COMMUNITY DEVELOPMENT BLOCK GRANT DISBURSEMENTS AFTER DISASTERS: ASSESSING SOCIAL VULNERABILITY

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DEDICATION

To my grandparents, thank you for exposing me to the possibilities.

To all of the children in my life - dream big and embrace change.

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Title of Study: COMMUNITY DEVELOPMENT BLOCK GRANT DISBURSEMENTS AFTER DISASTERS: ASSESSING SOCIAL VULNERABILITY

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Abstract: This research observed the differences among various State distributions of CDBG funds for recovery efforts following the 2005 and 2008 hurricane seasons. The distribution of CDBG funds was also used to assess if any disparities exist among certain socially vulnerable populations. Testing the socio-political ecology theory, this research used multiple regression analysis to estimate the affects of the social vulnerability on CDBG disbursement after disaster. The type of activities funding with the CDBG disbursements were separated into five groups; administration, economic development, housing, infrastructure, and public facilities. The results show that certain socially vulnerable factors were highly correlated with the amount of funding from the CDBG program at the county level. The findings suggest that the socio-political ecology theory may not be the sole theory accountable for the variation in CDBG funds during each hurricane season.

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CHAPTER I

INTRODUCTION

This dissertation examined the post disaster recovery distribution of Federal aid after several hurricanes, all of which was distributed in two allotments. In the United States, the Community Development Block Grant (CDBG) is one means by which the Federal government may allocate such aid. Typically, the CDBG program is used when disaster recovery needs exceed $2 Billion (Federal Register, 2009). This dissertation studied CDBG funds disbursed for purposes of recovery after Hurricanes Katrina, Rita, and Wilma (and others as described in the U.S. Federal Register) in 2005 and Hurricanes Gustav and Ike (and others as described in the U.S. Federal Register) in 2008. No means exist to determine how much of the CDBG funds are allocated specifically for Hurricane Katrina and not Rita or Wilma if the location was hit by more than one storm (Federal Register, 2006). Similarly, no means exist to determine funds for Ike and not Gustav (Federal Register, 2009). After the hurricane seasons, State Governments disbursed funds to impacted parishes and counties. The Presidential Disaster Declaration (PDD)

identified the impacted counties and parishes. Therefore, the disbursement of funds at the county-level from both hurricane seasons was analyzed in this study (i.e. most counties in Mississippi, Louisiana, and Texas). The disbursement of funds from the CDBG program was the dependent variable in this study. The independent variables related to the perceived social vulnerability of a county including income, race, sex, and disability.

Significance of the Problem

Disasters often reveal preexisting social and political problems, particularly that disasters disproportionately affect some populations more than others (Barton, 1969; Quarantelli, 1998; Waugh, 2006). For example, the Department of Homeland Security (DHS) noted that at least 71 percent of those who lost their lives during Hurricane Katrina were older adults or the infirmed (Townsend, 2006). Sharkey (2007) also noted that members of certain racial and ethnic groups died in numbers disproportionate to the general population after Hurricane Katrina (Sharkey, 2007).

During recovery, similar problems arise (Peacock & Girard, 1997; Peacock, Dash, & Zhang, 2007; Morrow & Enarson, 1996; Zhang & Peacock, 2010). Finch, Emrich, and Cutter (2010) noted that socioeconomic stratification and its distribution in the city [New Orleans] continued to influence the long-term recovery and mitigation efforts [Hurricane Katrina]. Individuals lacking adequate language skills, minorities, low-income households, and even female-headed household also have had a difficult time during recovery (Peacock, Dash, & Zhang, 2007; Morrow & Enarson, 1996). People in low-income households or low-income neighborhoods tend to have a harder time receiving financial assistance (Peacock, Dash, & Zhang, 2007; Siedenberg, 2006; Jopling, 2008). CDBG funds represent one type of financial assistance given to impacted areas after disasters. In this research, I used CDBG

funds to assess such disparities. The disbursement of the CDBG funds was used as the dependent variable. The rest of this section discusses the process of receiving CDBG funds.

When a disaster overwhelms the services of State and local municipalities, the governor can request Federal disaster relief. This signifies that State and local governments do not have enough material, personnel, or financial resources to meet their response or recovery needs. First, State governors request a Presidential Disaster Declaration (PDD) based on documentation collected during a Preliminary Damage Assessment (PDA). The PDD enables the President and Congress to release Federal funds to support an affected State for recovery-related efforts (Sylves, 2008; Platt, 1999). Under the Stafford Act of 1988, the President may authorize several types of assistance (Sylves, 2008; Platt, 1999). Specifically, the Stafford Act established five categories of aid (Stafford Act, 2007; Sylves, 2008):

- Essential aid
- Public assistance
- Repair and replacement of public sector buildings
- Debris removal
- Individual and household assistance

Next, the President determines which type of declaration to provide. Two types of declarations that can be made through the PDD: emergency and major declaration (Townsend, 2006; Federal Emergency Management Agency (FEMA), 2012). An emergency declaration limits the financial support that the State can receive from the Federal government to $5 million (Townsend, 2006). States that receive this declaration are also limited in the types of assistance they can be provided. Through the Stafford Act an emergency is defined as:

"Any occasion or instance for which, in the determination of the President, Federal assistance is needed to supplement State and local efforts and capabilities to save lives and

to protect property and public health and safety, or to lessen or avert the threat of a catastrophe in any part of the United States (Stafford Act, 2007, p. 2)."

