are identified in the literature as a contributor to social vulnerability, we geographically identified where various vulnerable groups live, and which neighborhoods have high levels of co-occurrence between different vulnerable groups.

We identified areas of flood risk using FEMA's flood insurance risk designation, which it publishes as static FIRMs layers available as PDFs, and as a GIS shapefile known as the national flood insurance layer. Linking specific geographies to the risk levels based on their location in or outside flood risk zones allowed us to create a ranking of risk to identify categories of risk based on storm levels, and locations of (known) inadequate flood protection infrastructure. Flood risk layer boundaries create artificial distinctions of who falls inside or outside the flood zones, such that one side of a block may be considered high-risk, while the opposite side is not. This distinction was particularly important to note, as those households living in areas just beyond the official flood risk zones are not required to hold flood

insurance as their neighbors, leaving them with a choice between a higher cost burden for insurance (if it is available at all), or risking greater losses. One major assumption we made was that the population is evenly distributed across the land. We assumed that if 50% of a block-group were in the flood zone, then 50% of the households were in the flood zone. While this was certainly false for any given block group, we had no reason to believe that it was biased in either direction, as we knew people were and are still building and living in flood zones across the region. In aggregate, we believed this assumption is reasonable based on our knowledge of the region and previous literature (Noonan, Richardson, and Sun 2022).

To determine the percentage of each block group that falls or fell in the flood zone, we overlaid the census block group boundaries with the flood zones. We first trimmed a shapefile of the block groups in the region to the shoreline. Where it was available, we used the National Flood Hazard Layer as our overlay. The areas we considered to be inside flood zones were any of the categories listed on FEMA's Flood Zone Designations, which are a list of areas coded by letters A, B, or C. "A" flood zones are flood zones that have a 1%+ chance of flooding in a given year (high likelihood of flooding), "B" zones are zones that have between 1% and .2% (moderate likelihood of flooding), or "C" or "X" zones, which fall outside the .2% range and have minimal likelihood of flooding. We then did a spatial join with the block groups and calculated the percentage that falls within the flood zones. The NFHL was available for currently valid flood zones for Orleans, St. Bernard, St. Charles, and portions of St. Tammany Parishes.

For historic FIRMs (those valid in 2006) and those not included in the current NFLH, we used a process of georeferencing and tracing to create the GIS shapefiles. To do this, we loaded PDF versions of the FIRMs as raster files, and using the ArcGIS georeferencing tools, matched them to shapefiles of known landmarks such as street intersections to add geographic scale and coordinates. We then traced the flood zones to create georeferenced flood shapefiles. This process, albeit labor intensive, resulted in a full digital shapefile of flood zones in greater New Orleans accurate in 2006 and in 2017, allowing us to calculate the percentages of block groups across the region that fall into flood zones accurate in each year of our study.

Analysis

We downloaded the data from ACS into SAS where we cleaned and ran the code, developing the nine datasets mentioned above. We matched these datasets to the percentage of land area for each block group that fall into FEMA-designated flood zones valid in 2006 and 2017 respectively, and then ran simple linear regressions for the four demographic categories—race, household income, housing tenure,

and education—for 2005–2009 and 2013–2017 to identify any association between each demographic group and the likelihood of living in a flood zone. We ran our analysis for each Parish individually and analyzed trends in the region. We also ran the analysis for the combined populations of the core parishes of Orleans and Jefferson, which are by far the largest and highest-density, and separately for the five other parishes: Plaquemines, St. Bernard, St. Charles, St. John the Baptist, and St. Tammany.

Our initial goal was to run this analysis for the metropolitan New Orleans region using four ACS variable categories that reflected vulnerability as described in the literature but for which a reasonable level of accuracy could be estimated in the region, including: educational attainment (less than bachelor's degree); household income (50 percent of area median income); housing tenure (renters); and race (nonwhite and Hispanic households).

For the two timeframes, we calculated the percentage of the block group that falls inside FEMA's flood zones. We run simple linear regressions with our ACS variables predicting the percentage of the block that is in a flood zone. A positive and significant result means that the increase of that characteristic relates to an increase in the percentage of the block group being in the flood zone—or, in more general terms, that the vulnerability characteristics is also an exposure factor. While this approach does not allow us to determine the average flood risk faced by specific vulnerable groups, it allows us a baseline, using publicly available data, for understanding how the complex influences of demographic shifts, changes in protective infrastructure, and changes in climate patterns have affected household vulnerability to date across the region.

Findings

The findings are categorized by the four characteristics of interest over two timeframes—the years immediately after Hurricane Katrina (2005–2009) and the most recent snapshot at the time of the study (2013–2017). Analysis at these different points in time provide should provide a sense of how demographic and mobility changes have altered the populations in places that, in turn, have faced changing infrastructure protections.

In reality, however, we see some truth to the hypothesis that infrastructure increased protection. Flood exposures—measured by a home's location in or outside of the flood zone—have shifted for most subgroups in most parishes over time. Several factors may contribute to this. First, the FIRMs have been slowly picking up on the regional infrastructure changes' effects on flood. This delay can be the result of infrastructure still being very much a work in progress as depicted in this report's infrastructure review

and additional protections (that is, more houses outside of the flood zone) may be forthcoming. Further, the FIRMs have also relied on different, presumably more exacting geological and hydrological tools. Combined with the changing demographic composition of these communities after Katrina, we see a nuanced story about who is more likely to live in harm's way.

Race/Ethnicity

We used our knowledge of the greater New Orleans area and focused on specific racial and ethnic groups in consultation with local partners and as available statistically from the national datasets. Table 5 summarizes the findings for both timeframes.

Across the region in the immediate timeframe after Katrina (2005–2009), white households were less likely to live within flood zones, despite their large presence in the coastal areas further from the City of New Orleans. This negative association was most notable in St. Tammany, Orleans, and Jefferson parishes, but remained statistically significant for the greater New Orleans region overall. In contrast, Asian and Pacific Islander, Black, and Hispanic households were significantly more likely to live outside of the flood zone in most parishes and in the overall region. Black households were significantly more likely to be in the flood zone in Orleans Parish, as were Asian and Pacific Islander and Hispanic households in Jefferson Parish.

TABLE 5

Regression Analysis of Share of the Block Group's Race/Ethnicity Being Inside the Flood Zone, 2005–2009 and 2013–2017

	2005–2009				2013–2017			
	Asian/PI	**Black**	**Hispanic**	**White**	**Asian/PI**	**Black**	**Hispanic**	**White**
Jefferson	1.725***	0.00445	0.733***	-0.124*	0.028	-0.155***	0.607***	0.136***
Orleans	-0.123	0.133***	0.141	-0.156**	-0.224	0.119***	0.226	-0.114**
Plaquemines	-8.497	0.253	-1.017	-0.218	4.127***	-0.0871	-1.98	-0.101
St. Tammany	-1.398	0.341	0.371	-0.344*	0.991	0.949***	0.876	-0.922**
St. John the Baptist	0.771	-0.151	-0.204	0.162	5.411	-0.222	2.350*	0.217
St. Bernard	1.092	-0.28	1.064**	-0.0166	1.918**	0.0395	-0.0187	-0.0605

	2005–2009				2013–2017			
	Asian/PI	Black	Hispanic	White	Asian/PI	Black	Hispanic	White
St. Charles	4.302	-0.0586	0.601	-0.0281	4.587*	-0.254	-0.087	0.24
GNO Region	0.517*	0.125***	0.409***	-0.170***	0.338*	-0.0971***	0.558***	0.0835***

Source: 2005–2009 ACS 5-year estimates and 2006 FEMA Flood Rate Insurance Maps for the first panel and 2013–2017 ACS 5-year estimates and 2017 FEMA Flood Rate Insurance Maps for the second panel.
Notes: PI = Pacific Islander. Hispanics include groups from all races, and each racial group excludes Hispanic members. Statistical significance: *p<.1; **p<.05; ***p<.01.

By the 2013–2017 timeframe, however, some patterns shifted. Across the greater New Orleans region, Asian and Pacific Islander households and Hispanics were still living in neighborhoods with a higher share of it in a flood zone. However, Black households had become less exposed to flood risk areas, and white households' exposure had increased. In St. Tammany and Orleans parish, though, Black residents still face a statistically significant higher exposure to flood zones white households face a statistically significantly lower exposure.

The changes between the two snapshots provide preliminary evidence of the effects of demographic changes occurring simultaneous to the first round of infrastructure projects in the interim. For example, the number of Black households increased in Orleans Parish by 35 percent while increasing in the other six parishes by only 16 percent. The number of white households in Orleans increased at a rate equivalent to the Black population growth (34 percent), but in the other six parishes by only about 3 percent. The reduced exposure rates for Black households in the region over the timeframe and simultaneous increased rates for white households may be due as much to do with the changing racial and ethnic profiles of these communities as to decisions on protective infrastructure.

Income

For the income variables at both snapshots, we used the Area Median Income (AMI) as a measuring point for three income values, specifically 50 percent of the AMI, 100 percent of the AMI, and 200 percent of the AMI. For example, the median household income in Orleans Parish in 2017 was $37,407. Half (50%) of the AMI is typically considered very low income.

The pattern across the region is that in the later timeframe (2013–2017) higher income groups are more likely to live in flood zones and face flood exposures compared to lower-income counterparts

(table 6). When looking at specific parishes, we find some variation. For example, for 2005–2009, Jefferson and St. John the Baptist parishes show that the more higher income households, the significantly higher the exposure to flood zones and the more lower income households, the less exposure to flood zones. In contrast, in Plaquemines Parish right after Katrina (2005–2009), the more highest income households, the less exposed to flood zones. This pattern in Plaquemines shifts in the more recent period such that a greater share of higher incomes households are more exposed to flood zones. This pattern may reflect the presence of higher income households investing in coastal homes in the parishes like Plaquemines, but also the fact the exposure profile is simply increasing for all households as can be seen not just in that parish but also in St. Tammany.

TABLE 6

Regression Analysis of Share of Block Group's Income and Being Inside the Flood Zone, 2005–2009

	2005–2009			2013–2017		
	50% of AMI	100% of AMI	200% AMI	50% of AMI	100% of AMI	200% AMI
Jefferson	**-0.426*** **	**0.564*** **	**0.352*** **	**-0.186***	-0.0401	-0.00419
Orleans	0.0555	-0.00793	-0.0969	0.0793	-0.0112	-0.0663
Plaquemines	0.36	-0.00125	**-1.423*** **	**0.835***	**0.945*** **	**1.120*** **
St. Tammany	0.199	-0.118	-0.197	**0.632*** **	**0.497*** **	**0.400***
St. John the Baptist	**-1.099*** **	**0.859***	**1.381*** **	**-0.644***	**-0.486*** **	-0.222
St. Bernard	-0.328	-0.21	**1.200*** **	0.0735	0.21	0.314
St. Charles	-0.446	-0.0148	0.549	-0.389	**-0.619*** **	**-0.568***
GNO Region	-0.055	0.061	0.0557	**-0.166*** **	0.0475	**0.103*** **

Source: 2005–2009 ACS 5-year estimates and 2006 FEMA Flood Rate Insurance Maps for the first panel and 2013–2017 ACS 5-year estimates and 2017 FEMA Flood Rate Insurance Maps for the second panel.
Note: Statistical significance: *p<.1; **p<.05; ***p<.01.

Housing Tenure

Housing tenure—that is, homeownership versus renting—is a commonly cited vulnerability factor in the literature given that owners can more readily make decisions about their property's qualities. Yet, in the years immediately following Katrina, we had no significant patterns by housing tenure for the region overall (table 7). In Jefferson, Plaquemines, and St. John the Baptist Parishes in the years just after Katrina a higher share of renters in a block group corresponded to a lower exposure to flood zones while a higher share of homeowners corresponds to a greater exposure to flood zones. This pattern persisted in St. John the Baptist Parish into the more recent study period of 2013–2017. However, this

pattern is reversed in St. Tammany Parish, with neighborhoods with a higher share of owners facing less risk of exposure to flood zones and renters facing more risk. In the more recent period, except for St. Tammany Parish, infrastructure efforts seem to benefit renters across the region.

TABLE 7

Regression Analysis of Share of Block Group's Tenure and Being Inside the Flood Zone, 2005–2009

	2005–2009		2013–2017	
	Owner	**Renter**	**Owner**	**Renter**
Jefferson	**0.195****	**-0.195****	-0.0131	0.0131
Orleans	0.0328	-0.0328	0.0667	-0.0667
Plaquemines	**0.620***	**-0.620***	-0.383	0.383
St. Tammany	**-0.636*****	**0.636*****	**-0.421****	**0.421****
St. John the Baptist	**0.849****	**-0.849****	**0.913****	**-0.913****
St. Bernard	0.425	-0.425	0.00727	-0.00727
St. Charles	0.283	-0.283	-0.132	0.132
GNO Region	0.0196	-0.0196	**0.237*****	**-0.237*****

Source: 2005–2009 ACS 5-year estimates and 2006 FEMA Flood Rate Insurance Maps for the first panel and 2013–2017 ACS 5-year estimates and 2017 FEMA Flood Rate Insurance Maps for the second panel.
Note: Statistical significance: *p<.1; **p<.05; ***p<.01.

Education

Educational attainment is also considered a distinct vulnerability factor. We look at households that have education levels that range from no high school diploma to college degree or higher, but find highly variable patterns. Across the region in the years immediately following Katrina (2005–2009), neighborhoods with a higher share of residents with no high school diploma had lower exposure to flood zones, however, no other educational attainment has a statistically significant association (table 8). In Jefferson Parish in the year immediately following Katrina, neighborhoods with a greater share of households with the highest levels of education are statistically significantly more exposed to flood zones. In contrast, the greater the share of the highest educated residents in Plaquemines Parish in contrast, those neighborhoods with the highest educated residents are significantly less exposed to flood zones. In St. Tammany, unlike the region overall, the higher the share of the lowest educated residents, the more exposed to flood zones.

TABLE 8

Regression Analysis of Share of Block Group's Education and Being Inside the Flood Zone, 2005–2009

	2005–2009			2013–2017		
	No High School Diploma	High School Diploma	Bachelors Degree	No High School Diploma	High School Diploma	Bachelors Degree
Jefferson	**-0.582*****	-0.149	**0.296****	-0.000161	0.00000869	0.0962
Orleans	-0.0858	**0.209****	-0.0936	0.0000944	0.0000687	**-0.166*****
Plaquemines	0.371	0.157	**-1.343***	0.0000327	**-0.000758*****	**-1.117****
St. Tammany	**0.640***	0.065	-0.191	-0.000132	**-0.000164***	**-0.447****
St. John the Baptist	-0.338	0.605	0.163	**0.00142****	**0.000646*****	0.775
St. Bernard	0.16	-0.418	0.249	-0.000339	-0.000248	-0.315
St. Charles	-0.402	-0.252	0.5	**-0.00207*****	-0.000122	**1.264*****
GNO Region	**-0.137***	0.0553	0.0312	0.117	**0.385*****	**-0.262*****

Source: 2005–2009 ACS 5-year estimates and 2006 FEMA Flood Rate Insurance Maps for the first panel and 2013–2017 ACS 5-year estimates and 2017 FEMA Flood Rate Insurance Maps for the second panel.
Note: Statistical significance: *p<.1; **p<.05; ***p<.01.

In the second period across the region, the more residents with a high school diploma, the more exposure to flood zones, while those with a bachelor's degree are less exposed, the latter pattern holding true for several parishes in the study –Orleans, Plaquemines, and St. Tammany.

Conclusion

To date, federal, state, and local investment in protective infrastructure in metropolitan New Orleans has been substantial on a scale of over $14 billion. As this chapter describes, much of the region remains at risk despite this substantial investment. Yet, when comparing the amount of a block groups' land that falls within the flood zone with various indicators of social or economic vulnerability, we found highly variable conditions. Indeed, while geological and hydrological land exposures to flood alter by infrastructure investments, the resulting association with factors that are associated with social vulnerability can change due to simple mobility and population change. The confluence of the two phenomena of infrastructure and demography shapes the landscape of protections in the region, and the resulting risk scenarios for any one house and household.[57]

The overlays of exposure and vulnerability revealed only a few consistent patterns. By racial and ethnic categories, Asian/Pacific Islanders' and Hispanics' exposures as measured by presence in a flood

zone remained high across the region, while white non-Hispanic households' exposure was higher in the more recent timeframe and non-Hispanic Black households had lower flood risk exposure . Higher-income households were more exposed to flood risk and lower-income households were less exposed in the more recent timeframe. The more homeowners in a neighborhood, the more exposed to flood zones in the most recent timeframe, and the more renters, the less exposed. Those areas with higher educated residents had lower rates of exposure to flood zones in the most recent timeframe. Still, many households currently categorized as protected simply because they reside outside of a flood zone may yet see changes in their categorization due to ongoing climate change effects that had not been accounted for in previous infrastructure or flood exposure maps.

Ultimately, exposure is an important factor to consider when investigating housing resilience, but not the only one. To substantively change the equity outcomes of protective infrastructure, though, the comprehensive vision must center vulnerable populations. As our analyses show, flood exposure is still a very real threat for many vulnerable populations. Regardless of how exposed populations are to disaster risk, some will have more built-in capacity to protect themselves financially and perhaps also politically and, therefore, have more capacity to mitigate disasters and to recover faster.

Disaster inequity is the difference in resources that communities and their residents must prepare for and mitigate risks to their lives, livelihoods, and property before the winds pick up, as well as the physical protections. Along with protective infrastructure, emergency managers, community planners, and regional policymakers must focus on ensuring that the needs and constraints in communities lacking resources are integrated in decision making, as well as making sure that resources such as accessible information, insurance, and home mitigation technologies that likely mirror vulnerability profiles.

2. Community Engagement

For comprehensive housing resilience, the level of community engagement and representativeness—or, in some case, overrepresentation—leads directly to infrastructure and land use decisions that determine individual communities' and homes' prospects. The presence and representation of individual households in these processes ostensibly secures the perspectives of their lives, livelihoods, and homes in this spatial and property governance. Yet this connection between regional and community actions, such as levee placement and their effect on individuals in measurable exposure reductions and reduced hazard insurance premiums, has been understudied. Much of the recent literature has focused on the negative aspects of public discourse related to governmental or community decisionmaking's effects on housing (Pendall 1999; Scally and Tighe 2015). However, the critical importance of engagement and participation in decisions about where infrastructure should be located and how hazard mitigation, rebuilding and development should transpire, and who (and whose property) benefits from these plans and decisions, is a housing matter (Godschalk, Brody, and Burby 2003; Aldrich 2012; Masterson et al. 2014; Haynes, Bird, and Whittaker 2020; Hamideh 2020).

When Hurricane Katrina made landfall on August 29, 2005, many citizens and analysts suggested that the region of greater New Orleans lacked not only a comprehensive recovery plan, but also a formal, systematic approach to metropolitan-wide planning. This held true even in the central city. At the time, the City of New Orleans' planning assets included a framework for the city's 13 planning districts and a half-developed Master Plan that were, arguably, largely ignored by both politicians and bureaucrats (Costa et al. 2005). Though the city had chartered a City Planning Commission (CPC) to manage planning and recovery activities, the CPC played a very limited role in transportation, economic development, environmental planning, hazard mitigation, and disaster preparedness. Additionally, in the months following the storm, Mayor Nagin reduced the CPC's staff from 24 to 8, and the CPC's authority was often disregarded in the recovery planning that took place directly after the storm (Olshansky et al. 2008).

This weak planning infrastructure hindered the city's ability to develop and implement a recovery plan, much less to engage residents in a recovery planning process, particularly since a massive quantity of recovery plans and long-term development plans began as early as 2006 just months after Katrina struck. Arguably one of the greatest omissions in the past planning processes, the inability to present, respond, and integrate citizenry concerns led to a major rethinking of constituent feedback and responsiveness in the post-Katrina era. Public officials and technical experts have shown a growing commitment to greater community participation and engagement in planning processes, going so far as

to devise a Neighborhood Participation Plan and a Neighborhood Participation Program in 2012 (City of New Orleans 2012).

Community engagement has become especially critical in more recent years, as climate adaptation and disaster resilience conversations become more ubiquitous and find convergences in terms of who is responsible for adaptation and mitigation efforts (Solecki, Leichenko, and O'Brien 2011). Some attribute this emphasis on community engagement as a better approach to address risk compared to top-down alternatives (Moser 2006).

This chapter explores the decade of project and development planning in the City of New Orleans, the seven parishes making up the greater New Orleans region, the State of Louisiana, and efforts funded by the US federal government to describe the evolution of community engagement practices and citizens' and civil sector perceptions of their effectiveness.

Background

In the years following recovery planning for Hurricane Katrina beginning immediately in 2006, city planners and planning processes have increasingly emphasized community engagement in. Yet, there have been challenges achieving diverse and substantive participation of residents. Several factors have shaped community engagement uniquely to the greater New Orleans region. Here, we categorize the factors that have shaped community engagement processes post-Katrina: displacement and changing demographics, an abundance of uncoordinated planning efforts, deeply rooted government distrust, and engagement fatigue that have been introduced in previous scholarship.

- Postdisaster displacement and changing demographics:

  In the aftermath of Katrina, thousands of New Orleanians grappled with displacement and the loss of loved ones, their homes, and other possessions (Collins 2015). Recovery planning began though many residents still had not returned to the city, making it even harder to engage all residents, especially long-term residents, in post-Katrina planning processes. Rapidly changing demographics challenge representativeness in community engagement practices (Williamson 2007).

- Abundance of uncoordinated planning efforts:

  Effective planning and community engagement requires collaboration horizontally—i.e., between agencies in the same jurisdiction—and vertically—or between nested jurisdictions

such as city, parish or county, regional or metropolitan, state, and potentially federal governments (Berke and Smith 2009; Martín and McTarnaghan 2018). In the case of the greater New Orleans region, many of these parties, particularly vertically nested ones, embarked on their own planning and projects and conducted parallel community engagement efforts.

Following Hurricane Katrina, there was a lack of both vertical and horizontal collaboration in planning efforts, and likely miscommunication between state and city agencies and FEMA regarding the involvement of neighborhoods and individuals across the effected region. Actors and decisionmaking siloes made decisions independently and often had limited awareness of other efforts, leading to community members' lack of patience and occasional distrust of resulting projects or plans (Olshansky 2009).

- Deeply rooted government distrust:

  New Orleans has a well-documented history of racial oppression. The city's Black majority viewed the rich and powerful elite white families who controlled municipal government with suspicion (Olshansky et al. 2008). This long legacy of resident distrust toward government contributed to a weakened planning and community engagement infrastructure well before Katrina hit. Existing civil-sector groups as well as new organizations created after Katrina could, in theory, help rebuild some trust with community groups but only with sufficient resources, collaboration, and demonstrable outcomes (Koritz and Sanchez 2009).

- Engager and participant fatigue:

  At least seven recovery plans were created between 2006 and 2007 in response to Hurricane Katrina. The number of post-Katrina disaster plans could lead to general confusion and engagement fatigue among vulnerable residents and grassroots organizations. While the plans have differed in geographic scope, timeframe, and subject area, they have still competed for the same level of engagement from the city's residents in terms of attending meetings and providing feedback. To ensure a representative perspective, the same groups were being called on repeatedly to perform these tasks for the various plans. Not only were they fatigued from repeated requests, but they were also expected to perform under duress in the aftermath of a traumatic disaster event (Davidson et al. 2007; Lukensmeyer 2007).

Several scholars have attempted to categorize and measure community engagement practices since the field was first professionalized in the post-Civil Rights era at a large scale in the US (Rosener 1978; Brown and Chin 2013; Slotterback and Lauria 2019; Lauria and Slotterback 2020). Only a handful have

also documented the planning processes in the greater New Orleans region in this dimension—particularly the generally rough start with the Bring New Orleans Back Commission's work which was among the first post-Katrina plans in the region (Costa et al. 2005; Olshansky et al. 2008; Nelson, Ehrenfeucht, and Laska 2007). Our study seeks asks: to what extent did plan or project organizers engage with a diversity of stakeholder populations in the greater New Orleans region in the aftermath of Hurricane Katrina, and what was the overall quality and outcome of these community engagement efforts?

Study Overview

The research team defines community engagement as the collective outreach methods that public agencies or project coordinators employed to solicit individuals for engagement opportunities beginning in 2006 with recovery planning efforts and up through the present long-term development activities. Community participation, in contrast, looks at those individuals' depth and frequency of activity as well as the outcomes from those entities' engagement opportunities, Specifically, the study explores two key research questions. First, to what extent have different populations participated in city and regional planning in the post-Katrina era? Second, do community stakeholders representing residents with different types of vulnerability perceive differences in engagement frequency, quality, and outcomes? These questions are particularly important because past studies have mainly focused on specific engagement initiatives, and not looked across time to understand the evolution of engagement efforts postdisaster.[58]

Data Collection and Analysis

Early in the recovery planning process, city leaders and planners were made aware that improving engagement would be a means toward improving relationships between racial groups; repairing broken trust in government; and strengthening planning functions that were critical to effective recovery plans. Consequently, the study team collected and analyzed data from a range of sources to provide a qualitative sense of both the engagement and participation.

DOCUMENT REVIEW

The team looked for planning processes and their community engagement across different types of planning efforts that took place in greater New Orleans over the course of over one decade after Katrina. Public documents provided information on (1) consultants, planners, and other stakeholders

involved with the development of plans; and (2) the formal strategies used for community engagement or to request participant feedback (such as a listed public hearing). Detailed descriptions of all plans included in the study are provided in the first set of findings below, but the following is the comprehensive list of those reviewed:

City Of New Orleans and Orleans Parish

- Bring New Orleans Back (2006)
- New Orleans Rebuilding Plan (The "Lambert" Plans) (2006)
- Unified New Orleans Plan (2007)
- New Orleans 2030 (2010)
- Resilient New Orleans (2015)
- HousingNOLA (2015)
- Climate Action for a Resilient New Orleans (2017)

Other Parishes

- St. Tammany Parish (2002)
- St. Charles Parish (2011)
- Plaquemines Parish (2013)
- St. Bernard Parish (2014)
- St. John The Baptist Parish (2014)
- Jefferson Parish ("Envision Jefferson 204") (2019)
- Hazard Mitigation Plans

State of Louisiana

- Louisiana Speaks (2007)
- Louisiana Coastal Master Plan (2007, 2012, and 2017)
- LA-SAFE (2019)

Federal

- HUD CDBG-DR Action Plan

An extensive taxonomy of planning, planning engagement, and planning participation codes was developed by which to review each of the above incidents. The research team also sought attendance records from public events, such as sign-in sheets or headcounts, and hearing transcripts when available which could also list contacts and organizational affiliations of participants. However, documentation was limited and often absent. Even where there was some publicly available documentation, it tended to only report on the quantities of activities (e.g., a given number of town halls) or the dates of their execution. Rarely were numbers of respondents documented, or any information about respondents' organizational affiliation, addresses, their demographic characteristics, or their individual comments.

In addition to the documented engagement information provided for each plan (when available), the research team reached out to planning officials whose contact information was provided in plan documents to enquire about any additional reported community engagement and participation information. In only a few cases did this outreach result in additional qualitative information about engagement activities. No contacted jurisdictions, associate planning or engagement officials, or engagement contractors or consultants was able to provide copies of attendee or participant lists.

INTERVIEWS AND FOCUS GROUPS

In contrast, the collection of data regarding civil-sector organizations' perspectives on the quality of engagement was met with wider reception. The research team sought the assistance of staff from local community groups to help identify the engagement events for one or more of the noted planning activities in which they participated as well as to contact individual residents among their group's constituents that participated in these engagement activities. For the purposes of this study, residents and community organizers are described as participants. Participants are individuals who attended community engagement events and provided input or feedback on plans either on their own behalf or on the behalf of other community members. Public and quasi-public entities, such as local urban planners, consultants, and government staff are described as engagers. Engagers typically contribute to the development of plans and solicit input or feedback from participants by, for example, hosting events or requesting public comment.

Two interview guides—one for the engagers and the other for participants including both community organizations that attended planning events and residents of communities relevant to the plans—were developed. The guides were developed based on the literature review as well as the research team's familiarity with the plans in question, and focused on the following themes, but with altering questions depending on the roles after the researchers presented information for their informed consent:

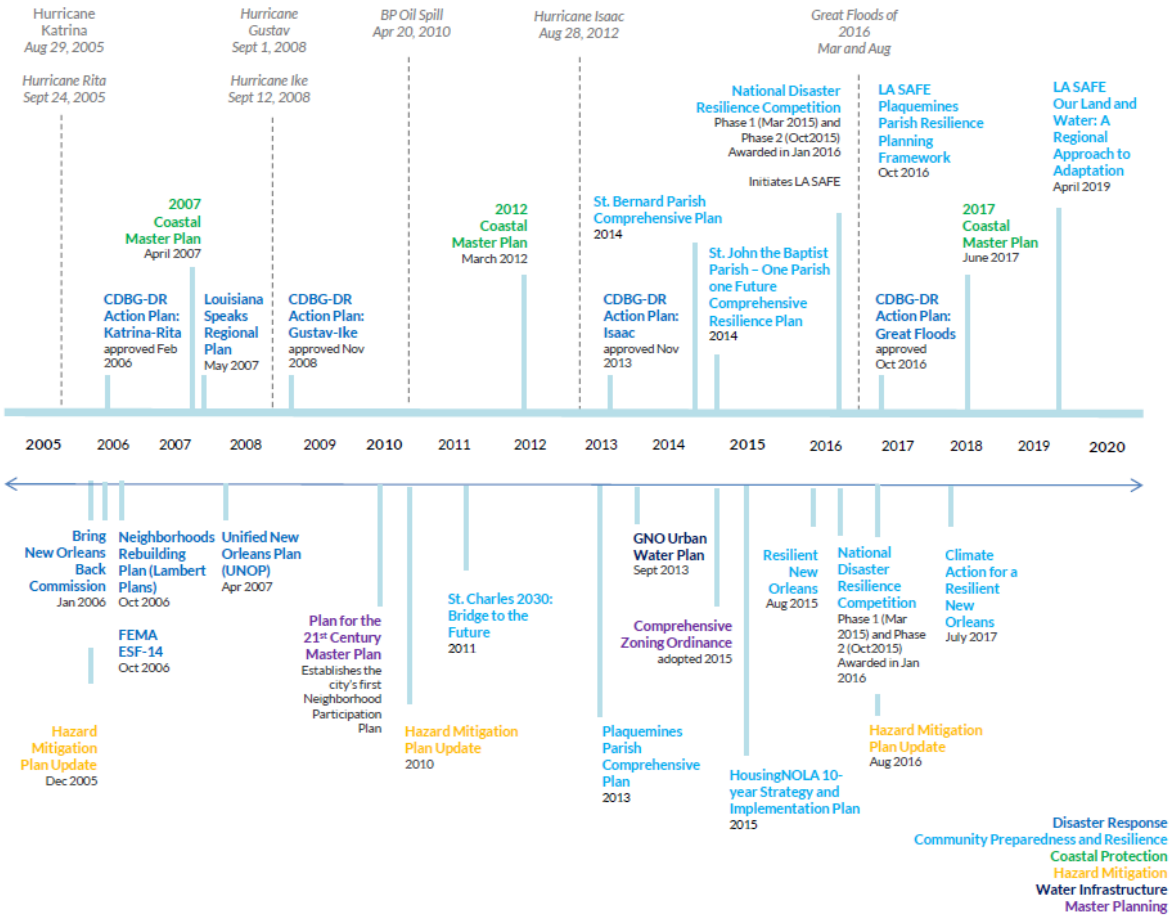
- individual and organizational roles and histories related to a specific community or government agency, and to a specific plan and its community engagement activities. Resident and community organization representatives were shown a timeline with the respective planning efforts described above and asked to identify the specific efforts in which they were involved (figure 6); the timeline included significant environmental hazards and disasters to help situate the participant. Engager respondents were asked to confirm the named planning efforts during introductions.
- identification of specific information sharing, exercises, and presentations or other activities during recruitment or advertising of an engagement event, as well as during the engagement event or medium. Participants were also asked about any services (e.g., childcare or food) or compensation for their participation, while engagers were asked about any formal documentation of participants' identification.
- mechanisms for recording and documenting participant comment and demonstrating the changes, as well as mechanisms for inquiring about participants' perceptions of the activity or even after if any
- the effectiveness of the above activities, including the representativeness of relevant local citizens in relation to recruitment efforts as well as the overall value of the activity, along with perceptions of whether the engagement activities resulted in any substantive changes in the relationships between the engagers and participants beyond technical changes to plans

The guides and recruitment methods, including those adopted for the COVID-19 pandemic shutdown, were approved by Urban Institute's Institutional Review Board (IRB). Through the project's local civil partners, the team was able to contact the lead organizers from a broad swath of other local community organizations that, in addition to being invited to participate in focus groups with other peer organizations or individual interviews, assisted the research team with contacting individual residents that they knew had participated in planning engagement activities. The research team partnered with three local community organizations to recruit interview and focus group participants: Gulf Coast Center for Law & Policy, Louisiana Language Access Coalition, and MQVN Community Development Corporation. Initial recruitments calls were conducted from March to August 2020. During outreach events and using direct phone calls, staff from the organizations informed individuals of the study and requested their participation. Telephone numbers and email addresses were then shared with the research team using a secure file transfer protocol, then the research team conducted direct outreach to schedule interviews and focus groups. Participants from both organizations and resident groups were

offered $40 gift cards to cover any costs of transport and provided light refreshments (for in-person focus groups and interviews).

FIGURE 6

Event and Planning Timeline for Participant Identification Exercise



Source: Urban Institute

Data were collected between June 2019 and June 2020. The research team conducted two in-person site visits to New Orleans, Louisiana in June 2019 and February 2020 at the Tulane University Medical Center in New Orleans, and one virtual site visit (that is, multiple interviews and focus groups using secure virtual meeting platforms) in May 2020 due to the COVID-19 pandemic to collect qualitative data from participants and engagers using semistructured interview and focus group guides. Individual residents were invited to participate either in focus groups with other residents or in individual interviews depending on their availability and privacy concerns. In total, eight engagers, twelve community organization representatives, and twelve residents were interviewed across four

focus groups and 28 distinct individual interviews. All interviews and focus groups were recorded and transcribed pursuant to IRB requirements and analyzed using NVivo qualitative coding software.

Findings: Planning History

Formal plan documentation provides us with at least the preliminary understanding of the effort's purpose along with details on whether community engagement procedures were integrated and recorded were available. We first summarize plans from the City of New Orleans and Orleans Parish, examining the relationship between community members, grassroots organizations, and city leadership and their participation in recovery and planning processes in the years following Hurricane Katrina. We then discuss a selection of short-term hazard mitigation plans and longer-term comprehensive plans from the six surrounding parishes that had significantly fewer, if any, Katrina-specific plans, looking specifically at variations in community participation and engagement in plans whose goals can span decades. Finally, we explore community engagement and participation in state and federally supported plans that would affect parishes across the entire region. This group of planning efforts statutorily require community input and, ostensibly, explicit activity documentation.

City of New Orleans and Orleans Parish

BRING NEW ORLEANS BACK (2006)

The city's first recovery planning effort was the 17-member Bring New Orleans Back Commission (BNOBC), a group of business and community leaders appointed by Mayor Ray Nagin to advise local officials in preparing a rebuilding plan. In January 2006, BNOBC released a preliminary rebuilding plan that recommended shrinking the city's footprint, imposing a moratorium on building permits in flood-affected areas, and converting properties in badly flooded areas to parks. African American residents were particularly resistant, viewing the planned shrinkage as a strategy to guarantee their permanent displacement, since they were more likely than white residents to live in low-lying flood-prone and flood-devastated areas.

Residents were also distrustful of commission members who they felt poorly represented their interests both historically and through BNOB. Additionally, many residents hadn't returned yet, so only residents and professionals who had managed to stay or return to the city could take part in public meetings. Fueling distrust further, the *Times-Picayune* published a map that symbolized high-flood-risk areas with green dots (which respondents referred to as "the green dot map"), suggesting that these

areas would be converted into parks or green space, even though no firm decisions had yet been made (Olshansky et al. 2008). Overwhelmed by public resistance, the Mayor and city leaders quickly backed away from the plan and deferred to residents to decide where to rebuild. This left the city without a rebuilding plan and with further broken trust (Nelson et al. 2007).

The final plan includes nine different reports for various recovery planning domains. Each of these reports was authored independently by different committees. These committees had different approaches to developing the reports. Though some of them do not cite any engagement activities, the reports for the public education system and cultural plan do describe engagement activities. The report for the public education system notes that the committee led a stakeholder input process through which they conducted interviews with students; engaged nearly 1500 parents, teachers, and principals in a public consultation process; and engaged the Teachers and Principals Union Leaders. The report also notes that they opened their subcommittee meetings to the public, maintained a website and email distribution list, and conducted outreach to diaspora communities.

The cultural plan summarizes its process which included: (1) appointing steering committee of 16 "diverse leaders in the creative industries"; (2) collecting data from organizations that study cultural development and the general public; (3) appointing advisory boards; (4) conducting public meetings; (5) conducting research, including a survey of cultural organizations and artists, interviews with local artists and cultural leaders, and examining cultural investment strategies in other cities; (6) hiring expert counsel from a consulting group; (7) securing funding for planning and analysis; (8) aligning recommendations with those from other BNOB committees; and (9) developing the framework. The remaining reports covering economic development, infrastructure, government effectiveness, land use, public transit, and criminal justice do not cite any engagement activities. The health and social services report has minimal detail on engagement activities.

NEW ORLEANS REBUILDING PLAN (THE "LAMBERT" PLANS) (2006)

As BNOB was ending, the City Council passed a motion to establish a formal neighborhood planning process in December 2005 (Nelson et al. 2007). A new recovery plan called the New Orleans Neighborhoods Rebuilding Plan (NONRP) would initiate this new function. Colloquially referred to as the Lambert Plans (after the Miami-based planning firm, Lambert Advisory, selected by the City Council to lead the process), NONRP was intended to generate recovery plans for the city's 49 flooded neighborhoods (Nelson et al. 2007). Unlike BNOBC, the Lambert process aimed to facilitate a more intentional and robust engagement strategy.

Despite its success with involving communities in the planning process, the Lambert Plans did not satisfy critical planning criteria outlined by the Louisiana Recovery Authority (LRA). Though contracted by the City Council, the Lambert team did not involve the City Planning Commission in developing the plans. Without the municipal expertise of the CPC, the Lambert team fell short on satisfying several technical guidelines in the plans. Specifically, rather than develop a cohesive citywide plan, Lambert developed 46 distinct neighborhood plans, making it difficult to plan for citywide infrastructure (Olshansky et al. 2008).[59] Furthermore, there was no standard procedure for prioritizing plan projects and there were wide discrepancies in cost estimates across the neighborhood plans. In addition, the Lambert Plans neglected to ensure that the planning process was inclusive of the entire city, not just flooded neighborhoods. The plan was ultimately rejected by the LRA, leaving the city without a recovery plan once more.

UNIFIED NEW ORLEANS PLAN (2007)

The Unified New Orleans Plan was a third attempt to get recovery planning right and release federal recovery funding the city was owed. After receiving a $7.5-million request from Mayor Nagin's office for the BNOBC neighborhood-planning process, the LRA reached out to Rockefeller Foundation for support. Rockefeller committed $3.5 million to a citywide recovery planning effort on several conditions: that the city employ top planners to lead the process, that the plan be completed in a timely fashion, and that public input be as representative as possible (Olshansky et al. 2008). With two additional contributions of $1 million each from the Greater New Orleans Foundation and the Bush-Clinton Katrina Fund, the city could proceed with a new planning process set up for successful approval by both the CPC and the LRA.

The resulting plan was a comprehensive vision for the city's rebuilding that reinforced every resident's right to return and prioritized better quality of life, economic opportunity, protection against future hurricane threats .[60] Cutting across all policy domains, the plan recommends hundreds of actions tailored to one of three levels of policy action (1) areas with less flood risk and/or higher repopulation rates; (2) areas with moderate flood risk and/or moderate repopulation rates; and (3) areas with highest flood risk and slowest repopulation rates. Importantly, the plan respects and incorporates recommendations developed through the BNOBC and Lambert processes. The plan is also explicit about its limitations, most notably that the plan did not prioritize specific projects over others and is heavily reliant on outside funding sources.

Given the variable history of engagement in previous recovery planning efforts, broad-based community engagement was integral to plan development . Government leaders wanted to regain

community trust and buy-in and overcome many of the challenges to engagement that characterized previous planning processes (Williamson 2007). To achieve this, UNOP contracted with AmericaSpeaks, a national organization specializing in large-scale resident participation, to design and lead the engagement process (Box 2).

UNOP facilitated **consensus-building** through the following efforts:

- establishing the **Community Support Organization (CSO),** comprising the mayor, city council, CPC, and emerging leaders (unaffiliated with government or politics) to represent all of the city's planning districts. The CSO was charged with guiding plan development. CSO meetings occurred biweekly, were open to the public, were televised, and allowed for resident input, at times attracting close to 100 in-person spectators. CSO members have noted that the presence of nongovernmental representatives was an asset, as these members were not motivated by election cycles (Williamson 2007).
- facilitating four rounds of **district-level planning meetings** that occurred in the city's 13 planning districts. This generated new district-level plans that built upon actions in the Lambert Plans.
- convening **three citywide Community Congresses**, which became the centerpiece of UNOP community engagement. During these events, residents engaged in small-group facilitated discussions, brainstormed and prioritize project ideas, and responded to live individual keypad polling. In addition, these two events were simulcasted to include residents in Atlanta, Baton Rouge, Dallas, and Houston, and webcasted to refugees in 16 other cities.
- convening several additional **public hearings** after the Community Congresses.

NEW ORLEANS 2030 (2010)

With the completion of the Unified New Orleans Plan, the city set its sight on fully transitioning from recovery to comprehensive planning by producing a Master Plan. Furthermore, in 2008 voters affirmed a ballot initiative to mandate a regular comprehensive planning process and provide the Master Plan the force of law. Through a $2 million recovery allocation, the city pursued a new Master Plan over the course of 18 months, working in partnership with Goody Clancy consulting firm. In August 2010, the city unanimously approved the first complete Master Plan: *Plan for the 21st Century: New Orleans 2030*. This plan set three goals, focused on livability; economic opportunity; and sustainability.

Immediately after adopting the Master Plan, the city transitioned to the second half of the comprehensive planning process, developing a corresponding Comprehensive Zoning Ordinance (CZO)

(which had not been updated since 1995), to codify Master Plan policies into user-friendly land use and development regulations (Collins 2010).

Public engagement procedures for the Master Plan took place through various stakeholder committees, including a community advisory group of residents; working groups with stakeholders from public, private, and neighborhood-based nonprofit sectors; and both a planning and zoning technical advisory group that involved both consultants and residents. Engagement methods included dozens of one-on-one and small group interviews with professionals, experts, grassroots organizers, and advocacy group leaders—focused on getting a better sense of local issues and other initiatives aligned with the plan. Plan leaders facilitated forums throughout the city where residents provided input on overarching priorities and facilitated 20 district-level public meeting to solicit community priorities and draft plan feedback.

Plan leaders also developed a website dedicated to the Master Plan and CZO that was routinely updated with plan information, event announcements, public meeting summaries and presentation materials, public input syntheses, and questions for online public response. They disseminated press releases; hardcopy newsletters distributed at meetings and popular commercial locations throughout the city; event flyers to promote public meetings; and TV and radio advertisements.

The city has amended the Master Plan twice (2011–2012 and 2016–2017) since its original 2010 publication, per the city's Home Rule Charter which mandates a Master Plan review at least once every five years. At each juncture, the CPC invited citizens to submit amendment applications to amend plan text and maps and hosted citywide public hearings and district-level meetings. Outreach for the amendment process included City Council meeting presentations, stakeholder meetings led by the CPC with city agencies, business associations, neighborhood leaders, and nonprofits. The city also created a webpage on the city's website dedicated to the Master Plan.

Engagement for the Comprehensive Zoning Ordinance began soon after the adoption of the Master Plan and lasted through 2015. During that time, the CZO underwent three public review drafts (shared online and via local media) that were vetted during over 20 public meetings and yielded over 1000 recorded comments (Collins 2010).

Finally, although public debate over several key issues delayed ultimate approval of the CZO, this is also evidence of the extent to which public engagement necessarily guides city planning in New Orleans. At the heart of these issues is a tension between "two competing values…: preservation and commerce" whereby certain residents are most interested in preserving neighborhood history and character while others prioritize the economic potential of new tourist-oriented development (Collins 2010).

Community Participation

It is difficult to ascertain how well different communities were represented in the engagement process. Quantitative or qualitative data recording demographic or other characteristics of engagement participants and regarding quality of engagement events is not publicly available.

Qualitative evidence about engagement events reveals several weaknesses in the city's engagement processes. First, a critical report by Bureau of Governmental Research found fault in the CPC for failing to present a complete first draft of the plan as of the day of the first public hearing (at that point, the draft still lacked key chapters including implementation, resident participation, and appendices) . Confusion around communicating the scope of the Master Plan vis-à-vis the CZO became also contentious as the city weighed the siting of planner Veterans Affairs and LSU hospitals in the Mid-City neighborhood. Another Times-Picayune article noted that residents, planning groups, and advocates for more than a year "bemoaned a lack of citizen participation" in decisions related to the 70-plus-acres hospital complexes—among the largest in the city.[61]

RESILIENT NEW ORLEANS (2015)

In 2015, New Orleans became the first city in the world to release a comprehensive resilience strategy, through its membership in the Rockefeller Foundation's 100 Resilient Cities initiative.[62] *Resilient New Orleans* offered a three-pronged vision to build a more resilient city for the next generation of New Orleanians: (1) adapt to the natural environment and climate change-related risks; (2) connect lower-income residents to opportunity by investing in an equitable economy; and (3) transform, modernize, and improve city systems like transportation and energy to prepare the city for future shocks. Actions featured in the plan affect household, neighborhood, city, and regional scales and cut across policy areas including coastal restoration, family economic stability, digital equity, small business, and energy efficiency, among many others.

100 RC provided a prescriptive model for both strategy development and community engagement. According to the *Resilient New Orleans* plan, this engagement took shape across several phases. First, the leadership team partnered with local organizations to design and moderate five workshops in which participants were asked to identify city's key resilience shocks, stresses, and assets. Meanwhile, planning team members recorded qualitative feedback from the workshops and mapped them on to 100RC's City Resilience Framework's 12 drivers of resilience, and the Office of Neighborhood Engagement convened neighborhood leaders to collect their perspectives on city resilience. This feedback formed the foundation for a Preliminary Resilience Assessment (PRA), a document that

defines four focus areas for the city's resilience challenge: adaptation, equity, transformation, and resident engagement.

Over 110 individuals took part in the five preliminary workshops, representing four key groups: (1) community leaders and advocates serving historically vulnerable populations; (2) professionals working in the built environment space; (3) young professional leaders in various sectors; and (4) city officials .[63] Across the workshops, participants affirmed the city's resilience strengths as New Orleanians' relationship to the city's history and culture, their dedication communities and social networks, and their history of experiencing and recovering from shocks. Common resilience challenges noted by participants included persistent inequity, failure of plan implementation, weakness in the city's infrastructure maintenance and innovation, climate change threats to the coast, and limited availability of quality jobs.