The major disaster declaration, however, enables all categories of Federal assistance to be available for the State. It also does not have a limit on the amount of monetary aid the State receives (Townsend, 2006). Both 2005 and 2008 hurricane seasons caused several impacted areas to receive a major disaster declaration. The major disaster is defined as: *"Any natural catastrophe (including any hurricane, tornado, storm, high water, winddriven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought), or, regardless of cause, any fire, flood, or explosion, in any part of the United States, which in the determination of the President causes damage of sufficient severity and magnitude to warrant major disaster assistance under this Act to supplement the efforts and available resources of States, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby (Stafford Act, 2007, p. 2)."*

Finally, monetary disaster aid is allocated based on the type of disaster declared. Information provided from the preliminary damage assessment (PDA) helps guide this decision. The Federal Emergency Management Agency (FEMA) conducts the PDA with aid from State and local officials (FEMA, 2012). This official tally includes the number of buildings, roads, and public facilities damaged after the disaster (Loftus, 2007; FEMA, 2012). Some structures are labeled minimally, moderately, or totally destroyed. Also calculated in the PDA are nonstructural damages, economic losses, and infrastructure damages, among other things. Each of these can be difficult to determine.

Nonstructural damage may require experts to assess economic losses and can be calculated a number of different ways, and infrastructure such as utilities may be located underground and missed in the initial PDA (Murphy et al., 2009).

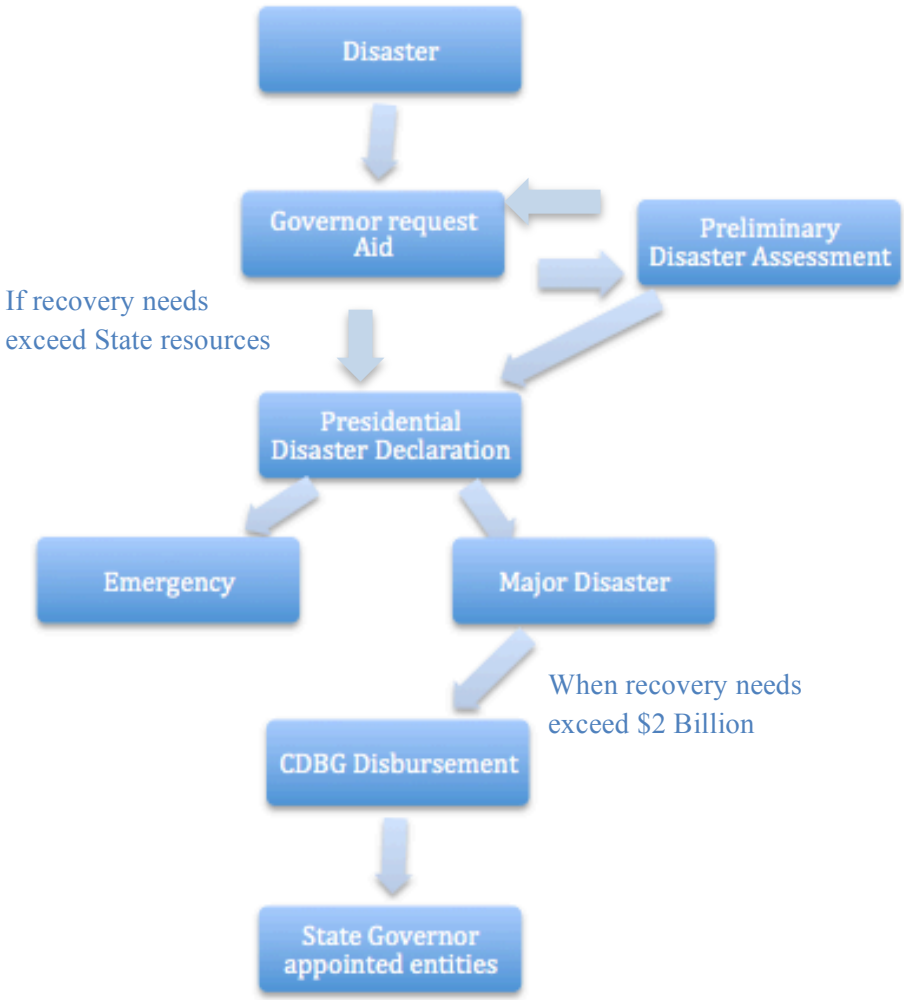


Figure 1: Chart depicting the process for receiving CDBG funds.

The chart in Figure 1 shows the process for State governors to receive CDBG funds after disaster. This research examined the funds from the CDBG allocation to assess

distribution of monetary Federal assistance. Funds allocated through the CDBG program are the only disbursements analyzed in this research. CDBG money is specifically for individual and household assistance, repairing public sector facilities, and public assistance for rebuilding infrastructure.

In 2009, the Government Accountability Office (GAO) issued a report on changing how Federal funds were distributed at the Federal and State-level (Government Accountability Office (GAO) # 09-437T, 2009). This proposed change was based, in part, from observations made of FEMA's public assistance program during the 2005 hurricane season (GAO #09-437T, 2009, p. 1). The GAO report focused on applying these lessons to our next big natural disaster, Hurricane Ike (GAO # 09-437T, 2009). Some of the lessons learned from other disasters with regards to public assistance include (GAO #09-437T, 2009, p. 1):

- Adopting a comprehensive approach toward combating fraud, waste, and abuse to protect disaster victims from fraud.
- Build State and local governments for implementing Federal Disaster Programs
- Implementing strategies for business recovery
- Implementing collaboration among Federal, State and local officials
- Build flexibilities to rebuild to the post-disaster needs of grant applicants

In the GAO report the authors observed that "According to Federal, State, and local officials, some critical long-term recovery funding, such as HUD's CDBG housing funds, and many long-term recovery projects do not become available or begin until 1 or 2 years after the disaster occurs, which is at least 6 months to a year after the Long Term Community Recovery (LTCR) concludes its assistance (GAO #10-0404, 2010b, p. 15)"

This research observed the differences among various State distributions of CDBG funds for recovery efforts following the 2005 and 2008 hurricane seasons. The distribution of

CDBG funds was also used to assess if any disparities exist among certain populations.

Conceptual Framework

An ecosystem framework was employed in this research to explore relevant data and suitable hypotheses (Bronfenbrenner, 1979). Bronfenbrenner (1979) developed a ranking system for complex environments working together within an ecological unit. Originally developed to analyze levels within child psychology, this framework has been used to explain levels within political science and disaster research (Kim, 1994; Silva, 2002). The ecosystem framework consists of four levels: macro-level, exo-level, meso-level, and micro-level. Changes in one 'layer' inevitably affect the others (Bronfenbrenner, 1979). The macro-level represents the culture, values, and morals that influence our society (Bronfenbrenner, 1979). The exo-level represents political and governmental activities at the Federal level (Bronfenbrenner, 1979; Garbarino, 1982). The meso-level represents activities that take place across organizations and agencies that connect to and contribute to the micro-level such as city county and State agencies (Bronfenbrenner, 1979; Kim, 1994). The micro-level represents activities aligned at the individual, household, and neighborhood levels (Bronfenbrenner, 1979; Garbarino, 1982).

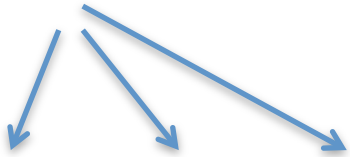
As Stallings (1996) reviewed, "author [Kim (1994)] used an 'integrative framework' to describe individual behavior and attitudes toward disasters and disaster policy (micro-level), the structure and mission of emergency management agencies (meso-level), and the structure, culture, and political economy of South Korea (macro- level) (p. 122)." Kim's 'integrative framework' mimicked Bronfenbrenner's ecosystem framework. In 2002, Silva wrote "the accuracy of predicting evacuee behavior and the detail required for modeling this behavior depends on whether the simulator uses a micro-, meso-, or a macro-level modeling

approach. The micro approach concentrates on simulating the behavior of each individual evacuating entity, while the macro-level approach concentrates on using flow equations that grossly average evacuee/entity behavior. The meso-level approach attempts to strike a balance between the two by averaging behavior among groups/batches of evacuees/entities (p. 59)." Here, the 'micro-, meso-, or macro-level modeling approach' also mimicked the Bronfenbrenner ecosystem framework.

The research presented in this dissertation represented micro-level activities with aggregate data, thus moving this interaction to the meso-level. I examined the distributions of funds for disaster recovery, through the actions of governor appointed entities. These actions are limited to the disbursement of funds and the types of programs funded. Furthermore, this research used the information on disbursements collected at the meso-level and compared it with the aggregate micro-level data for each county. The distribution of funds at the meso-level represented the dependent variable. The aggregate data of micro-level activities represented the independent variables.

Culture, which takes place at the macro-level, was not explored in this study. The table below describes the research intent using the ecosystem framework by Bronfenbrenner (1979), which will focus on the exo- and meso-levels of the ecosystem.

Table 1: An Ecosystem Framework Used to Show the Distribution of CDBG Funds

Exo-level Activities aligned at Federal level, which includes policy actions (Bronfenbrenner, 1979; Garbarino, 1982).	CBDG Funds $$$ 
Meso-level Activities that take place across organizations and agencies that connect to and contribute to the micro-level such as city, county, and State agencies (Bronfenbrenner, 1979; Kim, 1994).	Louisiana – Mississippi – Texas  Parishes/Counties using aggregate of the **micro-level** indicators at the county and parish levels.

Based on/Sources: Bronfenbrenner, 1979; Garbarino, 1984; Kim, 1994

Research Questions and Approach

I used a four-stage analysis to examine Federal aid distribution for two hurricane seasons using the ecosystem framework. In the first stage of this research, funding data was analyzed to reveal how meso-level actors distributed funds and if variations in aid distribution occur at the State and county level. In the second stage of this research, I explored CDBG funding to assess if variations of the distributions by program type occur across counties and parishes. As established by HUD, the CDBG program types included individual housing, rebuilding infrastructure, economic development, and restoration of public sector buildings (Federal Register, 2006; Federal Register, 2009; GAO #10-1011, 2010a). The program types represented a second set of dependent variables. In the third stage, I tested my hypothesis and constructed a model to ascertain whether a pattern exists in

the distribution of CDBG funds that corresponds to the social and economic composition of the counties. Finally in the fourth stage, CDBG distributions from the 2005 and 2008 hurricane seasons were compared to discern if any changes after policy recommendations were made in 2009. These stages are represented by four research questions:

(1) Do statistically significant variations appear in the distribution of CDBG disaster recovery program funds at the (a) State and (b) County Level? [meso-level]

(2) Do statistically significant variations appear in the distribution of CDBG disaster recovery program funds by program type at the (a) State and (b) County Level? [meso-level]

(3) Given that certain populations experience differential effects of disasters, do meso-level actors equally distribute funds to counties/parishes with such populations? [meso-level]

(4) Does statistically significant variation occur between the 2005 and 2008 hurricane seasons? [exo-level]

Data Sources

The CDBG disaster recovery program funds activities related to public sector rebuilding, infrastructure reconstruction, and individual assistance (Federal Register, 2006; Federal Register, 2009). FEMA approved State allocation information from CDBG reports were used in this research to identify the amount of aid given to each county. Governor appointed entities (or departments) determine the disbursements to impacted counties or parishes from allocations made at the Federal level. The records of these disbursements

appear in U.S. Department of Housing and Urban Development (HUD) quarterly progress reports. Links to the HUD quarterly progress reports were found on the HUD website.[1]