HOUSINGNOLA (2015)

The HousingNOLA 10-year Strategy and Implementation Plan was developed with long-term residents in mind. Managed by Greater New Orleans Housing Alliance with funding from Foundation for Louisiana's TOGETHER Initiative, the plan builds on the numerous recovery planning efforts that were developed following Hurricanes Katrina and Rita, with an emphasis on fair housing policies. HousingNOLA has five goals, to: 1) preserve the existing supply of affordable rental housing and homeownership opportunities 2) prevent displacement through development activities and continued study 3) enforce and promote fair housing policies 4) encourage sustainable design and infrastructure and 5) increase accessibility for all.

The 10-year plan details other plans that were released between 2010–2015, with an emphasis on the housing implications of those plans (effects on pricing, availability, location, etc.), specifically the New Orleans Master Plan and Comprehensive Zoning Ordinance. At the core of the plan is the demand model, which analyzes current total housing units (renter- and owner-occupied) and the national vacancy rate to estimate household growth rate, future construction, and other housing demand measures. To meet demand measures, HousingNOLA will create 2,000 rental units, 1,500 homeownership units, and 1,500 units for people with special needs, and it plans to do so by 2021. But as of late 2018, only about 750 units had been created, with Mayor Cantrell setting her housing focus on helping homeowners pay off second mortgages and using the Housing Authority of New Orleans scattered site strategy to address the city's affordable housing needs.

There were 50 total points of engagement held between November 2014 and November 2015. The community engagement team engaged 1,800 people through more than 35 community meetings, which

were held in each city council district. The plan lists a number of vulnerable populations including immigrants, previously incarcerated individuals, and populations with language access barriers, but it's unclear what efforts, if any, were taken to reach those populations.

Feedback from community meetings was said to be recorded, but specific meetings notes or comments were bit available in the plan. It is also unclear whether the 1,800 people engaged included those who participated in open meetings or if they were solely those who the engagement team contacted. The plan included some photos of the community meetings that show participants interacting with charrettes, giving comments, and participating in roundtable break-out discussions and news media interviews.

CLIMATE ACTION FOR A RESILIENT NEW ORLEANS (2017)

One month after President Donald Trump withdrew the United States from the Paris climate accord in 2017, the city released *Climate Action for a Resilient New Orleans*, a strategy to reduce annual greenhouse gas pollution by 50% from current levels. The plan is a direct consequence of proposed actions in the *Resilient New Orleans* strategy. Leveraging scientific data on the climate-related pressures in southeastern Louisiana—which include sea-level rise, heat stress, coastal land loss, land subsidence, intense weather, and lack of public awareness—the plan unequivocally affirms climate change as an "existential threat" that New Orleanians must reckon with to become more resilient.

The plan's 11 strategies and 25 actions support both mitigation of climate-related risks and adaptation to the changing environment. These actions are organized into four key activities: (1) modernize energy use by reducing reliance on carbon-intensive fuels, energy conservation, and infrastructure improvements; (2) improve transportation by reducing car dependency and increasing fuel efficiency; (3) promote waste reduction by bolstering recycling initiatives and generating value from waste; and (4) create a culture of climate awareness and action by growing the low-carbon economy, enhancing public access to climate data to encourage decisionmaking, and connecting culture to climate action.

Plan development was led by the city's Office of Resilience and Sustainability and Mayor's Office, and directly supported by local and national organizations including greater New Orleans Foundation and FUSE Corps (funded a fellowship); C40 (research and technical assistance), ICLEI (membership support), and 100 Resilient Cities and the Rockefeller Foundation. Based on a review of the plan and affiliated media, the planning team behind *Climate Action for a Resilient New Orleans* did not facilitate a broad-based public engagement process.[64] Rather, the planning team engaged specific staff across municipal and para-municipal agencies and representatives from local organizations and companies for

input, clarification, and support. Plan documentation does not specify details about the content or format of these engagements.

The strategy's acknowledgments lists the names of 54 individuals who supported strategy development. This includes 43 municipal staff, 18 representatives from local organizations and companies, and three Chief Resilience Officers from Boulder, CO, Mexico City, Mexico, and Melbourne, Australia. Individuals from outside city government represented para-municipal agencies (e.g., Sewearge and Water Board and Regional Transit Authority); local utility and infrastructure companies (e.g., Entergy and Posigen), national environmental advocacy groups (e.g., Trust for Public Land and Natural Resources Defense Council), and local nonprofits in climate justice, transportation equity, energy equity, and economic development (e.g., Deep South Center for Environmental Justice and Ride New Orleans).

Other Parish Plans

Comprehensive plans are a planning tool that towns, parishes, and cities use to periodically define their jurisdictions' economic, social, and cultural goals over five to ten-year periods. Comprehensive plans may also include a community or resident engagement components that allows a jurisdiction's population to weigh in on the goals and the strategies. Community engagement efforts typically take the form of public meetings where planners present plan drafts to the public and respond to questions about the plans' content, as well as open public comment periods.

Because Louisiana is particularly flood-prone, many of the comprehensive plans outlined here profile the environmental risk that cities and parishes face, disaster recovery strategies that they may employ to bounce back from climate shocks, and infrastructure changes that they can make to mitigate the impact of climate change. The plans often contextualize these measures as integral to ensure jurisdictions continued economic and operational health postdisaster. Additionally, the sample of plans included in this chapter represents a variety of community engagement strategies and a range in the amount of community input that plan leadership solicited.

ST. TAMMANY PARISH (2002)

St. Tammany's only comprehensive plan at the time of study dates to before Katrina. The plan minimally covers climate shocks and environmental risks, instead heavily focusing on outlining land use policies that foster the parish's economic growth.[65] The plan includes strategic economic policy meant to attract businesses to the area and a comprehensive rezoning plan to make the parish more appealing to

companies that are looking to expand into the region or set up their headquarters somewhere new. New Directions 2025 does not mention community engagement initiatives that St. Tammany residents could participate in. This plan also did not explicitly include or allude to any community participation initiatives that would allow St. Tammany residents to contribute to the plan's formation beyond what may be expected or required by state officials.

ST. CHARLES PARISH (2011)

Adopted in 2011, *St. Charles 2030* is an update to the 1990 comprehensive land use plan. With a 20-year outlook, the plan attempts to reconcile the need for economic growth amid stagnant population growth resulting from the 2005 hurricanes and the 2010 Deepwater Horizon oil spill, with the desire to maintain and celebrate the parish's "small-town way of life".[66] Infrastructure for storm protection and flood hazard mitigation are among the plan's top five planning priorities, which also include economic diversification; new development; provision of diverse, high quality, and affordable housing; and revitalization and preservation of commercial and residential property. The planning effort was funded by the Center for Planning Excellence and led by planning consultancy Wallace, Roberts, and Todd.

Over two years, the planning team engaged the public at various steps of the plan development, gathering community input to establish plan values and priorities, soliciting feedback on final plan elements, and encouraging the public to prioritize future capital spending. Planners drew heavily on both in-person and online media for outreach activities: they regularly hosted public briefings to Parish Council; presented to community groups; put out press releases and informational videos; and provided updates through Blogspot, Facebook, and Twitter. Planners hosted two phases of interactive workshops, including two months of 14 visioning sessions to understand community expectations for quality of life, development, and design character, and two days of "Shape the Future" workshops designed to collect feedback on where and how to grow the parish. Interactive exercises included a mapping exercise, visual preference exercise, an issue prioritization activity, and a discussion regarding the next "big idea" for the Parish's future economic development.

Toward the end of the planning process, the planning team also hosted five public open houses across three days to share key plan components including the future land use map. During the open houses, attendees were invited to prioritize future capital spending by posting comments and reactions both in-person and online. Plan leaders held an additional open house for high school juniors and seniors a local vocational school.

More than 1,000 residents took part in engagement activities. The 14 visioning sessions attracted 534 individuals in total, 160 of which the plan identifies as student participants. During the two-day

"Shape the Future" workshops, 275 individuals participated. Finally, 250 individuals attended the Open Houses. The plan does not include documentation about representativeness and diversity in participation.

PLAQUEMINES PARISH (2013)

Like other parishes' comprehensive plans, Plaquemines Parish's plan aimed to help residents and businesses adjust to the long-term effects of Hurricane Katrina and the Deepwater Horizon Oil Spill .[67] The plan focuses on weathering climate and environmental shocks—such as restoring the parish's levees and improving infrastructure, waste and wastewater facilities, and transportation facilities and creating and promoting sustainable economic growth.

Plan leaders identified a diverse set of community stakeholder groups to advise the planning process and constructed a steering committee that represented a social and cultural cross-section of the parish's population. While the planners engaged in some more common community engagement strategies, such as holding focus groups, publishing summary reports and monthly newsletters, and maintaining a website that included presentation materials, they also held several more informal non-planning-focused events (like a seafood festival and a rodeo) in an attempt to hear from members of the community that they might not otherwise reach.

Once the planners drafted an initial version of the plan, they held public hearings where parish residents could comment on the plan's contents. They also held five public meetings over two years (2010–2012) that had distinct agendas and goals. To build on the content of those meetings, the planners held a series of six visioning workshops across the parish in which residents were invited to help define the plan's objectives and come up with a vision statement for the community and for the entire parish between May 2010 and June 2010. Plan leadership held six additional open houses across the parish, during which a consultant would present on the most current iteration of the plan briefly and talk with residents in attendance to gather their feedback in a casual setting. Finally, the planners held an online visioning workshop so that parish residents who could not attend an in-person visioning workshop could participate in the planning processes

While the plan does not include information on the number of people who participated in most of their community engagement efforts, the planners were dedicated to making community engagement materials available to all parish residents; the online visioning workshop gave Plaquemines residents around-the-clock access to public meeting materials. Additionally, Plaquemines Parish hired a team of consultants to support the planning process, who collected feedback from parish officials, staff, residents, and community stakeholders. In total, the consultants spoke with 36 parish residents.

ST. BERNARD PARISH (2014)

The St. Bernard Parish Comprehensive Plan aimed to bolster the parish's competitiveness in the GNO region, particularly in attracting new residents and businesses to diversify the parish's economic base.[68] The plan's storm water management element frames the parish's flood vulnerability as one of the biggest issues facing the parish and a major barrier to retaining businesses and higher-income families. Thus, plan actions are aimed at reducing damage to property and converting water management infrastructure into a commodifiable amenity. This approach supports the plan's four strategies to beautify and upgrade property; stimulate the housing market; upgrade quality-of-life amenities; and enhance government's fiscal sustainability, transparency, and private-sector partnerships. Plan development occurred over the course of a year and was funded by the Louisiana Office of Community Development - Disaster Recovery Unit and the US Department of Housing and Urban Development.

The planning team used a variety of engagement methods to solicit resident feedback. First, the planning team appointed a Steering Committee representing a cross section of parish residents. Next, the team enlisted and trained a group of community volunteers to conduct outreach and feedback gathering activities with the support of the Steering Committee and parish government leadership. The team carried out several waves of public input activities, including small group discussion for St. Bernard Parish community members to share their perspective on a vision for the parish's future, as well as focus groups to identify key community challenges. The Parish also held two community-wide meetings focused on fair housing and used both an interactive website and online survey to gather input. The Steering Committee vetted the final plan document prior to submitting to the Planning Commission for review.

Despite its in-depth description of all engagement activities, the plan lacks mention of the scale of community events or the level of diversity and representation of community feedback. The plan does not share the number of responses received on the online survey, or attendance metrics. Furthermore, the online survey did not ask respondents to share demographic information.

We can ascertain from the Fair Housing element of the plan (the only element in which demographic characteristics besides income are discussed) that representation in St. Bernard Parish likely means white, working-class residents. As the plan states, the parish has traditionally been "homogenous" with over 90% of residents being white, working class, homeowning residents. Beginning in the mid-1990s, the parish began to see growth in its lower-income and black renter population, a trend that was accelerated by Hurricane Katrina. However, the parish has actively fought back against its changing demographics; in 2012, the Department of Justice alleged that the parish had strategically updated its land use code to displace African-Americans post-Katrina in an effort to restore its pre-

Katrina demographic composition.[69] The Greater New Orleans Fair Housing Action Center, in conjunction with the Department of Justice sued the parish on the behalf of a group of homeowners who collectively organized and the two parties ultimately settled, with St. Bernard paying millions in settlements to seventeen individuals.

ST. JOHN THE BAPTIST PARISH (2014)

Between 2012 and 2014, St. John the Baptist Parish led major planning processes to develop two linked but distinct plans: 1) *St. John the Baptist Parish Louisiana Community Recovery Strategy (2013)*, a plan for key rebuilding projects to recover from the aftermath of Hurricane Isaac in August 2012 and 2) *One Parish, One Future: Comprehensive Resilience Plan*, a 20-year vision to guide land use development toward a more resilient future.[70] Since the comprehensive plan was slated for development before Isaac struck, Parish leadership opted to develop the plans in succession and contracted with the University of New Orleans Planning Department to coordinate both efforts. The comprehensive plan also explicitly incorporates recommendations from the *Recovery Strategy*.

The *Recovery Strategy* functioned as an action plan outlining key projects and identifying partners, potential funding sources, and specific steps for implementation. The strategy includes short- and long-term initiatives to revitalize the parish across five domains: infrastructure, housing, natural and cultural resources, health and social services, and economy.

An update to the 2006 Land Use Plan, the *Comprehensive Resilience Plan* offers policy guidance for future development, generates a Future Land Use Map to guide development in relation to hazards like the 100-year flood plain, and produces a vision statement that succinctly defines resident priorities for future development . Moving beyond the impacts of Isaac, the plan highlights key challenges such as water and flooding vulnerabilities, transportation and disaster management challenges, limited multifamily housing options, need for increasing ethnic and racial population diversity, and slow economic growth. Resilience is a guiding principle for the plan and permeates all plan elements, from housing to economic development The plan also includes individual elements for resilience, hazard mitigation, and natural environment aimed at reducing vulnerability, increasing resident familiarity with resilience and disaster preparedness, strengthening infrastructure to reduce risk of man-made hazards, and preserving natural ecosystems to increase resilience.

Both the *Recovery Strategy* and *Comprehensive Resilience Plan* report intensive resident input and community ownership of a long-term vision as key elements and goals of each plan.

For the *Recovery Strategy*, plan leadership facilitated community-wide open houses and an online survey. During the first phase of open houses, participants exchanged recovery experiences and posted along the five plan domains including infrastructure, housing, natural and cultural resources, health and social services, and economy. Plan officials also convened a Citizens Advisory Committee (CAC), comprising of resident stakeholders who received technical assistance from FEMA staff and state partners. The CAC further developed and consolidated resident ideas into more than 50 projects and presented these during a second series of open houses. During this second phase, residents cast in-person and online ballots to prioritize five projects in each plan domain. Finally, the Citizens Advisory Committee synthesized and converted feedback into plan recommendations.

Engagement for the *Comprehensive Resilience Plan* explicitly built upon *Recovery Strategy* participation. Plan leaders hosted four planning workshops and administered a Community Image Survey, designed to introduce residents to land use concepts and gain feedback on community design values through a Community Image Survey .

As with previous plans, neither the *Recovery Strategy* nor the *Comprehensive Resilience Plan* include specific metrics about diversity and representation engagement. The Comprehensive Plan mentioned that participants included neighborhood groups, residents-at-large, nonresidential property and business owners, outside planning consultants, and Parish officials and staff. In addition, plans mention targeted outreach and engagement activities to specific groups by hosting additional planning sessions for youth and the elderly. Overall, nearly 750 residents took part in the *Recovery Strategy* planning process, while participation for the *Comprehensive Resilience Plan* was much lower with 100 attendees.

JEFFERSON PARISH (2019)

Envision Jefferson 2040, which was developed during the study timeframe, is a continuation of Envision Jefferson 2020, the parish's current comprehensive plan originally adopted in 2003.[71] Envision Jefferson 2040 is meant to update Envision Jefferson 2020 to reflect the parish's shifting priorities because of the impacts of Hurricanes Katrina and Rita, the Great Recession, and the Deepwater Horizon Oil Spill. The plan has seven main foci: land use, housing, transportation, community facilities and open space, natural hazards and resources, economic development, and administration and implementation. Therefore, despite that Envision Jefferson 2040 explicitly casts itself as a reaction to environmental, economic, and climate shocks, it is distinct from Plaquemine's comprehensive plan in that its scope is larger.

Since Envision Jefferson 2040 was still in the planning process during the study analysis, its community engagement strategies were unfolding. To gather direct input from the community on

Envision Jefferson 2040's objectives, Jefferson Parish conducted a series of interviews with parish government officials and community stakeholders to learn about the parish's infrastructure, facilities, programs, plans, services, and governmental functions. The steering committee also hosted two sets of public meetings in September 2018, where attendees participated in interactive planning and feedback exercises and watched presentations on the state of the planning process.

The Parish also drew from its local expertise to construct a thirteen-person steering committee composed of representatives from the parish's civic and business organizations. The steering committee deployed a survey to its residents that solicited their opinions on land use, housing, transportation, resilience, and the community's facilities. Finally, the parish heavily relies on social media to publicize its events and ideas.

Because this plan is still under development, there is not much information about how many residents of Jefferson Parish have participated in the planners' resident engagement initiatives. However, the most recent draft of the plan does mention that over three hundred people took the steering committee's survey. Additionally, Jefferson Parish has deployed an online survey that is meant to simulate the experience of attending the planners' spring 2019 open meetings.

HAZARD MITIGATION PLANS

At the beginning of each five-year update, each parish forms a planning team and steering committee and begins the document review process. The planning team is made up of the parish's Office of Homeland Security and Emergency Preparedness and, typically, a third-party contractor, and together they operate as the overall coordinator for the planning process. The Steering Committee is made up of parish officials and other community stakeholders that represent the parish, as identified by the planning team. The document review process varies in rigor; some parishes, like Plaquemines, don't have many plans released every five years, but for Orleans parish the document review process can be more intensive.

The risk assessment and mitigation strategy sections, but more specifically the list of hazards and goals, are the main sections of the plan that get updated. Given that each parish has different geographies and typologies, the hazards and action plans vary from parish to parish. Generally, flooding and storm surges are selected as hazards that require mitigation the most but some parishes like St. Tammany identified earthquakes as high risk while others like Jefferson identified tornadoes as a high risk. Third-party contractors help develop these sections by conducting research and analysis of hazards that have historically affected the parish and research on what hazards could affect the region in the future. This analysis forms the risk assessment, where each hazard identified typically receives a

ranking based on its estimated level of impact on the parish. From this risk assessment, each parish develops a mitigation strategy that includes a list of goals and actions for agencies to address—which aligns with the key hazards.

One of the requirements of the planning process is to allow residents, local and regional agencies, businesses, and other for-profit and nonprofit institutions to provide input during the plan's development. FEMA requires that the engagement process be detailed within the plan, though the information that each plan includes regarding public engagement and participation varies.

State of Louisiana Plans

LOUISIANA SPEAKS (2007)

The *Louisiana Speaks Regional Plan* provided the state and localities policy guidance on how to leverage federal government recovery funding, including CDBG and hazard mitigation grant funding. It was developed by the LRA—established by Governor Kathleen Blanco to guide all Hurricane Katrina and Rita recovery efforts.[72] The plan takes up rebuilding at the building, neighborhood, parish, and regional levels. Four key initiatives marked the 18-month planning process: (1) a parish recovery planning process, (2) three demonstration charrettes on neighborhood development (3) a pattern book that provided guidance on reconstructing the built landscape, and (4) a planning toolkit written for homeowners, builders, and developers focusing on rebuilding with updated safety and sustainability standards.

At the same time, FEMA activated its Long-Term Community Recovery (LTCR) Emergency Support Function (ESF), which deployed field teams to lead recovery planning processes in 20 parishes affected by Katrina and to build parish capacity to carry out future planning processes. Executed in conjunction with *Louisiana Speaks*, the LTCR planning process functioned as the parish-level component of the broader *Louisiana Speaks* plan, thus taking advantage of *Louisiana Speaks* engagement activities.

LOUISIANA COASTAL MASTER PLAN (2007, 2012, AND 2017)

In the aftermath of Hurricanes Katrina and Rita, the Louisiana Legislature established Coastal Protection and Restoration Authority (CPRA). Integrating the state's flood control and wetland restoration functions for the first time, this new governmental entity was charged with coordinating and directing efforts of local, state, and federal agencies to achieve long-term and comprehensive coastal protection and restoration. These efforts culminated into a Master Plan, a comprehensive vision of sustainability for coastal Louisiana that leverages scientific evidence and technical advancements to

prioritize restoration (nature), structural (infrastructure), and nonstructural (individual property-level) projects and initiatives. CPRA released the first Coastal Master Plan in December 2007, has since released 2012 and 2017 updates, and is developing a 2023 update as of this writing.

2007 COASTAL MASTER PLAN

Responding to the pressing coastal vulnerabilities exposed by Hurricanes Katrina and Rita, the 2007 Coastal Master Plan is a call-to-action for the state's political, planning, and scientific communities to support coastal sustainability. The plan sets four objectives for implementation: reduce risk to economic assets; restore sustainability to the coastal ecosystem; maintain a diverse array of habitats for fish and wildlife; and sustain Louisiana's unique heritage and culture.[73] It introduces sediment diversions as a key restoration strategy, offers multiple structural hurricane protection measures, and highlights the importance of resident-level "non-structural" solutions, such as flood insurance, elevation, and retrofits.

Importantly, the plan also seeks to remove institutional constraints that could impede implementation, from obtaining dedicated implementation funding and addressing federal-level challenges, to improving land use planning and increasing resident awareness and use of nonstructural protection measures. Finally, the plan attempts to incorporate findings from simultaneous planning efforts, namely the Louisiana Recovery Authority's 2007 Louisiana Speaks planning process and the US Army Corps of Engineers' Louisiana Coastal Protection and Restoration Report (released in December 2007, eight months after the Master Plan).

The 2007 Master Plan represented the state's unprecedented effort to mobilize cross-sector collaboration among scientific, policy, and planning experts and stakeholders in support of coastal sustainability. In a section on the plan's key principles, the plan notes that the planning process will involve all affected residents and stakeholders, specifically the "diverse interests that live, work, and play in coastal Louisiana, along with national interests who depend upon coastal Louisiana's continued health and existence".[74] Thus, engagement for the 2007 Master Plan occurred at two levels: stakeholder engagement and public engagement. Engagement activities were led by the plan's Integrated Planning Team (IPT), a group of employees from the state's Department of Natural Resources and Department of Transportation and Development. In addition, the IPT also developed a project website to circulate plan development updates and collect public comments.

Stakeholders were engaged at three stages in the planning process. First, even before the plan was drafted, the IPT gave introductory presentations to inform stakeholders about the master planning process and to collect feedback on how stakeholder groups believe the process should unfold. The IPT

presented to floodplain managers, regional planning districts, environmental interest groups, parish governments, and a group called Parishes against Coastal Erosion (PACE).

The IPT also presented at 14 levee board meetings as well as the Barataria-Terrebonne National Estuary Program Management Conference. In addition, the IPT led two workshops for stakeholders to review multiple planning scenarios and build consensus around the preferred coastal protection plans for planning units. The first meeting convened 38 professionals representing the state agencies, federal agencies, and members of the Science and Engineering Review Team (SERT), a group of local and national scientists charged with assisting in the development of the Coastal Master Plan. For the second workshop, the IPT convened the Interdisciplinary Technical Team, a preselected group of over 50 scientists, engineers, planners, USACE representatives, and state and federal agency officials. Both groups were charged with developing or vetting preliminary plan recommendations that would form the foundation of the preliminary draft plan.

Next, once the preliminary draft plan was complete, the IPT presented on that plan to national environmental organizations in Washington DC (at the request of Environmental Defense), including Environmental Defense, National Audubon Society, and National Wildlife Federation. In addition, the IPT held separate meetings with the SERT as well as the Louisiana Coastal Area (LCA) Science Board to collected "candid and critical comments." Finally, once the plan was fully drafted, the IPT hosted a final round of technical review meetings with the SERT and LCA. Members of the general public were also engaged before and after the plan was drafted. The IPT attended six public workshops hosted by the Louisiana Recovery Authority as part of the Louisiana Speaks planning process. It is unclear how participants were engaged, and how much they were aware that their feedback would inform both Louisiana Speaks and the Coastal Master Plan. CPRA then hosted 3 initial public meetings in November to coincide with the release of the preliminary draft plan and hosted 6 public open house workshops displaying boards with maps and summaries of stakeholder comments in 6 different parishes. Importantly, Plaquemines Parish volunteered to host a meeting to give those residents an opportunity to participate. Attendees received packets containing the draft plan, maps, and comment forms. Lastly, CPRA hosted 2 public meetings and 3 public hearings in 5 different parishes to collect feedback on the final draft of the plan.

The media was especially active in promulgating the 2007 Master Plan's community engagement strategies, both directly and indirectly. The 2007 plan was a culmination of then-Governor Blanco's efforts to create the Coastal Protection and Restoration Authority by combining portions of Louisiana's Department of Transportation and development with a division within the state's Department of

Natural Resources, which the media publicized.[75] The 2007 Master Plan, then, was the final installment of a series of the Governor's high-profile environmental initiatives.

In addition, the plan does not quantify demographics of participants. From the participation data that is available, community-based groups and direct service providers are noticeably absent from the list of targeted stakeholders. Though the plan does not quantify participation beyond the preplan stakeholder workshops, it can be inferred from the volume of engagement events and written comments received that hundreds of local officials, residents, and stakeholders likely took part in plan development in some way. While representatives from these groups may have attended public meetings or submitted written comments, it's important to highlight that CPRA's outreach approach did not specifically target vulnerable communities.

2012 COASTAL MASTER PLAN

The 2012 Coastal Master Plan is a 50-year, $50 billion plan with two goals: protecting the coast through a combination of restoration, nonstructural, and structural measures, and restoring land through integrated resilience and sustainability initiatives.[76] Like the 2007 plan, the 2012 plan paints a bleak picture of Louisiana's future without immediate action, describing land loss as a crisis and a national emergency. This urgency is matched with praise for progress made on the 2007 plan as well as the state's major financial commitments to the coast to date, such as $14 billion in federal dollars for hurricane protection and $496 million through the federal Coastal Impact Assistance Program. The 2012 plan seeks to leverage this momentum to implement unprecedented large-scale actions for coast protection, which include wetland restoration as a key hurricane protection measure and the nation's largest investment, over $20 billion, in sediment mining and marsh creation. In addition, recommendations are rooted in what the plan describes as the latest innovations in science and "unbiased" analysis. Finally, the plan also proposes policy and programmatic changes related to aligning existing programs throughout the state with Master Plan projects.

A new feature introduced during the 2012 effort was CPRA's emphasis of public input and dedication of resources to community engagement. CPRA formed an Outreach and Engagement team created to supply critical information for the public to make informed decisions, design an engagement process, and incorporate public feedback into the planning process. The 12-person team staffed functions including science communication, graphic communication, cultural heritage focus group management, outreach strategy development, local and community outreach, political outreach, website development and maintenance, and media engagement. The plan notes repeatedly that the

Outreach and Engagement worked closely with all other planning teams to ensure public feedback informed plan development.

The plan's outreach strategy aimed to strengthen the link between resident feedback and plan formulation in two ways: First, by ensuring residents were given ample time, opportunity, and fora to learn about and comment on both the planning process and the plan itself. Second, by ensuring that the planning team was given sufficient time to listen, respond, and incorporate public feedback in a meaningful way.

Between January 2011 and June 2012, outreach and engagement occurred across three phases: (1) baseline assessment or "Listening Tour"; (2) active community engagement to consider priorities and trade-offs; and (3) strategic engagement and public comment. The "Listening Tour" phase (January to June 2011) involved meetings with local legislators and parish officials to learn about their concerns and preferences for plan actions. CPRA also administered a telephone survey to gauge Louisiana residents' general knowledge, preferences, and concerns regarding the coast.

During the second engagement phase (July to September 2011), CPRA led ten regional community meetings to better understand residents' perspectives on their values regarding the coast and to share information about the Master Plan's approach. Importantly, the plan highlights how its Cultural Heritage Technical Advisory Committee guided the meeting planning, encouraging CPRA to have multiple meetings across the coast in variously sized locations. CPRA advertised for the meetings through its website, listservs, local media, and flyers. During these meetings, CPRA also administered a community survey asking residents to prioritize coastal plan actions for their communities and for the coast as a whole. Additionally, between April 2011 and January 2012, CPRA led ongoing meetings, presentations, and briefings with resident groups across the coast that had not traditionally been involved in large scale coastal planning efforts. Finally, CPRA launched its website where residents could view plan materials and draft and final plan versions.

In the third and final phase, (January to February 2012) CPRA released the draft plan, launched a media campaign that involved targeted outreach to editorial boards and media outlets, and continued targeted stakeholder outreach meetings, presentations, and briefings for local officials, legislators, and community and civic groups. CPRA also collected public feedback and comments on the draft plan during a public comment period through mail, email, website messages, verbal statements, and during three public meetings in New Orleans, Houma, and Lake Charles. Finally, rather than hosting a presentation, public meetings were structured as five-hour open house sessions where over 15 members of the planning team were made available to interact with directly residents. The open houses

offered seven exhibit booths with 14 posters that visually communicated the master plan process from start-to-finish, including a "Public Comments" booth.

The 2012 Master Plan reached thousands of Louisiana coastal and inland residents. The plan clearly tabulates participation levels for each engagement activity and summarizes participation by parish, but offers no demographic participation summaries. The statewide baseline assessment poll administered during engagement Phase 1 gained 1,002 responses from adult residents, 802 of which lived in the coastal area. During Phase 2, 805 residents completed the community survey; 447 completed the survey during the 10 regional community meetings, while 359 completed the survey online. The 326 respondents from GNO region parishes represented Jefferson (56), Orleans (122), Plaquemines (70), St. Bernard (32), St. Charles (3), St. James (2), St. John the Baptist (1), St. Tammany (37), and Tangipahoa (3). During Phase 3, over 750 residents attended the three public meetings, and over 11,000 people visited the CPRA plan website during the public comment period. By way of feedback, CPRA received 2245 public comments: 1765 through mass email forms, 378 through mail, email, or website, and 102 during the three open house public meetings. The plan notes that comments regarding specific comments were used to make adjustments to draft plan projects, while policy and implementation comments were used to guide implementation.

2017 COASTAL MASTER PLAN

The 2017 Comprehensive Master Plan for a Sustainable Coast builds upon the previous plans, proposing a range of projects to reduce risk to coastal communities, such as structural protection efforts, ridge restoration, shoreline protection, marsh creation, sediment diversion, and infrastructure improvements.[77] In total the plan included 124 projects and was projected to reduce coastal damage by $8.3 billion annually. The primary difference between the 2017 Coastal Master Plan and its predecessors is that the 2017 Plan focuses more on flood resilience and deliberately diversifies stakeholder engagement through its community engagement and community participation initiatives. Many project ideas in the 2017 Plan were originally submitted as comments or suggestions on the 2012 plan, which further links the two plans. Otherwise, though, the 2017 Plan builds closely off of the legacies of the 2007 and 2012 Coastal Master Plan.

The outreach and engagement strategy for the 2017 Coastal Master Plan mirrored the 2012 plan's approach, with several enhancements. The 2017 strategy was guided by the same four principles as the 2012 plan (scope, timing, fair hearing, and access). In addition, CPRA took an "adaptive management" approach to formulating the plan, which included multiple iterations of stakeholder engagement to inform CPRA's knowledge base. Like the 2012 plan, the 2017 effort also involved a three-phase

engagement approach: (1) baseline establishment (2) active engagement (3) draft plan review and comment. In addition, the 2017 team set four new goals for engagement including (1) developing public trust and confidence that CPRA is the "primary technical authority of coastal protection and restoration" and has the best interest of Louisiana's residents in mind; (2) developing broad-based support to influence adoption and implementation of the plan; (3) addressing and incorporating residents' concerns and ideas; and (4) establishing consistent, accessible, and coherent public dissemination methods.

Unlike the baseline establishment phase in for the 2012 plan, which involved a statewide resident poll and stakeholder briefings on general values and concerns related to coastal protection, the 2017 process was focused on facilitating public education and creativity. Baseline establishment began in 2014 with the launch of the New Project Development Program, which offered two public solicitations for project ideas to include in the Master Plan. In addition, CPRA developed educational materials accessible to the public including an online Master Plan Viewer, an interactive map visualizing property- and community-level flood risks and land loss projections as well as 2012 Coastal Master Plan projects. CPRA also developed and widely circulated a speaker's bureau presentation and brochure highlighting CPRA's progress, describing the plan and planning process, and highlighting opportunities for resident engagement. All of these resources, along with webinars, educational videos, and frequent asked questions, were housed on a Coastal Master Plan website and made available in Vietnamese.

Compared to the 2012 plan, the 2017 active engagement phase lasted longer and included more touchpoints with the public. Between May 2013 and December 2015 CPRA conducted over 100 stakeholder group briefings to educate the public about the master planning process. CPRA presented to industry associations, State task forces, local/regional governmental entities, advocacy organizations and nonprofits, and community groups. These briefings also helped CPRA identity existing community meetings at which to present.

From spring 2015 to spring 2016, CPRA facilitated four rounds of "community conversations" in parishes across the coast, a few of which (New Orleans, Lake Charles, and Houma) hosted multiple rounds. The first round was focused on gleaning resident perspectives on the success of existing mitigation efforts, barriers they face to reducing their flood risk, and the most appealing nonstructural projects. CPRA cohosted these events with local NGOs. The next two rounds unveiled specific CPRA initiatives including the Master Plan Viewer and CPRA's Flood Risk and Resilience Program. During these events, CPRA facilitated an open house, brief presentation, tabletop discussion, and provided complimentary dinner as well as flood resilience resources. Topical experts outside of the planning team also attended to answer questions about flood risk. The final round of community conversations took

place in Fall 2016, where CPRA shared draft lists of potential projects and scenario modeling to inform facilitated discussions. Community member feedback informed the development of the draft master plan.

The final draft plan review and comment phase began in January 2016 with the release of the draft plan. During this phase, CPRA hosted four public hearings that were structured much like the 2012 public meetings: a two-hour open house featuring posters on various elements of the plan and staff to interact with residents, an overview presentation, and formal public comment session. CPRA also conducted draft plan briefings with over 40 stakeholder groups.

Throughout the engagement process, CPRA provided information and training to outreach specialists, governmental employees, and community organizers across the state to support their ongoing outreach efforts to stakeholders and constituents. Additionally, CPRA, reconvened and regularly met with its advisory groups that representing local, state, and federal government, industry associations, advocacy organizations, and nonprofits. Importantly, this was the first Master Plan to include the Community Focus Group, a series of community organizers and other nonprofit organizations with community-based missions.

During the baseline establishment phase, CPRA conducted briefings with 100 stakeholder groups . CPRA also received 155 project ideas from 42 project sponsors through the New Project Development Program, 52 of which were evaluated for the Coastal Master Plan. Applicants included private residents, universities, government entities, community-based organizations, and businesses. Though participation statistics are not included for all community conversations, the fourth round of these meetings attracted 550 individuals. Over 800 people attended the four public hearings on the draft plan, offering 112 official public comments. In total, CPRA received 1221 public comments on the draft plan via mail, email, website, and roadshows. Hundreds of individuals participated in the Coastal Master Plan's many advisory groups; in particular, there were 13 participants in the Community Focus Group.

LA SAFE (2019)

Louisiana's Strategic Adaptations for Future Environments (LA SAFE) was a joint venture of the State of Louisiana's Office of Community Development and the Foundation for Louisiana (FFL) to support holistic, community-driven planning approaches to flood risk across the state of Louisiana. Established in 2017, LA SAFE is funded through a competitive grant from the US Department of Housing and Urban Development's National Disaster Resilience (NDRC) program, along with philanthropic support from blue moon fund, the Rockefeller Foundation, the Surdna Foundation, and the Ford Foundation.[78]

Our Land and Water: A Regional Approach to Adaptation along with the six parish-level strategies offer a 50-year vision state- and parish-level development that align with current and future flood risk profiles. Projects and policy actions recommended by the strategy address flooding and subsidence, safe and affordable housing development, transportation and mobility, economic diversification through education and employment, and community health, culture, and heritage. Since April 2019 publication of the final strategies, LA SAFE and the parishes have launched implementation for six demonstration projects in each parish, which together represent more than $47 million in project investments ($40 million of which was awarded through the NDRC grant).

Initiated in March 2017, the LA SAFE planning process is guided by three sources of knowledge: (1) community vision and input through an intensive engagement process of residents and parish officials, (2) planning and design best practices, whereby LA SAFE convened experts across sectors to bring community visions to life by designing effective policy, programs, and projects; and (3) scientific data and understanding to ground proposed LA SAFE projects in realistic risk scenarios.[79]

Community vision and input occurred over the course of nine months from March and December 2017, when LA SAFE hosted five rounds of meetings in each of the six parishes. Across the whole project, a team of seven private and university consultants supplied planning and design expertise, analyzed scientific data, helped design and execute community visioning, conducted a process evaluation, and authored the final plans. These included the Center for Planning Excellence, Waggonner & Ball, Concordia, GCR, APTIM, Pan American Engineers, and University of New Orleans Center for Hazards Assessment, Response & Technology (UNO-CHART). Between December 2017 and March 2018, a selection committee evaluated the projects and announced final selections in April 2018; seven of the 10 projects selected were among the highest ranked by participants. The final plans were published in April 2019.

Amid the many state-level resilience planning efforts such as the Coastal Master Plan, LA SAFE distinguishes itself in a few key ways. First, the entire planning effort was driven by community visioning and input, whereby community members in each parish generated project ideas, and selected and prioritized final projects. This "community co-design" model is a principle feature of LA SAFE, which describes its process as "a ground-breaking approach to community adaptation planning.[80] Second, LA SAFE represents Louisiana's first collaborative government-philanthropic approach to regional climate adaptation planning, which allowed LA SAFE to "assemble partners from across sectors who were committed to a community-driven planning process."[81] Third, LA SAFE is primarily interested in implementing nonstructural measures (as opposed to structural or restoration) that marry risk and

stormwater management planning to individual- and community-scale quality of life domains, including housing, transportation, economic development, education, recreation, and culture.

Despite these differences, LA SAFE locates itself in a longer history of planning related to resilience, coastal protection, and disaster recovery in Louisiana—the plan aims to integrate its community adaptation programs and projects into the 2023 Coastal Master Plan nonstructural project portfolio.

Federal Plans

CDBG-DR funds help cities, counties, and states recover following a federally declared disaster. The Department of Defense Appropriations Act, 2006 was established to allocate $11.5 billion to the States for disaster recovery. The US Department of Housing and Urban Development (HUD) serves as the administering agency, meaning that they administer the funding to the governing authority for the plan. In this case, the governing authority for Louisiana's recovery efforts, and the $6.21 billion of the States' allocation, is the Louisiana Recovery Authority (LRA) who, in conjunction with the Louisiana Office of Community Development Disaster Recovery Unit (OCD-DRU), determined how to allocate funds as a State and among the affected parishes and cities. A major part of the CDBG-DR plans was the needs assessment portion of the plan, as that determined how much funding is allocated to the CDBG-DR funding. The breakdown of the $6.21 billion in Supplemental CDBG-DR funds is as follows: $1.1875 billion for state and local infrastructure, $332.5 million for short- and long-term economic recovery, $4.37 billion for housing programs, $310 million for administration, $9.5 million for planning, and $500,000 for technical assistance. However, the federal government has at times required States to commit a certain percentage of funds toward low- to moderate-income households and commit to developing a certain about of affordable housing.

From the initial Hurricane Katrina and Rita CDBG-DR plan to the Great Floods of 2016 plan there are some core differences across the plans. For instance, following the Katrina/Rita plan, the plans began to add more visuals, specifically visuals that show the area most affected by the disaster. The public comment section also became more detailed, with the plans specifying at most the person who made the comment in addition to the actual letter that they wrote to the State Office, and at least the field or organization that the comment came from. The formatting and language used within the plan changed as well. The plan wasn't referred to as LCDBG anymore, simply CDBG, and the Local Government Representative (LGR), still exists, as there's mention of essentially a "problem solver" role in later plans, but not by this name. And in general, there's less of a need to define terms in plans going

forward so the structure of having the majority of the beginning of the plan being definitions was no longer there by the time the Gustav/Ike Plan was released.

One of the more consistent requirements of each CDBG-DR plan is to have a Citizen Participation Plan included in their overall plan in order to receive funding for disaster relief. The OCD-DRU supports the fielding of inquiries from residents and other stakeholders during the comment period, which usually lasts about two weeks. The OCD-DRU office website is also where residents and stakeholders can access the plan, any amendments, reports, and recovery programs. Unlike the Hazard Mitigation Plan, even though meetings are held, they're not always public facing and they aren't where the State receives comments it posts in the plans. Comments can be received via email, facsimile, mail, and the OCD-DRU website. It should be noted that comments can be addressed in future amendments to the plan, especially comments that require requesting more allocations for program activities. Despite the wide range of outreach methods, which typically include the State's government website, the local newspaper, and a press release, the plans typically only get 10 or less comments, if any at all. Beyond hearing comments, the State is also required to make sure that the plan is accessible to those who have limited English proficiency and people with disabilities.

Findings: Engagement Themes

Despite the data gaps in participant information for all the above planning efforts, the public- and civil-sector engagers and the resident participants alike confirmed that Hurricane Katrina jumpstarted unprecedented planning and intentional engagement around planning in New Orleans and the wider region. State-level engagers were acutely aware of the planning failures of early Katrina recovery efforts—specifically the green dot map released by the 2006 Bring New Orleans Back Commission, and the discordant engagement approaches of other recovery plans (e.g., the 2006 Lambert Plans and the more routine hazard mitigation plans).

Consequently, at least some mention of the importance of engagement was made by planners or explicitly in plans, though these references were only occasionally substantiated in the plan documentation as noted above. Engagers employed a range of engagement mechanisms to solicit feedback from community members on plans; these mechanisms can be categorized into three types of activities: outreach methods (often informing residents of an engagement activity), engagement activities (including in-person or online presentations of information, discussions, and deliberation), and feedback mechanisms afterwards regarding either the engagement process itself of the substantive

impact that the engagement had on a plan. Each of these methods are built into the plans of that were included in our study to varying degrees.

Clear patterns emerged both from the planning documentation itself as well as from the interview and focus group informants whose perceptions were recorded and analyzed by the research team related to these methods and engagement's ultimate objectives and effectiveness.

Outreach Practices

Government officials and third-party planners generally conducted outreach using flyers, posting on their websites, and newspaper advertisements. This type of outreach is common for plans that are more routine or developed based on funding, such as the hazard mitigation plans or CDBG-DR plans. Respondents spoke about these plans as being bureaucratic, requisite, and compliance-driven documents designed to secure federal funding quickly for recovery efforts, with little emphasis on encouraging meaningful engagement. The development of the planning initiatives in these cases takes place prior to the public engagement period, meaning that the planning team decides what efforts of hazards need funding and then present the initiatives to the public for feedback. For CDBG-DR plans, this feedback was captured during a two-week public comment window where residents submitted feedback on the plan via mail, facsimile, or email to the State's Office of Community Development—Disaster Recovery Unit. In short, the methods of informing and recruiting residents about engagement opportunities followed common practices and were not particularly innovative regarding social media, trusted local partner conduits (such as faith-based groups or local community organizations), or other word-of-mouth vehicles.

However, respondents reported a few improvements to the way that government-lead projects conducted outreach since the immediate post-Katrina time. For instance, the Jefferson Parish 2040 Comprehensive Plan incorporated much of the same activities from their 2020 comprehensive plan (including presentations, requesting feedback, and summarizing comments) but also included translation services for Vietnamese and Spanish speakers. More materials were made available online, particularly by the state and by parishes with more technological capacity such as Orleans and Jefferson.

For outreach efforts, we also inquired as to whether the formal engagement processes of government officials and third-party planners had adopted the informal processes conducted by grass-tops organizers. The practices that were increasingly used by community-based organizations and NGOs for organizing citizens were rarely noted as being integrated into public-sector activities.

Multiple stakeholders brought up civil-sector outreach recruitment efforts during church services, for example, which respondents said serve as key communication sources particularly for Latinx, African American, and Vietnamese immigrant communities. UNOP was the first of the post-Katrina plans to heavily incorporate community leaders and CBOs into the planning process and was praised by some for having more targeted engagement, such as briefings at churches, hosting healing circles, and simulcasting meetings to residents who were displaced and located in other regions of the country. LA-SAFE used "walker-talkers," which were people hired to do door-knocking and attend community meetings, church services, and attend other community events such as Little League baseball games.

Not all mission-driven outreach methods are received well by communities, however; community members have felt uncomfortable being a face for a plan or an organization that had not delivered on past promises. Sustained resources, therefore, also played an important role in how effective grass-tops organizations can be and their perception of their effectiveness. Larger organizations like Foundation for Louisiana have been able to provide sustained outreach, as well as advocate on behalf of communities to politicians. But some organizations have had to compete over resources, especially during times of recovery.

Participant Representativeness

Because of the research team's inability to access the participant attendance sheets or participation rolls for the planning exercises in question and, in several cases, even confirm that these existed, a quantitative analysis of the representativeness of participants—that is, determining whether participants proportionally reflected each plans' effected citizenry—was not possible. Therefore, the researchers asked focus group and interview informants to identify the studied planning efforts in which they had participated to determine whether they could speak to issues of representativeness in addition to directly asking informants whether they perceived the engagement efforts to have had adequate representation from their constituencies. From these reports, the research team pieced together a general sense that representativeness was still very much an aspiration and not a really for all but a handful of the post-Katrina planning efforts.

With outreach practices following largely traditional practice, local civil-sector leaders reported that there were rarely instances in which a whole community could be said to have been represented. Many engagers reported that there was a group of community members who would frequently attend engagement events and that more casual engagement event attendees, who would attend engagement events on a one-off basis, were rarer. The engaged participants in the former group were said to mostly

speak English as their first language and were described as having become versed in the language of planning through their frequent participation in engagement events if they had not had a professional background that relates to the topics of the plan being discussed already.

Community engagement events exclusively attended by regularly engaged households were deemed to be less efficacious than community engagement events that engaged people who were frequently left unengaged. The pattern of repeat participants may have assuaged some of planners' concerns around engaging community in planning processes, given the physical attendance of community members. However, after clearing the hurdle of getting people to attend engagement events, many of the organizers and residents with whom we spoke urged planners to look at the composition of their events' attendees and think about how the planners could encourage more members of vulnerable populations to attend engagement events.

Another theme gathered from interviews and focus groups is that the aggregate of individual community engagement events, while each being a crucial part of the planning process, rarely was acknowledged by planners or planning institutions in its ever-evolving nature. Each project or plan was viewed as its own effort and community outreach became the process of extracting information for that end rather than building off a history of knowledge and past engagement. Community organizers reported that public-sector outreach existed in a vacuum rather than as a continuum of relationships that governments have with their citizenry.

Engagement Activities

Engagement practice was noted as often being 1) overly formal; 2) too constricting; 3) off-putting for residents; and 4) burdensome for local civil society. Engagement activities and methods after recruitment differed greatly between plans, significantly more so than outreach activities. Some of the most common engagement activities occurring during public meetings, which are meetings that are, for the most part, open to the public, included presentations, open-forum feedback sessions, interactive mapping exercises. The number of public meetings varied between plans. Most plans hold more than one meeting, though, often at two different locations on different dates. On average, planners hosted anywhere from two to four public facing meetings, in addition to stakeholder meetings per the plans' documentation.

Respondents noted, though, that planners often kept to too strict of schedules, usually because of funder or governmental requirements. The period available for residents to provide feedback coincided with the organizing entities' goals rather than residents' desires. This was especially noted for federal

recovery planning or even periodic hazard mitigation planning, all of which were either expedited or dictated by another governmental requirement. For example, the planning period for hazard mitigation plans is typically 18 months to two years and, of this time, public meetings typically took place over wo months. Conversely, the HousingNOLA 10-year plan held 50 engagement events over a one-year timeframe between November 2014 and November 2015, and LA SAFE held 71 meetings throughout all of 2018. The differences between the quality of plans and their number of engagement events were attributed by respondents to that level of flexibility and extended engagement period.

Organizers also expressed particular concern about planners' interactions with community members during engagement, especially with those belonging to vulnerable populations. In most cases, the development of engagement activities fell largely on third-party planners, with consulting firms and private planning and design consultants being the most commonly reported.[82] For instance, one organization was hired for three of the parish hazard mitigation plans, resulting in a similar list of hazards, maps and other data visuals, presentation materials, and planning documents themselves. According to engagers, these organizations have built up a knowledge base about the specific communities and the region, as well as the best practices for conducting local outreach and engagement activities. Open-ended online platforms such as social media pages were described as hard to manage by both planners and civil-sector respondents alike, often resulting in harangues from a small set of individuals, and ultimately, not often utilized.

Yet, organizers and residents reported many negative interactions at community engagement events that were full of jargon, that did not give community members ample time to develop and express their opinions and did not compensate participants. Several informants noted that engagement should serve more of a purpose than receiving feedback on a plan; the themes of "meeting people where they are," overcoming language barriers by putting the language of the plan in "layman's terms," leveraging technology to visually show planning outcomes, or bringing residents directly to sites or on tours to show them how the plan would be implemented were all repeated in transcripts. Without these improvements, many community members felt dissuaded from participating in future planning processes.

Indeed, the reliance on scientific presentations often with predefined engineering projects presented as options for community input were often unintelligible to residents or presented authoritatively, both phenomena serving to dissuade open deliberation. More formal engagement also tended to have a rigid structure such as having an agenda, the quality and quantity of staff, and, for public meetings, the location of a meeting, length of meeting, and number of meetings held. Respondents noted that these activities contrasted with the informal and flexible engagement activities

of grassroots organizers. Organizers also noted that having engagement leaders who demographically mirrored the community racially and in socioeconomic status strengthened efforts, such as the trusted patterns engaged in LA-SAFE.

Finally, local groups were quick to note how roles—both formal and tacit—were maintained and resourced across most of these efforts. Government-lead engagement activities typically involved a cast of third-party planners, scientists or other technical personnel, and government officials, with the government officials mainly serving as managers or overseers. Oftentimes, many of the same consulting firms were utilized throughout planning processes in the region. For instance, one firm was consulted for three of the parish hazard mitigation plans. In contrast, one organizer recounted a time when a planner had asked the organizer to handle logistics for several engagement events for $500, which barely covered the cost of reserving a room and buying food, let alone compensating the organizer for her time. While the organizer, who themself works for a nonprofit that encourages civic action, empathized with the fact that the planners were working with scarce resources, the organizer lamented that the planners did not offer her enough money to compensate for her labor and time.

Engagement Roles

Indeed, the roles of local community organizers were repeatedly cited as being critical—despite not usually being acknowledged by the formal coordinating entity or its consultants beyond community recruitment. One of the civil leaders we interviewed spoke about being asked by planners to conduct outreach to her community and to serve as a translator for the engagement activity, but this same individual also met with communities a week before the engagement activity, without being asked by planners, to prepare them for the types of materials they may encounter during the meeting.

The study team found that organizers generally acted as intermediaries or translators between planners and community members even when they did not have a role, but even the way that organizers mediated the planner-community member relationship varied. Organizers' involvement in planning processes ranged from helping planners recruit community members to attend engagement events to planning the logistics for community engagement events, presenting at the events, and soliciting community members' feedback on plans directly. Organizers could also facilitate planner-community member relationships outside of community engagement events by inviting planners to speak at community group events and encouraging community members to give organizers feedback on plans, which the organizers would then relay to planners.

Another way the organizer attenuated the gap between planners and community residents was by improving residents' perceptions of planners. In the eyes of community members, organizers' participation with planners appears to confer legitimacy to planners' efforts. However, that generally seemed to be an unintended consequence of, rather than a reason for, organizer-planner partnerships. Indeed, some organizers with whom we spoke, who often worked for years within a community to build connections and advocate for community members' interests, expressed concern that those partnerships can impact their own reputations among community members. Organizers and community members believe that recruiting local community members and organizers to liaise between planners and communities demonstrates planners' sound engagement expertise. However, leveraging community organizers' expertise and connections reflected well on planners and could increase the efficacy of engagement efforts, but working with planners did not always reflect well on organizers.

The responsibility among these local organizers went above and beyond getting residents to attend a meeting or help residents understand what the plan hopes to accomplish. These groups were occasionally compensated for recruitment or translation efforts, but rarely for the range of other services they provide in support of a plan or project advancement. One alternative example came from the LA SAFE planning process when Foundation for Louisiana staff used a "train-the-trainer" model of training community members on how to facilitate community-facing planning meetings and having them own much of that work.

Incorporating Participant Comment

The output of community engagement—actual resident comments and opinions—was the least structured in terms of timing and methodology in practice, and the least documented among the already poorly documented practiced in the efforts reviewed. Some plans, like hazard mitigation plans, are required to include de-identified commentary and meeting notes in their planning document, while others like the 2017 Coastal Master Plan included meeting notes, comments received, photos, and presentation slides to provide transparency to residents on how their input was utilized. Because the research team could not access original versions of plans or engagement presentations for every planning effort (that is, any iteration of information provided prior to the final plan publication) nor the documentation of community input for most efforts, we could not systematically assess whether community engagement resulted in substantive change.

Consequently, we relied on interviews with the planning officials as well as the residents and their civil-society organizational representatives. Among the former, resident feedback was described by

planning officials as being captured at two main points during the planning process: the first being when a list of proposed projects or policies is developed and the second occurring once the plan is largely drafted, usually within months or weeks before the plan is to be released. There was also an informal, theoretical third round of feedback where plans will include comments or survey results within the final planning document. In most cases, planners noted that they did integrate community input where it was technically or economically feasible. With only a handful of exceptions, such as HousingNOLA, residents and community organizers noted that they were either unaware of whether their input was acknowledged and resulted in changes to planners' original intentions. They viewed other opportunities after planning efforts such as when actual construction projects were under design review or when funding for projects was appropriated to provide additional, direct input.

Feedback and Integration Mechanisms

Feedback mechanisms such as satisfaction surveys are ostensibly important to any planning process as they provide participants an opportunity to describe how participants felt about the process and what did or did not work well, as well as for the coordinating entity to describe how the participation informs final decisionmaking before a plan gets published or a project adopted. Plans such as the Coastal Master Plans, for example, sent out surveys with outreach notices for public meeting events, and many of the engagement activities across plans included a survey at some point during the meeting.

Yet, in addition to participant representativeness, most of the organizers with which we spoke lamented planners' opacity when using community members' feedback. The organizers made note of the fact that after community engagement events, planners would rarely circle back with engagement participants to update them on the status of plans or inquire about participants' satisfaction. This is one place where organizers noted that planners could make a concentrated, low-cost effort to improve their engagement. By circling back with the communities with whom they worked, planners can potentially meet community members who did not attend previous planning sessions and encourage them to come to future engagement events. Furthermore, planners can cement their role as peers of the community by hosting more events in the area. This could also help planners avoid the perception of conducting extractive research, which could alienate many already research-fatigued communities and, subsequently, solicit a larger range of opinions.

Perceptions of Engagement

The research team explored participants' general views of the engagement activities in which they had participated. During interviews and focus groups, we asked engagers and participants their overall perceptions of engagement activities for the plans reviewed, including the extent that engagement activities successfully reached populations most likely to be affected by the disaster and how well participant feedback was gathered and incorporated into final plans.

The difference in conditions by which engagers and participants labelled a community engagement activity as effective highlights an important tension noted by respondents. Namely, participants often assessed the experience of engagement, while organizers assessed whether and how well they presented information to their audience. Consequently, while the official plan engagers were interested in soliciting substantive community feedback on their work, they might have interpreted silence as agreement. Community members, in contrast, often interpreted engagement activities as simply a channel for conveying information and bonding with neighbors. Participants may have attended engagement events simply to learn about their towns', parishes', and states' plans for community planning and not always as opportunities for input for which they needed to prepare.

Most frequently, residents and organizers cited engagement events that did not compensate attendees for their time as an example of one way that experiences with engagement events alienated participants. Other reasons include community engagement events that rely on jargon to convey information; community engagement events that make attendees feel as though planners were more interested in saying that they held a community engagement event than soliciting attendees' thoughts; and a perceived lack of regard for community members' participation fatigue. In only a handful of cases, such as LA-SAFE across southeastern Louisiana and HousingNOLA for the City of New Orleans did respondents note any feelings of positive achievement by plan or project organizers in the process of community engagement.

Ultimately, we found that while residents generally understood the value and purpose of community engagements events, they do not always view community engagement and participation as effective. Most of the residents, organizers, and planners that we interviewed expected community engagement activities to be part of planning processes across community, parish, and state levels perfunctorily. Despite their acknowledgement of the importance of community engagement within planning processes, residents and organizers did not always believe that the community engagement events that they participated in were effective. Rather, residents and organizers with whom we spoke

indicated that several components of community engagement events either alienated or otherwise prevented them from participating fully.

When discussing the efficacy of community engagement, the organizers that we interviewed took care to distinguish between participation and engagement. According to them, community participation is necessary, but not sufficient, for an event to merit being designated as an engagement event. In many organizers' eyes, community engagement is predicated upon participants that come from a community's most vulnerable populations, accessible material, and a peer-to-peer style of interaction in which planners inform engagement participants about the components of the plan in question and participants respond to planners with their thoughts and ideas. Events that resulted in engagement were almost always deemed more efficacious than events that resulted in mere participation.

The organizers we interviewed also universally noted that engagement participants who demographically mirrored the community (both racially and in terms of participants' socioeconomic status) strengthened planning efforts' efficacy because they would be able to react to the plans from a diversity of perspectives. In addition, organizers emphasized the importance of facilitating communities' most vulnerable residents' ability to engage with plans and implied that while everyone should have access to engagement events, in the face of resource constraints, organizers should focus their attention on their communities' most vulnerable - People of Color, people who don't speak English as a first language, and low-income people. However, organizer interviewees indicated that from their observations, the people who most often participated in engagement efforts were white and of relatively high socioeconomic status.

Conclusion

In the 15 years post-Hurricane Katrina, numerous recovery plans have been developed and implemented that are intended to increase the resilience of communities and the individual homes and households that reside in them. Each of these planning efforts engaged communities to varying degrees. Planning focused on Orleans Parrish began immediately after the storm. As many residents, especially Black residents, had not returned, the early plans were viewed as an attempt to permanently exclude and displace residents. Over time, however, plans progressively engaged more residents, especially residents who were most vulnerable to being affected by recovery efforts, and community engagement became a standard for plan development. Community engagement became a method by which local government sought to regain the trust and buy-in of residents. While plans were developed in

surrounding parishes and at the state- and federal-levels, those developed within the Orleans Parrish appeared to have more robust community engagement strategies.

Engagement processes across plans tended to incorporate a common set of approaches, sometimes initiated by individuals working for the local government or consultants hired by local government to facilitate the planning process, and sometimes initiated by grassroots organizers. These approaches include outreach, engagement, and feedback. Outreach includes strategies used by engagers to publicize events and request participation of community residents. Engagement includes those activities used to solicit community feedback, the logistical mechanisms used to gather feedback and translate the content of plans into an accessible format. Feedback is the methods by which engagers gather and incorporate participants' input into plans, including the extent that residents are made aware of their feedback being incorporated.

Outreach, engagement, and feedback tended to vary by the role of the engagers. Government-initiated attempts to rely on more technical "by-the-book" approaches, for example, posting flyers or marketing events via social media. Engagement by government-based engagers tended to happen primarily via public meetings, and be focused on transactions—that is, presentations and feedback. Community organizers, however, tended to approach the process of community engagement as the building and maintaining of personal relationships. Their relationships with and knowledge of local communities meant that their reputations were also at stake. Those individuals who are being engaged have an expectation for how feedback will be gathered and shared with planners based on grassroots engagers previous interactions with the community. Because of this familiarity with local communities, government engagers have increased the frequency that they partner with grassroots organization to develop plans and solicit community feedback. In doing so, community members could see the planning efforts as more legitimate, and planners, especially government planners, would be held accountable by grass-top engagers who want to uphold their positive reputation and relationships with local community members.

Interestingly, all the community organizers residents we interviewed were acutely aware of the environmental context in which they lived in the New Orleans region, including the climate-related disasters and related chronic hazards that they were experiencing nearly on a daily basis. Consequently, they believed that plans were one way to mitigate the changes, and their awareness and involvement in those plans as a necessary activity. They expected community engagement to be part of those planning efforts both because they assumed that activity was a given and because they believed that an increase in community representation at community engagement events strengthens plans.

Yet, despite advances in the quantity and explicit desire for community engagement in greater New Orleans public planning, engagers have struggled to integrate the value of grassroot organizations and residents' expertise into the planning process. Although both groups saw planning as important for recovery and expected community engagement to be a part of planning processes, they sometimes saw their contributions as undervalued and undercompensated. Engagers will need to deepen engagement activities beyond merely hosting an event and consider the quality of those activities, how they are perceived by participants, and the competing demands for participants' attention and expertise. Ultimately, civil sector entities noted that engagement should serve more of a purpose than receiving feedback on a plan; it should hold the increase of social cohesion and neighborhood bonds as an objective as important as the specifications of an urban design or infrastructure project, if not more.

3. Risk Perception

A range of individual beliefs can inform individual perceptions of risks, and researchers have found variations along socio-economic characteristics as well as attitudes and past experiences. Without perceiving risk, a household may not take action to prevent risk or alter any behavior that could improve their home's ability to withstand, adapt, and persist through a hazard event of any kind. In this study, we empirically investigate whether individual perception of risk is a critical dimension of housing resilience (Ge, Peacock, and Lindell 2011).

In this chapter, we use responses from the project survey of homeowners in the greater New Orleans region to examine two dimensions of risk perception and related behavior regarding potential flood, hurricane, or related catastrophic environmental hazard events. This is the first chapter focusing not on the immediate recovery period after Katrina through 2008, but on the more stable years of implementation of the recovery reforms and, potentially, resident normalcy in the following decade. First, we identify the predictors of amplified or attenuated risk perceptions. Second, we identify the predictors of increased consideration flood risks when making home purchase decisions.

Background

The concept of risk involves "the potential for the realization of unwanted, negative consequences to an event" (Tierney 1999). Traditionally, risk scholarship has been divided between the study of "objective" and "subjective" risks, and the underlying interpretation of objectivity and subjectivity (Loewenstein and Mather 1990; Slovic, Flynn, and Layman 1991; Hansson 2010). Purportedly objective risk is assessed with actuarial methodologies and quantitative measures of exposure, property damage, mortality, and potential impact severity, while assessments of risk deemed to be subjective focus on social aspects of risk, particularly the social construction of public risk perceptions and related consequences. Both perspectives play roles in influencing risk mitigation activities and outcomes across a diversity of risk landscapes (Kahneman and Tversky 1973; Kahneman, 2011).[83]

Understanding how people think and feel about potential risks is critical to assessing housing vulnerabilities and responding to hazard exposures. Many risk researchers have found that individuals assess more dimensions of risk than institutional experts—such as mortgage lenders, real estate professionals, and insurance actuaries who assess risk quantitatively. Not only do individuals often solicit robust technical estimations and scientific data in determining risk, but they may also further

consider other dimensions such as social or cultural impacts or long-term harms to future generations (Renn 1998; Slovic 2010). Risk perceptions and assessments that are contextualized by quantitative assessments as well as cultural, political, and social factors, provide a fuller risk context (Flynn and Slovic 1999; Sjöberg 2001).

Consequently, risk perceptions are strongly influenced by social position, past experiences, worldviews, and individual biases. Self-efficacy, capacity, or individual agency are frequently associated with lower perceived risk toward hazards (Fothergill, Maestas, and Darlington 1999; Fothergill and Peek 2004). However, risk scholars emphasize that it is not biological or other intrinsic characteristics that influence these differences, but differences associated with social position, experiences, and worldviews that drive perceptions of risk. Educational attainment can also be associated with household's level of awareness of hazards, risks, and risk-mitigating actions (Brody, Highfield, Wilson, Lindell, and Blessing, 2017; Shao, Xian, Lin, Kunreuther, Jackson and Goidel, 2017; Cannon, Gotham, Lauve-Moon, and Powers, 2020). For climate change-related hazards, especially, political biases may shape individual perceptions of climate risks (McCright and Dunlap 2011a). Individuals who perceive environmental hazard risks may also have increased perceptions of climate-related risks (McCright and Dunlap 2011b; Slimak and Dietz 2006). Belief in climate change science and consequent support of climate policy and education varies substantially across the parishes of the greater New Orleans area.[84]

Study Overview

In the context of risk perception specific to floods, previous studies have assessed risk responses by considering sociodemographic differences in both flood insurance coverage and as significant predictors of mitigation incentives take-up. Consequently, our primary research questions are: first, which conditions or characteristics are associated with amplified or attenuated perceptions of risk concerning flood or hurricane hazards? Second, what characteristics—including risk perceptions—associate with consideration of flood risk in home choice decisions?

Variable Selection

To test for relationships between the conditions associated the first question on amplified or attenuated perceptions of risk about hazards and the second question on conditions associated with considering risks when deciding which home to purchase, two outcome variables were selected,

respectively. Risk perception was operationalized using a five-part Likert measure of perceived flood likelihood and damage to one's home in the next 10 years ranging from 1 (very unlikely) to 5 (very likely). The influence of risk perception on home choice was operationalized a four-point Likert measure of respondents' consideration of flood risks when choosing their home from 1 (not at all), 2 (not too much), 3 (some extent) and 4 (a great extent). In the models, the first two of these responses are combined.

Relevant predictor and control variables were identified from the risk perception, disaster, and environmental social science literatures and categorized into the following three groups.

- Sociodemographic and location variables

  Drawing from the literature, sociodemographic variables were selected to test for variation in risk perceptions and responses by race (non-Hispanic white versus Hispanic and other racial groups), age (18-30 years, 31-60 years, older than 60 years), gender (women versus men), employment status (employed full time versus not employed full time), educational attainment (less than a bachelor's degree versus bachelor's degree or more), annual household income (less than $90,000 versus more than $90,000) household purchase price ($50,000 ranges from less than $50,000 to more than $350,000), and disability status (no reported disability versus reported disability), and employment, education, income, and household purchase price used as proxies for social positioning. To evaluate floodplain location, respondents' addresses were geo-coded and households located within or outside of a FEMA-designated A or V floodplain (Special Flood Hazard Areas lower than base flood elevation and considered most hazardous).

- Environmental attitude, prior experience, and issue salience

  The influence of environmental attitudes specific to flood and related catastrophic weather events was measured using climate change belief (yes versus maybe, unsure, or no). Other measures of environmental risk perception were also included, including the extent to which a respondent thinks about flood risk (four-point Likert scale from 1 not at all/not too much, 2 some extent, and 3 a great extent), self-reported psychological trauma associated with a past hazard (yes or no) and whether a previous residence had been damaged (yes or no).

- Information access and efficacy predictors

  Information access was our first proxy measure for efficacy. A count of resource and information sources used by respondents to stay informed about potential risks from flood and related hazard events was constructed to test whether the quantity of information about risks influenced home purchase choice. Respondents were asked whether or not they were aware of

or utilized a wide range of information sources. The sources were then aggregated as a continuous variable to measure more versus less information. A second proxy, this one for representing knowledge and accessibility of public supports for risk mitigation, came from respondents' awareness of the Hurricane Preparedness Louisiana Sales Tax Holiday, a financial incentive that allows for tax-free purchases on disaster preparedness items and that was most widely known and utilized compared to others included in the survey instrument.

Note that although our variables for access to risk-related information sources considered the amount of information sources, the substance or quality of information from these sources was beyond the scope of this analysis. Because of this, in the following chapter, we do not assess whether potentially better or worse quality of sources and content may extend or contradict findings.

Descriptive Summary

Descriptive statistics from respondents to the project survey for the outcome variables as well as these predictor and control variables are provided in table 9.

TABLE 9

Descriptive Statistics of Selected Variables

		Statistical Measure					
Variable		**Obs.**	**Share**	**Mean**	**SD**	**Min**	**Max**
Outcome variables							
Likelihood of flood damage belief		943		2.62	1.25	1	5
1	Very unlikely	224	23.3				
2	Somewhat unlikely	251	23.7				
3	Neither likely nor unlikely	291	31.2				
4	Somewhat likely	102	11.4				
5	Very likely	102	10.4				
Risk considered at purchase		947		1.22	.72	0	2
0	No at all/not too much	167	17.6				
1	Some extent	408	43.1				
2	A great extent	372	39.3				
Sociodemographic and location predictors							
Race/Ethnicity		931		0.33	0.47	0	1
0	White Non-Hispanic	684	67.0				
1	Person of Color	247	33.0				
Age		948		0.84	0.76	0	2
0	18 - 40	383	37.9				
1	41 - 60	373	39.7				
2	60+	192	22.4				
Gender		939		0.50	0.50	0	1

		Statistical Measure					
	Variable	Obs.	Share	Mean	SD	Min	Max
0	Male	466	49.6				
1	Female	473	50.4				
Employment		946		0.78	0.42	0	1
0	Not Employed	466	50.3				
1	Employed	473	49.7				
Education		944		0.45	0.50	0	1
0	Less than Bachelors	362	55.3				
1	Bachelors	582	44.7				
Household income		904		0.43	0.50	0	1
0	Income < 90K	491	56.7				
1	Income >= $90k	413	43.3				
Home purchase price		945		4.54	1.93	1	8
1	< $50K	19	2.5				
2	$50K - $99K	65	9.3				
3	100K - $149K	192	23.3				
4	$150K - $199K	213	22.7				
5	$200K - $249K	151	13.4				
6	$250K - $299K	100	9.4				
7	$300K - $349K	61	5.8				
8	$350K or more	144	13.6				
Disability		920		0.83	0.37	0	1
0	No Disability	132	16.5				
1	Disability	788	83.5				
Flood zone status		952		0.38	0.48	0	1
0	Not in flood zone	633	62.3				
1	In flood zone	319	37.7				
Environmental attitude, prior experience, and issue salience predictors							
Climate Change Belief		950		0.55	0.50	0	1
0	Maybe/Unsure or No	420	44.8				
1	Yes	530	55.2				
Think about flood frequency		943		0.92	0.73	0	2
0	Low extent	303	31.4				
1	Medium extent	446	45.7				
2	High extent	194	22.9				
Personal/family psychological trauma		945		0.40	0.49	0	1
0	No	577	60.5				
1	Yes	368	39.5				
Previous home damage		927		0.12	0.33	0	1
0	No	832	87.8				
1	Yes	95	12.2				
Information access and efficacy predictors							
Number of hazard information sources		918		5.93	2.43	0	11
Aware of mitigation incentive		928		0.29	0.46	0	1
0	No	634	70.7				
1	Yes	294	29.3				

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020 (N=952).

Note: Shares of responses are weighted. Obs. = observations and are not weighted, SD = standard deviation.

In a preliminary review of responses to the project survey, we gain some insight into how the perception of hazard risks may factor into decisions affecting homebuyers in the project timeframe (table 10). For example, home affordability ranked as the highest reason for selecting a specific home across a range of location and construction factors; over 64 percent of respondent reported affordability of the home compared to the almost 39 percent of homes that looking for the home's location outside of a flood zone.[85] In contrast, 26 percent of respondents reported the home's location in relation to flood zones as a minor reason for their consideration.

TABLE 10

Share of Survey Respondents Citing Location-Related Reasons in Home Selection

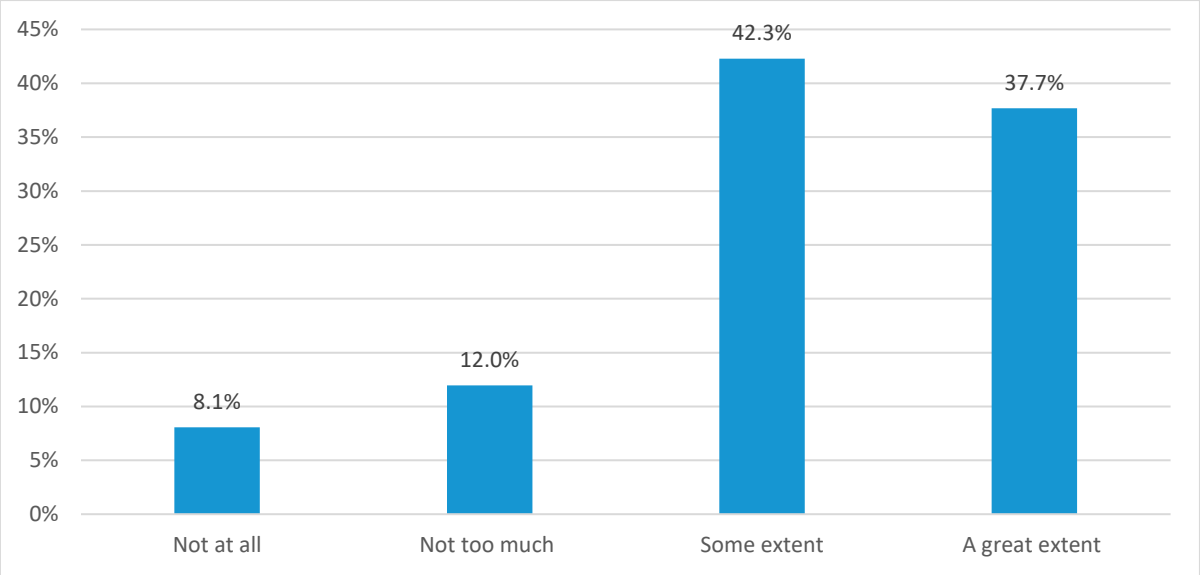
Reason	Major Reason	Major or Minor
Affordability	64.2%	89.3%
Level of crime or violence	61.2%	84.5%
Look, design, or amenities of neighborhood	48.6%	82.5%
Proximity to family or friends	42.9%	69.5%
Out of a flood zone	38.7%	64.9%
Proximity to job	34.2%	63.4%
Proximity to schools	30.3%	50.9%
Proximity to a body of water, recreational space, or natural amenities	18.1%	44.7%

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020. N = 937 to N = 943.
Notes: The table represents responses to the question, "To what extent were any of the following reasons you chose this location?" Answer options were: not a reason, minor reason, or major reason.

This pattern is further reflected in responses to explicit questions about whether flood or hurricane risks factored into home selection processes (figure 7); most respondents reported that they considered these factors either to some extent (42 percent) or a great extent (38 percent). These respondents also tended to be higher educated and more likely to have personal experience or have family with experience in a past hazard event.

FIGURE 7

Share of Survey Respondents Who Considered the Risk of Floods or Hurricanes in Home Selection



Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020. N = 947
Notes: The table represents responses to the question: "To what extent did you consider risk of floods or hurricanes when choosing your home?"

And, finally, based on the 950 survey respondents who reported on whether they would be likely to move if new flood, hurricane, or other risk information emerged about their home, slightly less than one third (27 percent) reported they would be very likely (6.7 percent) or somewhat likely (20.2 percent) to move. In short, there were sizable segments of this population for which perceptions of hazard risk were likely very high while, overall, risk perception was generally modest.

Analytical Models

The study team ran an ordered logistic regression modeling the conditions or characteristics associated with amplified or attenuated perceptions of risk concerning flood or hurricane to address question 1 (the risk perception model). To address question 2, the team ran an ordered logistic regression to estimate the conditions or characteristics—including risk perceptions—that associate with greater or lesser consideration of flood risks when choosing a home (the risk action model). To examine the effects of related predictors on risk perception and risk action, a nested or hierarchical ordered logistic regression was run for each model. For each model, we tested three related categories or sets of predictors: sociodemographic and location variables; environmental attitude, prior experience, and issue salience variables; and information access and efficacy variables.[86]

Prior to running the models, we conducted a crosstabulation analysis of categorical predictors to check for two-way significance using the Wald Chi-Square test and significance levels were recorded for all bivariates in each respective model. The crosstabulation analysis showed satisfactory cell counts across all variables such that variable distributions and samples sizes were adequate for regression modeling. Then, a test for multicollinearity showed a variable inflation factor (VIF) with a mean value 1.17 for the risk perception model and 1.26 for the risk action model, with none of the values greater than 1.74, indicating multicollinearity is not a concern for either model (VIF<10). A Brant test for proportionality showed that none of the variables in either model was significant such that p>.05, indicating the proportional odds assumption was not violated. After running final models, pairwise comparisons were estimated for categorical variables with more than two categories; no hidden significances were found.

For each model, the first block of variables was examined independently before each subsequent block was added to assess relative model fit. The third and final model that included all respective variable blocks was determined to be the best fit of the data for each model. AIC measures of relative model quality were the lowest with the final block addition, indicating that the last respective block of predictors was a superior fit to the data. Although the BIC measures for the risk action model were slightly higher when the final block (information, efficacy/capacity) was added, the category was retained for three reasons: 1) the AIC was lower with the block's addition; 2) information sources and awareness of incentives are theoretically relevant to the inquiry; and 3) including the category allowed for comparison with the Risk Perception model.

Findings

Model outputs are presented in table 11. Viewed together, the models offer insights into the influences on risk perceptions and subsequent risk-informed actions including home choice.

TABLE 11

Predictors of Risk Perception and Risk-Informed Action in Housing Choice

	Risk Perception Model			Risk Action Model		
Constant (with reference group)	**Log-odds**	**Odds**	**SE**	**Log-odds**	**Odds**	**SE**
Sociodemographic and location predictors						
Household of color (non-Hisp. white)	0.629***	1.88***	.33	-0.34	0.71	.15
Age 41—60 (18-40)	0.008	1.01	.16	-0.06	0.94	.16
Age 60 + (18-40)	0.073	1.08	.31	-0.29	0.75	.21
Female (Male)	-0.241**	0.71**	.11	-0.17	0.85	.14
Employed full-time (not full-time)	0.013	1.01	.25	-0.30	0.74	.18
Bachelor's+ (less than Bachelor's)	-0.314*	0.73*	.12	-0.09	0.91	.15
Household Income > $90k (< $90k)	-0.405**	0.67**	.12	-0.23	0.79	.15
Home purchase price (--)	---	---	---	0.08	1.08	.05
Disability (no disability)	-0.101	0.90	.20	0.37	1.45	.36
Home in flood zone (out)	0.444***	1.56***	.26	-0.57***	0.57***	.10
Environmental attitude, prior experience, and issue salience predictors						
Climate change belief (no/maybe)	0.324**	1.38**	.24	0.47***	1.60***	.27
Thinking freq. about flood (0-3)	---	---	---	0.46***	1.58***	.21
Likelihood of flood damage (1-3)	---	---	---	-0.22**	0.81**	.07
Prior personal/family trauma (no)	---	---	---	0.26	1.29	.22
Previous home damage (none)	0.584**	1.60**	.42			
Information predictors						
Hazard information sources	0.028	1.02	.04	0.06*	1.06*	.04
Awareness of incentive (not aware)	---	---	---	0.10	1.10	.18
Intercepts						
cut1	0.83			-0.87		
cut2	2.13			1.26		
cut3	3.77			---		
cut4	4.72			---		
Model Fit						
Chi2		104.25***			59.59***	
BIC		2334.169			1669.752	
AIC		2254.34			1580.532	
Log-likelihood					-771.27	

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020

Notes: Risk perception is determined in response to the question: "How likely do you think it is that in the next 10 years there will be a flood that will cause major damage to your home or your family's home" with response options from very unlikely (1) to very likely (5). Risk action is based on the question "to what extent did you consider risk of floods or hurricanes when choosing your home?" with response options not at all/not too much, some extent, or a great extent. SE refers to standard errors. ***p<.01; **p<.05; *p<.1

As a group, the demographic predictors play a significant role in informing perceptions of risk (the risk perception model), but no role in informing risk consideration in home purchase choice (the risk action model). Considering all effects, the strongest predictor of amplified risk perceptions is the

race/ethnicity variable: households of color are nearly twice as likely to exhibit heightened perceptions of risk toward future flood or hurricane events relative to white households, controlling for all other factors (OR 1.88, p<.01). Likewise, but to a slightly lesser extent, households with lower incomes (OR 0.67, p <.05) and those with lower educational attainment (OR 0.73, p<.1) were significantly likelier to exhibit heightened perceptions of risk than their counterparts with higher incomes and higher levels of education. These findings align with much of the extant environment, disaster, and risk research finding that households of color often perceive greater levels of risk toward hazard events, as do people with lower self-construal of efficacy or capacity, for which lower educational attainment and lower income are used as proxies.

Despite the higher likelihood of risk perception across these groups, a concurrent and important finding is that these same characteristics—particularly race and educational attainment—had no significant effect of on the likelihood of considering risks during home purchase decisions (p>.10). Households with characteristics that are traditionally associated with hazard vulnerability are more likely to acknowledge their future risks, but less likely to have acted upon that awareness. The apparent conflict between awareness and inaction is, therefore, informed by distinct factors, such as the resources or capacity to act.

A potential explanation not examined here is that agency in home choice is reduced by race and income inequalities. It is possible that despite exhibiting greater perceived risk, people with lower material capacity, agency, or resources or that have fewer choices in deciding where to live—such as due to existing social or familial networks or from segregation practices—may exhibit heightened risk perceptions are not the driver of their decisions as much as external limitations imposed by home price, home availability, and home access. The legacy of redlining and racial discounting of homes and properties in greater New Orleans would likely inform this capacity.

Analysis from other predictors in our models provide additional insights. Prior experience played a greater role in informing risk perception, such that predictors like previous experience with home damage is significantly associated with heightened perceptions of risk (OR 1.60, p<.05), whereas psychological disruption from past hazard events played no significant role in informing the consideration of risks in home choice (p>.10). Location in a flood zone, though, is statistically significant in both models, but to mixed effect: homeowners in flood zones are 56 percent more likely to exhibit heightened perceptions of risk around future flooding (OR 1.56, p<.01) but 43 percent less likely to have considered risks in home choice decisions, controlling for all else (OR .67, p<.01). It is possible that living in hazard-prone areas may increase homeowners' risk perceptions due to adverse experiences since the point of acquisition, or that homeowners in risk-prone areas already had high risk

perceptions, but they were not adequately informed about risks. If homeowners are not adequately informed about the potential for hazards at the time of purchase, they will not have the capacity to make housing decisions driven by concerns about them.

Environmental attitude and issue salience predictors exhibited durable influence on both risk perception and risk action in informing risk consideration in home choice. For example, belief in climate change (OR 1.60 $p<.01$) and frequency of thinking about flood risks (OR 1.58 $p<.01$) are the strongest among all predictors in influencing risk consideration in home choice, and respondents who expressed belief in climate change were also significantly likelier to exhibit heightened risk perception around future flooding and related hazards (OR 1.38, $p<.05$). This research also supports previous findings that those with stronger pro-environmental attitudes—measured as climate change belief—are likelier to perceive greater environmental risk, as are people with salient previous disaster or related loss experiences.

Yet, information and resource access play a limited role in informing risk considerations in home choice, and no role in informing risk perceptions. For example, although the number of information resources homeowners use to stay informed about risk has a positive and small but significant association with risk consideration in home decisions (OR 1.06, $p <.1$), it does not have a significant relationship with risk perception ($p>.01$). Likewise, whether a respondent is aware of the Hurricane Preparedness Louisiana Sales Tax Holiday has no significant effect in either model. In short, although greater information access plays a limited but significant role in whether risks are considered when making home purchase or acquisition decisions, there is no significant difference in levels of perceived risk given access to different levels of information.

This aligns with risk research finding that slower cognitive functions—or "risk as facts," such as the relatively extensive effort required to evaluate information—contribute less to forming or elevating perceptions of risk than do faster cognitive functions—or "risk as feelings," such as more immediate heuristics and top-of-mind attitudes. In informing risk perceptions about potential flood events, faster mental processes such as preexisting environmental worldviews—such as overarching beliefs in climate change—are likelier to play a strong role than slower, more deliberative processes, such as evaluating information, as is found here.

Conclusion

The strongest predictor of amplified risk perceptions is race and ethnicity. Households of color are nearly twice as likely to exhibit heightened perceptions of risk toward future flood or hurricane events relative to non-Hispanic white households. However, race and ethnicity had no significant effect of on the likelihood of considering risks during home purchase decisions. Those with lower incomes and lower educational attainment are also more likely to perceive risk, but those characteristics are not significant predictors on the likelihood of considering risks during home purchase decisions. We find that risk perception does not significantly affect home choice decisions. We also find that while greater information access plays a substantively small but significant role in considering risks in home choices across the population of recent homebuyers in greater New Orleans, it does not play nearly as strong a role in influencing the consideration of risks in home purchase decisions as do beliefs about climate change.

Three possible groups arise from this analysis that are of particular interest: vulnerable households who perceive the risks to their homes and livelihoods but have limited agency or capacity to act upon them; households with high levels of risk perception but who may not necessarily have adequate information to inform home purchase decisions; and those who do not perceive hazard risks at all, possibly due to inadequate information and make housing choices without regard to them. The apparent conflict between perceiving risk but not demonstrating signs of acting upon it has multiple plausible explanations, not the least of which are other factors related to having the capacity and resources to act.

Consequently, three policy and planning solutions are recommended to better target resources and supports to these groups. The first involves the underlying housing access and affordability challenges that limit options for certain groups—namely, households of color and low-income households, possibly forcing them to make home purchase decisions devoid of information about the selected home's risks to environmental hazards even when they perceive these risks to be real and impending. Addressing ongoing housing discrimination and affordability and will be critical to overcoming this most persistent and pernicious of challenges.

The second group of changes relate to countering disinformation and misinformation about the risks themselves. The continued influence of private-sector interests on policy decisions and public opinion suggests a need for innovation in education and awareness about risks. The frequency and severity of major hazard events that have affected southern Louisiana will likely push this change as

well, given our and other studies finding that previous home damages associate with greater perceived risk.

Finally, transparency of information about a home's risks could be a key tool for informing households' decisions about acquiring and occupying a home or mitigating its risks. Requirements to disclose information about potential hazards and a home's history with hazards, potential homebuyers could have the opportunity to comprehensively consider risks and related mitigation options.

4. Risk Information

The status of a home's risk is dynamic, changing over time and with changes in projections on future global climate change concerns, as well as physical alterations to a home, property, or surrounding community and its infrastructure. This makes access to adequate information about a home's hazard risk challenging, though scientifically and actuarially defined assessments at the property-level are increasingly available. Complicating this information landscape are the various actors involved in one household's decision to purchase and occupy a home. They have access to different components of information and can shape what information is shared and how (Kahn 2021). For example, possible property damages and financial losses typically inform insurers while real estate agents and lenders may seek to contextualize risk profiles based solely on the household's vulnerability and capacity to secure resources and institutional supports for home occupancy (Ouazad and Kahn 2022). State and local elected officials concerned with their constituents as well as the revenue that resources their government agencies may use available information to justify infrastructure investments that protect residential properties, but rarely to share with residents or require them to make alterations (Jerch, Kahn, and Lin 2023).

If we define adequacy of information as the quantity, quality, and accessibility of facts to secure the ability of a homebuyer, owner, or occupant to understand their current or future home's risks and accordingly, though, the state of risk information is incomplete at best. Information provided to and understood by different kinds of households also varies. Racism and other forms of social vulnerability likely also interact with access to risk information. Notably, a study in Harris County, Texas found that low-income and racial minority homeowners are less likely than white households to be informed during home purchase of hurricanes and toxic materials risks and are therefore less equipped to make informed decisions when choosing where to purchase a home (Zhang 2010).

Background

A growing movement in the last decade has called for regulations on housing and real estate institutions and professions to provide transparent and consistent information about homes' hazard risks to all stakeholders, but especially households. Yet, questions remain with regards to the most effective kind of information, in what form, and at what point it should be communicated in a home occupation history or transactions. Property disclosure rules at the point of sale are the most cited opportunity for improving the consistency and accessibility of information (Smith 2019). Because they involve regulation of real property, these rules tend to fall in state governments' jurisdictions which, inevitably, vary significantly across states

about the kinds of information required and how that information is communicated (Washburn 1994; Yeo 2003; Nanda 2008; Nanda and Ross 2012).

State of Housing Risk Information

No federal law requires natural hazard risk disclosures in home purchases, despite 74 percent of Americans supporting such a requirement.[87] As noted earlier, the disclosure of the possible existence of lead-based paint is the only disclosure requirement at the federal level and, states like Louisiana, is the only disclosure required for renters.[88] Other real estate disclosure requirements are set by states and can—but rarely—include flooding-related disclosures.

Most states do not require a seller to detail a home's history of flooding, but some states have set their own hazard disclosure regulations in the absence of a federal mandate.[89] Twenty-one states have no statutory or regulatory disclosure requirements related to a property's history of flood risk or other flood-risk factors. However, 29 states plus Washington, DC have realtor associations that provide voluntary disclosures about whether the property is in a designated floodplain before the sale. In some states, disclosure requirements are plagued by loopholes, such as paying a $500 fee at closing to avoid disclosure or being able to select an option that information is unknown.[90] In addition, 25 of the 29 states with disclosure requirements waive those requirements in cases of foreclosure.

Louisiana has been a leader in efforts to improve seller hazard disclosure since the state revamped its regulations after Hurricane Katrina, starting at the turn of the recovery and into more recent legislation. Indeed, Louisiana strengthened home risk disclosure laws in 2008, 2013, and 2018.[91] The state requires sellers to disclose details related to the nature and frequency of flooding, flood insurance requirements, past repairs (including elevation), and details regarding the type and amount of federal disaster aid previous owners received—but this was not always the case nor is it evenly applied to all households. Louisiana homeowners who acquired their homes before these periods did not benefit from disclosures except possibly if a mortgage lender requires flood insurance. Oklahoma and Mississippi also have strong disclosure policies, and other states may start to follow suit. In 2019, Texas became the latest in a now majority of states to require basic disclosure of whether a home lies in a floodplain.[92] Sellers in Texas must disclose information about previous receipt of aid for flood damage.[93] In Florida, a Residential Property Disclosures Bill was filed in January 2020, but died in committee in March.[94] Florida has no risk disclosure laws despite its frequent extreme precipitation and rising sea levels.[95] Counties there have also unsuccessfully attempted to create their own requirements for both purchases and rentals.[96]

Among the information conduits beyond property sales disclosure that are currently promoted, homebuyers can visit public tools like FEMA's Flood Map Service Center to see whether a prospective home

is in a floodplain, though this tool underestimates current and future flood risk.[97] FEMA does not provide a homeowner with their property's history of flood damages and NFIP claim payments unless the homeowner has already purchased an NFIP policy (Adler, Burger, Moore, and Scata 2019). Without this information, homeowners might not know whether to purchase a policy. More updated information sources, such as the First Street Foundation's Flood Factor, provide more rigorous and granular information in the near-term future for even more properties than those in FEMA flood maps.[98]

Outside of government-mandated disclosure, some real estate websites now provide flood-risk information in listings. Realtor.com and Redfin use updated flood map data from First Street Foundation, rather than FEMA maps, to display a flood risk ranking for hundreds of millions of homes across both platforms.[99] Finally, home inspections, a common source of information about a home's physical performance, have also been studied though rarely in relationship to future performance during a hazard event (Chatterjee and Mozumder 2014).

Quality of Information

Disclosure programs are implemented differently and have different outcomes across groups (Lindell and Prater 2000; Zhang 2010). The lack of their uniform implementation or accuracy can undermine the effectiveness of hazard disclosures (Lefcoe 2014). Seller disclosure forms, such as those required in Louisiana and Texas, provide an opportunity for the seller to simply check a box indicating previous flooding, location in a flood plain, flood insurance requirements, and other related considerations.[100] In states with extensive disclosure requirements but whose requirements deal much less with flood hazards (such as California's earthquake-related disclosures) both buyers and sellers can also opt to purchase more detailed disclosure reports from outside contractors to complete disclosure requirements.[101] In Louisiana, a seller or buyer is encouraged to contact FEMA or the Governor's Office of Homeland Security and Emergency Preparedness for more information, rather than purchasing a report from a third-party contractor.[102]

However, in all these cases, the underlying data may be inaccurate to increasingly unpredictable climate events or unable to provide highly targeted information about a specific property's risk.[103] Inaccurate data provided by FEMA and/or outside contractors can undermine the integrity of more stringent disclosure requirements. These and other limitations of disclosure requirements do not imply that such laws lack utility wholesale, rather they emphasize the need for broader oversight to ensure ease of implementation and maximal effectiveness and accessibility. At the same time, given the myriad reactions to receiving risk information like disclosure and other hazard knowledge, it is critical to consider a range of communication strategies tailored for target populations.

Besides disclosure statements, residents may access information on risks from other public notices, like hazard mitigation programs. Most risk communication happens through emergency management warning systems prior to a disaster event. Overall, clear communication of hazard risks directly to potential homebuyers is limited. Awareness strategies and programs for hazard mitigation are often directed at builders and developers rather than potential buyers (Peacock and Husein 2011). Some infrastructure and property development stakeholders actively avoid making disclosure statements or signage that make hazards obvious. If risk information is targeted to only certain stakeholders, that risk may not be effectively communicated to buyers, especially for the most vulnerable populations.

Further, respondents to the study team's interviews suggested that some real estate professionals intentionally provided inaccurate information to home buyers; for example, several parish flood managers noted that buyers were told they could use the first floors of their elevated homes even though those floors are statutorily required to be unoccupied. Ultimately, one 2002 study found that only eight percent of buyers found out about flood risks associated with the home before making an offer, with sixty percent learning of risks during closing (Chivers and Flores 2002).