The quarterly performance reports depict the amount of money approved, see appendix 1. For the 2005 hurricanes, reports were submitted from 1st quarter 2006 to 2nd quarter 2012 for a total of 26 reports. For the 2008 hurricanes, reports were submitted from the 1st quarter 2009 to 4th quarter 2012 for a total of 16 reports. Detailed in these reports are the locations of the disbursement, the amount of money used, and the type of projects funded. The reports were quite lengthy, ranging from 25 to over 2,000 pages each. I combined data collected from the information gathered in the quarterly reports with data collected from the U.S. Census reports to establish an appropriate database, see appendix 2.

Anticipated Outcomes of the Research

This research has implications for theory, practice, and research. At the policy level, this research influences the implementation and distribution of CDBG disaster recovery aid. Specifically, the findings here highlight the necessity for changes in the regulation and monitoring of fund allocation at the Federal level. Previously, a GAO report indicated that the guidance at the State-level needs improvement (GAO # 09-437T, 2009).

Additionally, this research study builds an overall understanding and implementation of disaster-based policies. This research also increases the knowledge base and gap of the CDBG aid distribution with regard to disasters. Furthermore, this study increases overall findings related to disaster recovery on a State-level for significant disasters.

[1] Location of the quarterly progress reports, accessed May 2013, http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs/drsi/activegrantee

With regard to practice, the findings of this research could change the practice of handing out Federal dollars at the State-level. This research tested the socio-political ecology theory with regard to the distribution of Federal aid at the meso-level. The socio-political ecology theory states that scarce resources available after disaster creates a competitive period in which socially vulnerable populations fail to secure adequate recovery resources (Peacock & Ragsdale, 1997; Tierney, 2007; Peguero, 2006). This theory is discussed in detail in chapter 2.

Researchers have observed, in at least one State (Mississippi), that preferences were given based on the social composition of the locations receiving CDBG funds (Lowe, 2012; Jopling, 2008). This research reveals whether these observations are accurate. Additionally, this study reveals recommendations on how to improve disaster aid disbursement at the State-level.

Additionally, this research will be evidence based and 'use-inspired.' Evidence-based research is quite common, it seeks a to obtain fundamental understanding and is applicable (Stokes, 1997). 'Use-inspired' research can bridge the gap between purely applied and pure theoretical research (Stokes, 1997).

Summary and Upcoming Chapters

The purpose of this dissertation was to study the disbursement of Federal disaster aid from the Community Development Block Grant program at the county level. State governors decide how to distribute such aid. This study specifically examined the distribution of Federal disaster aid through the CDBG program during the 2005 and 2008 hurricane seasons. Therefore, I explored the four highly related research questions, stated earlier.

Chapter two reviews the literature related to the dependent and independent variables. The chapter begins with a review of the dependent variable, CDBG disbursements. It highlights issues related to recovery efforts for housing, infrastructure, and public sector facilities. The second section explores the independent variables related to social vulnerability. Additionally, the second section introduces the definition of socially vulnerable populations and then systematically reviews income, race, gender, age, and disability. Each area highlights research related to recovery of these populations or evidence of hardships for these groups during major disasters in United States' history. The chapter ends with a summary.

Chapter three reviews the methodology, context, and research analysis of the dependent and independent variables. The first section of chapter three reviews the background and context of the problem. The second section introduces the research questions and hypotheses. In the third section I define, operationalize, and identify data sources of the variables. Finally, I present the statistical analysis and research design.

Chapter four presents the results of the analyses. The first section describes the data in detail. The second section summarizes the data. The subsequent sections are organized by the specific research questions separately.

Chapter five presents the conclusion. The first section presents the interpretation of the results. The second section identifies the limitations of the study. Finally the last section highlights the implications for theory, policy and future research.

CHAPTER II

LITERATURE REVIEW

The purpose of this research was to analyze the funds disbursed through the Community Development Block Grant (CDBG) disaster recovery program after the 2005 and 2008 hurricane seasons. In this chapter, I reviewed the CDBG grant program in greater detail. In the first section, I examined the research and reports related to CDBG disaster recovery program disbursement. In the second section, I reviewed the Federal aid disbursed after disasters with emphasis on aid specifically following the 2005 and 2008 hurricane seasons. In the third section of this chapter I reviewed conceptual definitions of socially vulnerable populations and related disaster recovery research.

Community Development Block Grants

The CDBG program started in 1974 and is currently in existence. The primary focus of the Department of Housing and Urban Development (HUD) -led program is to rebuild homes in low- or moderate- income areas (Gotham & Greenberg, 2008).

It is the longest running, frequently used program for administering monetary support for housing rehabilitation, neighborhood revitalization, and economic development (Government Accountability Office (GAO) # 09-437T, 2009; Lowe, 2012). The CDBG program has goals similar to those needed for State and local government disaster recovery efforts (GAO # 09-437T, 2009). CDBG disaster recovery funds have been allocated following several disasters over the years including Hurricane Andrew in 1992, Northridge Earthquake in 1994, the Oklahoma City Bombing in 1995, the Midwest floods of 1997, the terrorist attacks of 2001, Hurricanes Katrina, Rita, and Wilma in 2005, and Hurricanes Ike and Gustav in 2008 (GAO # 09-437T, 2009; McCarty, Perl, & Foote, 2006). The program is called the CDBG disaster recovery program when it is used as the conduit for delivering Federal disaster aid (McCarty, Perl, & Foote, 2006). The U.S. Congress allocates recovery funds through the CDBG program when appropriations made from Presidential Disaster Declaration (PDD) exceed $2 billion (Federal Register, 2009).