Outcomes of Disclosures

Most scholarship on hazard risk and hazard information channels have focused on warning and alert systems—that is, information provided when a hazard is realized (Mileti et al. 2004). Despite this focus, patterns with regard to the role of preexisting risk perceptions as well as actionability of messaging could shape what and how prehazard information is provided (Morss et al. 2016). Similarly, while many studies look at the impact of hazard risks on housing choices, little research has focused on the outcomes of the range of information sources about risk on household decisions, including disclosure laws as one highly promoted channel for communities at risk (Bin and Kruse 2006; Ewing, Kruse, and Wang 2007). Only a few researchers have examined whether and how buyers, renters, or occupants are made aware of hazard risks or how they understand the risks. That small body of existing work suggests that awareness and disclosure programs are implemented differently and have different outcomes across groups (Zhang 2010; Lindell and Perry 2012).

For example, Zhang (2010) found that homebuyers opted not to purchase homes in flood zones once they understood the existence of that risk, though the effect of risks to different hazards also varied (Zhang 2010). Actions taken by groups after receiving information vary and may be partially attributable to the fact that risk perceptions may also differ (Lindell and Hwang 2008). In theory, those households with heightened perceptions of risk may assimilate risk information more readily (Chatterjee and Mozumder 2014). Those households with more resources may also be more likely to choose not to purchase or occupy homes with higher risk profiles, though those with resources and low perception of risk may opt to select riskier homes

regardless of the information provided. However, the role of information quantity, quality, and channels in shaping or enabling risk perceptions and risk mitigation actions like home decisions requires further exploration.

The effect on housing markets of these disclosure rules is also severely understudied. Studies suggest buyers' perceptions of flood risks and likely higher insurance premiums lead to the rejection or exclusion of riskier homes and their resulting home devaluation (Troy and Room 2006; Pope 2008). Housing disclosure rules may result, then, in increased housing segregation as lower-income and lower-resources households occupy higher risk housing because of its affordability (Troy and Romm 2004). At the very least, one could assume that disclosure rules result in an alteration in the rate of home sales, yet preliminary evidence suggests this is not necessarily the case (Wes 2019).[104]

Regardless, additional study is needed to further explore how and when information is provided in prehazard scenarios regarding home purchase decisions, and which households access that information. Using the project's representative homeowner's survey, the team conducted a series of analyses to learn more about the nature of risk disclosures in home-buying.

Findings

The survey inquired about three relevant categories of information that respondents might have accessed during their home search and acquisition in the 2008 to 2018 timeframe—that is, after immediate recovery and as new legislation and practice requirements were implemented:

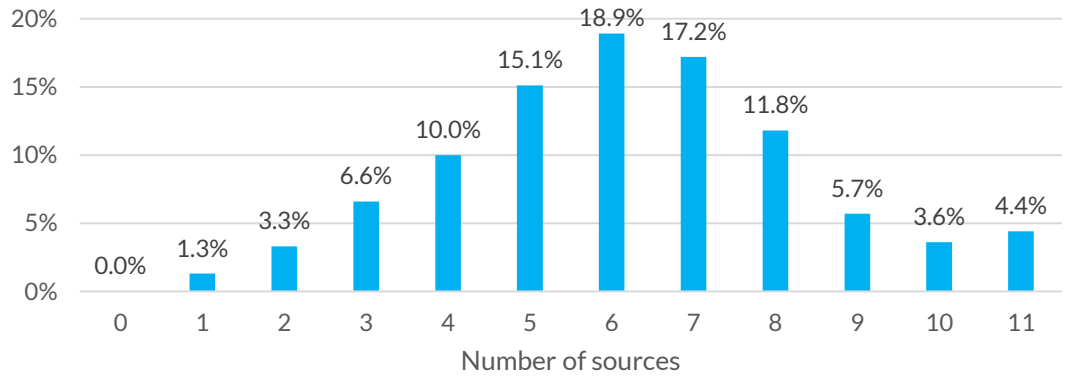
- use of the different information sources about the home's physical risk that could shape risk perceptions or subsequent behaviors for the whole population and by different household groups;
- substantive content or details about risk information regardless of source as they were provided to homeowners whose properties have higher risk profiles (that is, those in flood zones); and
- whether information about a home's risk led to any subsequent action or other outcomes on the homebuyer's part after purchase, such as mitigation activity.

Sources of Information

The number of sources of information on homes' hazard risks as well as general home conditions used by homeowners in greater New Orleans varies widely, though these followed a normal distribution with six sources being the average number of sources used and 63 percent of respondents using five to eight sources (figure 8).

FIGURE 8

Share of Homeowners Relying on Different Risk Information Sources by Number of Sources



Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020
Notes: The table represents responses to the question: "To what extent did you rely on these sources for information about your home's risk" where a source was counted if respondents select 2, 3, or 4 on a 1-4 scale of "Not at All" to "A Great Extent." Based on N=947. Percentages are weighted.

When it comes to the specific information sources about hazard risks that the same respondents use currently (that is, after home purchase), these also followed patterns like that found in studies of other US populations (table 12). General media and public-sector technical sources are highly consulted, but the information sources that are most useful during the home purchase process such as home inspectors and real estate agents were relied upon less.

TABLE 12

Share of Homeowners Relying on Different Information Sources About Hazard Risks

Information Source	Share (%)
Local or national media	83.5%
State or national government sources, including FEMA/NFIP maps or reports	82.8%
The internet	79.5%
Friends, family members, neighbors, or coworkers	79.4%
Local government sources, including from parish meetings or town halls	69.9%
Private insurance company	51.8%
Local nonprofits, disaster service providers (like the Red Cross), community groups, or churches	42.0%
Home inspector	41.9%
Real estate agents	22.9%
Local schools or universities	19.9%
Lenders	17.3%

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020
Notes: Based on N=941 to 945, depending on missing data. The table represents responses to the question: "Do you currently rely on any of the following sources for information regarding the potential risk to your home from future hazards?" with yes or no response options. Percentages are weighted?"

The sources relied upon to greater extent during the home selection process, however, were not expected (table 13). Despite Louisiana having among the strictest seller disclosure requirements, about 31 percent of households reported using the disclosures to a great extent. A higher share of households (almost 33 percent) reported not using disclosure statements at all—making the total share of households who did not consult disclosure statements for risk information (not too much or not at all) almost half (46 percent) of the population of recent homeowners in greater New Orleans. Though disclosure statements factored into most of the homeowners to some extent or more (54.5 percent), they were not as used as home inspections (77 percent relied to some extent or more) or real estate agent's communications (about 58 percent).

TABLE 13

Share of Households' Reliance on Different Sources of Risk Information During Home Selection

Source of Information	A great extent or some extent	Not too much or not at all
Inspection report or verbally from the inspector during home purchase	76.99%***	23.01%***
Documentation from the seller or seller's rep., inc. disclosure statements	54.49%***	45.51%***
Verbally from a real estate agent or other property representative	57.63%***	42.37%***
City, parish, or state documents such as property records or zoning maps	46.78%	53.22%
Verbally from the seller or previous owner	38.74%***	61.26%***
Online real estate sites such as Zillow, Trulia, Redfin, Realtor.com, MLS	30.12%***	69.88%***
Verbally from neighbors or neighborhood representatives	28.78%***	71.22%***

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020.
Notes: Based on N=952. The table represents responses to: "To what extent did you rely on these sources of information about your home's risks?" Percentages are weighted. Statistical significance: *p<.1; **p<.05; ***p<.01.

Differences across households as well as the resulting location of the selected home are further explored (table 14). Notable differences are found by income and house price, with higher-income households (those with annual incomes over $90,000) and those whose bought their homes at a higher value ($200,000 or more) using key sources of information -- including inspection reports, property records, and, most relevantly, disclosure statements--to some or a great extent at higher rates than their counterparts. Higher-income households referenced inspection reports at 7.7 percentage points higher than lower-income households, property records at 13.4 percentage points higher, and disclosure statements at 14.8 percentage points higher. Further, these findings could mask deeper differences by income group if a more refined income measure were possible.

TABLE 14

Share of Household Groups' Reliance on Different Sources of Risk Information for Sources Used to Some Extent or a Great Extent

	Share of Group Reporting Source Used to Some Extent or Great Extent									
	Household Race/Ethnicity		Household Income		Home Price		Education		Flood Zone	
Information Source	Non-Hispanic White	Households of color	<$90k	>=$90k	< $200k	>=$200k	<Bach	>=Bach	Out	In
Inspection report or verbally from the inspector during home purchase	77.2%	76.5%	73.5%	81.2%**	74.2%	81.2%**	70.3%	84.8%***	78.8%	74.0%*
Documentation from the seller or seller's rep., inc. disclosure statements	53.1%	55.9%	47.4%	62.2%***	47.0%	65.1%***	46.9%	62.8%***	54.1%	55.1%
Verbally from a real estate agent or other property representative	57.9%	57.7%	57.6%	58.8%	54.6%	61.9%**	54.7%	61.1%**	61.2%	57.4%
City, parish, or state documents such as property records or zoning maps	48.6%	43.2%	40.8%	54.2%***	40.4%	55.7%***	42.3%	51.4%**	48.3%	44.3%
Verbally from the seller or previous owner	39.6%	37.6%	40.0%	37.6%	35.4%	43.1%**	38.4%	38.6%	36.3%	42.7%*
Online real estate sites such as Zillow, Trulia, Redfin, Realtor.com, or MLS	29.7%	31.9%	29.0%	31.8%	27.7%	33.4%*	28.0%	32.1%	29.2%	31.6%
Verbally from neighbors or neighborhood representatives	27.7%	31.0%	26.4%	31.9%*	26.6%	32.0%*	27.9%	29.2%	28.3%	29.6%

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020

Notes: Percentages are weighted . N for Non-Hispanic white households ranges from 669 and 677; N for Households of color ranges from 239 to 241; N for < $90k Income ranges from 473 to 480 ; N for > $90k Income ranges from 408 to 412; N for Less than Bachelors ranges from 347 to 356 ; N for Bachelors or Greater ranges from 574 to 577; N for < $200K Purchase Price ranges from 474 to 480; N for $200k purchase price or greater ranges from 449 to 453. N for Not in Flood Zone ranges from 616 to 623; N for In Flood Zone ranges from 311 to 314. The table represents responses to the question: "To what extent did you rely on these sources of information about your home's risks?" The figures include those who relied information to some extent or a great extent, versus little or no extent. Statistical significance: *p<.1; **p<.05; ***p<.01.

Many households in the groups who did not use these formally available, institutionally required information sources to some or great extent simply did not use them at all when making their home decisions. For example, 38.9 percent of home purchase prices under $200,000 did not reference disclosure statement compared to the 23.2 percent of households with higher priced homes—a 15.7 percent point difference (table 15).

TABLE 15

Share of Groups' Nonreliance on Different Sources of Risk Information by Home Purchase Price

	Home purchase price	
Information Source	**<$200k**	**>=$200k**
Online real estate sites such as Zillow, Trulia, Redfin, Realtor.com, or MLS	52.8%**	44.9%**
Verbally from the seller or previous owner	49.7%***	36.2%***
Documentation from the seller or seller's rep., inc. disclosure statements	38.9%***	23.2%***
Verbally from a real estate agent or other property representative	25.2%**	19.0%**
Inspection report or verbally from the inspector during home purchase	17.8%*	12.52%*

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020
Notes: Based on N=945. Percentages are weighted. The table represents responses of "not at all" to the question: "To what extent did you rely on these sources for information about your home's risks?" Statistical significance: *p<.1; **p<.05; ***p<.01.

This pattern is repeated by household income group, with lower-income households not consulting disclosures 15.3 percentage points more than higher-income households (table 16). Those with lower education (less than a bachelor's degree) did not consult disclosures at 15.3 percentage points more than those with higher educations. The rates of not using disclosures were similar to their counterparts across racial/ethnic groups and flood zone location of purchased homes.

TABLE 16

Share of Homeowners Who Replied "Not at all" to Relying on Disclosures about Their Home's Risks

Respondent Group		**Share of Group**
All Households		32.5%
Race/Ethnicity	White households	32.8%
	Households of color	33.3%
Household Income	<$90,000	39.9%***
	>=$90,000	24.6%
Home Purchase Price	<$200,000	38.9%***
	>=$200,000	23.2%
Education	<BA/BS	39.7%***
	>=BA/BS	24.4%
Flood zone Location	Out	33.3%
	In	31.2%

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020
Notes: Based on N=933. Expect for all households, percentages are weighted for those who reported "Not at all" ranges from 262 to 271 due to omissions. The table represents responses to the question: "To what extent did you rely on these sources for information about your home's risks…Documentation from the seller or seller's representative, such as Louisiana Property Disclosure Statement". The table represents those who indicated "not at all" on a 4-point scale from not at all to a great extent. Statistical significance: *p<.1; **p<.05; ***p<.01.

Content

Along with the information sources, the survey directly asked households whether they had received specific pieces of information during their home selection process. This content especially focuses on measures or descriptions of hazard risk, and mirror those that are required components in Louisiana's property disclosure statements, such as the home's location in flood zone. Yet, despite the availability of this information, 16.1 percent of respondents who live in flood zones reported that they were not informed about their home's location in or out of the flood zone by the seller.

Comparing households whose purchased homes were ultimately in or out of the flood zone, 19 percent of households in the flood zone—that is, almost one fifth of households who purchased homes on riskier land—reported not being informed of their home's status (table 17). The rate is lower than the rates of not receiving other risk-related content, such the seller's flood insurance certification (which almost 46 percent of households with homes in the flood zone report not receiving) or the home's flood elevation certificate (which almost 42 percent of households with homes in the flood zone report not receiving).

TABLE 17

Share of Households' Not Receiving Select Information on Previous Damage During Home Selection

	Share of Households Not Receiving Damage Information	
	In Flood Zone	Out of Flood Zone
Previous flooding, water intrusion or accumulation, or drainage problem	38.8%*	45.6%*
Previous hurricane, wind, or hailstorm damage	42.0%	45.8%
Previous fire damage	72.2%	73.6%
Location of the home within or out of a flood zone	19.0%	14.4%
Location of the home within an area at risk of hazards other than flood	60.0%	59.8%
Any repairs made to the home due to hazard damage or risk	53.9%	59.8%
The seller's or previous owner's flood insurance certificate	45.7%***	63.7%***
The home's flood elevation certificate	41.8%**	50.6%**
Government assistance or private programs for disaster repairs that may have ongoing contractual requirements or assessments on the home	79.3%**	86.8%**

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2010–2020.

Notes: Percentages are weighted. Sample sizes for responses from homeowners in the flood zone that were not informed about conditions range from N = 312 to N = 315 dues to omissions; Sample sizes for responses from homeowners not in the flood zone who were not informed about conditions range from N = 620 to N = 627. The table represents responses to the question: "When you acquired your home, were you informed about any of the following conditions associated with it?" with response options yes or no. Statistical significance: *p<.1; **p<.05; ***p<.01.

Of homes outside the flood zone, rates for households not receiving information on their home's flood zone location is slightly better (14.4 percent) than those in the flood zone. The rates of not receiving other content among these households outside the flood zone are to those in the flood zone except for those pieces of information that were likely not provided intentionally since these conditions did not exist for them (e.g., the flood insurance certificate, flood elevation certificate, or disaster repair assistance program participation) though the existence of the information should have been part of disclosures. This suggests that, although all are entitled to this information, transparency about risk is more often volunteered for those most affected by risk because they are in a flood zone.

Outcomes

The survey asked several questions about what households did with the information about risks for the home they were purchasing regardless of the source. These included questions about decisions they made during the purchase negotiation (such as requiring the seller to make improvements) as well as actions taken after purchase (which we refer to as mitigation actions). Mitigation decisions and actions resulting from a range of variables are explored later in this report. However, descriptive cross-tabulations provide some additional insight into whether the provision of information on hazard risks from any sources led to substantive decisions or actions on the homebuyer's part. Rates of decisions appeared comparable across the two hazard risks of interest: flood and hurricane, wind, or hail risk (table 18) though these risks are not mutually exclusive.

TABLE 18

Share of Households Receiving Any Information on Hazard Risks During Home Selection Making Select Home Decision or Taking Mitigation Actions

	Hazard Risk Type When Acquired Home	
Actions Taken	Flood risk	Hurricane, wind, or hail risk
Before purchasing		
None, there were no risks	39.8%	40.5%
None, I acquired regardless and made no improvements	14.1%	14.7%
I required the seller to make repairs	16.0%	16.5%
I made improvements myself	18.6%	18.5%
I negotiated a reduced price	11.1%	9.9%
	100%	*100%*
Since purchasing		
Strengthened roof	19.3%	19.5%
Moved equipment	14.7%	13.9%
Storm shutters	12.5%	11.4%
Elevated entire home	6.5%	6.1%

	Hazard Risk Type When Acquired Home	
Actions Taken	Flood risk	Hurricane, wind, or hail risk
Strengthened foundation	6.1%	5.9%
Installed backwater valves	5.6%	5.3%
Retrofitted basement floor	2.7%	2.8%
Installed earthen berms	1.1%	1.0%

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020
Notes: Percentages are weighted. Based on N = 536 for those who were informed about flood risks; N = 516 for those who were informed about hurricane/wind/hail risks; For individual actions, N ranges from 537 to 541 due to omissions among those who were informed about flood risks and N ranges from 519 to 539 due to omissions among those who were informed about hurricane/wind/hail risks. The table represents responses to the questions: "When you acquired your home, were you informed about any of the following conditions associated with it?" with response options yes or no; "Based on the information about the risks to your home prior to acquiring it, what actions did you take to reduce the risk, if any?" with response options listed in the table; and "Have you done any of the following to your home?" with response options yes or no. Note that flood and hurricane/wind/hail risks are not mutually exclusive.

No one decision during negotiations was notably preferred by the informed homebuyers when comparing the population that was informed about flood risk versus hurricane risk. However, if buyers opted to conduct mitigation actions on their own, three specific actions—roof strengthening, moving of mechanical and electrical equipment, and storm shutter installation—all surface as the most common. These actions are also among the least costly of the list provided.

While information is an important factor for ensuring that homeowners are prepared for hazards, other factors may prevent buyers from deciding to act even when information has been disclosed. As noted in previous chapters, some homeowner simply did not perceive significant risks to their homes for factors unrelated to the home's location or its physical construction. Others may not have received the adequate content about risks from the sources upon which they relied, or they could not understand or interpret them because they are not provided in an accessible manner. Still others may simply not have the material resources.

When looking at the segment of informed households, for example, survey responses show that there was a higher percentage of lower-income household income who reported being informed about risks but made no improvements (17.8 percent) compared to those higher-income household (13.4 percent) (table 19), though this variation was not significantly different. Similarly, informed lower-income households appeared to make improvements themselves at slightly lower rates as well (12.4 percent compared to 13.5 percent of higher-income household).

TABLE 19

Share of Households Receiving Any Information on Hazard Risks During Home Selection Taking Select Home Decision or Mitigation Actions by Household Income Grouping

	Share of informed homeowners	
Household Income	Made no improvements	Made improvements themselves
Less than $90K	17.8%	12.4%
$90k and above	13.4%	13.5%

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020
Notes: Percentages are weighted. Based on N for "Less than $90K" = 479; N for "$90K and above" = 409.
The table represents responses to the question: "Based on the information about the risks to your home prior to acquiring it, what actions did you take to reduce the risk, if any?" where homeowners responded, "None, I acquired the home regardless of its risks and made no improvements" or "I made improvements myself". Statistical significance: *p<.1; **p<.05; ***p<.01.

Conclusion

Advocates have argued for stronger disclosure practices to help homebuyers protect themselves from potential risk. Scholars have also supported the concept that clear, consistent, and transparent communication of risk could empower homebuyers to protect themselves against catastrophic hazards and make them unwilling to accept risk when other options exist (Ratcliffe et al. 2019). By strengthening or better enforcing state and federal requirements to disclose basic flood risk, it is argued that policymakers can enhance buyers' bandwidth to understand risks, act on those risks, and combat other pressures and issues of distributive injustice they experience when purchasing a home (Collins, Grineski, and Chakraborty 2018). In a place like New Orleans where physical damages and human trauma still haunts the demography and culture, information is critical.

Homebuyers in the post-Katrina greater New Orleans region should be provided with consistent information about the risks of environmental hazards when purchasing a home. Yet, the kinds of information they receive, and, in turn, consult do not necessarily translate into consistent interpretations and resulting actions. Households with different backgrounds are also likely to access a different quantity and quality of information. In fact, nearly a third of respondents reported not consulting a disclosure statement at all despite those being required in Louisiana—the state viewed as having the gold standard of flood risk disclosure laws. Further, 19 percent of households purchasing a home in a flood zone report not being informed of that status during purchase.

Household income and consequent value of the purchase price of the resulting home as well as educational attainment appear to play significant roles in determining with which sources households

consult. They are also likely determinants of whether households can act upon the information through either home selection or taking mitigation actions after home purchase. These results suggest that multiple forms of risk communication are needed to target specific groups of homeowners and potential homeowners that are at specific exposure and vulnerability, but that these sources also need to be calibrated for those audiences. In some cases, they need to be supplemented with public and civil resources so that vulnerable households can act upon the information they have received more robustly.

Though financial capacity plays a critical role in household's outcomes, other possible factors can affect outcomes. In some cases, homeowners may have acquired homes with risks but previous mitigation acts (e.g., the home was already elevated at the time of purchase) reduced the need for them to take additional action. For others, however, the presence of property and hazard insurance are likely to have informed their decision to take on additional action. The next chapter explores this relationship with insurance further. Ultimately, access to information, its comprehensiveness, and households' ability to translate that information into action are all critical steps in building housing resilience.

5. Property Insurance

Affordable property and supplemental hazard insurance have been identified as tools to deal with hazard exposure and build housing resilience. However, the cost of property insurance can be burdensome, if not prohibitive (Cutter, Boruff, and Shirley 2003). In some cases, certain kinds of private insurance policies are simply not available, such as the case of Louisiana in the aftermath of Hurricane Katrina and subsequent disasters that continues to present a crisis for homeowners of all kinds.[105] Further, researchers and practitioners also recognize the potential for discrimination in insurance to play out including in inconsistent quotes, policy types offered, base premiums, and quality of service (Kousky and French 2022). Yet, recent studies on disparities in hazard insurance are limited and have yielded mixed results, with little conclusive evidence of race-based discrimination.

This study furthers this body of literature by describing whether climate and environmentally vulnerable groups in the seven-parish greater New Orleans region receive different insurance policies, premium rates, and claims treatment based on race and ethnicity, income, or location, controlling for other sociodemographic factors and housing characteristics that may influence outcomes in the decade after Katrina recovery and preliminary stabilization of insurance markets (2008 to 2018). The universe of accessible insurance data sources, however, is significantly limited; aside from insurer data, publicly available sources including from the NFIP and the State of Louisiana's Property and Casualty Insurance Commissions have been provided in aggregate only.[106]

Consequently, the study primarily relies on responses to the project survey of homeowners who purchased properties since 2008—a population most likely to be aware of their properties' insurance requirements from lenders and public institutions and to have recently shopped for insurance policies, but also likely to have experienced at least one hazard event recently given the frequency of flooding and hurricanes that the region has experienced.

Background

Our study focuses on homeowners in seven parishes in greater New Orleans: Jefferson, Orleans, Plaquemines, St. Bernard, St. Charles, St. John the Baptist, and St. Tammany parishes. New Orleans along the Gulf Coast where the estimate flood insurance take-up rate is 24.9 percent had been among the lowest in the country despite having among the highest number of policies.[107] Nationally, take-up rates are near 50 percent in flood zones and far lower outside of them.[108] Louisiana's coastal counties alone had a take-up rate of 16.2 percent on average at the start of the project's timeframe.

Though Orleans Parish, has a slightly larger flood insurance take-up rate of 20.7 percent, this is especially low for a location where 80 percent of the city was flooded during Hurricane Katrina in 2005. Over 200,000 homes were damaged because of this hurricane in the region alone.[109] Some speculate the perceived protection from the levee system in New Orleans may influence lower levels of insurance uptake (Green, Bates, and Smyth 2007; Cannon et al. 2020). Some evidence suggests that NFIP, the federally subsidized insurance program, benefitted higher income households over lower income households. Yet, the low take-up rate of flood insurance pre-Katrina may reflect lower incomes in the region overall.[110] The year after Hurricane Katrina, the state experienced an average increase in homeowner insurance premium rates—by over one fifth (22 percent), with the highest increase in coastal and flood zone hazard parishes.

Major recent changes that occurred after the project began such as the State of Louisiana's sunsetting of publishing homeowner insurance data and the advent of FEMA Risk Rating 2.0, have further highlighted insurance as a necessary tool for homeowners' resilience in the face of hazard risks.[111] But they also showcase the challenges ahead in ensuring that homeowners access the correct insurance, priced appropriately for insurers but affordable to all segments of the population. FEMA's new methodology for estimating flood risk and pricing went effect in October 2021. In Louisiana, where 495,900 insurance policies are active, 80 percent of households are expected to see their per-month premium cost increase, though only 3 percent are expected to see an increase of greater than $20 a month.[112] Louisiana encourages opportunities for insurance discounts, but they are not always utilized by residents. In fact, although Louisiana offers insurance premium reductions for code-compliant construction, anecdotal reporting suggests that most available funds go unclaimed. Overall, post-Katrina New Orleans has seen an increase in insurance policy stringency and rates.[113] Disparities in insurance offerings and in the subsequent outcomes for different policyholders, then, is a national policy concern (Avraham, Logue, and Schwarcz 2013; Schwarcz 2019).

Insurance Disparities and Outcomes

Insurance is a practice with legally and market-evolved terms that, in theory, could be procured in different ways to different households. Ultimately, though, insurance's purpose is to pay households out after covered damages occur to repair the damages and to make the households whole financially. Consequently, the composition of determinants that shape insurance outcomes is also of interest.

Recent studies on disparities for a range of demographic classes in hazard insurance are limited and have yielded mixed results when it comes to rates of being insured and the extent and quality of insurance, with little conclusive evidence on race-based discrimination in particular (Galster, Wissoker and Zimmermann 2001; Green et al. 2007; Shao et al. 2017; Cannon et al. 2020).. Some pilot studies suggest that racial disparities existed decades ago but have since diminished (Galster 2006; Regan 2007). A study that

considers the extent to which claim costs, prices, and type of insurance coverage can be explained by percent of racial minority residents, risk of loss, and demand for insurance found that risk of loss and demand for insurance had more explanatory power than the share of racial minorities (Grace and Klein 2009). Meanwhile, several studies that initially indicate differences in outcomes affiliated with race or ethnicity find that the differences do not stand up when controlling for other relevant factors (Galster et al. 2001; Regan 2007). Of the focus areas of our study, variability in premium pricing has been the most widely explored in the literature, followed by differences in insurance covered. Racial and economic disparities in claims are the least studied, though some studies have asked questions related to differences in service levels.

COVERAGE

A substantial body of literature explores factors that influence whether residents have coverage or not. Study findings related to hazard insurance coverage are mixed when it comes to the directions and significances of demographic variables. For instance, a 2020 study of 403 New Orleans residents found that some demographic characteristics, such as socioeconomic status, associate with flood insurance coverage, but other studies do not (Terpstra and Lindell 2013). The direction and significance of findings related to demographic characteristics used to predict hazard adjustments were mixed.

While legacies of housing segregation and historical discrimination in the mortgage market suggests a significant negative relationship between race/ethnicity and insurance coverage, evidence to date has been mixed. Several studies focus on whether homeowners and renters have adequate flood insurance. For example, a Phoenix and New York City-based study by Galster et al. (2001) uses a paired test to compare the treatment of insurance seekers in moderate-income, predominantly Black, or Hispanic-occupied neighborhoods to those in comparable predominantly white neighborhoods. They find that insurance-seekers from white neighborhoods are more frequently offered policies that provide better coverage for lost content than those in the Black comparison neighborhoods. Namely, those in white neighborhoods more frequently received replacement cost coverage on content as opposed to content coverage at actual depreciated cost values. Of the ten study indicators related to quoted offers, policy types, and policy offers, replacement cost coverage was the only indicator with a statistically significant difference by race.

Meanwhile, research on fire insurance coverage reveals a positive relationship between the share of more restricted dwelling fire policies in a state and the state's share of minority home owners; but the relationship was not significantly statistical after controlling for other factors such as the age of the dwelling or the acuteness of disaster risk (Regan 2007). A New Orleans-based study suggests that there were racial and income differences between those holding versus not holding adequate flood insurance at the time of Hurricane Katrina which the author concludes is tied to insurance redlining (Green et al. 2007). Another

New Orleans study found that race or ethnicity was not a significant determinant of having flood insurance (Cannon et al. 2020).

Past studies assessed the roles of other demographic factors in determining insurance outcomes such as employment status, levels of educational attainment, and gender. The 2020 study by Cannon et al. found that employment (full-time employed vs. not) was not a statistically significant determinant of flood insurance and that homeowners with higher levels of education were more likely to have flood insurance than those with lower educational attainment. Brody 2017 found that survey respondents who had voluntarily purchased flood insurance, on average, have significantly higher levels of education ($p < 0.05$) while Shao et al. (2017) similarly found that voluntary flood insurance purchase was influenced by educational attainment (Brody et al. 2017; Shao et al. 2017). Furthermore, Brody 2017 found that survey respondents who had voluntarily purchased flood insurance are, on average, significantly more likely to own more expensive homes.

Research on gender's influence on insurance outcomes concludes that the relationship is unknown due to lack of theoretical consensus and empirical results (Hung 2009). Even though Cannon et al. 2020 found that gender was not a statistically significant predictor of whether someone had flood insurance, the study refers to research that found women have higher risk perceptions than men across an array of hazard risks. Yet, the higher risk perception does not necessarily translate to behavior such as insurance purchase. Rather, it may be as a mediating factor for other risk-related predictors such as experience with hazards (Canon et al. 2020).

Age of the homeowner can furthermore interact with level of experience with hazards and risk perception. A past study that looked at the influence of age on insurance coverage, such as Cannon et al. 2020 which found that older homeowners are more likely to have homeowners' insurance. That study also notes that having a past flood damage experience is positively associated with the likelihood of having flood insurance when the flooding was caused by a hurricane but was not statistically significant for nonhurricane related flooding.

The influence of geographic characteristics has also been explored in past research. Whether a home is in or out of the flood zone is historically an imperfect predictor of whether a homeowner has flood insurance. In fact, recent FEMA data shows that, nationally, only 50 percent of residents living in flood zone areas have flood insurance, which raises the possibility of high uninsured flood-related losses.[114] This is despite federal flood insurance purchase requirements for homeowners with mortgages from federally backed or regulated lenders in a 100-year floodplain. A 2019 study found that 20% of all flood claims were made by households in low-to-moderate risk areas (Cannon et al. 2020).

Past studies have found that geographical proximity and risk perception that might lead to the purchase of flood insurance is mediated by recency, frequency, and severity of a hazard experience (Lindell and Perry 2012). Yet, some studies say proximity to a flood hazard area makes little or no difference in the decision to purchase flood insurance (Brody et al. 2017). Kousky (2010) found that insurance uptake increased outside of the 100-year floodplain and Lindell concludes that it is difficult to measure locational risk (Kousky 2011).

Finally, literature suggests that factors beyond demography are also determinants of insurance coverage, such as the age of a home. First, the home's age can indicate the housing quality, though is not a fully reliable indicator on its own because it does not account for remodels or mitigation activities that could have occurred over time. Secondly, the age might indicate whether a home received premium discounts as part of NFIP's statutory grandfathering policy, which says that homes built prior to flood insurance rate maps are eligible for subsidized flood insurance rates.[115] There is also "built-in-compliance" grandfathering for homes built in compliance with the flood insurance risk maps in effect at the time of the construction.[116]

PRICING

The research on insurance pricing has limited evidence suggestive of racial discrimination in insurance prices. Studies are mixed on whether differences across flood zones reflect racial or economic discrimination or if they are simply a reflection of different risks that play out through different location-based premiums (Galster et al. 2001). One paired test comparing predominantly white and Hispanic neighborhoods in Phoenix found that homeowners in Hispanic neighborhoods had higher premiums, yet the disparity disappears when prices are adjusted for rating territories. Elsewhere, a statewide Ohio-based study found no consistent pattern of minority homeowners living in areas with higher base premiums (Galster 2006).

In Louisiana, a policyholders' financial capacity (e.g., income, assets) can legally be included as a characteristic in insurance quoting, meaning this information could potentially be used in a discriminatory way.[117] From a resource constraint perspective, insurance coverage varies by the level of income. For example, purchasing voluntary flood insurance was influenced by income (Shao et al. 2017). The presence of disposable income can be an important factor in determining willingness to purchase flood insurance, but flood insurance purchase attitude was both income and price inelastic (Hung 2009). Additionally, Cannon et al. 2020 found a decrease in the likelihood of respondents having flood insurance in lower income brackets.

Ultimately, much of the flood insurance pricing debate to date has been around why some policies are priced below their full risk rate, and why NFIP pricing practices differ from the private sector (Kousky and Shabman 2014). Studies on both general property insurance and hazard insurance indicate that insurance policies and premiums are not based on "actuarial risk"—the actual possibility of economic loss—as they should be (Kunreuther, Pauly, and MacMorrow 2013; Kousky, Lingle, and Shabman 2016). The reasons why

premiums seldom reflect true property-level risk range from it being difficult to estimate future losses to the fact that premiums are averaged over large areas and may be cross-subsidized. Furthermore, properties may receive discounts due to affordability concerns or regulatory restrictions (Kousky and Kunreuther 2017). For example, insurance for properties that were built prior to the creation of flood maps may be subsidized, and rates that homeowners were quoted at the time of purchase may be "grandfathered in" (Kunreuther and Michel-Kerjan 2011). Sociodemographic factors may also be reflected in hazard insurance pricing. For example, a homeowner's insurance prices will vary based on factors such as the size and value of a home and its contents.[118] In addition, premium discounts may be given for hazard mitigation, altering the price of insurance (Kousky and Kunreuther 2017).

LEVEL OF SERVICE

Literature reveals that levels of service can differ across race/ethnic groups, namely in the level of information that was provided to customers and in claims processing times. For instance, in a New York city study, residents with homes in predominantly white neighborhoods were more likely to receive both written and verbal quotes than testers in predominantly minority neighborhoods (Galster et al. 2001). A separate study found that home insurers were generally able to detect a customer's race by the sound of their voice, and furthermore found that this information impacted the service provided to the inquirers (Squires and Chadwick 2006). In addition, Green et al. 2007 reported that low-income and Black homeowners more often insure through second tier, regional insurers that tend to give out lower and slower payouts in the event of a claim (Bolin and Bolton1986; Peacock, Morrow, and Gladwin 2000; Green, Bates, and Smyth 2007). Consequently, there is preliminary evidence of variations in treatment by household characteristics. For example, a Brooklyn based study of flood insurance policies found that some homeowners expressed extreme difficulty in receiving claims payment (Paganini 2019).

Study Overview

This research adds to the universe of insurance data and augments the discussion about the factors that contribute to variations in insurance premiums by focusing on property and hazard insurance policies in greater New Orleans. The study relies on the project survey of introduced earlier. In the survey, 29 targeted questions relate specifically to home and hazard insurance—namely asking about homeowners and other property insurance policies, coverage, premiums, and claims treatment. It also solicits information related to reasons why homeowners may not have certain coverages and if they have done anything to receive discounts on homeowners of flood policies. It adds information around rates of insurance coverage, the extent of coverage, insurance premiums, hazard mitigation behavior for the home and how mitigation affects insurance premiums and deductibles and claims outcomes.

Research Questions

Our study asks whether climate- and environmentally vulnerable groups receive different insurance policies, premium rates, and claims treatment based on race/ethnicity or income controlling for location and housing quality. Three underlying question address outcomes in terms of insurance coverage, insurance pricing, and level of service, respectively:

- Do we find racial/ethnic or income-based disparities in insurance policy coverage (e.g., having it; amount of protection; coverage for floods losses, hurricane, or wind losses)?
- Does cost of homeowner's insurance premiums and deductibles vary by race/ethnicity or income?
- Does quality of claim outcomes or claims-related service vary by race/ethnicity or income?

The three research questions are addressed using a series of statistical models to measure the relationship between demographic characteristics such as race/ethnicity and income with different sets of insurance-related dependent variables, controlling for other relevant factors.

Variable Selection

To test for the relationship between race/ethnicity, income, and outcomes related to insurance coverage (question 1), insurance pricing (question 2), and level of service (question3), nine outcome variables were selected—two for question 1, three for question 2 and three for question 3. For question 1, insurance coverage was operationalized using three binary outcome variables a) whether a homeowner has insurance for damage from a flood due to a natural hazard event or disaster (yes or no); b) whether a homeowner has insurance coverage for damage from a hurricane or windstorm (yes or no); and c) whether a homeowner has insurance policies that cover damages from all perils versus only basic perils. Models to answer question 1 are based on logistic regression.

For question 2, insurance pricing was operationalized using a) respondents' homeowners insurance premiums (USD); b) respondents' flood insurance premiums (USD); and c) respondents' coverage limits (USD). The coverage limit is based on the highest coverage limit among all the property insurance policies held by the respondent. Models to answer question 2 were based on ordinary least squares regression.

Finally, for question 3, level of service was operationalized as a) the time it took to process claims (less than one month, 1-2 months, 3-5 months, 6 or more months); b) a measure of the level of satisfaction a homeowner felt with their claims process from 1 (very dissatisfied) to 5 (very satisfied); and c) a measure of the level of satisfaction a homeowner has with the current insurance provider from 1 (very dissatisfied) to 5 (very satisfied). Models to answer question 3 were based on ordered logistic regression.

Relevant predictor and control variables were identified from the risk perception, disaster, and environmental social science literatures and categorized into the following three groups. table 20 presents weighted responses to the survey on questions related to insurance policy coverage, hazard coverage, and claims outcomes overall and by race/ethnicity and household income.

- Variables of interest:
  The research sets out to answer questions about associations between race/ethnicity, income and insurance outcomes. Hence, all models included both race/ethnicity and household income as predictor variables. Variation by race/ethnicity is measured as non-Hispanic white households or households of color. Variation by household income is measured as having an annual household income of less than $90,000 or $90,000 or more.

- Location control variables:
  A flood zone indicator (in vs. out of a FEMA-designated 100-year flood plain) is included as an indicator of hazard risk and as an indicator of flood insurance requirements. Respondents' addresses were geocoded such that areas with the flood plain prefix of A or V were considered flood zones. An Orleans Parish indicator (living in vs. out of the parish) was also included as a proxy for the level of urbanicity. It is presumed that homes located in Orleans Parish have more urban localities than homes in the other six greater New Orleans parishes. [119]

- Sociodemographic control variables:
  Sociodemographic controls were selected for the models based on literature. In addition to the household income variable, other indicators of financial status that can influence insurance outcomes include the purchase prices of homes ($50,000 ranges from less than $50,000 to more than $350,000) and employment status (employed versus not employed). Credit score (350- to 850-point scale) was also included because it is a measure insurance companies use as an indicator of financial risk. Other proxies for social positioning that may impact insurance-related outcomes include gender (women, men), age (18-40 years, 41-60 years, older than 60 years), level of educational attainment (less than a bachelor's degree, bachelor's degree or more) and retirement (yes or no).

- Other control variables:
  Several variables specific to the insurance market were included in the insurance pricing and the level-of-service models because of the potential effects that they might have on insurer perceptions of risk.[120] These include the number of physical mitigation actions a homeowner took (count of 0 - 6 actions) and whether a homeowner received mitigation incentives from a federal or state program (yes if any, no if none). Shopping frequency (0- to 4-point scale of never, not since first policy, rarely, every few years, at least once a year) was also included because shopping more might allow

homeowners to identify better policies or prices. For the level-of-service models, indicators of claims treatment were added including the level of coverage (all perils covered versus limited perils covered), whether a homeowner was denied coverage in the past (yes or no), and whether a homeowner ever had a policy cancelled (yes or no). In the insurance models, past experience with a hazard (yes or no) is included as an indicator of issue salience given that previous experience with hazards may raise risk perceptions.

TABLE 20

Descriptive Statistics of Selected Variables

Variable Name	Obs.	Share (%)	Statistical Measure: Mean	SD	Min	Med	Max
Outcome variables—Insurance Coverage							
Flood insurance coverage	912		0.83	0.38	0	1	1
0 No flood damage coverage	155	17.1					
1 Has flood coverage	757	82.9					
Hurricane or wind insurance coverage	912		0.94	0.23	0	1	1
0 No wind/hurricane damage coverage	45	5.7					
1 Has wind/hurricane damage coverage	867	94.3					
Perils covered by insurance policy	905		0.71	0.45	0	1	1
0 Basic perils	248	29.0					
1 All perils	657	71.0					
Outcome variables—Insurance Pricing							
Homeowners insurance premium	848		$ 2,501	$1,521	$202	$2,273	$18,500
Flood insurance premium	687		$795	$722	$9	$504	$10,000
Coverage limit	536		$32,116	$160,710	$ 35	$208,000	$1,800,000
Outcome variables—Level of Service							
Claim processing time	287		1.88	0.93	1	2	4
1 Less than 1 month	121	42.6					
2 1 to two months	104	34.5					
3 3 to 5 months	42	15.5					
4 6 or more months	20	7.4					
Claims process satisfaction	293		3.98	1.22	1	4	5
1 Very dissatisfied	17	6.5					
2 Fairly dissatisfied	22	7.4					
3 Neutral	41	13.6					
4 Fairly satisfied	74	26.5					
5 Very satisfied	139	46.0					
Insurance provider satisfaction	907		3.89	0.96	1	4	5
1 Very dissatisfied	13	1.6					
2 Fairly dissatisfied	25	2.7					
3 Neutral	315	34.3					
4 Fairly satisfied	249	27.4					
5 Very satisfied	305	34.0					
Predictors of interest							
Race/Ethnicity	931		0.33	0.47	0	0	1
0 White, Non-Hispanic	684	67.0					
1 Person of Color	247	33.0					
Household income	904		0.43	0.5	0	0	1
0 Income < $90K	491	56.7					
1 Income >= $90k	413	43.3					
Location controls							
Flood zone status	952		0.38	0.48	0	0	1
0 Not in flood zone	633	62.3					
1 In flood zone	319	37.7					
Urbanicity status	952		0.26	0.44	0	1	1

		Statistical Measure						
	Variable Name	Obs.	Share (%)	Mean	SD	Min	Med	Max
0	Not in Orleans Parish (not Urban)	740	73.8					
1	In Orleans Parish (Urban)	212	26.2					
Sociodemographic controls								
Home purchase price		945		4.54	1.93	1	4	8
1	< $50K	19	2.5					
2	$50K - $99K	65	9.3					
3	$100K - $149K	192	23.3					
4	$150K - $199K	213	22.7					
5	$200K - $249K	151	13.4					
6	$250K - $299K	100	9.4					
7	$300K - $349K	61	5.8					
8	$350K or more	144	13.6					
Employment		946		0.78	0.42	0	1	1
0	Not in labor force	466	50.3					
1	Employed	473	49.7					
Credit Score (350-850 scale)		813		727.3	75.2	350	740	850
Age		948		0.84	0.76	0	1	2
0	18 - 40	383	37.9					
1	41 - 60	373	39.7					
2	61+	192	22.4					
Gender		939		0.5	0.5	0	0	1
0	Male or other	466	49.6					
1	Female	473	50.4					
Education		944		0.45	0.5	0	0	1
0	Less than Bachelors	362	55.3					
1	Bachelors	582	44.7					
Retired		946		0.14	0.35	0	1	1
0	No	823	85.7					
1	Yes	123	14.3					
Other controls								
Past hazard experience		943		0.68	0.47	0	1	1
0	No	278	32.0					
1	Yes	665	68.0					
Mitigation action				0.6	1.14	0	0	8
0	No actions	611	66.3					
1	One action	182	19.7					
2	Two actions	67	7.7					
3	Three actions	26	2.9					
4	Four actions	9	1.7					
5	Five actions	7	0.8					
6	Six actions	4	0.5					
7	Seven actions	1	0.1					
8	Eight actions	3	0.3					
Received mitigation incentive		941		0.18	0.39	0	0	1
0	No	760	81.9					
1	Yes	181	18.1					
Shopping frequency		936		2.02	1.27	0	2	4
0	Never	101	12.4					

			Statistical Measure				
Variable Name	Obs.	Share (%)	Mean	SD	Min	Med	Max
1 Not since first policy	240	26.3					
2 Rarely	226	24.0					
3 Every few years	226	21.1					
4 At least once a year	143	16.1					
Level of coverage	905		0.71	0.45	0	1	1
0 Limited perils	248	30.0					
1 All perils	657	71.0					
Past coverage denial	940		0.04	0.21	0	0	1
0 No	898	95.6					
1 Yes	42	4.4					
Past policy cancellation	944		0.06	0.23	0	0	1
0 No	891	94.2					
1 Yes	53	5.8					

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020
Note: Total respondents are N=952. Percentages are weighted. Obs. = unweighted observations, SD = standard deviation.

Analytical Models

Insurance coverage models look at the association of race/ethnicity and income with whether homeowners have insurance, whether homeowners have supplemental insurance, and the level of protection provided by insurance policies in terms of structure, content, and admissible causes of damages.[121] Insurance pricing models look at the impact of race/ethnicity on homeowner's premiums, flood insurance premiums, dollar values of coverage limits, and dollar values of deductibles. Lastly, level-of-service models look at the association between race/ethnicity and income on claims outcomes in terms of if and how much of the claim was honored, months to process claims, the level of satisfaction with the claims process and, finally, the level of satisfaction with the insurance company.

The models were tested for correlation between independent predictors and control variables.[122] No variables across any models were close enough to one to be cause for concern. A test for multicollinearity found that the highest average Variance Inflation Factor (VIF) across all models was 1.37 and the highest VIF overall was 2.8 (VIF<10) further indicating that multicollinearity is not a concern. Model fit was tracked from the first to second iteration by looking at the AIC (Akaike Information Criterian) and BIC (Baysian Information Criterion) which decreased with the addition of control variables in every case, indicating an improved model fit. The Wald Chi-Square test was also recorded for logit and ordered logit models while the Deviance Chi-Square test was recoded for linear models. All chi-square statistics were significant ($p < .01$ for models including all controls).

Findings

For each of the three research questions, crosstabulations of survey responses are presented followed by the results of each question's statistical models and a discussion of findings.