How HUD has historically determined funding during normal times

In 2010, the Government Accountability Office (GAO) issued a report on how all-50 States distributed CDBG funds under normal conditions. The report showed that each State chose different methods to distribute funds at the local level (GAO #10-1011, 2010a). States or municipalities were able to use a formula, competition, open application, or a combination thereof to distribute funds (GAO #10-1011, 2010a, p. 1). At the time of the 2010 GAO report, a standard did not exist for how States distributed CDBG funds. In most States, the applications process was both competitive and open (or formula) based (GAO #10-1011, 2010a). For example, in Houston, Texas a non-profit

entity was created by the city to deliver loans to businesses while the administration department handled issues regarding housing, economic development, public infrastructure, and public services (GAO #10-1011 2010a, p. 35). The administration department used an open-ended application process while the non-profit used a competitive 60-day request for proposal process (GAO #10-1011, 2010a, p. 35). In New York, NY, nearly 20 city agencies received the funds and used a variety of processes among them to distribute the funds (GAO #10-1011, 2010a, p.34).

Under normal conditions (not for purposes of disaster recovery), States must disburse at least 70 percent of CDBG funds allocated to aid entitlement communities (Richardson, 2005; Walker et al., 2002). States can distribute the remaining 30 percent of CDBG funds in non-entitlement communities (Richardson, 2005; Walker et al., 2002). The requirement remained the same since 1981(Richardson, 2005; Walker et al., 2002).

HUD uses certain indicators to identify the entitlement status of a community (Richardson, 2005; Walker et al., 2002). The indicators impact whether a community receives funding or entitlement status (Walker et al., 2002; GAO #10-1011, 2010a). Determining entitlement status occurs before States receive any funding. HUD uses the term entitlement to describe cities of Metropolitan Statistical Areas, metropolitan areas with populations greater than 50,000, and urban counties with populations greater than 200,000 (HUD, 2013). Non-entitlement is used for cities and counties that do not meet the above description.

HUD determines the amount of funding for communities by using formulas (Walker et al., 2002; Richardson, 2005). The formulas used to allocate the funds among entitlement and non-entitlement communities can impact how much money a community

receives (Richardson, 2005; GAO #10-1011, 2010a). As of 2004, CDBG program officials have used two main formulas for determining fund allocation; see below (Richardson, 2005). HUD uses a needs-based index based on the factors from each formula (Richardson, 2005). The needs-based index is based on formulas to determine neighborhood quality.

Formula A: (.25) Population + (.50) Poverty + (.25) overcrowding (1)

Formula B: (.20) growth lag +(.30) Poverty + (.50) pre-1940 housing (2)

In formula A, HUD determines need by population, poverty, and overcrowding in the jurisdiction. Each factor is weighted separately and indicates which are closely tied to the need. Formula A remains the same for both entitlement and non-entitlement communities with two exceptions (Richardson, 2005). First, instead of using the population of the jurisdiction, the population of the State is used by HUD. Second, instead of using the overcrowding variable, population of the jurisdiction is used by HUD.

Formula B, as shown above, represents the equation used for both entitlement and non-entitlement communities. In this formula HUD determines need by growth lag, poverty, and housing older than 1940 (Richardson, 2005). The growth lag is a variable based on the current population growth of a city or county compared to whether that same city or county grew similar all metropolitan areas since 1960 (Richardson, 2005). The determined rate of growth of all metropolitan areas since 1960 is 37.4 percent (Richardson, 2005). Those cities or counties having a growth rate higher than 37.4 percent received zero for the growth lag variable (Richardson, 2005). Only when the growth lag is less than 37.4 percent is the variable counted (Richardson, 2005). HUD

then calculates the needs-based index using the value from either formula A or formula B. After calculated, the formula that produces the higher need for the community is used. The accuracy of the CDBG formulas has been questioned.

In a report on the impact of CDBG spending, Walker et al. (2002) found two new indicators deemed reasonable for determining neighborhood quality: residential mortgage lending activity and area businesses. Walker et al. (2002) used the median loan amount gleaned from Home Mortgage Disclosure Act data and the number of area businesses from Dun and Bradstreet to pinpoint the impact of the two indicators. Their research, however, did not provide a representative sample of local jurisdictions nation-wide (Walker et al., 2002). Walker and colleagues (2002) determined that a correlation could be made between observed changes in neighborhood quality and funds disbursed from the CDBG program. Their scope was limited; however, a positive correlation with the amount of funding was found in the 17 neighborhoods studied (Walker et al., 2002). In 2005, Richardson (2005) proposed four new alternative sets of in an effort to generate better indicators of the community status. He provided three alternatives, with a set of two formulas. The last alternative only requires one formula. In the new formulas Richardson introduced new indicators (Richardson, 2005).

Richardson added specificity to each of the proposed new formulas. He included indicators that begin to resemble those found in vulnerability-based theories. The variables found in these formulas reflect past studies on the CDBG, in which other factors related to the community's need (Neary and Richardson, 1995). These factors included the number of older adults, poverty status, immigrant growth, and number of female-headed households with children (Richardson, 2005). In his study, Richardson

found that any one of these alternatives could markedly impact the distribution of CDBG funds and better targets the needs of the jurisdictions (Richardson, 2005). The proposed change in formulas by Walker et al. (2002) and Richardson (2005) are for those used during normal conditions.

Disaster Times

The standards change when determining where to allocate disaster recovery aid through the CDBG program. For the 2005 hurricane season, Congress allocated CDBG funds under the following criteria: (1) funds were to be used expressly for the most severely impacted areas, (2) maximum feasible priority should have been given to benefit low- and moderate- income families, (3) at least 50 percent of the funding should have benefit low-and moderate-income families, and (4) the State should not have attempt to recover capital costs of public sector improvements with CDBG funds (Federal Register, 2009).

During the 2008 hurricane season, Congress allocated CDBG funds based on two criteria allocated CDBG funds: unmet housing needs and concentrated damage (Federal Register, 2009). States could have disbursed up to 50 percent of the funding to prevent slum areas. In addition, States should have disbursed *at least* 50 percent of the funding to benefit low- to moderate-income families (Federal Register, 2009). The disbursement of the allocation should have been handled at the State level by governor-appointed entities or departments (Federal Register 2006, Federal Register, 2009).

The GAO reported on the disaster recovery efforts in the Gulf Coast region in 2009 (GAO # 09-437T, 2009). In this report, they addressed issues on the CDBG program. The GAO office reported on the difficulties State officials faced in

administering the housing recovery program and in the allocation of CDBG funds in Mississippi and Louisiana (GAO #09-437T, 2009). The authors used interviews and analyzing the data found from the distribution of State funds (GAO #09-437T, 2009). The report found that Federal guidance was insufficient to address Louisiana's approach to housing recovery (GAO #09-437T, 2009). Overall the conclusion of the report was that the CDBG fund process gave significant discretion to the States. Additionally, the report found that the Federal guidance provided to Louisiana was inconsistent and at times conflicting (GAO 09-437T, 2009).

The GAO further discussed the specific release of disaster recovery funds via the CDBG program in another GAO report #10-0404 (GAO, 2010b). In this later report, authors found similar issues after Hurricane Ike (GAO #10-0404, 2010b). One major concern was that even though the disaster took place in September 2008, funds the CDBG program did not distribute until June of 2009 (GAO, 2010b). The Federal Emergency Management Agency's (FEMA) Long Term Community Recovery (LTCR) program concluded in early 2008. The LTCR is responsible for helping communities create recovery plans and facilitate Federal assistance for recovery (GAO #10-0404, 2010b). FEMA leads the LTCR to coordinate multi-level recovery assistance and to help develop long-term recovery plans at the community level (GAO #10-0404, 2010b). Without the help from the LTRC States missed necessary guidance for properly disbursing the funds (GAO #10-0404, 2010b).

Hurricane-Related CDBG Disbursement

In 2006, Congress funneled supplemental funding for the 2005 Hurricane season through HUD for purposes of disaster aid, which included Hurricanes Katrina, Rita, and

Wilma (McCarty, Perl, & Foote, 2006; GAO #09-437T, 2009). The first appropriation of this supplemental funding provided a total of $11.5 billion dollars to the HUD-led CDBG program to distribute to the States and significantly impacted by the storms (Federal Register, 2006).

Table 2: Distributed CDBG Funds Specifically for the 2005 Hurricane Season.

State	**Federal Dollars**
Alabama	74,388,000.00
Florida	82,904,000.00
Louisiana	6,210,000,000.00
Mississippi	5,058,185,000.00
Texas	74,523,000.00
Total	11,500,000,000.00

The allocation in the table above represents the first of three total appropriations. The second and third appropriation was $5.2 billion and $3 billion, respectively (GAO # 09-437T, 2009). U.S. Congress slated all appropriations to provide disaster relief, long-term recovery, and restoration of infrastructure due to the storms (Federal Register, 2006). Recipients used CDBG funds for a variety of disaster recovery activities including housing for the uninsured (with severe damage) and for counties with 50 percent or more of damage (Federal Register, 2006). The funds from the CDBG disaster program was not provided for activities that are already reimbursable by FEMA or Army Corps of Engineers (Federal Register, 2006). Each grantee was required to submit a plan of action and to describe the use of requested funds to HUD (Federal Register, 2006; Federal Register, 2009).

In 2009, the U.S. Congress granted funds to assist in recovery efforts under the declaration of major disaster from storms in 2008 allocated through HUD (Federal Register, 2009). CDBG funds totaling $6.5 billion dollars were set aside for use in disaster relief, long-term recovery, restoration of infrastructure, housing, and economic revitalization for areas affected by Ike and Gustav. The first disbursement was for $2.1 billion (Federal Register, 2009). The 2009 CDBG allocation is shown in table 3.

Table 3: Distributed CDBG Funds Specifically for the 2008 Hurricane Season.

State	**Federal Dollars**
Arkansas	20,294,857.00
Florida	17,457,005.00
Georgia	4,570,779.00
Illinois	41,984,121.00
Indiana	95,042, 622.00
Iowa	125,297,142.00
Kentucky	3,217,686.00
Louisiana	438,223,344.00
Mississippi	6,283,404.00
Missouri	13,979,941.00
Puerto Rico	17,982,887.00
Tennessee	20,636,056.00
Texas	1,314,990,193.00
Wisconsin	25,039,963.00
Total	2,145,000,000.00

Once allocated, funds from the CDBG program become the sole responsibility of

the States (and Puerto Rico). Management and administration of CDBG disaster recovery funds took place at the State level for each State receiving grants. The Federal register provided similar restrictions for the use of funds in affected States. State governments were also required to submit an action plan and describe their use of funds to HUD (Federal Register, 2009). Following distribution, each State submitted a quarterly performance report (HUD, 2013).