General Policy Coverage

The first research question focuses on whether there are disparities in insurance policy coverage by race and income. For the entire population of respondents, 96 percent (of 929 respondents) reported having some type of insurance coverage for their home, but the type of insurance coverage varies. [123] Nearly all respondents who reported having any type of insurance reported having homeowners' insurance (99 percent), 76 percent of respondents who reported having any type of insurance reported having flood insurance through NFIP, another provider, or a combination of both, and 46 percent of respondents reported having supplemental insurance (wind or hail, umbrella, or other).[124]

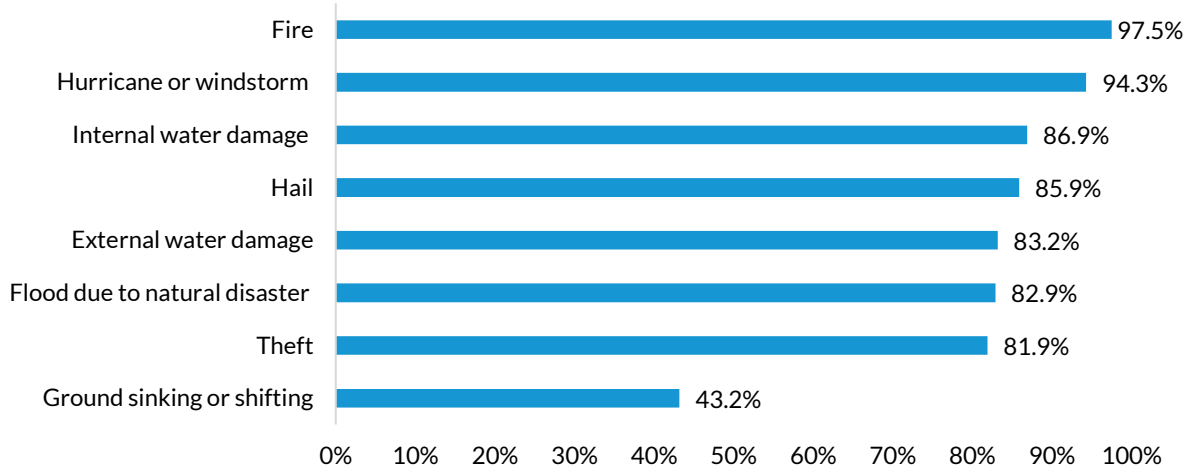
When we break out insurance coverage by race and ethnicity descriptively, we do begin to see differences in coverage (table 21). A smaller portion of respondents of color reported having flood insurance coverage in comparison to white households. Among households of color, 69 percent reported having flood hazard insurance compared to 78 percent of white households. When controlling for flood zone designation, we see similar differences. Seventy percent of white households that were not living in a flood zone, and therefore not required to have flood insurance, still had flood insurance either through NFIP or another provider. In comparison, 64 percent of households of color did. Yet, a larger portion of households of color (50 percent) reported having supplemental wind, hail, umbrella, or other supplemental in comparison to white households (46 percent).

Respondents that reported having annual household incomes of $90,000 or more reported having insurance coverage in comparison to respondents in households with reported household incomes less than $90,000 for all insurance types. For respondents with annual incomes of $90,000 or more, 83 percent reported having flood insurance through NFIP or through another provider, while 71 percent of respondents in households with incomes less than $90,000 reported having any flood insurance coverage. When controlling for flood zone designation, 77 percent of households with incomes of $90,000 or greater had flood insurance when they were not required to do so (that is, did not live in a 100-year FEMA designated flood zone). In comparison, 62 percent of households with incomes less than $90,000 had flood insurance if they did not live in a flood zone. Among higher income households, 49 percent reported having supplemental insurance, compared to 43 percent lower-income households.

The survey included questions on specific loss coverage across the respondent's insurance policies (figure 9). Across all insurance policies, nearly all (98 percent) respondents reported having coverage for losses caused by fires, and 94 percent have coverage for losses caused by hurricanes or windstorm. Reported coverage for water related damages (including hail, flood, and water damage from external sources, such as sewer backup, or internal home appliance or plumbing malfunction) were consistent with reported flood insurance coverage.

FIGURE 9

Share of Households Reporting Insurance Coverage for Specific Losses by Hazard Type



Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020.
Notes: Percentages are weighted. The sample size of respondents who selected each hazard type are: Fire (N=898), Hurricane or windstorm (N=867), Internal water damage (N=795), Hail (N=792), External water damage (N=761), Flood due to disaster event (N=757), Theft (N=767), Ground sinking or shifting (N=383). The table represents responses to the question, "Across all of your insurance policies together, are losses from the following events covered?"

TABLE 21

Shares of Select Household and House Groups Reporting Coverage by Insurance Type and Special Loss Coverage

	Insurance Type					Special Loss Coverage							
	Homeowner	Any Flood	Flood (NFIP)	Flood (Other)	Supplmnt	Hurricane or wind	Flood due to disaster	Fire	Internal water damage	External water damage	Hail	Theft	Ground sinking or shifting
All Respondents	98.6%	76.0%	62.1%	24.8%	45.8%	94.30%	82.90%	97.50%	86.90%	83.20%	85.90%	81.90%	43.20%
Race/Ethnicity													
White, Non-Hispanic	99.3%	78.4%	64.1%	24.2%	45.9%	95.20%	77.50%	99.60%	88.80%	85.60%	87.90%	86.10%	41.90%
Households of color	96.8%	69.4%	55.5%	26.6%	50.2%	87.80%	76.60%	90.20%	77.00%	72.30%	83.50%	72.90%	40.50%
Household Income													
Less than $90,000	97.5%	70.9%	55.5%	24.7%	43.3%	88.90%	70.50%	95.00%	80.00%	77.50%	82.70%	76.60%	41.10%
$90,000 or more	99.6%	82.6%	70.6%	23.7%	49.3%	99.00%	84.60%	99.60%	91.00%	85.30%	92.50%	90.10%	43.20%
Flood Zone Status													
Not in flood zone	98.2%	69.1%	57.8%	19.8%	48.1%	93.00%	77.50%	96.60%	85.20%	81.60%	86.80%	82.30%	41.80%
In flood Zone	99.1%	87.7%	69.3%	33.3%	42.0%	96.40%	92.20%	99.10%	89.90%	85.80%	84.40%	81.30%	45.60%

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020

Notes: Percentages are weighted. NFIP = National Flood Insurance Program. Sample sizes for respondents who selected having each insurance type: Homeowners N = 904; Any Food N = 629; Flood, NFIP N = 897; Flood, Other Provider N = 213; Supplemental Insurance N = 437. The table represents responses to the question, "Do you currently have any of these insurance types?" Supplmnt = supplemental insurance. Households of color include all Hispanics and those of race groups other than white.

White households and higher income households reported higher coverages for eight categories of losses in comparison to households of color and lower income households. Further the difference in proportions of white households versus households of color who are covered for flooding due to disaster event is smaller than the difference for hurricane or windstorm coverage, where 95.2% of white households are covered versus 87.8% of homeowners of color.

This question's regression models look at coverage for three hazards: flood due to hazard event, hurricane or windstorm , and all perils combined. Together, the models offer insights into variation in insurance coverage (table 22).

First, the insurance coverage models show that race/ethnicity does not significantly predict the level of insurance policy coverage. Rather, income appears to be more predictive: homeowners with higher household incomes have better insurance coverage, controlling for other factors. Homeowners with higher household incomes ($90,000 or more) are almost six times more likely to be covered for hurricane or windstorm losses compared to those with lower incomes (less than $90,000). In addition, those with higher household incomes are over twice as likely (OR 2.09, p <.01) to have coverage for all perils or losses (aside from listed exclusions) compared to those with lower incomes, controlling for other factors. Although most respondents reported having coverage for damage from windstorms or hurricanes (94.3 percent), almost all the households without coverage (87.7%) were lower income.

Other economic and demographic indicators also predict whether a homeowner's coverage, though to a lesser degree and for different coverage types. For example, high credit scores (OR 1.01, p<.01) have a statistically significant though slight positive relationship with hurricane/wind coverage. Those with higher home purchase price are 30 percent less likely to have hurricane/wind coverage than someone in a lower purchase price bracket (OR .70, p<.05). In contrast, homeowners with a higher home purchase price are 15 percent more likely to have flood losses covered (OR 1.15, p < .1). Employed homeowners in greater New Orleans are more likely to have specific losses covered than those unemployed, nearly three times more likely for windstorm/hurricane losses (OR 2.76, p < .05) and more than two times more likely for flood losses (OR 2.30, p < .05). Education and age are also significant predictors of insurance coverage. Homeowners with a bachelor's degree or higher are almost 50 percent more likely to have coverage for all perils compared to those with less than a bachelor's degree (OR 1.48, p < .1). Those over age 60 are more likely than those age 18 to 40 to have coverage for all perils (OR 1.89, p < .1). However, it is 38 percent less likely for homeowners aged 41 to 60 to have flood coverage than those age 18 to 40 (OR .62, p <.1). Homeowners reporting an experience with hazards are over twice as likely to have coverage for windstorm/hurricane damage (OR 2.25, p < .1), though not for flood hazard damage.

Of greater assurance, homeowners residing in a FEMA-designated 100-year flood zone are five times more likely to have an insurance policy that covers flood damages from a disaster event (OR 5.05, p < .01), as expected. Yet approximately 7.8 percent of respondents who are assessed by the study team to be in the flood zone do not have flood insurance. Living in Orleans Parish, the most densely populated Parish, is also a statistically significant predictor of having flood coverage (OR 1.76, p <.1).

TABLE 22

Insurance Coverage Model Results

Variables (with reference group)	Flood Losses Covered			Hurricane / Wind Losses Covered			All Perils Covered		
	Log-odds	Odds	SE	Log-odds	Odds	SE	Log-odds	Odds	SE
Constant	-1.00	.36	0.45	-3.83	0.03	0.04	-0.47	0.62	0.76
Primary Predictors									
Household of Color (non-Hisp. white households)	0.18	1.20	0.34	-0.59	0.55	0.23	-0.006	0.99	0.24
Income >$90,000 (<$90,000)	0.03	1.03	0.32	1.91	6.73***	3.71	0.74	2.09***	0.52
Location Controls									
In Flood Zone (out)	1.62	5.05***	1.77	0.62	1.87	0.90	-0.03	0.97	0.22
In Orleans Parish (other 6 parishes)	0.57	1.76*	0.57	-0.33	0.72	0.37	-0.25	0.78	0.19
Sociodemographic Controls									
Home purchase price (--)	0.14	1.15*	0.09	-.36	0.70**	0.11	0.02	1.02	0.07
Employed full-time (not full-time)	0.83	2.30**	0.77	1.01	2.76**	1.12	0.21	1.23	0.41
Credit score (scale 350-850)	0.002	1.001	0.002	0.01	1.01***	0.003	0.00	1.00	0.002
Age 41-60 (18-40)	-0.48	0.62*	0.17	-0.34	0.71	0.71	0.18	1.20	0.27
Age 61+ (18-40)	-0.00	1.00	0.40	0.58	1.78	1.78	0.64	1.89*	0.72
Bachelor's+ (less than Bachelor's)	0.31	1.36	0.32	-0.21	0.81	0.81	0.21	1.48*	0.31
Female (male)	-0.28	0.76	0.20	0.33	1.39	0.60	-0.16	0.86	0.18
Other Controls									
Past hazard experience (no experience)	-0.25	0.78	0.21	0.81	2.25*	1.01	0.15	1.16	0.26
Model fit									
Chi2, p-value		44.25, p<0.0000			48.98, p<0.0000			27.99, p<0.0056	
AIC		578.448			241.21			827.07	
BIC		638.404			301.19			886.99	
Log-likelihood		-276.22			-107.61			-400.53	

Source: Responses to project survey.
Notes: Statistical significance: *p<.1; **p<.05; ***p<.01. SE refers to standard errors. Model outcomes are based on the following survey questions: "Across all of your insurance policies together, are losses from the following events covered?" with a response of "flood due to disaster event" (sample size =744) or a response of "Hurricane or windstorm" (sample size = 745); and "Which of these best describes the perils of losses covered under your regular homeowners insurance policy? with response of "all perils or losses aside from listed exclusions" (sample size =742).

Insurance Pricing

The second question and its subsequent analytical models focus on the cost of insurance, including premiums and deductibles, and how these varied by homeowner race/ethnicity and income.

Across all respondents, the median annual homeowner insurance premium was $2,273 and median annual flood insurance premium was $504 (table 23). The median annual flood insurance premium for respondents within a flood zone was $747 versus $475 for respondents outside of a flood zone. When looking at the highest value deductible across all policies, the median highest deducible was $2,580. Higher income respondents reported having higher deductibles as well as homeowners and flood insurance premiums as did white respondents except for flood insurance, for which households of color reported having a slightly higher annual flood insurance premium.

TABLE 23

Median Highest Value Deductible and Premiums for Homeowners and Flood Insurance Among Homeowners by Race/ethnicity, Annual Housing Income, and Flood Location

	Insurance Pricing Values		
Homeowner characteristic	**Median highest value deductible, across all policies**	**Median annual homeowner's insurance premium**	**Median annual flood insurance premium**
All households	$2,580	$2,273	$504
Race/ethnicity			
White, non-Hispanic	$3,000	$2,370	$500
Households of color	$2,500	$2,000	$541
Household income			
Less than $90,000	$2,500	$1,987	$504
$90,000 +	$4,000	$2,600	$516
Flood Zone Status			
Not in flood zone	$2,550	$2,215	$475
In flood zone	$3,500	$2,281	$747

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020

Notes: The table represents responses to the questions, "For all the property insurance policies you have, what is the highest value deductible among all your deductibles?"; "What is the amount you pay for your annual homeowners insurance premium only"; "What is the amount you pay for your annual flood insurance premium only?" The calculations exclude those who do not have policies and therefore pay nothing. Households of color include all Hispanics and those of race groups other than white.

Results of the three insurance pricing models are presented table 24. Their results suggest that homeowners experience different insurance pricing and coverage depending on their race/ethnicity and income.

Those with higher incomes have better coverage limits—the maximum amount of money an insurance company will pay for a covered claim. Households with higher incomes ($90,000 or more) paid significantly more for their annual homeowner's insurance premium ($289 more, $p < .05$) than their lower-income counterparts, but the coverage limit for higher income households was also significantly higher ($27,001 more, $p < .05$). That means every extra dollar spent in the insurance premium translated to $93 in added coverage.

Meanwhile, households of color report paying less for homeowner's insurance and having lower coverage limits. Households of color report paying $255 ($p < .05$) less for their homeowner's premium than those who are white but have a coverage limit that is $41,111 ($p < .05$) lower than white households—meaning that, even though they are paying a slightly lower premium than whites, they are getting a much lower coverage limit. No statistically significant associations are present between race/ethnicity or income and flood insurance premiums, however.

Home purchase price also has a statistically significant positive relationship with a homeowner's insurance premium, in addition to being positively associated with coverage limit. However, home purchase price has a significantly negative relationship with flood insurance premiums, after controlling for other factors (Coeff. -$44, $p < .1$). This significantly negative relationship is contrary to a typical relationship where the insurance premium increases as the value of a home increases—confirming that NFIP subsidized premiums for certain households before the recent Risk Rating 2.0 pricing changes. Consequently, being in a flood zone is also associated with paying a higher flood insurance premium, which follows risk-based approaches to determining premiums. The model predicts with statistical significance ($p < .01$) that homeowners located in a flood zone pay, on average, $433 more for their flood insurance premium than homeowners located outside of the flood zone, controlling for other variables.

A handful of other significant relationships surfaced. There is a positive, statistically significant relationship between living in an urban versus a nonurban area across all three outcome variables. e.g., urban areas have higher-valued property and are exposed to other nonhazard risks. A homeowner's educational attainment has a positive statistically significant relationship with coverage limit; on average, a person with a bachelor's degree or higher has a coverage limit that is $29,264 higher ($p < .05$) than a homeowner without a bachelor's degree. In addition, someone who shops more frequently has a coverage limit that is $7,622 higher ($p < .1$), on average, controlling for other variables, than someone who shops less frequently. Shopping more results in modestly lower premium prices for homeowner's or flood insurance, though neither is statistically significant. Having taken any mitigation action, however, is not associated with any pricing outcome.[125]

TABLE 24

Insurance Pricing Model Results

Variable (with reference group)	Homeowners Insurance Premium		Flood Insurance Premium		Coverage Limits	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Constant	$892	583.67	$1,465***	404.47	$78,401	11,7253.9
Primary Predictors						
Household of Color (non-Hispanic white household	-$255**	111	-$58	93	-$41,111**	16,924.7
Income >$90k (<$90k)	$289**	133	-$34	83	$27,001**	12,612.0
Location Controls						
In Flood Zone (out)	-$131	107	$433***	74	-$6,398	12,227.1
Sociodemographic Controls						
Home purchase price (--)	$183***	378	-$44*	22	$27,295***	441.0
Employed full-time (not full-time)	$110	169	-$143	152	-$24,624	25,839.0
Credit score (scaled of 350-800)	$0.22	0.80	-$0.85	0.54	-$84	141.0
Age 41-60 (18-40)	$162	115	$91	84	$11,324	13,947.1
Age 61+ (18-40)	$446**	207	$63	131	$40,584	37,704.2
Bachelor's+ (less than Bachelor's)	$11	103	$94	68	$29,264**	11,490.0
Female (male)	-$114	103	-$25	84	-$3,554	12,128.8
Retired (not retired)	-$92	249	-$346*	195	-$54,553	42,598.2
Other Controls						
Shopping frequency (not frequent shopper)	-$28	41	-$24	28	$7,622*	45,56.8
Mitigation actions (count)	$49	54	$39	29	4313	6,453.9
Received incentive (none received)	-$98	115	$42	104	-$13,088	17,273.9
Made past claims (no claim)	$263**	115	$95	93	-$2,204	15,189.0
Deductible	$0	0.002	$0.00	0.002	$0.05	0.1
Supplemental Coverage (no supplemental)	$185	173	---	---	$13,600	20,110.0
Homeowner insurance premium	---	---	---	---	$20*	12
Model Fit						
Chi2, p-value	10375.23		8184.50		10524.79	
AIC	10413.27		8220.50		10564.79	
BIC	10497.10		8296.90		10644.62	
Log-likelihood	-5187.64		-4092.25		-5262.40	

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020.

Notes: Reference groups are specified in parentheses next to the variable's primary category label. SE = standard errors. Sample: Homeowners Insurance Premium Model N = 609; Flood Insurance Premium model N = 515; Coverage Limits model N = 400. Based on the following survey questions, respectively: "What is the amount you pay for your annual homeowners insurance premium only"; "What is the amount you pay for your annual flood insurance premium only?"; and "For all the property insurance policies you have, how and what is the highest coverage limit specified that your policies provide in the event of a loss or damage?". Statistical significance: *p<.1; **p<.05; ***p<.01

Level of Service

The final set of models explored whether the quality of claim outcomes (that is, their adjudication) or other insurance-related service (referred to here as satisfaction with claims treatment and overall satisfaction with the insurer) also varied by race/ethnicity, income, or flood zone. Preliminary crosstabulations of survey responses describe a mixed bag. Of respondents who reported having filed a claim (a small share of survey respondents), 83 percent reported those claims were either fully paid or mostly paid (table 25). Wealthier households reported higher payment outcomes for their claims in comparison to respondents lower-income households: 86 percent versus 79 percent, respectively. A higher proportion of white households also reported having their claims paid in full or mostly paid (88 percent) compared to households of color (73 percent).

TABLE 25

Shares of Household Groups by Claims Payment Outcomes

	Payment Outcomes of Most Significant Claim (if any)				
Homeowner characteristic	**Paid in full**	**Mostly paid**	**Partially paid**	**Minimally paid**	**Denied**
All households	49.6%	33.7%	8.4%	3.9%	2.8%
Race/ethnicity					
White, Non-Hispanic	50.4%	37.6%	6.1%	2.8%	2.1%
Households of color	47.2%	26.0%	14.2%	6.8%	3.3%
Household income					
Less than $90,000	45.6%	33.5%	11.6%	4.7%	2.7%
$90,000 or more	50.2%	36.1%	6.1%	3.8%	2.8%
Flood Zone Status					
Not in flood zone	52.2%	32.2%	9.0%	3.2%	1.7%
In flood zone	45.4%	36.5%	7.5%	5.1%	4.7%

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020
Notes: Sample sizes for those who responded that their claims were: Paid in Full (N = 139); Mostly paid (N = 101); Partially paid (N= 25); Minimally paid (N = 11); Denied (N = 9). Percentages represent weighted responses. 5 respondents reported having their claims still in process at the time of the survey. The table represents responses to a question about respondents' most significant claim filed in their lifetime: "What was the outcome of the claim?" NH=non-Hispanic. Households of color include all Hispanics and those of race groups other than white?"

Results of the level-of-service models are presented table 26. Across all the models, household income is positively associated with the quality of claims processing. Homeowners with higher household income ($90,000 or more) are significantly more likely to face a shorter claim processing time. Higher-income households are nearly three times more likely to have higher levels of satisfaction with the claims process ($p<.01$). However, households of color are 59 percent less likely to be satisfied with their claims process (OR 0.41, $p <.05$) and 34 percent less likely to be satisfied with their current insurance company compared to white households (OR 0.66, $p < .05$).

TABLE 26

Level-of-Service Model Results

Variable (with reference group)	Claim Time			Claim Satisfaction			Homeowners Insurance Satisfaction		
	Log-odds	Odds	SE	Log-odds	Odds	SE	Log-odds	Odds	SE
Primary Predictors									
Household of Color (non-Hispanic white household)	-0.41	0.66	0.29	-0.89	0.41**	0.18	-0.42	0.66**	0.13
Income >$90,000 (<$90,000)	-0.84	0.43**	0.16	1.008	2.74**	1.18	0.31	1.36	0.27
Location Controls									
In Flood Zone (out)	-0.15	0.86	0.27	-0.24	0.79	0.28	0.03	1.03	0.19
In Orleans Parish (other 6 parishes)	1.06	2.89**	1.32	-.03	0.97	0.50	-0.62	0.54***	0.10
Sociodemographic Controls									
Home purchase price (--)	-0.08	0.92	0.09	-0.11	0.89	0.10	0.01	1.01	0.05
Employed full-time (not full-time)	0.03	1.03	0.64	0.15	1.16	0.51	0.10	1.11	0.29
Credit score (scaled of 350-800)	0.004	1.00*	.002	0.004	1.004*	0.002	0.001	1.00	0.0009
Age 41-60 (18-40)	0.42	1.52	0.64	0.17	1.18	0.47	0.29	1.33	0.26
Age 61 or older (18-40)	0.35	1.42	0.62	0.87	2.38*	1.13	0.34	1.41	0.41
Bachelor's or more (less than Bachelor's)	-0.10	0.90	0.29	-0.27	0.76	0.28	-0.19	0.83	0.16
Female (male)	-0.26	0.77	0.24	-0.00	0.99	0.35	0.09	1.09	0.18
Other Controls									
Shopping frequency (not frequent shopper)	0.35	1.41**	0.19	-0.05	0.95	0.14	-0.13	0.88*	0.06
Mitigation actions (count)	0.26	1.30*	0.19	-0.42	0.66**	0.12	0.02	1.02	0.06
Made past claims (no claim)	---	---	---	---	---	---	0.05	1.06	0.19
All perils covered (not covered)	-0.50	0.61	0.23	0.33	1.39	0.51	0.25	1.28	0.24
Supplemental Coverage (no supplemental)	0.54	1.71	0.80	-1.23	0.28**	0.14	-0.43	0.65	0.18
Past Claim Denial (no denial for past claim)	-0.97	0.38**	0.16	0.38	1.47	0.72	-0.71	0.49*	0.19
Past Cancellation (no cancellation	-0.04	0.97	0.42	-0.64	0.53	0.21	-0.44	0.64	0.19
Claim Time (--)	---	---	---	-1.33	0.27***	0.06	---	---	---
Intercepts									
/cut 1		2.92	1.69		-5	1.84		-3.96	0.88
/cut 2		4.67	1.73		-3.71	1.84		-2.83	0.8
/cut 3		6.33	1.75		-2.44	1.8		0.09	0.78
/cut 4		---	---		-0.77	1.81		1.32	0.77
Model fit									
Chi2, p-value		41.65, 0.0008			89.57, 0.0000			50.21, 0.0001	
AIC		503.97			494.36			1608.09	
BIC		571.85			568.92			1707.76	
Log-likelihood		-231.99			-225.18			-782.04	

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020

Notes: Comparison groups are specified in parentheses next to the variable's primary category label. SE refers to standard errors. Sample sizes are: Claim Time model N = 220; Claim Satisfaction model N = 219; Homeowners Insurance Satisfaction model N = 686. Model outcomes are based on the following survey questions respectively: in response to a question about the respondents' most significant claim filed in their lifetime: "How many months did it take for the insurance provider to process your claim?"; in response to a question about the respondents' most significant claim filed in their lifetime: "How would you rate your satisfaction with the claims process overall?" (Model 3.2); and "Overall, how satisfied are you with the homeowners insurance company that you now have for this home?". This is an ordered logistic regression (ologit). Statistical significance: *p<.1; **p<.05; ***p<.01.

Several other factors have strong negative, statistically significant relationships with claims satisfaction. Homeowners with longer claims processing times (OR 0.27, p<.01), any form of supplemental insurance (OR 0.28, p<.05), and those who reported taking more mitigation actions (OR 0.66, p < 0.05) are less likely to report higher levels of satisfaction with the insurance claims process.[126] While shorter claim times were a predictor for claims satisfaction, longer claim times were predicted by multiple variables. Homeowners who lived in a more urban area (Orleans Parish) were three times more likely to experience longer claims processing times (OR 2.89, p<.05), possibly because a higher rate of claims in urbanized areas lead to slower processing. Homeowners who undertook more mitigation actions were also more likely to have longer claims processing times (OR 1.30, p<.1). A plausible explanation for this delay is that claims adjusters are faced with the challenge of accounting for and verifying the mitigation action and its designed benefit in relation to the damage claimed. Finally, homeowners who shopped more frequently were significantly more likely to have longer claims processing times (OR 1.41, p<.05), presumably because repeated shopping reduced personal contacts with a single insurer.

Aside from race/ethnicity and income, the greatest predictor of satisfaction with claims is mitigation action. Those who took more mitigation actions are 34 percent less likely to be satisfied with the claims process for the most significant claim they filed in their lifetime (OR 0.66, p<.05); this is the closest that our study gets to answering whether mitigation pays. The lower levels of claims satisfaction among those who undertook more mitigation actions is consistent with the longer processing times that are associated with mitigation.

Factors that influence a homeowner's dissatisfaction with their insurance company aside from race/ethnicity include past denial of coverage (OR .49, p<.1), location in an urban area (OR .54, p<.01), and shopping frequency (OR 0.88, p<.1). The significant relationships of shopping frequency with claims processing time and insurance satisfaction collectively indicate that those who shop more frequently face longer claims processing times and are less likely to have higher levels of satisfaction with their insurance providers.

Conclusion

This analysis provides several insights into the three areas of insurance interest: coverage, pricing, and level of service. Households of color are just as likely to have various forms of insurance coverage (flood, hurricane/wind, or all perils) against disaster events than their white, non-Hispanic counterparts. In fact, neither race/ethnicity nor income levels predict flood coverage. This is most likely because the NFIP leveled the playing field, securing flood insurance for all those who need it. In fact, the largest predictor

of having flood insurance is living in a flood zone, where residents are five times more likely to have flood coverage than those not living in a flood zone.

When it comes to other forms of hazard insurance, however, those with higher income are more likely to have coverage against hurricane or wind losses and coverage against all perils. Those with higher credit scores and those who are employed versus those not in the labor force, indicators of higher economic stability, are also more likely to have hurricane or wind coverage. Because hurricane or wind insurance is not required, it may be seen more as a luxury for lower-resourced households. Counter to our expectations, those with higher home purchase prices are more likely to have flood insurance, but less likely to have hurricane/wind coverage. This may be because some homeowner's insurance, perhaps those with higher premiums, are believed to cover wind damage.[127] Households who have past experience with a hazard are more likely to have hurricane or wind insurance, as well. The salience of the degree of damage potential may lead those homeowners to seek additional coverage compared to their counterparts without personal hazard experience.

Pricing analysis also introduces new insights. Like trends on flood coverage, household heads of color have flood insurance premiums that do not vary from white, non-Hispanic households. Flood insurance premiums are also no different depending on the household income. As we would expect, however, households living in a flood zone have significantly larger flood insurance premiums—a risk-induced condition that will likely become even more apparent due to recent FEMA reform. Living in more urbanized areas leads to higher premiums for home insurance and flood insurance, suggesting a unique risk profile there despite the likelihood of greater protective infrastructure in these places.

Racial/ethnic differences exist in premiums and their coverage limits. Households of color have statistically significant lower homeowner's insurance premiums than white, non-Hispanic households, by about $255, but their coverage limit is substantially lower (over $41,111 less in coverage limits). This is equivalent to households of color losing $161 in coverage for every dollar less spent on premiums compared to whites. This suggests that although households of color are paying less for their premium, they are getting a disproportionately lower coverage rate compared to white households. In contrast, higher-income households pay about $289 extra dollars, on average, for home insurance than those with lower incomes, but that translates into $27,001 in higher coverage for their highest coverage limit insurance policy. This equates to gaining $93 in coverage for every additional dollar spent on premiums.

Homeowners with higher levels of education and those who more frequently shop for homeowner's insurance providers have significantly higher insurance coverage rates for their highest limit insurance,

suggesting that understanding one's own policy is important for homeowners to maximize their results—provided a household has the time and capacity to do so.

Finally, regarding levels of insurance service, households of color do not vary in their claim processing time from white, non-Hispanic households, but they are significantly less satisfied with their claims process if they filed one, and significantly less satisfied with their insurance provider. This may be because the treatment that led to the outcomes of their claims was unsatisfactory. Those with higher household income have significantly shorter claim time and are significantly more likely to be satisfied with the claims process. Households in urban areas, namely Orleans parish, have significantly longer claims time than residents in other surrounding parishes, and are significantly less satisfied with their homeowner's insurance providers. The longer claims times in Orleans parish may be related to higher population density, such that when one homeowner experienced property damage, other neighbors did as well, creating a claims backlog. Those with longer claim times are significantly less satisfied with the claims process, and those who have had a claim denied in the past are less satisfied with their homeowners insurance provider.

Somewhat surprisingly, those who have taken more steps toward hazard mitigation face a significantly longer time on their claims and significantly lower satisfaction in the claims process compared to those who took no or fewer mitigation actions. This may be because these homeowners expected that their actions would have provided more protection, making them feel less responsible for damage in the aftermath of a natural hazard, regardless of their insurance provider. Similarly, households with supplemental insurance predicts a significantly lower level of satisfaction with the claims process.

Homeowners who shop more frequently for alternative homeowner's insurance providers tend to have faced significantly longer claims times in the past and are less satisfied with their current homeowner's insurance provider. It may be that these households who shop more frequently do so because they are dissatisfied with their insurance. We are unable to determine exactly when the shopping behavior occurred, but only 6.1 percent of respondents reported that the last time they shopped for new insurance was because they had poor claim service. It may be that those who shop more frequently for insurance providers do so because they have faced longer claims time and poorer customer service, leading them to be less satisfied with their current provider than those who shop less frequently. Future research should work to better understand the motivation behind insurance shopping frequency behavior.

Ultimately, this study expands the conversation around service in the insurance industry in terms of how insurance claims are handled among residents of various demographic and geographic characteristics. The statistical models fill gaps in the insurance coverage literature related to: 1) the characteristics of people who have insurance coverage; 2) the extent of coverage; 3) the quality of insurance policies; and 4) the quality of service that different groups receive. Although several studies assess flood insurance rates, this study considers differences in coverage for specific hazards, such as hurricane or wind-related losses versus flood-related losses. While other flood insurance studies focus on coverage, ours includes an assessment of what factors associate with differences in homeowner's property insurance premiums, flood insurance premiums, and coverage limits. Past studies have not looked closely at the claim outcomes of homeowners by income or race/ethnicity, and most have focused on customer service such as treatment and information provided over the phone, as opposed to claims service. Further, the models expand the conversation around service in the insurance industry—that is treatment by insurance providers—by analyzing factors that have contributed to better or worse process and satisfaction outcomes.

6. Home Mitigation

Chapter 3 finds that homebuyers in greater New Orleans after Hurricane Katrina have on the whole not made decisions about home purchases based on the home's physical capacity to withstand future hazards or mitigate future hazard damages or on the potential costs and effort of mitigating the home after purchase. Consequently, as is found in chapter 4, only a fraction of homeowners who purchased homes in a region with such heightened awareness of hazard consequences ultimately invested in mitigation for their homes. In theory, property insurance and home mitigation are companion solutions to help households prepare their homes and themselves for the future. Yet, chapter 5's findings suggest that households' actions to physically mitigate their homes do not result in changes in insurance pricing, nor do they lead to increased satisfaction with insurance claims processes or with insurance providers—in fact, having mitigation in some form led to greater dissatisfaction with those insurance dimensions. So, why do households mitigate? And more specifically, which households choose to—and can—mitigate?

This chapter focuses on the behaviors and activities of individual households seeking to protect against the damages brought on by disasters in the postrecovery timeframe when more financial and knowledge resources were allotted to mitigation efforts and, ostensibly, more individuals were aware of property mitigation's benefits. The complex system of grants and assistance programs introduced earlier in this report is also explained in more detail. It is important to note, that infrastructure at the multiple scales described in chapter 1 is deeply interconnected with home mitigation efforts not only because these all contribute to the property-level risk profile but also in subsequent risk perceptions, requirements for risk information disclosure, and the coverage and pricing of hazard insurance among many other potential resilience actions—not the least of which is access to home mitigation resources. Decisions on city planning, home construction and home mitigation after the original construction, and infrastructure development are all made in the backdrop of the evolving risks due to climate change.

Background

The construction of the levees through the history of the greater New Orleans area's settlement are reported to have reduced the incentives for developers and homeowners to mitigate individual homes, and increased incentives for development in flood-prone areas—exacerbating the proverbial "levee effect" (Burby 2006; Kunreuther 2006; Oakle et al. 2020). There is some scholarship focused on how those regional protective actions have influenced individual household decisions, often resulting in less attention and property mitigation (Wohl 2000; Godschalk 2003; Brody et al. 2017). The paradox of

public works' protections for individual homes led to development in place like New Orleans to expand into more flood prone areas, without household level mitigation, relying on flood protection systems to reduce risk (Nance 2009). Indeed, elevating homes to well above sea-level, which had been the prevailing norm for the previous two centuries became less common as concrete slab foundations gained popularity. Individual home mitigation, then, became an undervalued home resilience action for most of the last century compared to protective infrastructure and, to a much lesser extent, land use decisions (Mileti 1999; McNutt 2013; Perry, Lindell, and Tierney 2001; Sutton and Tierney 2006).

The devastation of Katrina, however, led to a spate of decisions about where and how to rebuild to prevent similar damage and harm in the future (Bates. and Green 2009; Spader and Turnham 2014). There has been renewed focused on the engineering aspects of home mitigation actions and their likely performance economically (Bass, O'Connor. and Perotin 2018; Multihazard Mitigation Council 2019). However, there is little scholarship on the current prevalence of mitigation actions, on individual homeowners' decisions to mitigate or participate in formal mitigation programs, and on the subsequent impact of home mitigation on other housing and housing resilience actions, such as affordability, access, insurance, and the range of other interventions in this study. When studied, home mitigation has been found to be a valuable asset, for example, increasing home sales prices due to home elevation (McKenzie and Levendis 2010).

Despite their purportedly limited diffusion, a range of property-level actions are possible, though local programs and policies typically shape their potential. Building codes and designated areas, such as flood zones, dictate what mitigation, if any, is required for newly constructed homes and whether those requirements vary by risk level. Elevation of a home, requirements for building materials, and structural reinforcements can be required at the construction stage or as part of later retrofits with federal assistance. Once a home is constructed, programs at the federal and local level may require or incentivize additional mitigation ranging from storm resistant shutters to elevation of the existing structure. Most drastically, home mitigation can take the form of acquisition and relocation (commonly referred to as a buyout).

Given that there are mitigation opportunities despite their purportedly limited diffusion, why do households choose to mitigate? Much literature has focused on the immediacy of a recent hazard event as a primary motivator for mitigation action when, combined with individual risk perceptions and risk attitudes, weigh more heavily that the perceived costs of mitigation (de Koning et al. 2019; Botzen et al. 2019). Across these various forms of mitigation, households also face a housing-constrained set of decisions about what mitigation actions they will pursue. For instance, renters have little ability to affect the mitigation of the properties in which they reside.

Ultimately, much of the homeowner's decision about how and when to mitigate is determined by public policy even beyond the governmental infrastructure investments creating the levee effect. For example, governmental mandates to mitigate are likely inducers (Aerts and Botzen 2011). The presence of rebuilding and recovery funds and programs has also created a moral hazard by reducing mitigation incentives (Kousky, Michel-Kerjan, and Raschky 2018). Further, homeowners who decide to mitigate their homes or are required to do so face a complex set of mitigation strategies and assistance requirement that continue to evolve (Sims and Baumann 1987). The sources of funds, their application and approval processes, and the specifications for individual mitigation actions will vary widely but play a significant role in home mitigation take-up. Consequently, a description of these programs is in order.

Mitigation Programs

Historically, homeowners have relied on the pool of resources for home mitigation coming from FEMA, which administers hazard mitigation assistance grants to states that, in turn, hold control over how funds are deployed to counties or parishes and municipalities or special districts.[128] Other federal agencies administer programs that may be used for home mitigation, such as the three different grant types funded under formula CDBG by the US Department of Housing and Urban Development (including regular CDBG, CDBG-DR, and CDBG-MIT). Smaller pools of funds are also available from the US Department of Agriculture's Emergency Watershed Protection Program Floodplain Easement program and the Army Corps' Flood Risk Management Program, though individual home improvements do not make the bulk of these strategies.

Several challenges have been documented with the receipt of these resources. First, most of the assistance dollars for mitigation have historically been offered after a community has suffered a disaster. This precondition holds for the Hazard Mitigation Assistance Program that had been the largest program by appropriation during the study period and until the more recent Building Resilient Infrastructure and Communities program which, along with the Pre-Disaster Mitigation program, can be accessed without a declaration and have, therefore, reduced this limitation though these programs are competitive. Another pool of resources from the Flood Mitigation Assistance program is focused exclusively on NFIP policy-holding properties, particularly those that have suffered repeated losses (hence, suffering a disaster for eligibility).

Second, the requirements from all these programs tend to allow only larger-scoped mitigation activities—that is, those that are most likely to result in structurally improved mitigation capacity, such as home elevations, wind retrofits, safe room construction, or complete buyouts. Consequently, these

are also among the most expensive of mitigation actions. Combined with the related third challenge of required cost-sharing by the jurisdictions for the federal funds, the total pool of funds that can be allotted are insufficient to meet the magnitude of risk exposures in the country and, further, are ultimately distributed across a small subset of homes.[129] Fourth, the ability to undergo all the administrative protocols in eligibility determinations and untimely bureaucratic processing reduces the likelihood of historically underserved households without the capacity to manage these processes to be among those whose homes are part of that distributions (Weber and Moore 2019). Fifth, the requirement that a positive benefit-to-cost-benefit ratio justifies federal intervention further reduces the likelihood that low-valued properties—those most likely to be occupied by lower-income households—would be able to participate, though exceptions are frequently made. Combined with the fact that all the federal programs were under resourced until very recently, the potential for vulnerable households to access these federal resources for home mitigation improvements is slim. [130]

If federal programs are designed to support the larger home mitigation actions such as home elevations and buyouts, state, local, and tribal government programs are often designed to fill in the gaps for smaller interventions. Most states have their own mitigation programs, which are smaller in budget than the federal programs and tend to rely on more easily managed tools such as financial incentives. In Louisiana, for example, incentives include sales tax exclusions for storm shutter devices, tax deductions for insured property owners who retrofit existing residences to the State Uniform Construction Code, and insurance discounts for retrofits or mitigation improvements.[131]

These programs outcomes vary in method and uptake. From July 2016 through June 2018, the Louisiana Department of Revenue waived the state sales tax on hurricane preparedness supplies during the annual sales tax holiday weekend. Taxes were not applied to the first $1,500 spent on preparedness items, including: portable light sources, portable radios, waterproof sheeting, ground anchor systems or tie-down kits, batteries, generators, and storm shutters.[132] Even with this waiver, the program was fairly limited in scope in that it was only available one weekend per year. A more comprehensive tax policy in the state involves the exclusion of state sales tax and use tax when a homeowner purchases storm shutter devices, regardless of the time of year.[133] Additionally, homeowners may be eligible for tax deductions for voluntarily retrofitting a home to bring it up Louisiana State Uniform Construction Code (and now Fortified Home standards, discussed below). This deduction can total up to 50 percent of the amount spent on retrofitting up to $5,000.[134] However, the property cannot be a rental property, and the work must be inspected and certified by a code enforcement officer of another person registered with the Louisiana State Uniform Construction Code Council.[135]

Along with the state's tax incentives, the Louisiana Department of Insurance also incentivizes mitigation through a series of reductions in insurance premiums. As of 2007, insurance companies were required to establish and offer discounts for property owners that invest in mitigation. Property owners that voluntarily retrofit a home up to the State Uniform Construction Code or install damage mitigation improvements that reduce loss from a windstorm or hurricane are eligible for reduced insurance premiums.[136]

Because of the patchwork and inconsistent nature of available federal, state, and private resources, some homeowners have sought to mitigate their homes independently and with their own resources. In fact, there is a growing pool of remodelers, home elevation contractors, and other related service providers in places like Louisiana that have suffered repeated hazard events (Joint Center for Housing Studies 2023). The specific activities that these contractors may implement will vary, as will the quality of any individual installation. However, standard activities include those that would be make the project eligible for direct public grant funding (such as the federal mitigation programs), for an incentive program (such as a rebate or tax incentive), or for a private insurance premium reduction. Among the last group, there has been an inconsistent and evolving set of specifications for what mitigation action might quality for an insurance incentive, due in part to the variability of insurance regulation across states. However, the most common program for specification mitigation projects that has insurance industry support is the Fortified Home Program administered by the Institute for Business and Home Safety.[137]

Finally, a mix of philanthropic efforts—nonprofits and faith-based—fill gaps in immediate recovery and relief with varying levels of focus on home mitigation for lower-income households. In the wake of Katrina, philanthropic dollars and volunteers seeking to participate in the relief effort poured into the Gulf Coast. Some of these organizations were locally based, while others sprung up to support the burgeoning need.[138] By 2007, almost $1.3 billion had been given by institutional donors, primarily corporate, donors who tended to focus more on the immediate recovery rather than rebuilding or mitigation, and only 3.6 percent of grants by the largest 1,000 philanthropic funders went to resilience, risk reduction, and mitigation combined.[139]

In the greater New Orleans region, faith-based efforts like the United Methodist Committee on Relief and Catholic Charities USA both provided disaster relief services after Katrina and subsequent storms that often involved home repairs Other charitable efforts focused on housing recovery, such as the Make It Right Foundation, had negative outcomes due to shoddy construction.[140] In contrast, nonprofit organizations like Habitat for Humanity and the Saint Bernard Project (now formally SBP) were focused on supporting immediate recovery need. Habitat for Humanity focused on gutting flood-

ravaged properties, clearing debris, and making minor repairs, while SBP focused on providing the essentials necessary for families to return to their homes. While both efforts helped in the immediate aftermath, they did not explicitly incorporate long-term mitigation strategies. Early on, projects conducted by local nonprofits or through faith-based organizations may not have had explicit or rigorous application or eligibility requirements and may not keep diligent reporting records of work conducted postdisaster. Additionally, their housing efforts were not coordinated across the groups and were largely self-directed on an ad-hoc basis per interviews held with their leadership and staff as part of this study.

Study Overview

To better understand the primary factors associated with homeowners' mitigation decisions, the research team underwent two connected efforts. First, the team conducted extensive interviews with federal, state, and local officials, charitable organizations' staff, and other local stakeholders affiliated with public, civil, and private mitigation programs in greater New Orleans to gauge their perceptions regarding the challenges associated with accessing local mitigation resources for individual homeowners. The qualitative findings from this exploration informed the second effort, a quantitative analysis of responses to questions regarding mitigation and preparedness actions that recent homebuyers have undertaken as well as their capacity to take future action in the previously described project survey.

Qualitative Themes

Findings from our survey confirm that there is a large population of homeowners who purchase homes in high-risk locations, as well as a large population that does not believe that hazard conditions will worsen due to climate change. Indeed, some residents may have the means to continue living in risky areas, and others may not have the capacity to avoid living there. While education, information provision, public communications, and subsidies and financial assistance can help deter some from building, buying, or staying in hazard-prone areas, they will not eliminate exposures or vulnerability.

In 2019, we spoke to 26 stakeholders representing public, private, and civic networks and institutions active in mitigation policy, funding, and programming in the greater New Orleans area. Interviewees included stakeholders from government agencies, nonprofit organizations, and community and civic groups. Their insights and feedback along with review of the literature and practice

on mitigation informed the following analysis of the systemic barriers that homeowners face in understanding, accessing, and funding mitigation in their homes. Four primary themes surfaced: quality variation, restrictive program requirements, conflicting incentives and communication, and inequities in accessing mitigation resources.

- Quality variation

  All interviewees noted that there are basic challenges with ensuring that the quality of a specific mitigation installation or construction meets the necessary physical specifications—potentially leading to negative perceptions among individual homeowners about mitigation's effectiveness and informing their willingness to participate. The challenge of conclusively determining whether any specific mitigation action lead to performance improvements during a hazard event and monetizing those benefits transparently also generates confusion for households trying to make decisions between them.[141] The quality of the substantial rebuilding efforts in the aftermath of Katrina was variable, and even when consistent construction was monitored, the homes were rebuilt to different standards and specifications. Since most mitigation resources were historically offered after disaster events when recovery was simultaneously occurring (including during the time of study), the variability has led to confusion about the benefits and effectiveness of mitigation efforts for many.

- Restrictive program requirements

  Interviewees reported that many mitigation problems are challenges for homeowners both in terms of the types of mitigation activities allowed as well as the overall bureaucracy of applications, approvals, construction, and verification. This starts with the numerous preconditions associated with federal and state programs that can be confusing or administratively prohibitive for some households. For example, stakeholders noted the cost of NFIP insurance is a major barrier to accessing HMGP funding. The requirement to bring an existing home up to current building code for postdisaster mitigation programs if damages exceed 50 percent of a home's value could also lead some households to underreport damages or forgo mitigation altogether. Further, households with lower incomes may not be able to afford flood insurance at all, while those that live outside of defined flood zones but who may still face flood risk are not required to purchase it. Many mitigation programs and resources also require certifications or inspections that are intended to ensure mitigation activity occurs, such as elevation certificates for federal grants or inspection reports for state tax incentives, but associated costs can make mitigation activities cost prohibitive for households with limited resources. Indeed, one respondent suggested that the cost of paying for private inspectors can

offset the value that the tax credit offers altogether. For the higher-cost mitigation actions that federal and state assistance covers, these barriers to entry are particularly onerous.

Yet not all barriers are rooted in costs. Government programs require various forms of documentation, including deeds and other forms that document ownership. However, multigenerational homeowners may not be able to produce these documents. This is especially damaging as the structures occupied by these households may be those most at risk of severe damage because of their reduced rate of home improvement and subsequent higher probability of lower quality. The bureaucracy and prolonged time horizons for applying, even for those households with full documentation and clear motivation, is also daunting.

- Conflicting incentives and communications

  Interviewees noted that many households did not understand the various programs or their own eligibility, particularly given changing program rules as well as their own properties' characteristics and flood zone status. Without resources to provide constant and effective communications, program staff could only rely on households' voluntarily solicitation of programs with a few exceptions such as repeat-loss properties. Further, because mitigation resources were available at the same time as recovery aid, the expansive number of programs and their offerings over time could confuse households further. Ultimately, however, respondents noted a general lack of awareness of any mitigation programs as a key concern.