Research on CDBG Funds in Disasters

In 2006, a study on the funding for Hurricane Katrina disaster relief suggested that clear and consistent method of how and where State officials spent the money was lacking (Fellowes, Liu, & Mabanta, 2006). HUD allocated most of the money for recovery efforts, targeting programs for emergency housing for families, debris removal, and other emergency activities (Fellowes, Liu, & Mabanta, 2006). However, because of the way the grant program was written by HUD and allocated by U.S. Congress, no means exists to distinguish how much money was slated for each separate hurricane: Katrina, Rita, or Wilma (Fellowes, Liu, & Mabanta, 2006, Federal Register, 2006). This was similar for hurricanes during the 2008 season, as funding Ike and Gustav were lumped together (Federal Register, 2009). It was also difficult to discern how State governments used the CDBG money for emergency response or long-term recovery (Fellowes, Liu, & Mabanta, 2006). This vagueness has affected the distribution methods for determining how funding would be used by the States (Fellowes, Liu, & Mabanta, 2006).

Other researchers have studied the CDBG grants with respect to post-disaster recovery after 9/11 terrorist attacks and Hurricane Katrina (Gotham & Greenberg, 2008;

Lowe, 2012). Gotham and Greenberg found that the issues found in the recovery efforts for both the 9/11 terrorist attacks and Hurricane Katrina reflect features of neoliberal government action (2008). Here they defined neoliberalism as an ideology that "advocates market-based solutions to social problems and has influenced a range of policies to engineer economic growth, privatize public services and assets, and intensify inter-urban competition for capital investment (Gotham & Greenberg, 2008, p. 1042)." Such neoliberal government action allowed officials to advocate for controversial public programs that increase private-sector profit margins (Gotham & Greenberg, 2008). For instance, HUD waived several CDBG program requirements after Hurricane Katrina and 9/11. This allowed State officials (New York and Louisiana) to focus more on building tourism than rebuilding communities (Gotham & Greenberg, 2008).

Lowe (2012) examined lower-income housing recovery in Mississippi. Lowe agreed that neoliberalism might offer an explanation to post-disaster housing crises in Mississippi (Lowe, 2012). However, Lowe defined neoliberalism as "the rejection of government guarantees in welfare right protections such as housing and other redistributive supports necessary for enhancing quality of life (Lowe, 2012, p. 58)." In Lowe's assessment an uneven distribution of money from the CDBG funds occurred at the State-level (Lowe, 2012). He noted that low-income, renters, and public housing residents received fewer resources (Lowe, 2012).

Disaster Recovery And Federal Aid Disbursement

Research has not been extensive in the area of disaster recovery in general including the area Federal aid disbursement (Mileti, 1999). Previous research highlighted disparities due to the lack of standardization of disbursement (Fellowes, Liu, & Mabanta,

2006; Jopling, 2008) and disparities on where and to whom the disbursements are received (National Council on Disability (NCD), 2009; Craemer, 2010; Aldrich, 2011). Disaster recovery literature also highlighted barriers to recovery for certain populations (Peacock, Dash, & Zhang, 2007; Morrow & Enarson, 1996; Siedenberg, 2006; Jopling, 2008; Zhang & Peacock, 2010). In chronological order, I review the literature related to Federal aid disbursement and disaster recovery as related to the CDBG or Hurricane seasons of 2005 and 2008.

Federal Aid Disbursement

The Congressional Research Service estimated that approximately 700,000 families had to relocate due to the impact of Hurricane Katrina (McCarty, Perl, & Foote, 2006). In the report entitled *HUD's Response to Hurricane Katrina*, researchers examined the administrative initiatives and Congressional actions related to HUD's involvement in the recovery efforts and the impact on formulas (McCarty, Perl, & Foote, 2006). HUD's administrative initiatives included assisted housing, grant programs, and mortgage insurance programs (McCarty, Perl, & Foote, 2006). Congressional actions included supplemental appropriations and introducing new legislation (McCarty, Perl, & Foote, 2006).

HUD was involved in finding vacant units across the country for the victims of Hurricane Katrina (McCarty, Perl, & Foote, 2006). Through a joint venture with FEMA, HUD gave out vouchers to previous homeowners and renters. HUD provided rental assistance for the pre-disaster homeless and those previously receiving rental assistance (McCarty, Perl, & Foote, 2006). Additionally, HUD provided waivers to cities and communities so that funds from other programs (including pre-disaster CDBG funds)

could be reallocated to disaster recovery efforts (McCarty, Perl, & Foote, 2006).

Research on disaster recovery

This section reviews research related to inequalities in disaster recovery with heavy emphasis on housing (Green, Bates, & Smyth, 2007; Peacock, Dash, & Zhang, 2007, Jopling 2008). Green, Bates, and Smyth (2007) researched the recovery of the Lower Ninth Ward in Louisiana after Hurricane Katrina. The Lower Ninth Ward was historically heavily populated by people unable to rebuild, majority of which are low- to moderate income, minority owned households (Green, Bates, & Smyth, 2007). Using a stratified sample survey of the area, Green, Bates, & Smith (2007) analyzed nearly 3800 residences (in terms of land plots). They found that 59 percent of previously non-vacant lots in the area showed no signs of recovery one year after the storm (Green, Bates, & Smyth, 2007). A broader review of the Orleans parish (Orleans) revealed that the Lower-Ninth Ward lagged behind similarly damaged areas (Green, Bates, & Smyth, 2007). Among the factors that contributed to the lag were flood insurance coverage, levee reconstruction, employment shortage, and a burdened service sector (Green, Bates, & Smyth 2007, p. 322).