- Inequities in mitigation

  Respondents noted that cost factors exclude some households, but these disparities are highlighted in areas that have been underserved by public services, infrastructure, and housing assistance—leading to a lack of mitigation in places that may have the highest vulnerability. Because many of the programs had not been utilized by lower-income households, for example, the respondents could not comment on their particular barriers or challenges for accessing mitigation resources and performing mitigation actions beyond noting the apparent disparity within their program recipient pools.

Quantitative Analysis

All these themes provide a rich context for exploring individual homeowner's decisions to mitigate. Differences in individual program's dosage or detailed program-related engagement or take-up qualities for each survey respondent could not be quantified, however. In fact, in many cases, interview stakeholders noted that homeowners were challenged with even identifying the names of different

programs beyond which level of government was the primary point of contact. Though participation in mitigation programs is an outcome of interest, the quantitative analysis of mitigation decisions includes predictor variables related to the homeowner's characteristics rather than those of the various programs.

DATA AND DESCRIPTIVE SUMMARIES

Like other studies, this hazard mitigation analysis relies on responses from the project survey. From those responses, we noted that few homebuyers conducted mitigation activities; no more than one fifth of households had conducted any one mitigation activity, such as roof strengthening, moving of mechanical and electrical equipment, and storm shutter installation (see question 50 in appendix B for the list of all actions). These are among the least costly of the list provided to survey respondents, a list for which most actions had been implemented by single-digit shares of households.

To expand on the range of household actions beyond mitigation, then, the team also includes responses to preparedness questions (e.g., actions to ready during a hazard event) to descriptively gauge their rates of uptake across homeowners and whether the latter informs the former, and to describe. Preliminary observations from these survey responses shed insight into the general uptake and selection across preparedness and mitigation actions, awareness of incentive programs, and the monetary amounts that households have paid, and report to be willing to pay, for them.

Descriptive statistics from respondents to the project survey are provided in table 27.

TABLE 27

Descriptive Statistics of Selected Variables

		Statistical Measure					
Variable		**Obs.**	**Share**	**Mean**	**SD**	**Min**	**Max**
Outcome variables							
Any Mitigation		952		0.36	0.02	0	1
0	No mitigation action	611	64.2%				
1	Any mitigation action	341	35.8%				
Preparedness		919		4.1	0.05	0	6
0	No preparedness actions	20	2.2%				
1	One preparedness action	56	6.1%				
2	Two preparedness actions	76	8.3%				
3	Three preparedness actions	122	13.3%				
4	Four preparedness actions	188	20.5%				
5	Five preparedness actions	319	34.7%				
6	Six preparedness actions	138	15.0%				
Sociodemographic and locational controls							
Race/Ethnicity		931		0.33	0.47	0	1
0	White Non-Hispanic	684	67.0%				
1	Person of Color	247	33.0%				
Age		948					
0	18 - 40	383	40.4%				

Variable		Statistical Measure					
		Obs.	Share	Mean	SD	Min	Max
1	41 - 60	373	39.4%				
2	Older than 60	192	20.2%				
Gender		939		0.50	0.50	0	1
0	Male	466	49.6%				
1	Female	473	50.4%				
Household Income		904		0.43	0.50	0	1
0	Income < $90K	491	56.7%				
1	Income >= $90k	413	43.3%				
Disability				0.86	0.01	0	1
0	No Disability	132	16.5%				
1	Any disability	788	83.5%				
Flood zone status		952		0.38	0.48	0	1
0	Not in flood zone	633	62.31				
1	In flood zone	319	37.69				
Information sources				6.06	0.08	0	11
0	No information sources	20	2.2%				
1	One information source	12	1.3%				
2	Two information sources	30	3.3%				
3	Three information sources	61	6.6%				
4	Four information sources	92	10.0%				
5	Five information sources	139	15.1%				
6	Six information sources	173	18.9%				
7	Seven information sources	158	17.2%				
8	Eight information sources	108	11.8%				
9	Nine information sources	52	5.7%				
10	Ten information sources	33	3.6%				
11	Eleven information sources	40	4.4%				
Supplemental Insurance				0.87	0.01	0	1
0	No	118	12.8%				
1	Yes	798	87.2%				
Able to pay				0.73	0.01	0	1
0	Nothing	248	26.9%				
1	More than $0	674	73.1%				

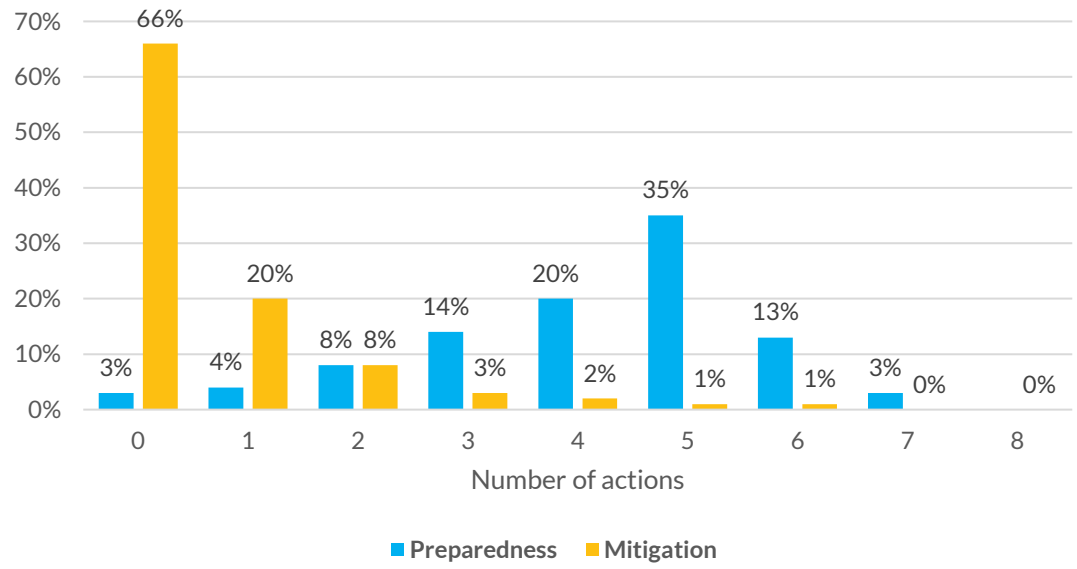
Source: Responses to project survey (N=951).
Note: Shares of responses are weighted. Obs. = observations and are not weighted, SD = standard deviation.

Preliminary inspection of survey crosstabulations reveals, however, the most households reported that they had not taken any mitigation actions. Far more homeowners took actions to prepare for potential disasters that tend to require less financial outlay than took actions to mitigate the effect of a disaster. For example, even though fewer than one in three respondents reported having an emergency generator (30.8%)–a preparedness item—this rate was still nearly twice that of those reporting having made improvements to strengthen their roof (17.7%)—a more costly action.

Households tended to take multiple preparedness actions as well (figure 10). Among the two respective groups of households that took any preparedness action and those that took any mitigation actions, respectively, the largest number households elected to do five preparedness activities (35 percent of households) compared to no mitigation (66 percent).

FIGURE 10

Percentage of Homeowners Who Took Mitigation and Preparedness Actions



Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020

Notes: N for preparedness items ranges from 936 to 944; N for mitigation actions ranges from 935 to 940 due to omissions. The number of possible preparedness actions allowed by the survey is six (not including "other") and for mitigation actions is eight.

There are only modest demographic differences across reported preparedness actions (table 28). For example, white households were significantly more likely than households of color to have a generator—the costliest of the preparedness actions—but households of color were more likely to have emergency water, other emergency supplies, and an evacuation or family meeting plan. Younger households (those aged between 18 and 40 years) were less likely to have taken preparedness actions than older households for every preparedness action except for having important documents collected, for which there was no significant difference by age.

In contrast, no demographic differences were found across any of the mitigation items—including race/ethnicity variables.

TABLE 28

Share of Household Group Implementing Select Preparedness and Mitigation Actions

		Household Group						
		Race / Ethnicity		Age (years)			Gender	
Action	All	White	People of Color	18 to 40	41 to 60	Over 60	Female	Male
Preparedness actions								
A generator to provide electricity	30.8%	33.3%**	24.1%**	21.3%***	34.1%	40.9%	34.8%*	26.6%*
Enough nonperishable food to feed yourself and household three days	84.6%	84.4%	84.3%	78.2%***	89.3%	87.2%	86.1%	83.3%
At least three gallons or 24 bottles of water for each household member	73.9%	71.8%*	77.7%*	63.8%***	81.9%	77.2%	75.4%	72.6%
Necessary emergency supplies and available to take if evacuated	74.5%	73.5%*	77.0%*	70.4%**	78.7%**	73.7%	73.7%	75.5%
Important documents together and available to take if evacuated	87.5%	88.1%	86.3%	86.1%	86.8%	90.9%	86.3%	88.6%
Evacuation plan or family meeting points	61.3%	58.5%*	67.1%*	53.4%**	67.0%**	64.3%	62.2%	60.7%
Mitigation actions								
Strengthened the home's roof	17.7%	17.2%	19.4%	15.5%	18.8%	21.0%	17.0%	18.9%
Moved equipment	12.9%	12.9%	12.9%	10.3%	16.1%	12.9%	11.9%	14.2%
Installed storm shutters	10.9%	9.9%	13.0%	6.3%	13.6%	15.1%	12.2%	10.0%
Strengthened the home's foundation	6.0%	6.6%	4.5%	7.1%	5.3%	6.0%	5.7%	6.3%
Elevated your entire home	5.7%	4.8%	7.0%	6.2%	5.6%	5.3%	4.6%	7.1%
Installed backwater valves	5.0%	5.1%	4.9%	4.3%	7.1%	3.2%	5.8%	4.2%
Retrofitted your basement or first floor	2.0%	1.9%	2.5%	2.9%	1.8%	1.3%	1.6%	2.6%
Installed earthen berms	0.9%	0.8%	1.2%	1.6%	0.7%	-	0.7%	1.1%

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020

Notes: Statistical significance: *p<.1; **p<.05; ***p<.01 ; N for preparedness items ranges from 936 to 944 due to omissions; N for mitigation actions ranges from 935 to 940 due to omissions. The preparedness actions are based on response to the following survey question: "Which of the following do you have available or on hand in case of an immediate hazard event or emergency?," The mitigations actions are based on response to the following survey question: "Have you done any of the following to your home?" Analysis is with no controls.

As noted by interviewed stakeholders, survey results show that households likely were unaware of the public and private incentive programs for which they may have been eligible. Fewer than one third (29 percent) of households were familiar with the most common state program, the Preparedness Sales Tax Holiday (table 29). Within each program for which households were aware, even a smaller proportion had applied.

TABLE 29

Household Awareness and Application to Select Preparedness and Mitigation Programs

Mitigation Program	Aware	If Aware, Also Applied
Hurricane Preparedness Louisiana Sales Tax Holiday	29%	29%
Insurance Premium Discounts	24%	45%
Tax Deductions for Voluntary Retrofit	10%	7%
Louisiana State Sales and Exclusion Tax Credit for Storm Shutters	8%	5%

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020

Notes: N for mitigation actions ranges from 144-146 due to omissions. Responses to question "Are you aware of any of the following grants, loans, or other financial incentives available to you for your property? These may be from the federal, state, or local government or local nonprofits. If so, indicate if you are aware or have taken advantage of the incentive.

The most common reason why homeowners did not take advantage of any programs even when they were familiar with them was because they did not understand the incentive programs, reported by 34 percent of respondents. This difference is slightly more pronounced by race/ethnicity. As table 30 shows, households of color reported higher rates of not understanding incentive programs.

TABLE 30

Share of Household Racial/Ethnic Group Aware of Incentives but Did Not Act by Reason

	Non-Hispanic White Household	Households of Color
My home is not eligible to receive the incentives	16.6%	11.6%
I cannot afford to implement the mitigation technologies	11.3%	12.7%
I do not understand the incentive program	31.7%	40.8%
I have not had time to apply for the incentive program	19.7%	14.2%

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020

Notes: N = 670.

Another important series of questions in the survey focused on the costs of projects that households had taken (among those that reported having made hazard mitigation improvements) and what they might be willing to pay for future mitigation actions or improvements (table 31). There were

only modest differences by racial/ethnic group in past project costs, suggesting that costs for projects undertaken were generally similar. However, there were slightly wider differences in ability to pay for future improvements. On the whole, non-Hispanic white households were more likely to report being able to pay more than households of color. Households of color were more likely to report that they could pay nothing, and less likely to report that they could pay higher amounts.

TABLE 31

Share of Household Racial/Ethnic Group Reporting Paying or Being Able to Pay for Mitigation Costs

	Payment for Past Mitigation Action		Ability to Pay for Future Mitigation Action	
Expenditure range	Non-Hispanic White Households	Households of Color	Non-Hispanic White Households	Households of Color
$0	56.9%**	47.5%**	27.4%**	37.0%**
$1 to $2,499	14.8%	16.2 %	22.8%	24.7%
$2,500 to $4,999	6.4%**	10.8%**	18.2%	17.7%
$5,000 to $9,999	7.1%	9.5%	13.8%**	9.8%**
$10,000 to $19,999	8.0%	5.9%	6.9%**	4.3%**
$20,000 or more	7.5%	10.0%	10.9%**	1.3%**

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020.
Notes: N = 874-904 depending on question omissions. Statistical significance: *p<.1; **p<.05; ***p<.01 with the reference category being zero.

In shorts, costs, or rather, the differential abilities to pay for the costs of mitigation actions, surface as an important factor from our survey's respondents. This is true even with regard to taking advantage of inventive programs: lower-income households (again, those with annual incomes less than $90,000) were twice as likely (14.6 percent) to report not being able to afford mitigation action even when they were aware of incentive programs and reported not taking advantage of them compared to their higher-income counterparts (7.4 percent) with the same incentive awareness and lack of utilization.

VARIABLE SELECTION

Specifically, to test for relationships between the conditions and characteristics associated with taking preparedness and mitigation actions, the study team selected two primary outcome variables. We assessed preparedness by whether respondents had taken past preparation actions that would allow them to address immediate challenges or risks in the event of a future disaster emergency. Respondents

were asked to select all answers that applied to them in response to the question, "Which of the following do you have available or on hand in case of an immediate hazard event or emergency?"[142]

We considered that taking a greater number of preparedness actions associated with being more prepared and taking fewer preparedness actions associated with being less prepared. In contrast, we assessed mitigation by whether respondents had taken any past actions to reduce potential negative impacts in case of a future disaster emergency. Respondents were asked to select all answers that applied to them in response to the question, "Have you done any of the following to your home?"[143] Because the mitigation actions are substantively larger and require greater financial outlays relative to most of the preparedness actions, we measured mitigation as having taken at least one mitigation action relative to having taken no mitigation actions. Relevant variables were identified from the risk perception, disaster, and environmental social science literatures and categorized into the following two groups.

- Sociodemographic and location predictors

  Sociodemographic variables were selected to test for variation in preparedness and mitigation, following similar specifications as all previous studies by race/ethnicity, age, gender, annual household income, and disability status. Respondents' addresses were also geocoded to evaluate any effect of residential location within or outside of a flood zone.

- Efficacy and capacity predictors

  A count of resource and information sources used by respondents to stay informed about risks was constructed to also test whether information about potential risks influences preparedness and mitigation actions. Respondents were asked whether they were aware of or utilized the range of information sources noted in chapter 4. Sources were aggregated as a continuous variable to measure more versus less information. Purchase of supplemental insurance was another measure for capacity, assuming that if respondents were able to afford additional insurance beyond standard homeowner's policies, they may be better positioned take preparatory or mitigation actions.

  As a final indicator of capacity for mitigation actions specifically, we included a measure for how much respondents would be able to pay now for related costs. Respondents were asked to indicate how much they would be able to pay in construction costs to significantly reduce their home's risk to hazards in the future: $0; $1-$2,499; $2,500-$4,999; $5,000-$9,999; $10,000-$19,999; and $20,000 or more.

ANALYTICAL MODELS

The study team ran two regression models to assess the likelihood of taking preparedness and mitigation actions.[144] To model preparedness actions, the team conducted a Poisson regression. To model individual characteristics and other conditions associated with taking a greater number of preparedness actions (the preparedness model), we conducted a Poisson regression. Because mitigation actions are substantively larger and require greater financial outlays relative to the preparedness actions—which, by comparison, tend to be less expensive and potentially more actionable—we were interested in identifying the characteristics or conditions that associate with taking at least one mitigation action. To assess the probability of taking at least one mitigation action, we conducted a logistic regression, which allows for the exploration of factors that predict taking at least one mitigation action versus taking no mitigation action (the mitigation model). For each model, sociodemographic measures, location measures, and efficacy and capacity measures were tested.

Prior to running the Poisson model, a histogram of observed data revealed a right skew with many lower values and fewer higher values, indicating a generalized linear count model may be appropriate. To assess Poisson model fit relative to negative binomial (or other inflated) model fit, a likelihood ratio test statistic produced results that were not significant ($p>.1$), indicating that proceeding with a Poisson model was appropriate as it was a better fit to the data. Prior to running the models, we conducted a crosstabulation analysis of categorical predictors to check for two-way significance using the Wald Chi-Square test and significance levels and tested for multicollinearity.

Findings

The models offer insights into the household characteristics associated with the decision to invest in preparedness or mitigation actions (table 32). For preparedness, age is the only sociodemographic or location characteristic that associates with having taken a greater number of actions, with older households (those whose head is age 41 or older) more likely to have taken a greater number of preparedness than their younger counterparts. No other demographic variables, including race/ethnicity or income, or spatial ones such the home location in or out of a flood zone, were significant predictors of having taken more preparedness actions. Having access to more sources of information was associated with having taken a greater number of preparedness actions although the effect is substantively small.

TABLE 32

Preparedness and Mitigation Action Model Results

	Preparedness Action Model			Mitigation Action Model		
Variable (with reference group)	**Coeff.**	**IRR**	**SE**	**Log-odds**	**Odds**	**SE**
Sociodemographic and location predictors						
Household of color (non-Hispanic white)	-0.03	0.97	0.04	.30	1.34	0.28
Age 41—60 (18-40)	0.13	1.14***	0.04	.14	1.15	0.22
Age 60+ (18-40)	0.14	1.15***	0.04	.01	1.01	0.25
Female (Male)	0.02	1.01	0.03	.09	1.09	0.20
Household Income > $90k (<$90k)	-0.01	.033	0.03	-.13	0.88	0.16
Disability (no disability)	0.004	1.00	0.04	.06	1.06	0.27
Home in flood zone (out)	0.006	1.00	0.03	.01	1.01	0.19
Efficacy and capacity predictors						
Information sources (count)	0.02	1.02***	0.007	-.02	0.98	0.04
Supplemental insurance (no supplemental)	0.03	1.03	0.05	.12	1.13	0.31
Ability to pay (no ability)	---	---	---	.42	1.52**	
Preparedness (no actions)	---	---	---	.08	1.08	0.07
Intercepts						
cut1	1.17	3.21	0.08	-1.36	.26	0.12
Model Fit						
Chi2		2916.32***			957.79, .48	
BIC		2983.03			1031.02	
AIC		2936.32			979.78	
Log-likelihood		-1458.16			-478.89	

Source: Greater New Orleans Homeowner's Survey, Urban Institute, 2018–2020

Notes: Weights were used in the model. IRR refers to the incidence rate ratio. SE refers to the standard error. Preparedness is based on count of affirmative responses to zero to seven options to the question: "Which of the following do you have available or on hand in case of an immediate hazard event or emergency?" Given the dependent variable is a count of the number of preparedness actions, we use a Poisson regression. Mitigation is based on indication of taking any mitigation at least one of the eight mitigation actions specified int response to: "Have you done any of the following to your home?" Given the dependent variable is predicting one of two conditions, we use a logistic regression model to predict taking any mitigation action. Statistical significance: *p<.1; **p<.05; ***p<.01

In assessing mitigation actions, no sociodemographic or location characteristics were significantly associated with increased likelihood of having taken at least one mitigation action. The purchase of supplemental insurance was also not a significant factor. Only the ability to pay was associated with having taken at least one mitigation action. In fact, with each additional expenditure range a household was able to pay, the odds of having taken at least one mitigation action in the past increased by about 50 percent.

Conclusion

No disaster highlighted the complexity of housing mitigation more than Hurricane Katrina. The system of levees which catastrophically failed during the 2005 storm, capture much of the public's attention. Yet, the Gulf Coast's other mitigation strategies like community and land use planning and building elevation are just as critical to understanding why later hurricanes caused so much damage.

Three key insights emerge from this analysis that highlight civic and policy engagement opportunities to increase homeowner preparedness and mitigation actions against future hazard and disaster events by prioritizing investment and resources to three population groups: those living in floodplains, younger adults, and people of color. An important finding to emerge from this analysis is that neither home location in or out of a flood zone or access to information about home risk associates with whether households will take mitigation or preparedness actions. Having access to multiple sources of risk information only appears to minimally inform preparedness, but not mitigation activities. Although no significant differences were found by floodplain location, households living in flood zones would ostensibly benefit the most from resources to reduce costs and other barriers to access for mitigation and preparedness actions., though no significant difference was found.

Though age was a predictor of preparedness (that is, older households appear more likely to have taken preparedness actions), age has no effect on mitigation actions. Having taken preparedness actions is also not a predictor of mitigation action, though mitigation advocates and institutions often attempt to communicate both through the same messages. In the future, targeting risk communication information and resources to younger adults—who, in our analysis, were less likely to be prepared—could reduce future risks for these populations.

Finally, we did not find race and ethnicity to associate with taking either preparedness or mitigation actions in the past. Yet, there were statistically significant differences between white households and households of color in their reported ability to pay for future mitigation actions now, with households of color much more likely to report they are not able to pay any amount, and much less likely to report they could pay higher amounts ($20,000 or more) than white households. The intersection of race and ethnicity with the ability to pay is of critical importance, as the historical lack of familial wealth by Black and Hispanic households compared to white ones even when controlling for income is likely prohibiting the kinds of investments that are required in the design of most current mitigation programs.

In short, ability to pay is the primary determinant of mitigation action. A more granular measure of income would likely have corroborated this. This holds more strongly for the costlier mitigation actions that could be subsidized with public assistance. But the unaffordability of mitigation actions could also

be a deterrent for lower cost items for which there are financial incentives such as state tax deductions, sales tax forgiveness, and premium reductions from private insurers—all of which require upfront expenditures on the households' part. Mitigation programs that either help offset the upfront costs completely or allow for a longer payback period could help level out differences between households. Combined with better and more strategic outreach and recruitment, a new pricing scheme could also increase the low rates of mitigation that currently occur in the region with one of the highest risk profiles in the country.

This chapter contributes to the currently limited body of scholarship on the factors associated with taking preparatory and mitigation actions to reduce vulnerability to climate hazards. Yet, there is much more work to be done to understand mitigation actions' effects on the occupants' perceptions or risk, their engagement with and advocacy for regional protective infrastructure, and resulting insurance coverage, pricing, and treatment—not to mention the ultimately measurable protective benefits from individual mitigation actions during hazard events.

Conclusion

Better housing is known as a platform for numerous life outcomes (Turner 2010). Better housing improves the financial wealth, health, and other outcomes critical for the lives and livelihoods of its occupants. Housing conditions—physical quality and location—also determine environmental risks (Bullard 1993). The risks from hazards associated with climate change—from acute disasters such as hurricanes to chronic ones such as flooding from sea-level rise—are no different (Pastor et al. 2012). Housing can be a key opportunity for building resilience and sustaining well-being not just for the individuals who shelter in it, but for the communities that built it and the regional infrastructure and public works that sustain it.

Our system of mitigation the risks of person and property damages from these hazards has evolved into a complex web of infrastructure, building design, construction and rehabilitation, and community planning and decisionmaking at multiple levels of governance and scales of action. Yet, the most common strategy for physically mitigating homes from hazard risks historically in the US has been by building that local or regional infrastructure to protect whole swaths of land and communities—that is, not necessarily mitigating individual homes (Nance 2009). Many policymakers from federal to local government as well as members of the professional class of housing industry occupations arguably view the almost 130,000,000 homes that already exist in the US today as an overwhelmingly immutable physical, economic, and political monolith—one whose transformation in light of changing environmental and cultural may be insurmountable.

The findings presented in this report suggest that this is not the case. Further, they argue that the conventional wisdom must change. Chapter 1 provides evidence that these massive investments in protective infrastructure result in public works that—although critical pieces of the mitigation landscape—are often costly, cumbersome, largely unresponsive to underlying social vulnerabilities, and, as we have seen happen repeatedly in the greater New Orleans areas, challenging to maintain in an ever-changing climate. Chapter 2 suggests that these projects have also largely been exclusive, guided by political interests and professional technocrats more than the households that have, currently do, and will settle the lands that the projects are designed to protect. Considering and elevating the individual homes will help make the discourse over national mitigation inclusive.

Consequently, the study explores four additional channels that pertain to behaviors, decisions, and activities that fall within the agency of the home occupant. The variability of perception about risks, their impending presence, and their potentiality for igniting personal jeopardy is the focus of chapter 3.

That chapter finds heightened risk perceptions among vulnerable populations among low-income households and households of color, but an inability to translate that perception into actionable housing decisions likely due to the persistent and pernicious legacy of racism and growing income disparity and their cumulative effect of limiting housing choice. These same societal foundations likely determine the kinds and qualities of information different households received about their homes' past and current exposures to future hazards, as well as their capacity to understand that information and translate into action as described in chapter 4. The most conventional action, the access to property insurance at the appropriate level of coverage to match the risk while being affordable and treating all households fairly, is the substance of chapter 5, while chapter 6 reviews the opportunity to physically strengthen homes or, when those options' benefits diminish, possibly lead to compassionated and tempered abandonment and relocation. Both actions, for now, continue to be harnessed at different rates by different members of local and national community—particularly low-income families and households of color.

Each of the six studies conducted under this project provides insights that should inform changes both in current policy and in future research agendas. Yet, the project's focus on disparities and inequities across all housing resilience dimensions brings several potential changes to current policy and many opportunities for additional scholarship. This project advances our understanding of the role of public policy in affecting housing resilience and for exploring it further in scholarship.

Principles of Housing Resilience

The solutions that are explored in this inquiry into housing resilience have evolved significantly over the last century, particularly as consciousness about hazards, or socio-environmental disasters, have become more frequent and severe and our exposed populations and settlements have grown larger. This evolution in thinking has highlighted the importance of four fundamental principles in our thinking about how to respond collectively to hazards. These principles span our modes of governance, our stewardship over both ecosystems and the public commons, most importantly, our belief in fairness.

The first, and most important, of these principles is that of equity. Housing is one of the earliest and most significant areas of public policy and economic transaction to face inquiry over who benefits disproportionally from positive societal decisions and actions and who bears the burden of negative consequences. Fairness in housing access, treatment, and outcomes from current policy and programs that also acknowledges and repairs past social damages applies to future environmental ones.

Much recent media and advocacy attention has focused on past instances in which either a disaster recovery was grossly insufficient and inequitable in general (typically in instances of major severe disasters) or that left a legacy of ongoing social, economic, and political divisions in a community that continue to be ascribed to the disaster event after. In both cases, equity theory posits that policy interventions need to first prioritize those communities that still suffer from past disaster disparities for funding and recruitment. More significantly, they argue that public intervention must provide resources above and beyond typical disaster repairs or the norm for the current program to rectify the legacy and trauma from multiple or even intergenerational hazards. The identification of demographic and behavioral groups in the disaster affected areas is an essential step toward measuring differences between them in relation to a service. The primary federal agencies focused on housing resilience have recently made notable strides toward these goals.[145]

However, more work is needed given the persistent disparities that this project has documented. Authentic resilience in housing, simply, cannot continue inequitable practices. Ongoing disparities in housing practices including several found in this project compels change, starting with the acknowledgment of the mutual dependence between households when it comes to hazard responses and mitigation, from insurance pools to regional infrastructure.

This interdependence also requires shared stewardship of land and community assets to distribution of risk pools that make insurance and governance possible. The efficient use of funds, another principle for reform, is critical to ensure that funds that should be provided to support households and their housing is not wasted in bureaucracy or profit-seeking. While the continuum of equity dimensions is central to reform, the dimensions associated with efficiency are more practical. Typically, these items are measured by speed of delivery (time), overall expenditures and per household (costs), and staff numbers and obligations across the relevant federal, state, and local governments and their designated representatives (bureaucracy). Despite public accountability including regulations of private housing and insurance transactions, however, there is no clear assessment of costs per household across programs or of the value addition of different stakeholders. In fact, there has been more of a focus on household fraud rather industry abuse.

A third and related principle of reform comes from considering whether policies, programs, and private actions work—that is, effectiveness. In the case of housing resilience, mitigating all homes physically is not an effective solution considering the interconnected physical systems in communities and the changing environmental conditions. Even more broadly, mitigation homes from harm will not, ultimately, remove that harm or reduce the risk completely. In some cases, investments in either

infrastructure or home mitigation will create an inaccurate sense of security and an inappropriate set of responses by households and communities.

Moral hazards created by any public intervention among disaster-exposed communities and disaster-vulnerable households must also be considered. For programs like the NFIP, Congress has established an institutional order in which households forgo more financially or environmentally appropriate decisions with the expectation of public assistance after a hazard event. The increased expectation that the federal government will intervene during and after every disaster has generated unreasonable expectations about the speed and magnitude of response while disincentivizing individual agency at the community level (for example, to improve community infrastructure and invest in governmental planning and preparations) and among households (through the purchase of hazard insurance policies). This is especially so among communities and individuals with the knowledge and financial resources to act independent of federal intervention. The reduced future implicated costs of current recovery actions must be considered against benefits in realistic—though still equitable and comprehensive ways—in future reforms and interventions.

Finally, effectiveness requires evidence. This project has demonstrated only further evidence of the range of actions that can be associated with housing resilience, particularly those related to disparities. But more work must be done to measure disparate impacts between group. Health, housing, and financial outcomes for vulnerable households have been known to diminish severely due to hazard events, particularly for those that were in hardship or vulnerable beforehand. The kinds of interventions that are produced from the range of interventions and resilience strategies described in this report, while physically helpful for households' immediate mitigation, have a deeper contribution to long-term impacts that may determine whether the intervention was ultimately equitable. For example, a concentrated investment in home buyouts or community-level infrastructure could result in rising housing unaffordability, displacement, and gentrification. Yet, these life outcomes are rarely measured and monitored though their cumulative effect is a critical dimension of disaster equity.

To all four of these principles, then, the project's research team proposes a range of policy and scholarly recommendations.

Policy Recommendations

The overriding concerns that spurred this project—that housing matters and that disaster policy solely focuses on properties' market values—respectively lead to two general policy recommendations that

our studies' findings echo. First, simply, policymakers must support affordable and physically durable housing. Housing is infrastructure. It is as critical as the major public works that are the backstop in American hazard management history. This is especially true for rental housing which this project was unable to fully integrate.

Recent major legislation ignored the importance of housing in our nation's economy and our communities' livelihoods and households' lives—that is, housing continues to be overlooked as the physical and social infrastructure that it is. Affordable and resilient housing development needs to be supported financially through Congressional appropriations, with more stringent regulations about how nonresilient homes are financed, and with improved formula and competitive grant programs that foster better state and local policies to ensure that sufficient resources are diverted to house the most vulnerable households in resilient housing. The purported tension between affordability and higher housing quality must viewed as false binary, though further research and development funding could explore cost-effective housing resilience strategies beyond the paltry few that exist and that are analyzed in this project.

Along with better housing policy, second, we need better disaster and emergency polices that are community-centered and whose implementation is household-focused. This means supporting community decisionmaking processes and planning directly rather than having those be administrative line items for the implementation of other projects, working collaboratively across jurisdictions with shared hazard risks to coordinate housing stocks, and providing at least as many resources for decentralized housing specific hazard mitigation actions as for large defensive infrastructure. For each of the housing resilience dimensions, additional recommendations follow.

Infrastructure Protections

The study found that the protective infrastructure that theoretically allows for individual buildings, homes, and other constructions and economic activities to exist behind or in proximity to that infrastructure does not consistently distribute the benefits of reduced risk equitably. Our recommendations strive to rectify this imbalance.

- The focus of new infrastructure and maintenance of current infrastructure should be on serving the underserved. Too often, the most exposed household are aggregated into regional plans for public works and land decisions without attention to their vulnerabilities. A more equitable investment would first prioritize the geographic communities that were underserved in the

past, as well as ensure that they have access to the infrastructure's benefits—without creating new burdens that they would bear.

- Increasing transparency about infrastructure priorities would help communities plan for when they are climatologically and hydrologically better served by infrastructure investments versus assistance to individual households should for mitigation of their current homes or relocation.
- Better project benefit-cost analysis is needed include cultural value, ecosystems, social networks, neighborhood cohesion, and other nonmonetized assets as well as more refined analyses of distributional effects by income, race, and cumulative hazard exposures.

Community Engagement

Community-centered decisionmaking processes—that is, beginning with engagement at the earliest stages of problem identification rather than at project selection—is imperative. Despite ongoing rhetoric to the contrary, however, this level of thoughtful, flexible, and authentic engagement is rarely conducted. We recommend a range of strategies for improving the quality of community participatory practices in public decisions and increasing the feedback from residents into the substance of the decisions while decreasing the burden of frequent and time-consuming engagement on residents.

- Consequently, there is a need for improved engagement processes and science communications such that these exchanges are more effective while still being responsive to community demands.
- Project and plan engagement moments should also be viewed as opportunities to build social networks and community cohesion beyond the focus on individual project and land decision timeframes. An engagement process that is convened for a single purpose both ignores past interactions and disregards how communities build local memory and knowledge over time.
- Finally, the study on community engagement calls for explicit financial support for the community groups that organize, coordinate, and often represent residents. These important intermediaries are rarely compensated despite their alacrity and effectiveness.

Risk Perception

The study affirmed previous scholarship's findings that there are demographic differences in general risk perception across households, and that past experiences with events when the risk is realized—e.g.,

a hurricane or flood— inform these differences. Consequently, we recommend strategies for greater communication of scientifically confirmed measures of risk that are targeted to different groups.

- Active and robust campaigns to counteract disinformation about risks are needed from all levels of government and from civil and private sector partners concerned with the long-term wellbeing of the households they serve. The persistence of ignorance about risks in the face of scientific fact harms all households in a community.
- This campaign should involve programs to create awareness and educational curricula regarding risks that include but are not exclusive to housing considerations among the real estate brokers and agents, building officials, appraisers, inspectors, and contractors that shape risk perception locally.
- Local and state governments—and to a lesser extent, federal policymakers—should identify populations or neighborhoods at higher risk of socio-psychological disruption from a hazard event, document the psychological, social, policy, and material barriers which may inhibit them from exercising risk mitigating behaviors, and develop appropriate risk communication strategies. Materials could include risk identification exercises in home purchase counseling and in rental search guides.

Risk Information

The quantity of sources for information about a specific home's risks from an environmental hazard are increasing, but their varying quality, potentially conflicting details, and ultimate contribution to a homebuyer's decision to occupy that home continue to evolve. We recommend several policy strategies for increasing transparency while acknowledging the material limitations of households' ability to act on that information.

- Central clearinghouses of information regarding risks to various exposures should be considered by federal and state agencies. These should exceed but build on current flood maps and national risk indices that continue to be improved in timeliness and granularity.
- Federal and state governments should consider expanding on rental disclosure laws given the overall shutout of renters in decisions related to housing's physical quality and environmental exposures. Pursuing property disclosure laws is also a worthy pursuit, but with extensive campaigns on what disclosure rules means and monitoring of their effectiveness.

- Monitoring and enforcing property disclosure rules should extend being their documentation (i.e., checking forms) but also through analysis of the informal communications by real estate brokers and agents and other stakeholders that shape households' decisions.
- Postdisaster recovery resources could also be used for informational campaigns in addition to physical rebuilding.

Property Insurance

The study found a vastly underfunded and under-incentivized set of technologies that could help homebuyers and property owners mitigate their risks of environmental hazards and, effectively, buy time. We recommend a range of policy interventions to assist in this effort.

- With pricing being an ongoing concern, the investment in an assistance program for low-income households, including renters' insurance, to be able to afford actuarially based premium but that is tied to both mitigation and buyout assistance programs should be pursued. Increases in flood and other hazard insurance will certainly disadvantage low-income households but, if considered like other insurance types beyond property insurance, may yield broader pools of insureds such that appropriate resources are provided to the most vulnerable households.
- There should be increasingly transparent requirements of private insurers for premium reductions for mitigation. This would not only encourage more mitigation, but also catalyze a greater awareness among households of their home's physical qualities and better coordination in communities for neighborhood- and regional-level infrastructure planning.
- Parametric hazard insurance policies that provide a policyholder a claim payment based on a predetermined hazard severity rather than individual loss calculations could expedite claims processing more fairly—a challenge noted for key populations in this project.

Home Mitigation

- Public and private entities should help create a pool of "resilience auditors" like home energy auditors in the most exposed regions. These auditors could assess individual home risks and household financial capacity to better assess mitigation strategies tailored to each household. Local building and housing departments could be especially helpful in identifying houses and households in need of additional assistance.

- The housing resilience and climate adaptation community could benefit from other strategies developing in the climate mitigation world. For example, higher-value, targeted mitigation assistance programs (e.g., tax credits for higher income households' mitigation actions and rebates for lower income households) could lead to more effective mitigation adoption. These well-calibrated incentives could also benefit from better publicity, supported by mortgage lenders, private insurers, and public agencies as well as mortgage insurers and secondary markets--including those supporting rental multifamily properties.
- Finally, funding for further research and development is a critical policy priority. Better mitigation technologies, as well as an understanding of mitigation behaviors, decisions, and disparities will require an all-scholars-on-deck exploration.

Research Agenda

To this last point, there is a growing body of research on housing and community climate adaptation that intersects with hazard scholarship for many reasons, not the least of which being that increasingly severe and frequent disasters are the most acute manifestation of climate change's effects. Global warming's chronic effects in the present and future such as slow-onset sea-level rise, extended heatwaves, and drought, however, are less investigated in the disaster scholarship though these have just as many implications for homes. Disaster studies' emphasis on postdisaster response and recovery contrasts with climate adaptation's focus on preparation and mitigation.

Consequently, because housing matters in both acute and chronic event scenarios, additional research on the physical quality of housing before events and the physical and financial capacity of households to mitigate their homes is needed as the first overarching recommendation for future research agendas. This holds especially true of rental units, since they are variably maintained, and their occupants typically have little say over their capital improvement.

Second, because of the fundamental finding that homes' hazard exposures and households' hazard vulnerability, there simply needs to be more context-specific inquiry—that is, the study of more places and more corroboration of places that have already been studied beyond repeat locations such as this project's focus on New Orleans. The research team will continue to analyze the rich data collected as part of this project across all studies. However, there are many opportunities to apply this same context-driven approach in other locations across multiple lines of inquiry:

Infrastructure Protections

The linkage between infrastructure protections of communities and the individual resilience of houses and households in those communities—and the distribution of protections across them—is vastly understudied. This oversight may be due to disciplinary boundaries, but it has been alluded to qualitatively in the environmental justice scholarship. More empirical work is needed.

Community Engagement

Planning scholarship on communication engagement and participation has been limited by the real and practical challenges associated with conducting engagement—that is, scholars repeatedly assess the limitations of the same contemporary engagement practices. The study of successful models, detailing community organizing strategies that could be integrated into project- or plan-centered engagement, and the experimentation of new media, graphics, and recruitment models could break this barrier.

Risk Perception

Our study found that the psychology and politics of risk perception are methodologically challenging. Inquiring about an individual risk overlooks the plethora of future risks and current struggles that play out in the lived experiences of households. Belief systems—including those that are religious or political as well as understanding of the role of government and the public good—shape all these outlooks and, in turn, the perception of physical risks to one's home. Study informed by theory in psychology, communications, political science, and behavioral economics can better articulate the evolution of individual perceptions and ostensibly irrational behaviors.

Risk Information

We know precious little about the details about the professional practices associated with home searches, purchases, and maintenance that may inform the quality and depth of household's information. It is possible, for example, that less information that is more detailed or better communicated—or vice versa—may elicit stronger effects. Future research could consider information quality as much as amount and access. We know even less about how housing tenure factors into this picture since several of the study's components focus on homeowners because of assumptions about renters' access to resources. The information renters receive (or access independently) about their unit's exposure and other resources to mitigate it is especially ripe for exploration.

Property Insurance

Though highly regulated as industries and policies, private and public property insurance remain a black box in both housing and disaster scholarship. Proprietary data constraints as well as the dominance of state governments in setting insurance policies (with the notable exception of the NFIP) constrain this field. Additional work from industrial economics and sociology might help uncover the professionals, procedures, and products to develop more insights into the terms of individual home policies, the treatment of their occupants, and how risk is distributed across such a wide and segregated group of players.

Home Mitigation

This project focused on the mitigation of existing housing for which individual households have at least partial control. Additional inquiry into geographic variations on household preferences and financial capacity across mitigation techniques is needed. The case for more construction engineering and architectural research for affordable and easily installed mitigation techniques has been made, but there is also the need to understand the capacity, methods, and knowledge of the industry of remodelers and other service providers that literally intervene in homes and the economic behaviors of households and property owners that could be incented to allow the interventions. How any mitigation actions result in both altered performance of a home in a hazard event as well as changes in insurance coverage, pricing, or insurer level of service is also a largely understudied question.

Further study of the acquisition or buyout of existing properties and the development of new housing where current mitigation's benefits will be ineffective (possibly exacerbating risks to both new and existing homes in the surrounding areas) as well as the planning, financial, and political enablers of these actions should also be studied considering community-level mitigation efforts. This focus on local government's actions extends beyond but is highly connected to individual households' agency. Perhaps even more desperately, there is a need to understand the unintended effects of these property-level and, increasingly, community-level constructions. These improvements could alternately lead to increased property differentiation between the households with resources for their installation and those without or, when applied more generally, could lead to increasing property values and the potential for eviction, gentrification, and displacement.

In short, more work is to be done to ensure that all houses and households are resilient to environmental shocks. Understanding how current and future risks can be equitably communicated and distributed requires assessing how individual homes and households' actions fit into the larger public common. This report sheds light on some of the current strategies for accomplishing that end.

Appendix A. Area History and Recent Demography

Because of its unique location on the alluvial plane of the Mississippi River, New Orleans has depended on flood protection since its inception. As the urban area has grown, increasing land use such as agriculture, shipping, heavy industry, and later suburbanization, have required the channeling of the Mississippi, constricting it from its traditional shifting path. 150 miles north of New Orleans, the Old River Control Structure defines the path of the current Mississippi through our region of interest, shifting some water to the Atchafalaya River to the West, while streaming the main flow through Baton Rouge and St. James Parish before passing the greater New Orleans parishes of St. John the Baptist, St. Charles, St. Tammany, Orleans, and finally Plaquemines before emptying into the Gulf of Mexico. Within the New Orleans metro area, the complex network of pumps, canals, seawalls, floodgates, dikes, levees, and more recently, restored wetlands and rain gardens, comprise one of the most extensive flood protection systems in the world. However, the present system is also a product of the region's complex history, and reflects its social, economic, and climate influences.

Social History

Compounded by a long history of racist violence, income inequality, and under-resourced public- and civil-sector organizations, greater New Orleans is the ideal site to consider the relationship between housing, housing governance, and environmental hazards. The city of New Orleans at the region's center is located below sea level on a formerly swampy area along the Mississippi River. The city's unique topography is a result of the Ice Age and its subsequent ecological period (Campanella 2002). As sediment-rich glaciers and ice sheets melted and extended inland, dispersed sediments created a deltaic plain alongside the Gulf of Mexico. The earliest inhabitants of this region, including the Chitimacha, Houma, and Chacta Yakini people, adapted to the river's volatile movements by creating artificial elevation and making seasonal migrations (Freudenberg et al. 2009). With a focus on "agricultural and resource extraction," Western colonizers would take a different approach, constructing levees, walls, weirs, barriers and canals to prevent water from affecting their permanent settlements (Campanella 2016).

Although the first suspected European sighting of the region occurred in the early 1500s, Europeans did not become actively interested in the New Orleans territory until the late 1600s.

Following the pivotal La Salle expedition of 1682, the French came to recognize its geographic importance and redoubled their efforts to explore and colonize. French explorers Iberville and Jean Baptiste Le Moyne first landed on what would become New Orleans in 1699. The settlement struggled to maintain its population over the next several decades in light of battles with local tribes and internal mismanagement. Despite these early challenges, Jean Baptiste Le Moyne formally founded New Orleans in 1718.

Slavery was an important feature of early New Orleans. Prior to the city's official founding, the territory passed from public ownership to private charter, managed by the Company of the East, which promised to bring 6,000 settlers and 3,000 slaves to the area over a ten-year period. In a century's time, the bustling commercial center would become one of the busiest slave markets in the South, earning the title of "slavery's metropolis" (Campanella 2007; Mitchell and Atkinson 2018). Free African American men and women would also play an integral role in defining the city's unique character, economy, and residential landscape.

From its initial colonization, New Orleans' geography and location offered dueling advantages and disadvantages. Early explorers and settlers recognized that the region provided arable land, fresh water, and accessible trade routes, as well as flooding from the Mississippi and unpredictable wetlands. When the Europeans first arrived, there were natural levees that stood three-to-five meters above sea level. The new city experienced its first major flood in 1719, and early settlers responded by building rudimentary levees as a first attempt at flood management.

At the turn of the 19th century and after the Louisiana Purchase in 1803, the city experienced massive population growth as Anglo-Americans and manumitted slaves flooded the area. While the influx of free men and women breathed new life into the city's Creole culture, Anglo-American emigrants brought with them a more rigid racial hierarchy. Despite racial mixing in many parts of the city, New Orleans remained a slave-holding society. In fact, by the 1830s, New Orleans was considered the largest slave market in the American south (Freudenberger and Pritchett 1991). There was a high demand for slave labor and professional traders worked in a highly competitive market: historians estimate that more than 135,000 slave sales were made between 1804 and 1862. By the late 1820s, the burgeoning slave market became cause for concern among local politicians, who worried that conditions were ripe for insurgency.

Residents of early 19th century New Orleans negotiated environmental risks and hazards alongside social norms. Those living in the upper parts of the city benefitted from high elevation and transportation, while those living closer to the riverfront, characterized by ample opportunities for low-

skilled employment, lived in lower-quality housing with greater environmental risks. Residential patterns fell along race and class lines with wealthy white families living in low-risk areas with high-quality housing and lower-income families of color living in more environmentally vulnerable neighborhoods in lower parts of the city and its outskirts. Residents living in the upper city also benefitted from natural levees, while the poor and freedmen settled in flood-prone areas (Landphair 2007). Settlement patterns solidified over the next several decades as German and Irish Immigrants moved to the poorer, flood prone areas.

As the nation inched closer to Civil War, New Orleans continued to battle the Mississippi River. In 1849, the devastating Sauvé Crevasse Flood breached levees and flooded cane fields and residential areas along the city's periphery. Poor African Americans and white immigrants bore the brunt of the flood. The Sauvé Crevasse Flood not only highlighted the inadequacy of the existing system, but also expanded mitigation responsibility to the federal government. Congress responded by passing the Act to Aid the State of Louisiana in Draining the Swamp Lands, which aimed to generate funds for levee reconstruction, facilitating residential and industrial development on 65 million acres of former wetlands (Horowitz 2020). As with later disasters, mitigation strategies and land reclamation inadvertently put future generations at heightened risk by altering the natural environment.

New Orleans' population continued to balloon until the Civil War and directly after. Despite population growth and an expanding labor force, the city suffered economically (Kelman 2003). The temporary closure of the Mississippi River port and expansion of railways hurt the local economy, which failed to fully recover until the end of the 18th century. Racial tensions remained high during and following the Civil War, Reconstruction, and establishment of a white supremacist government. The city—which once boasted racial mixing in some parts—became increasingly segregated. The Housing Act of 1937 brought segregated public housing developments to the city, while racist deed covenants excluded Black families from reclaimed riverfront areas (Long 2007). During the Jim Crow era, Black residents were excluded from meaningful participation in the regional economy (Germany 2007a). A small group of wealthy whites served as the city's political elite while Blacks toiled as low-wage workers.

Advances in engineering and technology brought new developments to the city's flood mitigation system. Municipal improvements in pump and drainage infrastructure accompanied the city's expansion. During the early 1900s, engineers and local leaders raised concerns regarding the city's reliance on levees: while some favored a "levee-only" approach, others advocated for a diverse set of strategies that included levees and artificial outlets. "Levee-only" advocates believed that by restricting

the river's width, it would create abrasions in the underlying earth that would eventually reduce the river's height. Despite its unfounded claims, the "levee-only" approach prevailed.

The Flood of 1927 called the city's exclusive reliance on levees into question. When flood waters threatened to overwhelm the flimsy system, the Army Corps of engineers dynamited the Mississippi River levee to prevent massive flooding. Engineers and local leaders took bold action to protect the wealthiest parts of the city at the expense of St. Bernard Parish - home to poor Blacks and immigrant families, 630,000 of whom were displaced (Kates et al. 2006). This disaster not only exposed "the failure of centuries worth of piecemeal attempts" to control the river, but also shed light on the harsh intersection of racial segregation and unequal environmental impact.

During levee reconstruction afterwards, oil was discovered in the marshes surrounding the city. This discovery brought more residents and industry to coastal areas. While the oil industry boomed, Black activism led school desegregation efforts at the onset of the Civil Rights Movement. While local labor organizations and churches dominated the local movement, national chapters of CORE, NAACP, and the Urban League were also involved. In New Orleans, Black activism grew momentum while the city's population declined due to white flight. Like in other American cities, as whites left the city for the suburbs, they took political power and resources with them, leaving behind inadequate infrastructure and services. The economic boom that followed WWII cemented the city's segregated landscape, as did ongoing violent intimidation.

By the 1960s, Black and white residents inhabited vastly different realities. Three quarters of all Black residents lived near or below the poverty line with limited employment opportunities, overcrowded schools, and poor-quality housing (Germany 2007b). In the Lower Ninth Ward—a low-lying area home to working class and poor Black families—only half of residents had more than an eighth-grade education. 86 percent of streets did not have adequate drainage or paving. Housing was labeled as the number one social problem facing the community: officials identified one fourth of the city's housing stock as dilapidated or deteriorating.

As if to further cement the region's intertwined social and environmental histories, Hurricane Betsey hit New Orleans one month after the passage of the Voting Rights Act. Local leaders dynamited the Industrial Canal to preserve more affluent neighborhoods, resulting in a devastation of the Lower Ninth Ward (Landphair 2007). Residents of the area held widespread resentment for the decision, which many believed was intentionally made to destroy the neighborhood. The city continued to hemorrhage white residents following the hurricane: while the Black population rose during subsequent years, the white population declined by 22 percent. The federal government responded by

instituting safeguards such as the NFIP and revamping levees, drainage systems, and pumps (Kates et al. 2006).

In the aftermath of the hurricane, Lyndon B. Johnson's Great Society issued a flurry of federal activity to address health, education, recreation, transportation, consumer rights, and housing. In New Orleans, local leaders used a mix of private and federal, state, and city dollars to spur economic growth and competition, and opportunities for marginalized residents. The city's poverty rate was in decline by the 1970s, only to be reversed a decade later with federal cuts to state funding. State and local governments' reliance on oil industry revenues increased. The long-term environmental impact of resource extraction weighed heavily on the city's precarious surroundings. By pursuing activities requiring extensive hydrological and geological transformation, New Orleans was ill-positioned for the threats of the 21st century.

Scientists warned politicians of the impending danger hurricanes and floods posed to the city in the early 21st century with little success. New Orleans experienced several major disasters in the late 1990s and early 2000s. Though none paralleled the devastation of Katrina, hurricanes George and Ivan required varying degrees of evacuation and rebuilding. Hurricane Katrina, a category five hurricane originating near the Caribbean, made landfall in New Orleans on August 29, 2005. Katrina's initial impact was less severe than feared: despite major breaches to the Industrial Canal and severe flooding through the Lower Ninth Ward, St. Bernard's Parish, and several other neighborhoods, the hurricane's primary devastation would not become evident until the following day. On August 30, New Orleans' man-made bowl-shaped topography filled with tepid water full of oil, pesticides, fertilizers, and other hazardous materials (Brunsma, Overfelt, and Picou 2010). The flood waters breached 50 different locations across the levees, flooding 80 percent of the city with up to twelve feet of water (Adams 2013).

Although 455,000 people successfully evacuated in the days preceding, two out of every nine residents—the majority of whom were elderly, disabled, and/or lacked transportation—remained stranded in the city. Katrina's impact was severe, with estimates that approximately forty percent of the city's population—76 percent of whom were African American—lived in areas drowned by the hurricane (Gotham and Campanella 2013). This included 70,000 elderly people and 124,126 children. 70 percent of all housing units were damaged, but Black residents were hit particularly hard, outnumbering white residents with flooded homes by 23 percent (Data Center 2015; Campanella 2007). Of the over 1,800 people who died, 66 percent were African American, which was more than double the death rate of whites.

Long-term recovery planning began approximately ten weeks after Katrina hit. At the federal level, the Army Corps of Engineers and FEMA sponsored research studies to understand the full scope of the hurricane's impact and future mitigation needs (Kates et al. 2006). The city and state launched the Bring New Orleans Back Commission and Louisiana Recovery Authority respectively. After ten months of disagreement surrounding the planning process, the city commission developed its own plan for recovery, which involved a smaller city with flood protections and other civic improvements. On-the-ground rebuilding efforts looked very different. As residents returned to the city, they began rebuilding their homes where previously located. Government response remained slow and rebuilding continued without significant efforts to alter land use patterns, integrate wetlands for future barrier protection, and often the same construction specifications as preexisted the storm.

Like the hurricane itself, recovery efforts reflected the city's long-standing inequities. Neighborhoods composed of wealthy residents were better positioned to rebuild than their lower-income counterparts. The Road Home Program, sponsored by the Louisiana Recovery Authority in 2006 with HUD recovery funds, also failed to deliver on its promise of equitable recovery. The program offered three options to residents: $150,000 to eligible homeowners with over 50 percent damage, the opportunity to sell their lot to the state and purchase another home in Louisiana, or the opportunity to sell their lot to purchase a home out of state. Most residents—aside from those in the Lower Ninth Ward—kept their homes (Gotham 2014; Campanella 2016). The Road Home program was both slow-moving and flawed (Turnham et al. 2010). By basing compensation determinations off pre-Katrina property values, the program undervalued homes located in lower-income areas, which was eventually resolved in the court settlement. By 2015, the city's population stood at 80 percent of what it had in 2005. The city's Black population, which once stood at nearly 323,400 in 2000, was only 71 percent.

Today, despite significant rebuilding and returns, New Orleans remains burdened by familiar challenges. In the years since Hurricane Katrina, historians and social scientists of the region have explored the lead-up to and aftermath of the landmark disaster event. Many have argued that, instead of viewing Katrina as a singular event or aberration, it should instead be considered a logical outcome of the city’s complex social and environmental history as well as a fundamental milestone and catalyst for the region after. Simply, Katrina’s legacy continues.

The flurry of legal and practical in housing, infrastructure, planning, property insurance, and related policy immediate during the formal recovery period (defined here as 2006 through 2008) revised many of these same institutions. In theory, the implementation of these changes in the subsequent decade (2008 to 2018) should prove to be a testing ground for whether the long-standing structural systems still held—and could be an omen of what is to come in other US communities. Consequently, the greater

New Orleans region is an ideal venue for this study. A review of the area's environmental protections—that is, its infrastructure—further corroborates this selection.

Recent Demography

We also wanted to understand the demographic changes occurring in the region during and between the time directly following Hurricane Katrina, and the current era in order to conceptualize how the distribution of people in vulnerable areas has shifted. We analyzed race, income, education, and tenure as measures for understanding the characteristics of the population in the region. These measures are also used in our later analysis to analyze trends between flood risk and demographics vulnerability.

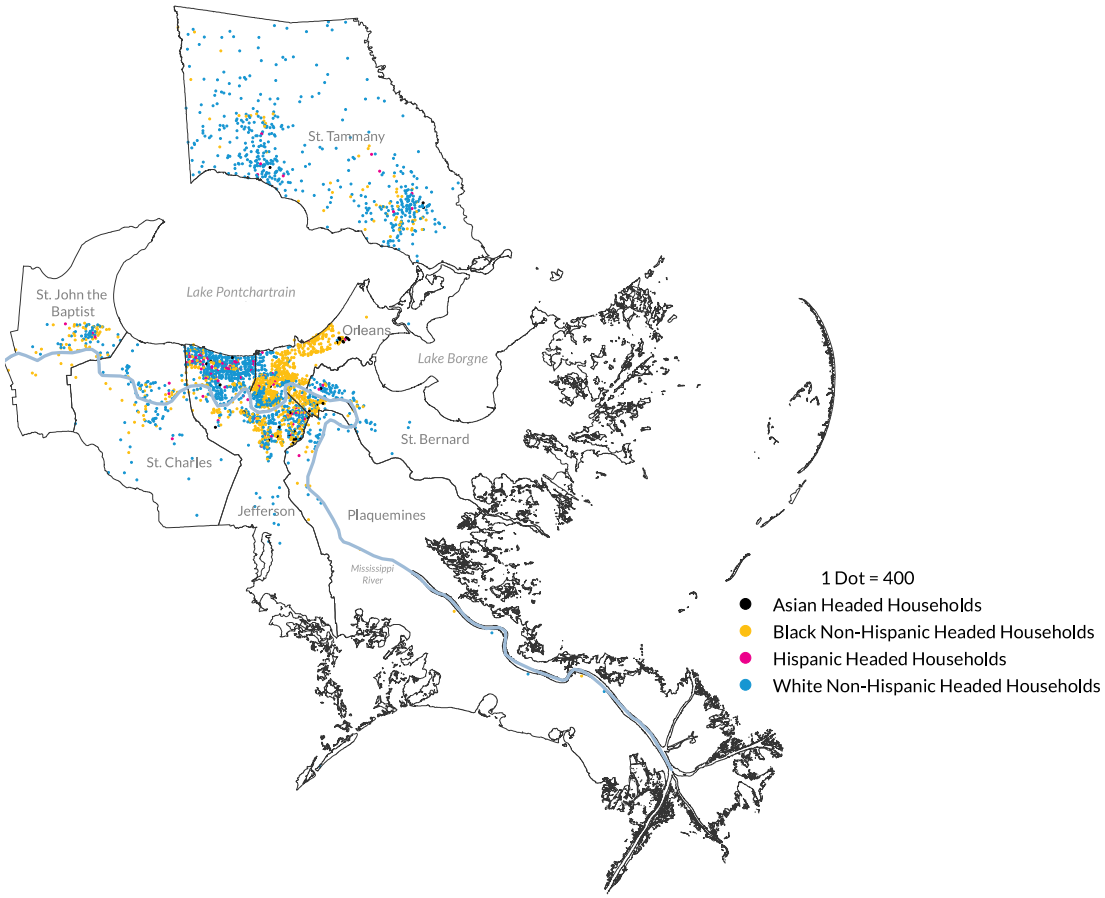
RACE AND ETHNICITY

ACS data for 2005–2009—the closest we have to an immediate post-Katrina measure—shows a total of 424,000 households across the region (figure 11). Of these, over 60 percent (approximately 270,000) had a white non-Hispanic (hereafter "white") head-of-household. St. Tammany Parish had the highest percentage of white-headed households at 85 percent, although Jefferson Parish had more in absolute numbers at approximately 114,000. Orleans Parish was the only parish in our study area where white-headed households made up less than half of all households at 39 percent. Plaquemines Parish had the smallest number of white-headed households with just 5,738, yet this represented 75 percent of the overall households in the Parish.

Orleans Parish was the only parish with a majority of Black non-Hispanic (hereafter "Black") headed households (55 percent). It also had the largest absolute number of Black-headed households with just below 67,000. Orleans Parish was largely segregated by race, with Black-headed households located on the east side of the parish, and white-headed households located largely in downtown New Orleans, along the northern coast of Lake Pontchartrain, and clustered in the "uptown" neighborhoods running west along the Mississippi. Jefferson Parish had the second highest number of Black households with 35,800, while St. John the Baptist had the second highest percentage with 44 percent. Black-headed households comprised 30 percent of all households across the seven-Parish region.

FIGURE 11

Race of Households in the Greater New Orleans Region, 2005–2009



Source: ACS 2005-09 5-year estimates, NHGIS, and WorldMap
Note: Hispanics include all racial groups of Hispanic ethnicity. Other specified racial groups exclude Hispanics.

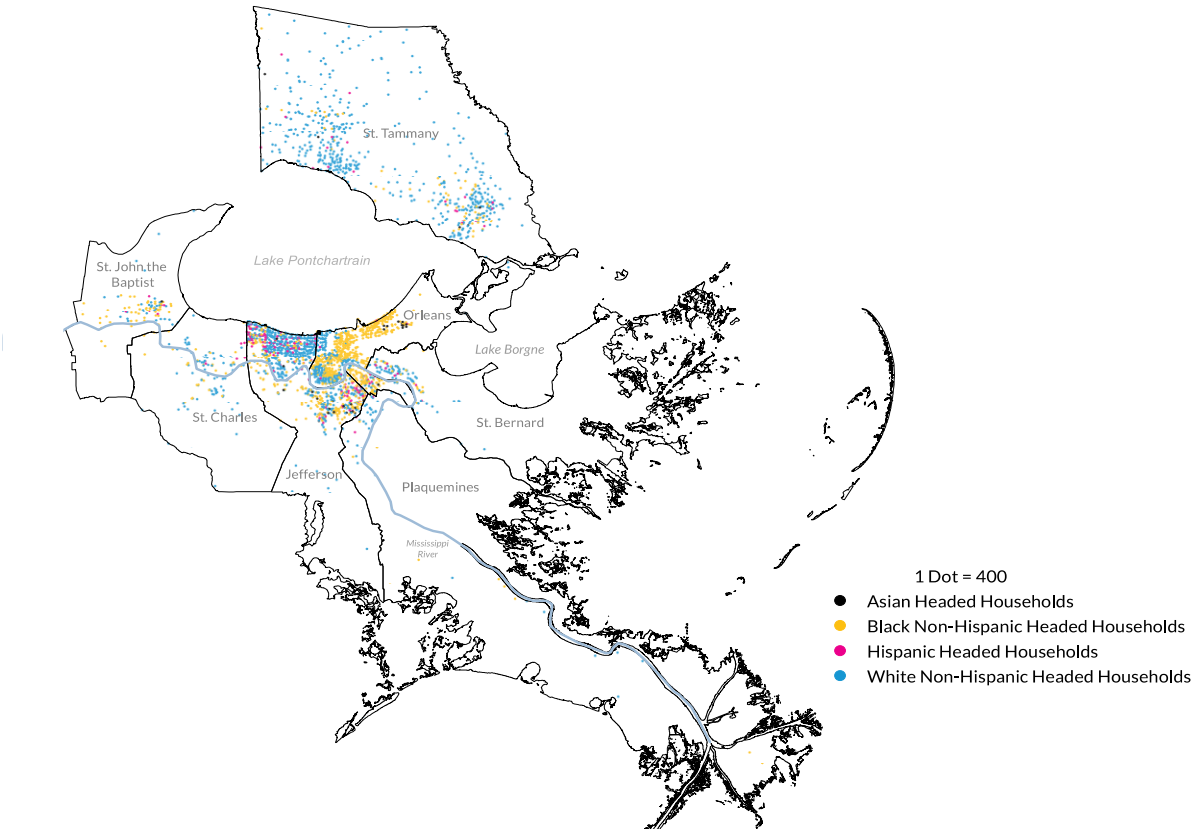
Asian non-Hispanic (hereafter "Asian") headed households made up an estimated two percent of those in the region, with the largest number located in Jefferson Parish (4,650), followed by Orleans Parish (2,260). Jefferson Parish also had the highest percentage of Asian households, comprising just under three percent of the population. It should be noted that while the absolute number of Asian households are small, Asian—specifically Vietnamese—immigrants have played an important role in the region's economy in the 20th century, especially in fishing. Hispanic-headed households of all races exhibited a similar pattern to Asian households, with Jefferson Parish having the greatest number (12,400), followed by Orleans (4,000). Jefferson Parish also had the highest percentage of Hispanic-headed households, comprising seven percent of the parish population, followed by St. Bernard then St. John the Baptist Parishes. Native American-headed households made up less than half of a percent of

the overall population in the region, and less than one percent in all of the parishes except for Plaquemines, where the ACS data estimated 155 households comprised two percent of those in the parish.

According to ACS data for 2013–2017—the measure used to approximate the present era—the population in the region increased by 68,500 households (figure 12). Each individual parish saw an increase in the overall population except for St. John the Baptist which saw a slight decrease, largely driven by a loss in white-headed households. White-headed households increased by approximately 21,100 between time periods, just under an eight percent gain, yet due to the increase in the population overall, white-headed household actually represent a smaller percentage point share of the region. Similar to directly following Hurricane Katrina, Jefferson Parish remained the parish with the largest population of white-headed households, with around 113,300, followed by Orleans Parish. ACS data showed a 33 percent increase in the number of white-headed households in Orleans Parish, while in Jefferson Parish the number of white-headed households decreased by less than half a percent. White-headed households remain largely segregated from other races in Orleans parish, located mostly in the west of the parish in downtown New Orleans, as well as in the north along Lake Pontchartrain. White-headed households comprise more than half of the population in all the parishes except for Orleans and St. John the Baptist. St. John the Baptist was the parish with the largest overall decrease in number of white-headed households between the two time periods.

FIGURE 12

Race of Households in the Greater New Orleans Region, 2013–2017



Source: ACS 2013-17 5-year estimates, NHGIS, and WorldMap
Note: Hispanics include all racial groups of Hispanic ethnicity. Other specified racial groups exclude Hispanics.

Black-headed households increased in total number in all parishes except for St. Charles, where they shrunk by around seven percent. This widespread increase in Black residents follows a substantial decrease in the population directly after Katrina, when many Black residents were displaced, which is not clearly reflected in the data—likely resulting from the smoothing effects of using the 5-year of the ACS estimates. Orleans parish saw the largest increase in number of Black-headed households, largely concentrated in the downtown area of New Orleans and eastern Orleans Parish. Interestingly, the share of Black-headed households decreased slightly in Orleans even though the population increased due to the overall increase in the parish population, although this relatively small variation could be due to variation in sampling and margins of error. During the 2013–2017 period, Black households made up more than half of the population in Orleans and St. John the Baptist Parishes.

The number of Native American-headed households decreased in all parishes except for St. Tammany, where ACS data estimates they increased by 215, mostly near Slidell as well as in the North of the parish. In the 2013–2017 period, the ACS data showed a probable drop in St. John the Baptist to no Native-headed households, indicating that the small population in the time directly following Katrina moved away. Native-headed Households comprised less than half of a percentage of the population in all parishes except for Plaquemines, where they comprised one percent. All measures of Native American households should be received with caution due to small sample sizes.

The number and percentage share of Asian-headed households increased in all parishes between time periods. Jefferson parish retained the greatest number of Asian households, with approximately 5,580, a 20 percent increase, largely concentrated in the suburban town of Gretna. Orleans Parish had the second largest population but saw the largest increase in the number of Asian-headed households of any parish, with a cluster in the historically Vietnamese neighborhood of Versailles in the far east of the parish. Plaquemines Parish saw the greatest percent change between periods with an almost five-fold increase in the number of Asian-headed households, largely because of the small absolute numbers.

Finally, Hispanic-headed households also increased in number in every parish, growing by an estimated 13,140 households across the region, a 62 percent increase. This increase may be due to a noted influx of workers for recovery related jobs (Campanella 2011). Jefferson Parish maintained the largest population of Hispanic-headed houses with the ACS reporting an estimated 19,200 households, a 12,420 increase from the previous period, largely concentrated to the north of the parish in the suburbs of New Orleans. Orleans Parish had the second largest Hispanic-headed household population, mostly concentrated on the West of the Parish, followed by St. Tammany Parish and then St. Bernard. Plaquemines only increased by approximately 320 households, yet this was an almost three-fold increase from the previous period.

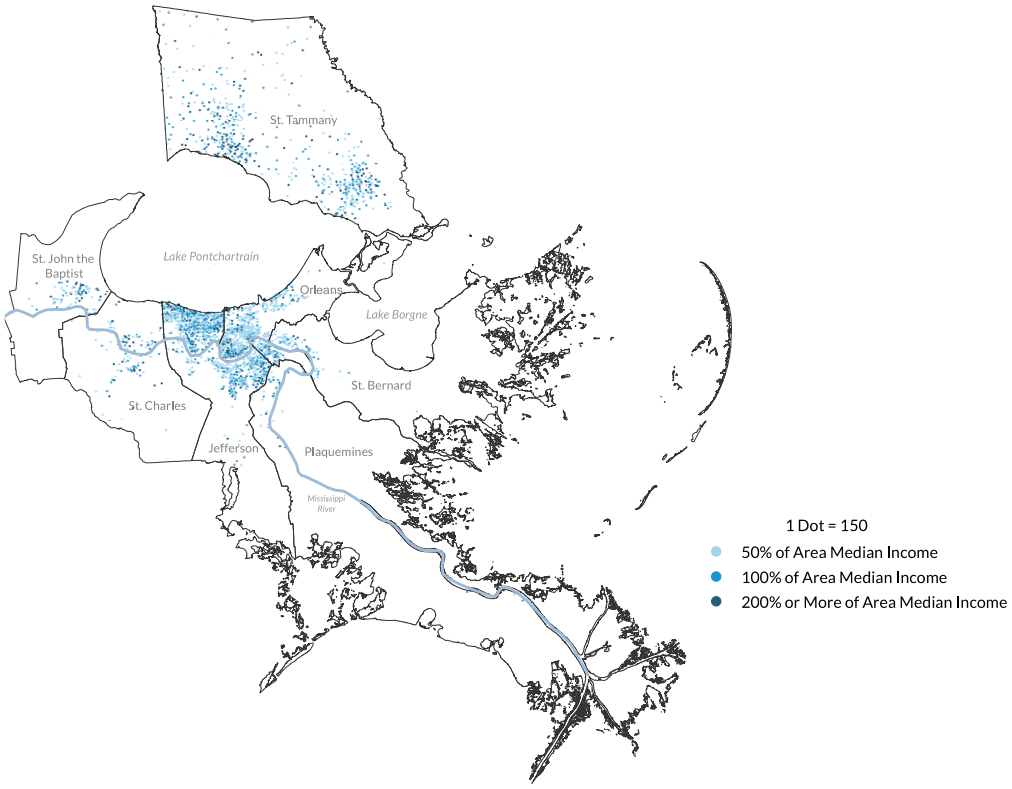
INCOME

We measured income as the percent of the Average Median Income (AMI) that the head of a household makes using the closest cutoff point. Across the region, and in each individual parish, those making up to half of the AMI for the seven-parish region were the largest share of households. In the seven-parish region during the recovery phase (figure 13), 52 percent of households made up to half the AMI. In the individual parishes, the exact percentage varies from St. Tammany with 42 percent to St. Bernard with 63 percent. St. Charles Parish had the highest percentage of households making 100 percent of the AMI with just over a third of Parish households, and Orleans had the least with just over a fifth falling in this range. Households making above 100 percent of the AMI are the smallest category in every parish. Only

ten percent of St. Bernard Parish made over 100 percent of the AMI, while 24 percent of St. Tammany did, which is the greatest share out of any parish.

FIGURE 13

Percent of Area Median Income of Households in the Greater New Orleans Region, 2005–2009



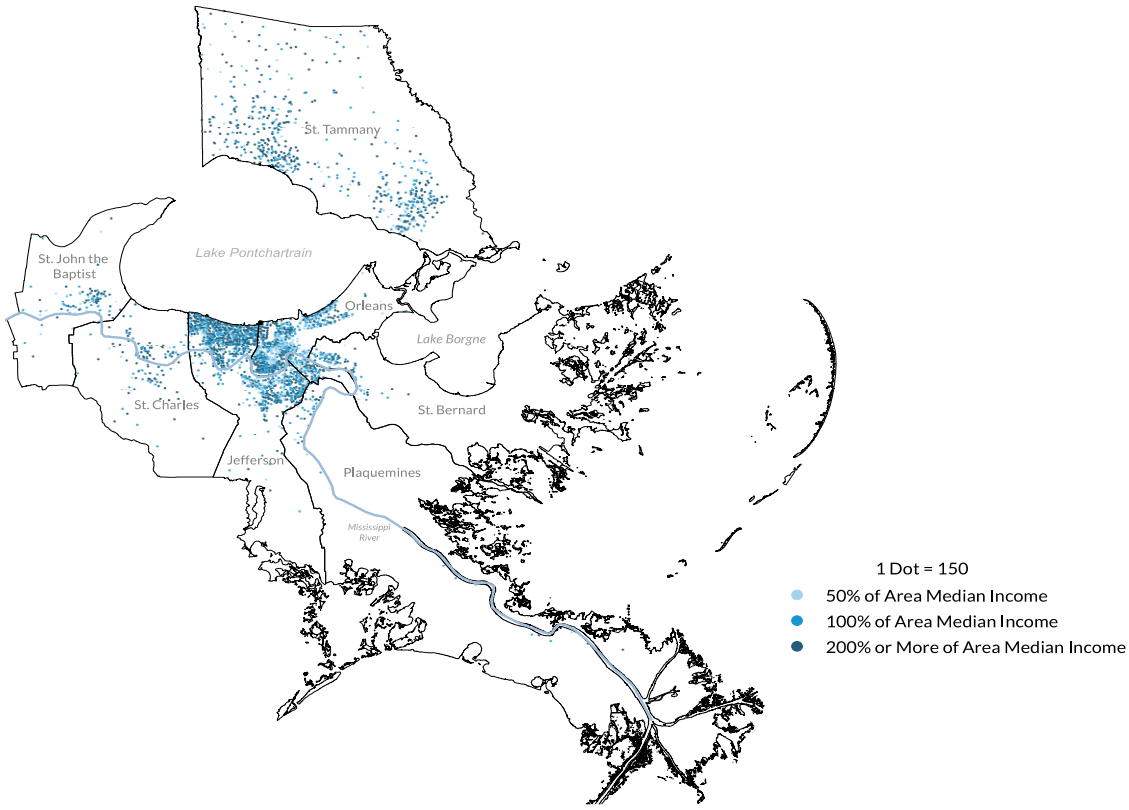
Source: ACS 2005-09 5-year estimates, NHGIS, and WorldMap

All of the parishes except Plaquemines, saw a decrease in the number of households making below 50 percent of the AMI (figure 14). Orleans Parish has the greatest number of households making below 50 percent of the AMI, followed by St. Bernard Parish, with St. Tammany Parish having the lowest percentage of households in this category. Conversely, Households making up to 100 percent of the AMI also increased in all of the parish, with the largest increase in Orleans Parish. This income range accounts for 32-39 percent of the population in all of the parishes. The largest increases were seen in the number of households making up to 200 percent or more of the AMI, with all parishes seeing more than a two-fold increase in this population. These households expanded throughout metropolitan New Orleans. St. Tammany Parish has the highest percentage of households making 200 percent or more of the AMI, concentrated around Slidell and Covington, and Mandeville, and St. Bernard has the least. We

should note that the increase in higher-income individuals across all Parishes almost certainly denotes new arrivals to the region, rather than local individuals making more.

FIGURE 14

Percent of Area Median Income of Households in the Greater New Orleans Region, 2013–2017



Source: ACS 2013-17 5-year estimates, NHGIS, and WorldMap

EDUCATION

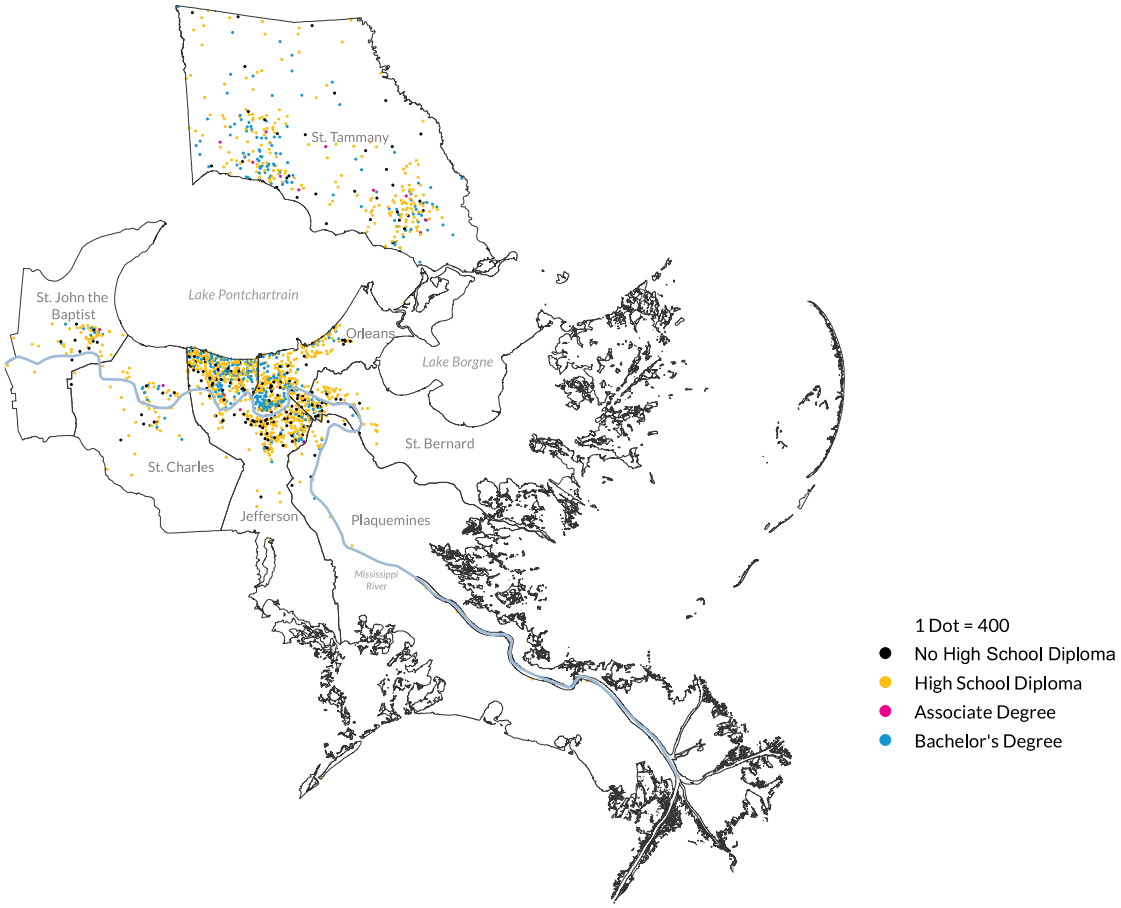
Educational attainment reported here is measured for adults 25 and older and is measured for individuals rather than households. More than half of the population in Plaquemines, St. Bernard, St. Charles, and St. John the Baptist Parishes did not have a high school diploma during the recovery phase (figure 15). Jefferson Parish had the largest number of residents without a high school diploma with 43,715, yet this population only comprised 25 percent of the parish residents, which is the smallest share out of any of the parishes.

Those with a high school diploma made up 35 percent of the population in the region overall, and this distribution is similar in the individual parishes as well. Jefferson parish had the largest percent (40 percent) and population (70,362) with a high school diploma followed by Orleans and St. Tammany

Parishes. Plaquemines had the smallest number (3,990) and percent (18.4 percent) of residents with a high school diploma. 26 percent of the population in St. Bernard, St. Charles and St. John the Baptist had a high school diploma.

FIGURE 15

Educational Attainment of Population 25 and Older in Greater New Orleans, 2005–2009



Source: ACS 2005-09 5-year estimates, NHGIS, and WorldMap

Both across the seven-parish region, and in each parish, the population with an associate degree was the smallest of any educational attainment, in terms of both total numbers and share of the population. Across the region, nine percent of the population held an associate's degree, which is similar to the parish level breakdown as well. Orleans Parish had the lowest percent of those with an associate degree, with and estimated six and a half percent of the population, and Jefferson parish had the largest total number (18,779), and percent (10.7 percent) with an associate's degree.

Finally, across the region, and in each individual parish, there were more people with a high school diploma or lower than those with a bachelor's degree or higher. Across the region, 21 percent of the population held a bachelor's degree or higher. Jefferson parish had the largest population with a bachelor's degree, with 43,156 residents, followed by Orleans and St. Tammany Parishes. St. Bernard had the smallest share of residents with this educational attainment accounting for just under ten percent of the population.

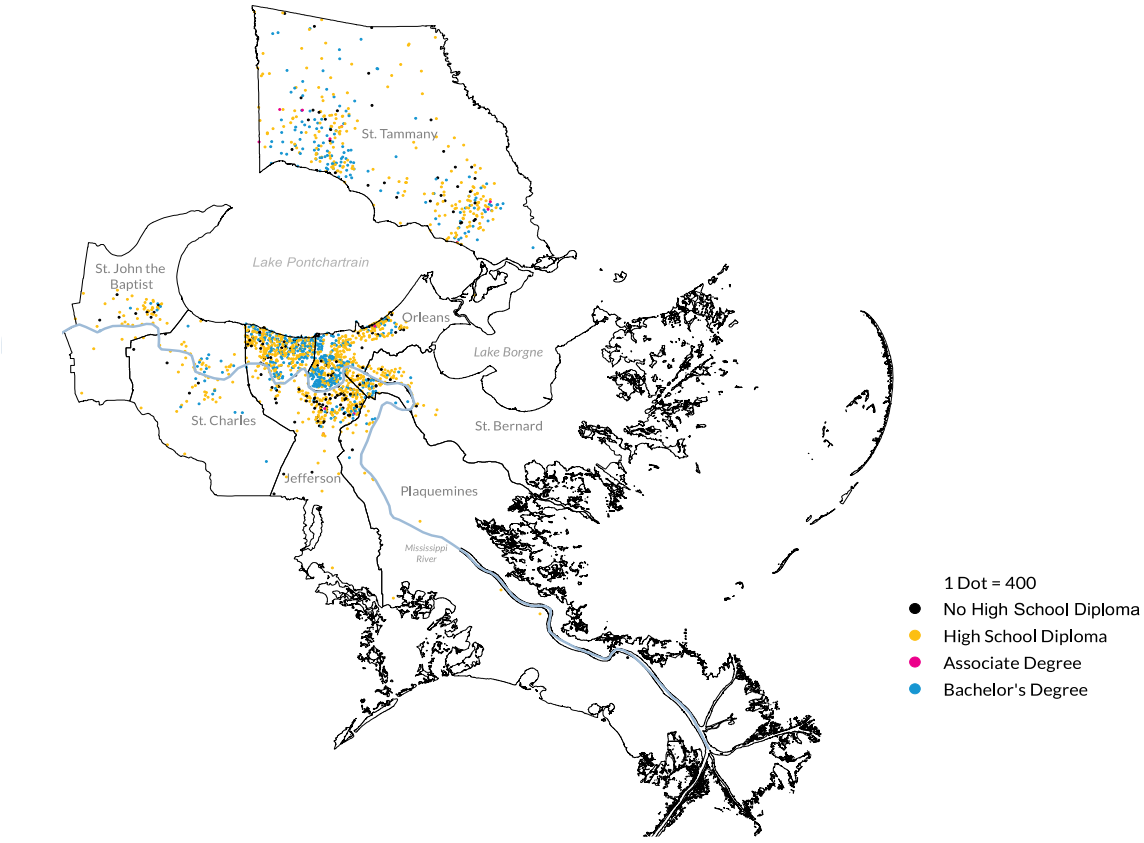
Overall, the level of educational attainment increased across the region between time periods (figure 16). The population with no high school diploma decreased across the region, and in all individual parishes except for Jefferson and Orleans Parishes. Jefferson parish maintained the largest population with this educational attainment, followed by Orleans and St. Tammany Parishes. St. Charles Parish saw the largest decrease in the number of residents with no high school diploma, with 10,738 leaving between time periods.

Across the region, the number of residents with a high school diploma rose in all parishes by 50,000, a 32 percent increase. Orleans Parish saw the greatest increase in the number of residents with a high school diploma (19,744), which is a 56 percent increase from directly following Hurricane Katrina. This population was largely concentrated in the east side of the parish, and segregated from the west side which has a larger concentration of residents with a higher educational attainment. St. Bernard surpassed Jefferson Parish as the location with the largest percent of residents that hold a high school diploma, with 49.7 percent of the parish falling in this category.

The population with an associate degree rose overall across the region, however the on the ground reality was much more variable in each parish. The greatest increase in the population with an associate's degree was in Orleans Parish, where it rose by 6,404 people, followed by St. Tammany which saw a 4,460 person increase. The largest decrease was in Jefferson parish followed by Plaquemines. St. Charles saw virtually no change in this population.

FIGURE 16

Educational Attainment of Population 25 and over in the Great New Orleans Region, 2013–2017



Source: ACS 2013-17 5-year estimates, NHGIS, and WorldMap

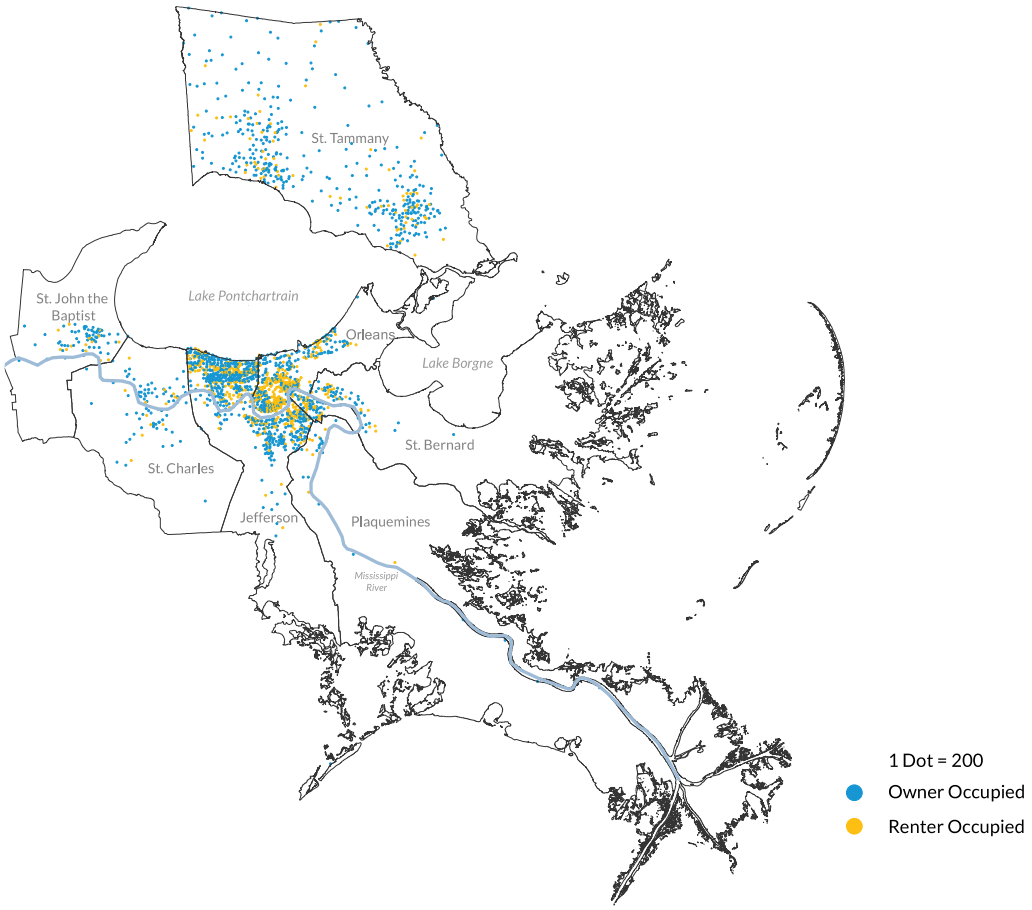
Finally, the population holding a bachelor's degree or higher increased in all parishes except for Plaquemines and St. John the Baptist, where ACS data estimates that it decreased by approximately 455 and 155 residents respectively. Orleans Parish saw the greatest increase in the population with this educational attainment, a three-fold increase, leading it to overtake Jefferson Parish as having the largest population with a bachelor's degree or higher. This population is concentrated in the west of the parish, and largely segregated from areas with lower levels of educational attainment, an overlap between the white and Black household segregation in the area. 36 percent of the population in St. Tammany Parish have a bachelor's degree or higher, which is the highest share out of any of the parishes, with St. Bernard having only 14 percent of the population fall in this category, which is the lowest.

TENURE

All parishes had more owner-occupied units than renter occupied units during the recovery years (figure 17). However, almost half of all units in Orleans Parish were renter occupied, which was the greatest share out of all the parishes. St. Charles Parish had the lowest percentage of renter occupied units, with just under 18 percent.

FIGURE 17

Tenure of Households in the Greater New Orleans Region, 2005–2009



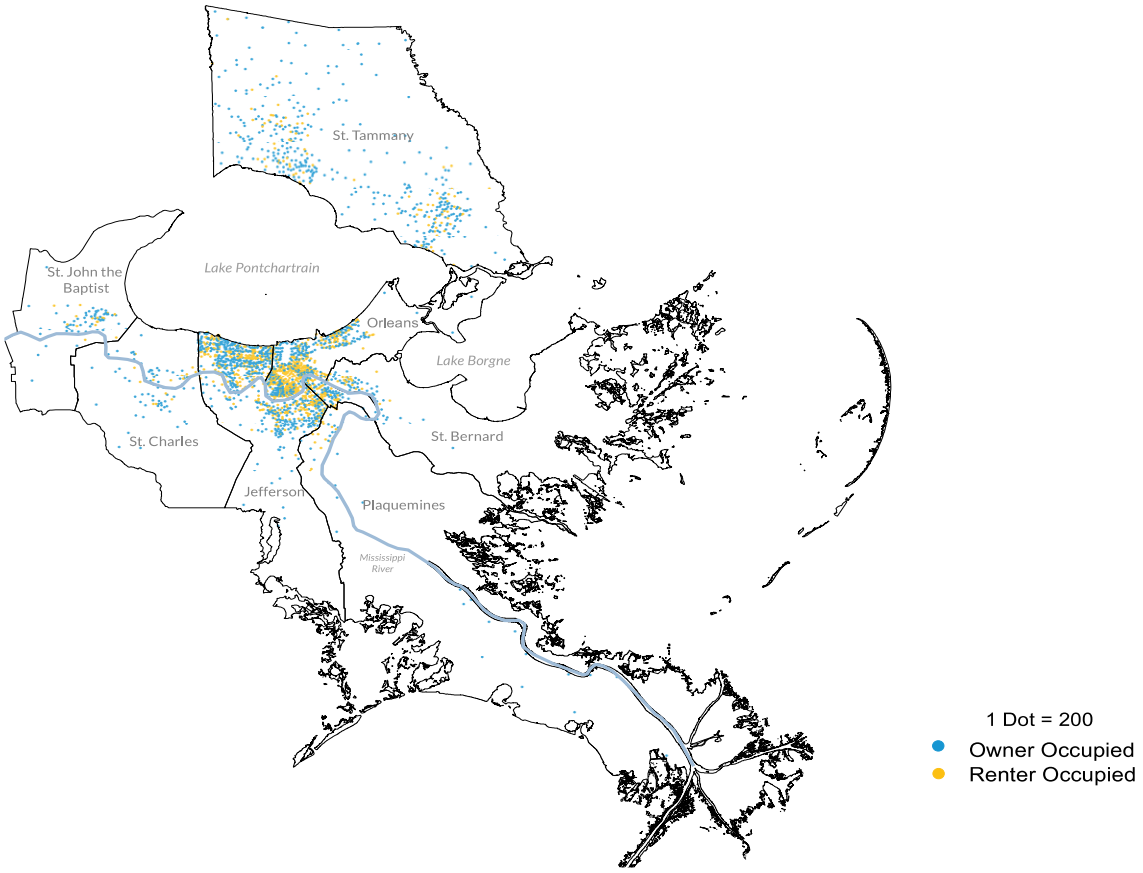
Source: ACS 2005-09 5-year estimates, NHGIS, and WorldMap

All parishes except for Orleans continue to have more owner-occupied units than renter occupied in the more recent era (figure 18), where renter-occupied units are concentrated in downtown New Orleans and the eastern suburbs with less overlap with owner occupied units. Jefferson and St. John the Baptist were the only Parishes to see a decrease in the number of owner-occupied units, with all other Parishes also seeing increases between the periods. In Orleans Parish, just over half of the units are

renter occupied, with a 26,000 unit increase from directly following Katrina. In St. Charles, St. John the Baptist, and St. Tammany Parishes 20-25 percent of the units are renter occupied, while Plaquemines, St. Bernard and Jefferson Parishes have 30-40 percent renter occupied units

FIGURE 18

Tenure of Households in the Greater New Orleans Region, 2013–2017



Source: ACS 2013-17 5-year estimates, NHGIS, and WorldMap

Disaster Protection History

Early settlement in New Orleans was concentrated on a narrow strip of embankment along the Mississippi, limited by the river and the *cipiere* (cypress swamps) and *prairies tremblantes* (grassy marshes) that covered most of present-day Mid-City and on to the shores of Lake Pontchartrain. [146] The trademark crescent shape of the city formed with growth, as plantations and later neighborhoods spread along the river's natural embarkment. Until the mid-1800s, drainage used the "gravity"

approach, planning all housing to have setbacks with runoff ditches leading to the street, and ultimately to the swamp.

In this era, the city population lived with water, and accepted regular flooding (and the associated swamps) as a fact of life. The second half of the 19th century brought the "dry" period of urban development, in which engineers sought to remove water from the city using an early system of pumps and canals. This era saw the building of key outfall canals of 17th Street, Orleans Avenue, and London Avenue, and the establishment of the Drainage Advisory Board. In addition to more water pumped along the canals to Lake Pontchartrain, the new system created new waterways leading to Lake Borgne by way of the Industrial Canal built in 1918 (Seed et al. 2006).

The new infrastructure dried the swamps, creating the "'back of town' neighborhoods of creoles, working class whites, and free households of color."[147] These new low-lying neighborhoods were prone to flooding from the beginning, and started the process of urban subsidence, as water removed from the ground destabilized the soil foundation of the city. This process is still occurring today.

At the same time, the new developments along Lake Pontchartrain necessitated seawalls and levees, closing off the lake from its traditional marshes, and creating the city's distinctive "bowl" topography, where the old strip of southern neighborhoods along the Mississippi and the new northern strip of neighborhoods along Lake Pontchartrain remain above sea level, with those neighborhoods in between remaining the lowest and wettest, as well as the poorest and most racially diverse. This system—a 19th century series of outflow canals and pumps, along with 19th and early 20th century levees and waterways—remained the core of the city's flood protections until the beginning of the 21st century and the devastation of Hurricane Katrina. Most flooding resulting from Katrina did not occur along the river or the lake but instead from storm surges flowing up through the man-made outflows from Lakes Borgne and Pontchartrain, along the drainage and shipping canals that cut through the core of the city and overflowed the levees and floodwalls protecting the canal banks, once again filling the low-lying neighborhoods (Seicshnaydre et al. 2018).

The period since Katrina has been, by necessity and mandate, one of reconstruction and reinvention, but not always toward the goal of better or more equitable protection. As the Army Corps of Engineers were building extensive new floodgates and repairing levees and seawalls, planners, city officials, and communities were starting to think about how they could live with water again, rather than struggling to remove it. The Coastal Protection and Restoration Authority (CPRA) began rebuilding shorelines, while local governments piloted new permeable greenways, rain gardens, and marsh restoration projects. The remainder of this section outlines the current state of infrastructure in

this new era, a move to incorporate the old gravity-based, "wet" infrastructure along with the historic framework of pumps, canals, and levees.

Following the devastation of Hurricane Katrina and the ensuing overwhelming failure of the flood protection infrastructure, the region saw an influx of funding and new infrastructure projects aiming to ameliorate past deficiencies. Part of this funding came from new federal dollars slated to complete projects that had previously stalled prior to the hurricane. Several key organizations emerged at this point as major actors in flood protection development planning and implementing across the region.

Among these were the US Army Corps of Engineers (USACE) for the New Orleans District, the largest builder of major flood protection projects such as levees, floodgates, and canals and, as a branch of the Army, is a significant federal presence in Louisiana. With a focus on the Louisiana coastline, the USACE implements storm risk reduction systems, flood protection in the form of levees and floodwalls, and coastal restoration. While funding for USACE projects is largely federal, they often come with a local cost-share. Additionally, even as most USACE projects are large in scope, they often encompass locally serving components.[148]

After Katrina, the Louisiana government replaced the parochial levee boards that had existed since the colonial era with two regional levee authorities to improve the coordination, planning, and maintenance of flood protection in the New Orleans region across parishes.[149] The Flood Authorities work with the USACE to design and implement gray flood infrastructure projects, and then are responsible for operating and maintaining them. The state intended for this organized leadership to foment better governmental disaster response preparation and to increase protection for residents in the face of extreme weather events. The two levee authorities serving metropolitan New Orleans are the Southeast Louisiana Flood Protection Authority-East and the Southeast Louisiana Flood Protection Authority-West.

The Southeast Louisiana Flood Protection Authority-East is governed by a commission of nine members appointed by the Governor. Main flood protection systems under its jurisdiction include: the Lake Borgne Surge Barrier, the Seabrook Floodgate Complex, the Hurricane and Storm Damage Risk Reduction System, the Mississippi River and Tributaries (MR&T) Levee System, and the Interior Nonfederal Levee Systems. The Authority's jurisdiction spans from north of the Mississippi River to Lake Pontchartrain, and from eastern Jefferson to western Orleans and St. Bernard Parishes. The Flood Protection Authority inspects, maintains, and exercises the flood protection systems so that they are prepared to enact gates, valves and pumps to protect the region. Following storms, they inspect all the infrastructure for damage, and reopen the floodgates to allow for regular waterflow.[150]

The Southeast Louisiana Flood Protection Authority-West is comprised of two flood districts: The West Jefferson Levee District, which covers the west bank of Jefferson Parish, and the Algiers Levee District, which covers the west bank of Orleans Parish. Like the Authority East, the Authority West is also overseen by a seven-member board of commissioners appointed by the governor and comprised of Jefferson and Orleans Parish residents who are engineering professionals. The flood authority maintains 68 inland-based floodgates, and three navigable sector gates including: the Bayou Segnette Sector Gate, the West Closure Complex, and the Harvey Canal Complex Sector Gate.[151]

The Coastal Protection and Restoration Authority (CPRA) is the state-level body responsible for coastal planning in Louisiana. Their Comprehensive Master Plans are released in six-year increments, and largely determine the priorities, projects, plans and benchmarks for coastal protection and restoration initiatives statewide. Since inception in 2007, CPRA has completed 113 projects over the course of 3 published plans. The bulk of CPRA's projects fall into the categories of shoreline protection (24 projects; $395 million), marsh creation (24 projects; $585 million), and structural protection (21 projects; $4.3 billion).[152] CPRA's planning processes function as the agenda-setter for the region, as the organization evaluates hundreds of proposed projects to determine which should be included in the master plan. The main criteria for selecting projects are those that provide risk reduction on the regional and local scale, protect estuary habitats, and provide benefits with minimal maintenance in the face of sea-level rise.[153]

Another state-level organization, Louisiana's Strategic Adaptations for Future Environments (LA-SAFE) was established in 2017 to coordinate flood risk abatement statewide. A joint venture of the State of Louisiana's Office of Community Development and the Foundation for Louisiana, LA-SAFE supports equitable, community-driven planning approaches to flood risk across the state of Louisiana. LA-SAFE is largely funded through a competitive grant from the US Department of Housing and Urban Development's National Disaster Resilience (NDRC) program, along with philanthropic support from the Rockefeller and Ford Foundations.[154] LA-SAFE produced many locally driven infrastructure and community plans for the area.

Finally, many of the project are cosponsored by parish and municipal governments. Each parish has an emergency preparedness department and is required by FEMA to update its hazard mitigation plan every five years. These plans are used to coordinate and guide mitigation efforts and local policy in the jurisdiction. Often these plans are prepared by a third party such as the Stephenson Disaster Management Institute at Louisiana State University, or the Center for Planning Excellence. While these plans are parish-specific, they are required to integrate into regional and state-level efforts.

Appendix B. Survey Instrument

The following is the direct set of questions as depicted for the paper version of the instrument. Online and phone modes were also provided with identical questions.

GREATER NEW ORLEANS FAIR HOUSING ACTION CENTER

URBAN INSTITUTE

Welcome to the Homeowner Survey!

The goal of this study is to learn about your experiences with property insurance and information you have received about your home's risks from hazards, disasters, and other emergencies that might affect your home.

Your participation in this survey is entirely voluntary. You can skip any questions you don't want to answer, and you can choose to discontinue the survey at any time. Your refusal to participate will not affect you in any negative way. Everyone who works on this study, including staff at the Greater New Orleans Fair Housing Action Center and the Urban Institute, has signed a Pledge of Confidentiality requiring them not to tell anyone outside the research team anything you tell us. All of your responses will be kept completely private. Your name will be separated from your answers, and your answers will be reported together with everyone else's as a group.

To take this survey, you must be a **homeowner living in a home in the greater New Orleans area and have acquired the home within the last 10 years**. Please answer the questions on the next page to determine if you are eligible to participate in the survey. As a token of our appreciation, eligible survey participants will receive a no-fee $50 Amazon gift card after you complete the survey.

Do you wish to participate in the survey? (Please check one.)

1. Yes → ***If yes, please go to the "Eligibility Questions" on the next page.***

2. No → ***If no, we are sorry that you do not wish to participate in this survey. Please return the survey booklet in the provided pre-stamped envelope. Thank you.***

For questions or concerns, please contact the survey hotline at: (504) 267-3396 or email homesurvey@urban.org.

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Eligibility Questions

We need to ask a few questions to ensure that you are eligible to take the survey. Please answer "Yes" or "No" for each question with a "✓" in the box supplied.

A. Do you live in one of the following Parishes: Jefferson, Orleans, St. Tammany, St. John Baptist, St. Charles, St. Bernard, Plaquemines?
   a. Yes
   b. No → STOP

B. Is this home occupied by the owners?
   a. Yes, it is owner-occupied (or it will be shortly)
   b. No, it is renter-occupied → STOP

C. Are you the homeowner?
   a. Yes
   b. No

What is the name and phone number of a household member who owns this home that we can contact to give this survey to someone eligible?

- Name _____
- Phone Number _____ → STOP

D. Did you acquire this home in 2008 or later?
   a. Yes
   b. No → STOP

E. Do you live in one of the following types of homes: single family detached or attached house, a unit in a double or duplex, a unit in a multi-family building? (Answer "No" if you live in a cooperative building, a mobile home, a manufactured home, a HUD-Code home, a house boat, an RV, or other mobile residence.)
   a. Yes
   b. No → STOP

F. Are you age 18 or older?
   a. Yes
   b. No → STOP

Thank you for answering the eligibility questions. **If you answered "Yes" to <u>all</u> of the eligibility questions, please continue** to the instructions below.

If you answered "No" to <u>any</u> of the eligibility questions A through F, you are not eligible to take the survey. Please <u>stop</u> answering questions and return the survey in the pre-stamped envelope we provided.

Through this survey of eligible participants, we hope to revise home insurance standards and help leaders better communicate about risk to make it easier for homeowners to protect their homes and property.

Instructions

You are eligible to take the survey and receive the $50 gift card after completion. Because the survey asks for details about your home insurance policy, we **strongly encourage you to have your policy available** (if you have one) for reference as you answer the questions about your coverage. This will reduce the time needed to complete the survey significantly. Please answer all questions with a "✓" if there is a box supplied. For questions where each part asks "Yes" or "No," please check "Yes" or "No" for each.

Please provide a preferred email address that researchers may use to clarify any answers to the survey.

- Email: _____

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Section 1. Homeownership and the Home

We want to know about your current home and how you selected it.

1. **Is this the first home you have ever owned?**
   a. Yes
   b. No

2. **How did you acquire this home?**
   a. Purchased with a primary mortgage only
   b. Purchased with a primary and secondary mortgage, including a "soft secondary"
   c. Purchased without a mortgage or in cash
   d. Inherited it

   i. **Did your inherited home come with debt? → [Answer and Go to Q5]**
      1. Yes
      2. No

   ii. **How much was the debt?**
      i. Less than $1,000
      ii. $1,000 to $2,999
      iii. $3,000 to $4,999
      iv. $5,000 to $9,999
      v. $10,000 to $ 19,999
      vi. $20,000 or more

3. **What was the purchase price of your home? (Exclude any amount needed for renovations.)**
   □ Less than $50,000
   □ $50,000 to $99,999
   □ $100,000 to $149,999
   □ $150,000 to $199,999
   □ $200,000 to $249,999
   □ $250,000 to $299,999
   □ $300,000 to $349,999
   □ $350,000 or more

4. **What was the down payment that you put on your home, if any?**
   □ 0%
   □ 0.1% to 4.9%
   □ 5% to 9.9%
   □ 10% to 14.9%
   □ 15% to 19.9%
   □ 20% or more

5. **To what degree were any of the following reasons you chose this home?**

	Not a reason	Minor reason	Major reason
Location……	□	□	□
Size ……	□	□	□
Move-in ready……	□	□	□
Quality of Construction……	□	□	□
Height above the ground……	□	□	□
To own or invest in property….	□	□	□
Price……	□	□	□
Previous home was damaged in a hazard event, disaster, or accident……	□	□	□
Other (specify)_____	□	□	□

6. **To what degree were any of the following reasons you chose this location?**

	Not a reason	Minor reason	Major reason
Proximity to job……	□	□	□
Proximity to family or friends…	□	□	□
Proximity to schools……	□	□	□
Look, design, or amenities of neighborhood……	□	□	□
Proximity to a body of water, recreational space, or natural amenities or space ……	□	□	□
Out of a flood zone……	□	□	□
Level of crime or violence……	□	□	□
Affordability……	□	□	□
Other (specify)_____	□	□	□

7. **To what extent did you consider risk of floods or hurricanes when choosing your home?**
   □ Not at all
   □ Not too much
   □ Some extent
   □ A great extent

8. **If new flood, hurricane, or other risk information emerged about your home, how likely would you be to move?**
   □ Very unlikely
   □ Somewhat unlikely
   □ Neither likely nor unlikely
   □ Somewhat likely
   □ Very likely

Section 2. Risk Information and Perception

We want to know about the information given to you when purchasing or acquiring your home.

9. When you acquired your home, were you informed about any of the following conditions associated with it?

	Yes	No
Previous flooding, water intrusion or accumulation, or drainage problem	☐	☐
Previous hurricane, wind, or hail storm damage	☐	☐
Previous fire damage	☐	☐
Location of the home within or out of a flood zone	☐	☐
Location of the home within an area at risk of hazards other than flood	☐	☐
Any repairs made to the home due to hazard damage or risk	☐	☐
The seller's or previous owner's flood insurance certificate	☐	☐
The home's flood elevation certificate	☐	☐
Government assistance or private programs for disaster repairs that may have ongoing contractual requirements or assessments on the home	☐	☐

10. To what extent did you rely on these sources for information about Your home's risks?

	Not at all 1	2	3	A great extent 4
Documentation from the seller or seller's representative, such as a Louisiana Property Disclosure Statement	☐	☐	☐	☐
Verbally from a real estate agent or other property representative	☐	☐	☐	☐
Verbally from the seller or previous owner	☐	☐	☐	☐
Verbally from neighbors or neighborhood representatives	☐	☐	☐	☐
Online real estate sites such as Zillow, Trulia, Redfin, Realtor.com, or a Multiple Listing Service	☐	☐	☐	☐
City, parish, or state documents such as historical property records or zoning maps	☐	☐	☐	☐
Inspection report or verbally from the inspector during home purchase	☐	☐	☐	☐
Other (specify) _____	☐	☐	☐	☐

11. Based on the information about the risks to your home prior to acquiring it, what actions did you take to reduce the risk, if any?

- ☐ None, there were no risks
- ☐ None, I acquired the home regardless of its risks and made no improvements
- ☐ I required the seller or previous owner to make repairs before I acquired it
- ☐ I negotiated a reduced price
- ☐ I made improvements myself
- ☐ Other (specify) _____

12. Before acquiring this home, did you decide not to purchase another home because of a hazard risk?

- ☐ Yes
- ☐ No

We want to know about your general experience with risks from hazards, disasters, emergencies and related natural events in the past, and your understanding of risks in the future. We use the term "hazard" to refer to all of these events in the following questions except where noted.

13. As you think about your lifetime, have community-wide hazards affected you?

- ☐ Yes
- ☐ No

14. Are any of the following statements true about your experience with hazards?

	Yes	No
You or a family member's property was damaged	☐	☐
You or a family member was physically injured or died	☐	☐
You or a family member suffered mental or emotional trauma	☐	☐
Property of a friend, neighbor, or coworker you know personally was damaged	☐	☐
A friend, neighbor, or coworker you know personally was physically injured or died	☐	☐
A friend, neighbor, or coworker you know personally suffered mental or emotional trauma	☐	☐
You or a family member suffered loss of employment or income	☐	☐

15. Do you currently rely on any of the following sources for information regarding the potential risks to your home from future hazards?

	Yes	No
Local or national media	☐	☐
The internet	☐	☐
Friends, family members, neighbors, or coworkers	☐	☐
Local government sources, including from parish meetings or town halls	☐	☐
State or national government sources, including FEMA/NFIP maps or reports	☐	☐
Local non-profits, disaster service providers (like the Red Cross), community groups, or churches	☐	☐
Private insurance company	☐	☐
Real estate agents	☐	☐
Lenders	☐	☐
Home inspector	☐	☐
Local schools or universities	☐	☐
Other (specify)_____	☐	☐

16. To what extent do you currently think about risk of floods or hurricanes to your home?

- ☐ Not at all
- ☐ Not too much
- ☐ Some extent
- ☐ A great extent

17. How likely do you think it is that in the next 10 years there will be a flood that will cause…

	Very Unlikely 1	2	3	4	Very Likely 5
Major damage to your home or your family's home?	☐	☐	☐	☐	☐
Major damage to property in your neighborhood?	☐	☐	☐	☐	☐
Injury or death to you or your family members?	☐	☐	☐	☐	☐
Injury or death to people in your neighborhood?	☐	☐	☐	☐	☐
Disruption to your job that prevents you from working?	☐	☐	☐	☐	☐
Disruption of electrical, telephone, and other basic services?	☐	☐	☐	☐	☐

18. **How likely do you think it is that a major natural hazard event or disaster will occur in your community <u>in your lifetime</u>?**
    - ☐ Very unlikely
    - ☐ Somewhat unlikely
    - ☐ Neither likely nor unlikely
    - ☐ Somewhat likely
    - ☐ Very likely

19. **Do you believe that climate change may be influencing the timing and severity of natural hazards?**
    - ☐ Yes
    - ☐ No
    - ☐ Maybe or unsure

Section 3. Home and Hazard Insurance

We want to know about your homeowners insurance and all other property insurance policies and coverage related to your home. We recommend that you have a copy of your insurance policy documents and coverage statements (if you have insurance).

20. **Was any form of property insurance required by your mortgage lenders or other institutions when you purchased your home?**
    - ☐ Yes
    - ☐ No→ **[Go to Q22]**
    - ☐ Not applicable, I don't have a mortgage → **[Go to Q22]**

21. **Which types of insurance were required by your mortgage lenders or other institutions when you purchased the home?**

	Yes	No
Standard homeowners insurance.....	☐	☐
Supplemental flood insurance either from the National Flood Insurance Program or another insurance provider.....	☐	☐
Supplemental wind or hail insurance from the Louisiana Citizens Property Insurance Corporation.....	☐	☐
Supplemental wind or hail insurance from another insurance provider.....	☐	☐
Any other supplemental insurance (specify)_____	☐	☐

22. **Do you currently have <u>any</u> insurance to protect your home or the contents within it?**
    - ☐ Yes
    - ☐ No→ **[Go to Q45]**

23. **Do you currently have any of these insurance types?**

	Yes	No
Standard homeowners insurance.....	☐	☐
Supplemental wind or hail insurance from the Louisiana Citizens Property Insurance Corporation.....	☐	☐
Supplemental wind or hail insurance from another insurance provider.....	☐	☐
Any other supplemental insurance (specify)_____	☐	☐
Supplemental flood insurance from the National Flood Insurance Program.....	☐	☐
Supplemental flood insurance from another insurance provider.....	☐	☐

↳ **If you answer "No" to <u>both</u> questions in the box, please answer Q24.**

Otherwise, go to Q25.

24. **If you do not have flood insurance from any source, what are the reasons**

for not having it?	Not a reason	Minor reason	Major reason
My property is not in a flood zone	☐	☐	☐
I cannot afford it	☐	☐	☐
I assume my other insurance will cover damages	☐	☐	☐
I have the resources to cover losses or damages on my own	☐	☐	☐
I expect to get government financial assistance in the event of a flood	☐	☐	☐
I expect to get charitable financial assistance in the event of a flood	☐	☐	☐
I expect my family and friends to assist me financially in the event of flood	☐	☐	☐
Other (specify)_____	☐	☐	☐

25. Which of these <u>best</u> describes your regular homeowners insurance policy?

- ☐ Protects the structure of the home only
- ☐ Protects both the structure of the home and the property within it
- ☐ Protects the property within the home only

26. Which of these <u>best</u> describes the perils or losses covered under your regular homeowners insurance policy?

- ☐ Basic perils or losses only
- ☐ All perils or losses aside from listed exclusions
- ☐ Special insurance for old houses

27. Across all of your insurance policies together, are losses from the following events covered?

	Yes	No
Fire	☐	☐
Water damage due to internal home appliance or home plumbing malfunction	☐	☐
Water damage due to external source, such as sewer backup	☐	☐
Flood due to natural hazard event or disaster	☐	☐
Hurricane or windstorm	☐	☐
Hail	☐	☐
Theft	☐	☐
Ground sinking or shifting	☐	☐

28. What month and year did you get your current homeowners insurance policy?

_____ _____

(MM) (YYYY)

29. What month and year did you get your current flood insurance policy?

_____ _____

(MM) (YYYY)

We want to know about the costs of your property insurance.

30. What is the amount you pay for:

a. Your annual homeowners insurance premium only? Indicate zero if you do not have a policy.

$_____

b. Your annual flood insurance premium only? Indicate zero if you do not have a policy.

$_____

We want to know about your experience with insurance claims.

31. Has the cost of your homeowners insurance premium changed since you've had the policy?

- ☐ Increased cost
- ☐ Decreased cost

- ☐ No change

32. Has the coverage of your homeowners insurance changed since you've had the policy?

- ☐ Expanded coverage
- ☐ Reduced coverage
- ☐ No change

33. For all the property insurance policies you have, what is the highest value deductible among all your deductibles? $_____

↳ **a. Has this deductible changed since you've had your homeowners insurance policy?**

- ☐ It has increased even though the coverage is the same
- ☐ It has increased and the coverage expanded
- ☐ It has decreased even though the coverage is the same
- ☐ It has decreased and the coverage decreased
- ☐ No change

34. Have you done anything to your house to receive a discount on your homeowners or your flood policy?

- ☐ Yes
- ☐ No

35. For all the property insurance policies you have, how and what is the highest coverage limit specified that your policies provide in the event of a loss or damage? (Answer only one.)

- ☐ **If the coverage limit is a percentage of the home value, what is the percent of the home value?** _____%
- ☐ **If the coverage limit is a percentage of the replacement or repair costs only, what is the percent of the costs?** _____%
- ☐ **If the coverage limit is a specified dollar value, what is the value of the highest coverage limit?** $_____

36. Have you made any claims on any of your insurance policies <u>in the past 10 years</u>?

a. Yes
b. No

i. **How many claims have you filed <u>in the past 10 years</u>?**

- ☐ 1 claim
- ☐ 2 to 3 claims
- ☐ 4 to 6 claims
- ☐ 7 or more claims

In answering the next set of questions about your claims, refer to the <u>most significant</u> claim you have ever filed in your <u>lifetime</u>.

37. What was the cause of the loss or damage related to the claim?

- ☐ Fire from an external source outside of the home
- ☐ Fire from an accident or malfunction within home
- ☐ Water damage from an outside flood
- ☐ Water damage from internal plumbing or mechanical malfunction
- ☐ Roof or exterior wall structural damage from a storm
- ☐ Theft
- ☐ Combination of causes
- ☐ I have never filed a claim → **[Go to Q42]**
- ☐ Other (specify) _____

38. What month and year was the claim filed?

_____ _____
(MM) (YYYY)

39. What was the outcome of the claim?

- ☐ Paid in full (100%)
- ☐ Mostly paid (66-99%)
- ☐ Partially paid (35-65%)
- ☐ Minimally paid (1-34%)
- ☐ Denied
- ☐ Other (specify)_____
- ☐ Not applicable. The claim is still being processed.

40. How many months did it take for the insurance provider to process your claim?

- ☐ Less than 1 month
- ☐ 1 to 2 months
- ☐ 3 to 5 months
- ☐ 6 to 12 months
- ☐ More than 12 months
- ☐ Not applicable. The claim is still being processed.

41. How would you rate your satisfaction with the claims process overall?

- ☐ Very satisfied
- ☐ Fairly satisfied
- ☐ Neutral
- ☐ Fairly dissatisfied

46. For the <u>most recent</u> time you shopped for homeowners insurance, regardless of whether you purchased it, what were the reasons you decided to shop?

Yes No

- ☐ Very dissatisfied

42. Since you've acquired your current home, have you ever chosen not to file a claim even though you experienced damage or loss that was covered by your insurance policy?

- ☐ Yes
- ☐ No →**[Go to Q44]**

43. To what degree were any of the following reasons you chose not to file a claim?

	Not a reason	Minor reason	Major reason
The loss was less than my deductible……	☐	☐	☐
I was concerned that my premium would increase……	☐	☐	☐
The claims process was too burdensome……	☐	☐	☐
I was concerned I would lose my coverage……	☐	☐	☐
The amount of the claim wasn't worth it……	☐	☐	☐
The insurance or claims representative discouraged me from filing……	☐	☐	☐
My policy didn't cover the damage or event……	☐	☐	☐
Other (specify)_____	☐	☐	☐

44. Overall, how satisfied are you with the homeowners insurance company that you now have for this home?

- ☐ Very satisfied
- ☐ Fairly satisfied
- ☐ Neutral
- ☐ Fairly dissatisfied
- ☐ Very dissatisfied

45. How often do you shop for homeowners insurance?

- ☐ More than once a year
- ☐ Yearly
- ☐ Every few years
- ☐ Rarely
- ☐ Not since I took out my first policy
- ☐ Never

To get a better price……	☐	☐
To better satisfy my coverage needs……	☐	☐
Required to purchase new insurance……	☐	☐
I was dropped by my existing insurer……	☐	☐
Poor claim service from existing insurer…	☐	☐
I prefer another insurance company over my existing insurer……	☐	☐
Not applicable. I have never shopped for homeowners insurance ……	☐	☐
Other (specify)_____	☐	☐

47. Have you ever been denied homeowners insurance coverage?

- ☐ Yes
- ☐ No

48. Have you ever had a homeowners policy canceled?

- ☐ Yes
- ☐ No

Section 4. Risk Action

We want to know if you have taken any steps or done anything to your property in preparation for future hazards.

49. Which of the following do you have available or on hand in case of an immediate hazard event or emergency?

	Yes	No
A generator to provide electricity……	☐	☐
Enough non-perishable food to feed yourself and your household for at least three days ……	☐	☐

At least three gallons, or 24 bottles, of water for each person in your household	☐	☐
Necessary emergency supplies together and readily available to take with you if you have to evacuate your home	☐	☐
Important documents together and readily available to take with you if you have to evacuate your home	☐	☐
Evacuation plan or family meeting points	☐	☐
Other (specify) _____	☐	☐

50. Have you done any of the following to your home?

	Yes	No
Elevated your entire home	☐	☐
Strengthened the home's roof, including wind bracing, strengthening connections to supporting walls, attaching a roof deck, or rebuilding roof with stronger covering materials	☐	☐
Strengthened the home's foundations, including strengthening the connections to supported walls	☐	☐
Retrofitted your basement or first floor with water barriers, flood-proofing, or other secondary water barrier	☐	☐
Installed storm shutters or other protections for window, door, and skylight openings	☐	☐
Installed backwater valves or other improvement to water and storm water connections	☐	☐
Installed earthen berms around your entire home	☐	☐
Moved equipment, such as the water heater, to a higher location or protected equipment by a floodwall	☐	☐

51. Of all the adjustments you made to your home property, how much <u>did</u> you pay?

- ☐ $0
- ☐ $1 to $2,499
- ☐ $2,500 to $4,999
- ☐ $5,000 to $9,999
- ☐ $10,000 to $19,999
- ☐ $20,000 or more

52. How much <u>would you be able to</u> pay now in construction costs in order to significantly reduce your home's risk to hazards in the future?

- ☐ $0
- ☐ $1 to $2,499
- ☐ $2,500 to $4,999
- ☐ $5,000 to $9,999
- ☐ $10,000 to $19,999
- ☐ $20,000 or more

53. Are you aware of any of the following grants, loans, or other financial incentives available to you for your property? These may be from the federal, state, or local government or local nonprofits. If so, indicate if you are aware or have taken advantage of the incentive.

	I am not aware of this incentive	I am aware but have not applied	I received this incentive	I was denied
The Severe Repetitive Loss grant program ...	☐	☐	☐	☐
The Repetitive Flood Claims program ...	☐	☐	☐	☐
The Flood Mitigation Assistance program ...	☐	☐	☐	☐
The Pre-Disaster Mitigation program ...	☐	☐	☐	☐
The Louisiana State Sales and Exclusion Tax Credit for Storm Shutters	☐	☐	☐	☐
Hurricane Preparedness Louisiana Sales Tax Holiday	☐	☐	☐	☐
Insurance Premium Discounts	☐	☐	☐	☐

Tax Deductions for Voluntary Retrofit	☐	☐	☐	☐
Other parish or city program (specify)_____	☐	☐	☐	☐
Other charity or nonprofit program (specify)_____	☐	☐	☐	☐

54. If you did not take advantage of any programs but you were familiar with them, what was the <u>main</u> reason you did not?

- ☐ My home is not eligible to receive the incentives
- ☐ I cannot afford to implement the mitigation technologies
- ☐ I do not understand the incentive program
- ☐ I have not had time to apply for the incentive program
- ☐ Other (specify) _____

We want to know your perceptions of the various organizations or groups that may provide services related to your home and hazards.

55. To what extent do you think that the following entities are responsible for <u>protecting</u> your property from a hazard?

	Not at all 1	2	3	A great extent 4
Federal government.....	☐	☐	☐	☐
State or local government.....	☐	☐	☐	☐
Home insurance companies.....	☐	☐	☐	☐
Friends, neighbors, or coworkers.....	☐	☐	☐	☐
Yourself and your family members.....	☐	☐	☐	☐

56. To what extent do you think that the following entities are responsible for helping your property <u>recover</u> from a hazard?

	Not at all 1	2	3	A great extent 4
Federal government.....	☐	☐	☐	☐
State or local government.....	☐	☐	☐	☐
Home insurance companies.....	☐	☐	☐	☐
Friends, neighbors, or coworkers.....	☐	☐	☐	☐
Yourself and your family members.....	☐	☐	☐	☐
Local non-profit, church, or other community organization.....	☐	☐	☐	☐

Section 5. Homeowner Information

We want to know some basic information about you and your household.

57. Please verify the address of your home:

- Street Address: _____
- City, State, ZIP Code: _____

58. How do you describe your gender?

- ☐ Female
- ☐ Male
- ☐ Other

59. Do you describe you ethnicity as Hispanic or Latino/a?

64. Please identify if any of the following apply to you or anyone in your household:

	Yes	No
Serious difficulty hearing.....	☐	☐
Blind or serious difficulty seeing, even when wearing glasses.....	☐	☐
Serious difficulty concentrating, remembering or making decisions because of a physical, mental, or emotional condition.....	☐	☐
Serious difficulty walking or climbing stairs.....	☐	☐
Difficulty bathing or dressing.....	☐	☐

- ☐ Yes
- ☐ No

60. How do you describe your race?

- ☐ White
- ☐ Black or African American
- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Hawaiian or Pacific Islander
- ☐ Other (specify) _____

61. What is your age?

- ☐ 18 to 30
- ☐ 31 to 40
- ☐ 41 to 50
- ☐ 51 to 60
- ☐ 61 to 70
- ☐ Older than 70

62. What is the highest level of education that you have completed?

- ☐ Less than a high school diploma
- ☐ High school graduate, GED, or equivalent
- ☐ Some college, no degree
- ☐ Associate's degree or technical certificate
- ☐ Four-year college graduate
- ☐ Some postgraduate school, no degree
- ☐ Master's degree, professional degree, or doctorate degree

63. What is your current employment status?

- ☐ Employed full-time
- ☐ Employed part-time
- ☐ Self-employed
- ☐ Unemployed and currently looking for work
- ☐ Unemployed and not currently looking for work
- ☐ Retired
- ☐ Stay-at-home caregiver
- ☐ Student
- ☐ Other (specify) _____

Difficulty doing errands alone, such as shopping, because of a physical, mental, or emotional condition.....	☐	☐

65. What is your total household income? (In addition to income from employment, please include other sources.)

- ☐ Less than $30,000
- ☐ $30,000 to $34,999
- ☐ $35,000 to $39,999
- ☐ $40,000 to $49,999
- ☐ $50,000 to $59,999
- ☐ $60,000 to $74,999
- ☐ $75,000 to $84,999
- ☐ $85,000 to $89,999
- ☐ $90,000 or more

66. Including yourself, how many people live in your household who are age 18 or older? Please include adult children. _____ people

67. How many people live in your household who are under age 18? _____ people

68. How many people live in your household who are age 65 or older? _____ people

69. To the best of your recollection, what was your credit score at the time you acquired your current insurance policy? _____points

Finally, we want to know how you accessed the insurance information you reported in this survey (if any).

70. Did you refer to your insurance policy to answer questions in this survey?

e. Yes
f. No

i.In what format did you access your insurance policy?

	Yes	No
Paper copy.....	☐	☐
Website	☐	☐
Insurance company app on an electronic device.....	☐	☐
Online chat with or email from your insurance company.....	☐	☐
Phone call with your insurance company.....	☐	☐
Other (specify) _____	☐	☐

The Survey is Complete!

Thank you for completing the survey! **Please return the survey in the pre-stamped envelope we provided.** As a token of our appreciation, you will receive a no-fee $50 Amazon gift card. If you choose to receive your Amazon gift card in the mail, please allow extra time for delivery.

With what method do you prefer to receive your $50 gift card?

a. Email to the address specified at the beginning
b. Email to an alternative email address
    i. Email: _____
c. Postal mail to the street address to which this survey was sent
d. Postal mail to the street address specified in Section 5
e. Postal mail to a different street address
    i. Street Address:

    _____

    ii. City, State, ZIP Code:

    _____

For questions or concerns, please call our survey hotline at (504) 267-3396, or email homesurvey@urban.org.

Notes

[1] We use the term "postdisaster" in this report in accordance with Urban Institute style, while recognizing that others in the field often hyphenate the term as "post-disaster."

[2] Laura Lightbody, "77% of Americans Say Federally Funded Infrastructure Must Be Flood Ready," Pew Charitable Trusts, March 13, 2019, https://www.pewtrusts.org/en/research-and-analysis/articles/2019/03/13/77-percent-of-americans-say-federally-funded-infrastructure-must-be-flood-ready.

[3] Louisiana State Legislature, LA Rev Stat § 22:1319, https://legis.la.gov/Legis/Law.aspx?d=508233. For more discussion about the implications of the legislation, see Rebecca Marx, Clare Salerno, and Carlos Martín, "Without Robust Requirements That Sellers Disclose a Home's Flooding History, Buyers Are More At Risk," Urban Wire (blog), July 21, 2020, https://www.urban.org/urban-wire/without-robust-requirements-sellers-disclose-homes-flooding-history-buyers-are-more-risk.

[4] "Fortified Home," Insurance Institute for Business & Home Safety, accessed November 28, 2023, https://fortifiedhome.org/

[5] We use the term "postdisaster" in this report in accordance with Urban Institute style, while recognizing that others in the field often hyphenate the term as "post-disaster."

[6] "Louisiana's Comprehensive Master Plan for a Sustainable Coat: Committed to our coast," 2012 Coastal Master Plan, Coastal Protection and Restoration Authority of Louisiana, accessed December 21, 2023, https://coastal.la.gov/our-plan/2012-coastal-masterplan/

[7] Louisiana State Legislature, LA Rev Stat § 22:1319, https://legis.la.gov/Legis/Law.aspx?d=508233.

[8] "Lead Disclosure Requirements When Buying, Selling, or Renting a House or Apartment: Section 1018 of Title X and the Disclosure Rule," State of Louisiana, Department of Environmental Quality, 2008, accessed December 19, 2023, https://deq.louisiana.gov/assets/docs/Air/Lead_Paint/LeadFAQ4.pdf.

[9] "State of Insurance 10 years post-Katrina." State of Louisiana, Department of Insurance. 2015. https://www.ldi.la.gov/docs/default-source/documents/publicaffairs/consumerpublications/state-of-insurance-10-years-post-katrina.pdf.

[10] See also "LAHouse," Louisiana State University Agricultural Extension Center, accessed December 20, 2023, https://www.lsuagcenter.com/topics/family_home/home/lahouse.

[11] "State of Insurance 10 years post-Katrina." State of Louisiana, Department of Insurance. 2015. https://www.ldi.la.gov/docs/default-source/documents/publicaffairs/consumerpublications/state-of-insurance-10-years-post-katrina.pdf.

[12] This report refers to the "Greater New Orleans" area in reference to the seven parishes that include Orleans and its surrounding parishes. These are the geographic focus of analysis for all component studies, including the survey. The term is used in this report not to center the City of New Orleans, but as an abbreviated reference to the region that is commonly understood there per our local partners as well as the region's historians, except where the authors are specifically referencing one of the parishes or the City of New Orleans explicitly. Note that the Census-defined New Orleans metropolitan statistical area also include Tangipahoa Parish in addition to these seven parishes, which was excluded from our analysis based on our local partners' guidance.

[13] "Geographic Crosswalks: IPUMS NHGIS," National Historical Geographic Information System, accessed December 4, 2020, https://data2.nhgis.org/main.

[14] An analysis of data available publicly at this project's 2015 planning start from the State of Louisiana Department of Insurance, Act 427 Reports found the average annual insurance premium rates for residential properties in

averaged in zipcodes from the Greater New Orleans area excluding the Central Business District to be about $2500, and an average of the averages in zipcodes in surrounding parishes at about $1800—both almost twice the rate of other parishes. The Act 427 reporting was sunsetted in 2017 and their data now unavailable: https://www.ldi.la.gov/industry/regulatory-forms/act-427.

[15] A more robust discussion of this data selection is provided in chapter 1. The original flood zone designations used to sample homeowners in St. Tammany, Plaquemines, and St. John the Baptist parishes were based on hand-drawn flood zone maps; consequently, the team undertook a spatial joining process to update and merge in flood zone designations into final datasets.

[16] For example, Zillow "Zestimates" were used to identify the home value of 134 survey responses as a proxy for the home purchase price when these were provided in a percent of home-value format in the project survey. These observations were collected manually and incorporated to bolster the insurance analytical models.

[17] See also Metz. J., "72% Of Homeowners Don't Understand Essential Home Insurance Coverage." Forbes, May 26, 2023, https://www.forbes.com/advisor/homeowners-insurance/survey-homeowners-insurance-knowlege/.

[18] "Center for Texas Beaches and Shores," Texas A&M University at Galveston and Hazard Reduction & Recovery Center, Texas A&M University at College Station, accessed July, 2021, https://ifsc.tamu.edu/Engagement/Partnerships/The-Center-for-Texas-Beaches-and-Shores.

[19] "Protecting Homes from Natural Disasters and Household Perils," Insurance Research Council. 2003. accessed June 2, 2020; "Natural Disasters, Insurance Research Council. 2005." accessed June 2, 2020; "Influence of Coastal Proximity on Natural Disaster Preparedness and Planning," Insurance Research Council, 2006, accessed June 2, 2020; "Insurance Satisfaction and Shopping," Insurance Research Council, 2009, accessed June 2, 2020, https://www.insurance-research.org/research-publications/public-attitude-monitor-2009-insurance-satisfaction-and-shopping; "Public Understanding of Hurricane Deductibles: Need for Consumer Education Persists," Insurance Research Council, 2017, accessed June 2, 2020, https://www.insurance-research.org/research-publications/public-understanding-hurricane-deductibles-need-consumer-education-persists.

[20] A detailed review of the survey experimentation was virtually presented at the American Association for Public Opinion Research 75th Annual Conference, June 11-12, 2020.

[21] This percentage does not exclude failed outreach attempts and bounce back mails.

[22] Original (raw) and weighted data from this survey are available at: https://datacatalog.urban.org/dataset/housing-resilience-greater-new-orleans.

[23] In one instance, a model with a slightly higher BIC was selected over another for the purposes of cross-comparison and because of the theoretical relevance of the model's variables.

[24] By one account, NFIP premiums dropped for many Orleans parish residents in 2016 because of revised flood maps, suggesting that infrastructure changes since Katrina had contributed to new risk assessments: Adelson, J., "New Orleans' revised flood maps set to slash insurance rates for many homeowners," The Advocate, September 29, 2016, https://www.nola.com/news/new-orleans-revised-flood-maps-set-to-slash-insurance-rates-for-many-homeowners/article_5ab88d73-a3e7-5934-8750-e6b76dd726f4.html. However, these premium changes were not corroborated and are now likely moot given Risk Rating 2.0.

[25] Song, L. and L. Younes. "EPA Calls Out Environmental Racism in Louisiana's Cancer Alley." ProPublica: October 19, 2022, https://www.propublica.org/article/cancer-alley-louisiana-epa-environmental-racism.

[26] Marshall, B. "The Louisiana Coast: Last Call—How we Got This Way: Canal Dredging," New Orleans Public Radio. February 19, 2021, https://www.wwno.org/post/louisiana-coast-last-call-how-we-got-way-canal-dredging.

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[29] Richards, H.,"$100M oil, gas settlement called 'breakthrough' for La. Coast." EnergyWire, September 27, 2019, https://subscriber.politicopro.com/article/eenews/1061173285.

[30] "100-Year Level of Risk Reduction." US Army Corp of Engineer, New Orleans District, accessed December 4, 2020, https://www.mvn.usace.army.mil/Missions/HSDRRS/Risk-Reduction-Plan/100-Year-Level-Protection/.

[31] "Lake Pontchartrain and Vicinity General Re-evaluation Report," US Army Corp of Engineer, New Orleans District, accessed December 21, 2023, https://www.mvn.usace.army.mil/About/Projects/BBA-2018/studies/LPV-GRR/.

[32] Schleifstein, M. "Corps does not need Congress' OK to elevate New Orleans Levees to 200-year levels, study says." NOLA, November 24, 2020, https://www.nola.com/news/environment/article_3af2c85c-29fb-11eb-a5aa-6bae5e0900e7.html?utm_medium=social&utm_source=email&utm_campaign=user-share.

[33] Marshall, B. "Losing Ground: Southeast Louisiana is Disappearing, Quickly." ProPublica. August 28, 2014, https://www.propublica.org/series/losing-ground.

[34] "About CWPPRA," Coastal Wetlands Planning, Protection, and Restoration Act program, accessed December 4, 2020, https://lacoast.gov/new/About/Default.aspx.

[35] "Deepwater Horizon Oil Spill Restoration," Coastal Protection and Restoration Authority, accessed December 4, 2020, https://coastal.la.gov/deepwater-horizon-oil-spill-content/oil-spill-overview/restore-act/,

[36] "Cheniere Ronquille Barrier Island Restoration," Coastal Wetlands Planning Protection and Restoration Act Program, Louisiana Coastal Wetlands Conservation and Restoration Task Force, accessed November 8, 2020, https://www.lacoast.gov/reports/gpfs/BA-76_hq.pdf.

[37] "Gov. Edwards Announces $215 Million in Louisiana TIG Funding for Two Coastal Habitat Restoration Projects," State of Louisiana, Office of the Governor, September 29, 2020, https://gov.louisiana.gov/index.cfm/newsroom/detail/2709.

[38] "Golden Triangle Marsh Creation," Coastal Protection and Restauration Authority, 2014, accessed December 20, 2023,https://coastal.la.gov/wp-content/uploads/2014/11/RESTORE_Golden-Triangle-Fact-Sheet_11.10.14.pdf.

[39] "Biloxi March Living Shoreline," Coastal Protection and Restauration Authority, accessed December 4, 2020, http://coastal.la.gov/wp-content/uploads/2014/11/RESTORE_Biloxi-Marsh-Living-Shoreline-Fact-Sheet_11.12.14.pdf.

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[83] Risk researchers distinguish between System 1, or fast thinking—thinking that is automatic and unintentional—from System 2, or slow thinking—which is thinking that is comparatively effortful and deliberative. System 1 thinking is comprised of unselfconscious, intuitive processes, mental heuristics and biases, and memory; System 2 thinking includes intentional processes, such evaluating information, computation, and reasoning. Faster System 1 thinking—that is, top-of-mind, affective cognitions, or risk as feelings—have been shown to strongly influence perceptions of risk.

[84] At the time of study, residents in many parishes exhibited lower rates of climate belief than national averages—as low as 10 points lower in St. Tammany Parish and 9 points lower St. Bernard Parish—according to national polling. See the Climate Opinion Factsheets for the State of Louisiana and individual parishes published by the Yale Program on Climate Change Communication (Marlon et al. 2022).

[85] Note that construction or physical housing qualities aside from location were also considered, but those that related to hazard durability or mitigation quality were slightly less frequently cited than locational factors. For example, 48.2 percent of respondents marked "Quality of Construction" as a major reason why they chose their home, while 32.4 percent marked "Height above the ground" as a major reason.

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[120] Having a past insurance claim was initially included in the model since it may influence insurance pricing, but the sample size was too small for inclusion.

[121] Refer to the Analysis section of the Introduction for more information about model specifications and analysis approach.

[122] The sample is stratified by parish, and therefore the models specify these strata. With small sample sizes in less populous parishes, results are reported across the seven parishes as opposed to reporting differences by strata. Each model was run first with only the predictors of interest: race /ethnicity and household income, controlling

for a flood zone indicator. The models were run a second time with all control variables. This nested approach allows us to observe changes in explained variance.

[123] Hypothetically, a homeowner has supplemental coverage because their homeowners insurance denied them a specific coverage, such as for wind damages. However, the study cannot determine whether survey respondents purchased supplemental insurance in particular because of denials or effective denials (e.g., extreme price increases) or for any other reason such of their own choice or another set of catalyzing events.

[124] Presumably, the purchase of supplemental insurance such as a wind peril policy is spurred either because the owner is denied coverage by their existing homeowners' insurance, because the owner is required to by a mortgage lender, local statute, or other external party, or because the owner is conscious of their own need for additional coverage. This study does not explore the causes of supplemental insurance purchase or contributing or predictive factors for supplemental policy purchase because of denials or effective denials (e.g., extreme price increases) or of their own market choice, let alone determine why a subgroup such as those in the floodzone had to purchase it, unfortunately. Questions 20-21 ask about required insurance coverage (including supplemental types) and Questions 45-48 ask about shopping, denial, and cancellation but not tied to a specific policy type.

[125] See Maldonado et al. (2016) for example use mitigation as a predictor for risk in the Miami and Houston areas but not as a predictor for insurance outcomes.

[126] The negative relationship of claim time to satisfaction also holds when claim time is used to predict insurance satisfaction, controlling for other factors. However, the claim time variable was not included in the final insurance satisfaction model because it drastically reduces the sample size of the model.

[127] The team notes that some homeowners' insurance might cover certain wind or hurricane damages. See: https://www.houselogic.com/finances-taxes/home-insurance/is-hurricane-insurance-worth-it/

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[143] Mitigation options included: having elevated your entire home; strengthened the home's roof, including wind bracing, strengthening connections to supporting walls, attaching a roof deck, or rebuilding roof with stronger covering materials; strengthened the home's foundations, including strengthening the connections to supported walls; retrofitted your basement or first floor with water barriers, flood-proofing, or other secondary water barrier; installed storm shutters or other protections for window, door, and skylight openings; installed backwater valves or other improvement to water and storm water connections; installed earthen berms around your entire home; and moved equipment, such as the water heater, to a higher location or protected equipment by a floodwall. Mitigation options were derived from FEMA household guidance documents.

[144] Refer to the Analysis section of the Introduction for more information about model specifications and analysis approach.

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