Housing recovery is one of the more critical aspects of overall disaster recovery (Peacock, Dash, & Zhang, 2007). Return to permanent housing can be shaped by access to financial resources and previous social inequities (Peacock, Dash, & Zhang, 2007). Researchers found that those lacking adequate language skills, minorities, low-income households, and even female-headed household have had a difficult time during recovery (Peacock, Dash, & Zhang, 2007; Morrow & Enarson, 1996). Low-income households or

neighborhoods tend to have a harder time receiving financial assistance for reestablishing housing (Peacock, Dash, & Zhang, 2007).

Jopling (2008) examined the housing recovery two years after Hurricane Katrina. In five parts, his study explored the damage assessment in Mississippi, identified State-level legislation created by the governor, critiqued the programs, offered new tools, and provided lessons learned (Jopling, 2008). Jopling (2008) found that low-income renters were impacted the most. Nearly 57 percent of the houses impacted by the storm were from low-income level households (Jopling, 2008). The Mississippi Development Authority (MDA) became the main agency responsible for disseminating the funds from the CDBG program (Jopling, 2008; GAO # 09-437T, 2009). The primary issue the author found with MDA's dissemination process was that it focused almost entirely on previous homeowners and not on renters (Jopling, 2008). The researcher found that the burden of housing recovery was significantly harder on the low – and moderate-income level households in Mississippi (Jopling, 2008).

In this dissertation, the effects of the Federally funded recovery efforts after 2005 and 2008 hurricane seasons are studied. The Federal government allocated monetary aid and State Governors disseminated the money for both storms. HUD allocated CDBG funds directly to the State governments (Federal Register, 2006; Federal Register, 2009). However, research on recovery after disasters has suggested that specific populations often have a harder time receiving aid for a variety of reasons. Most of these populations are considered socially and economically vulnerable. Indeed as Allen, Bezdek, and Jopling (2010) found, a number of the municipalities affected by Hurricane Katrina in 2005 suffered from poverty, racism, inadequate housing, and declining infrastructures,

which can cause lingering and difficult recovery experiences. Accordingly, in the next section I review the disaster research regarding socially and economically vulnerable populations.

Social Vulnerability

This study rests on socio-political ecology theory with regards to the disbursement of CDBG disaster funds. Socio-political ecology theory states that scarce resources available after disaster creates a competitive period in which socially vulnerable populations fail to secure adequate recovery resources (Peacock & Ragsdale, 1997; Tierney, 2007; Peguero, 2006).

Perhaps one of the most extensive examinations of sociopolitical ecology theory applied to disaster research was by Peacock and Ragsdale (1997). They stated that the ecological network is any community and is not dependent on size, location, or development (Peacock & Ragsdale, 1997). Sociopolitical ecology theory is the interest in "political economy and critical perspectives including the analysis of minority, gender, and inequality issues at all phases of disaster (Peacock & Ragsdale 1997, p. 21)." During the recovery phase in particular, an important measure of returning to 'normal' requires the restoration of infrastructure as well as the reestablishment of social networks (Peacock & Ragsdale, 1997). Important factors of micro-level recovery include financial, medical, material, and information resources (Peacock & Ragsdale, 1997). Critical to Peacock & Ragsdale's (1997) argument is (among other things) "policies and programs of the government plays a role in determining resources available for [micro-level] recovery (p. 25)." Pre-existing issues in inequality may also play a role (Peacock & Ragsdale 1997; Fothergill & Peek, 2004). Factors related to inequality in the United

States have included socioeconomic status, gender, age, and ethnicity (Peacock & Ragsdale, 1997; Enarson & Morrow 1997; Morrow & Phillips, 2008; Peacock & Girard, 1997; Dash, Peacock, & Morrow, 1997). In a thorough review of extant literature, Fothergill et al. (1999, p. 164) noted that socio-economic factors marginalize minorities during the recovery stage of disasters. In another review of literature, Fothergill and Peek (2004) recognized that the sociopolitical ecology theory analyzes "inequality issues (p. 90)" during disasters, such as access to resources, information, shelter, and the return to permanent housing. Peguero (2006) found that beyond socioeconomic differences, problems with language and the perception of the credibility of government authorities could increase racial and ethnic minorities' vulnerability to disasters. In this dissertation the political program studied is the disbursement of CDBG disaster recovery funds. Only one resource important to recovery is studied, financial assistance. In this section of the chapter I outline research related to the each of the factors of social vulnerability, however, instead of socioeconomic status I use income. Income is one of the foremost aspects influencing one's socioeconomic status (Mileti, 1999). Where as, "gender, ethnicity, [and disability] are indicators of one's possible lower economic status (Mileti, 1999, p. 122)."

Definition

Given this perspective, the term socially vulnerable has to be defined. Socially vulnerable populations have been defined in various ways (Wisner et al., 2004; Cutter, 2001; Bolin, 2007; Lindell & Perry, 2004). Some researchers have attempted to define socially vulnerable groups of people (Wisner et al., 2004; Gaines, 2006). Gaines (2006) discussed how these populations are usually present in plural societies where various

groups may have different social statuses. Plural societies have two or more coexisting and distinct groups, such as in the U.S. (Gaines, 2006). For those living in the United States, social vulnerability is often defined by characteristics in which individuals cannot readily move in and out of including race, gender, disability, age, and income (Enarson & Morrow, 2000; Bolin, 2007; Lindell & Perry 2004; Wisner, 2004). Many of these characteristics can be conceptualized as ascribed statuses or ones that people are born with and influence their life chances (the probabilities that one will benefit from what society has to offer, such as disaster resilience) (Phillips, 1990; Wilson & Oyola-Yemaiel, 2008). Specific characteristics, such as gender, may be experienced as "master statuses" or powerful positions within a social structure that directly impact opportunities (Williams, 1990; Fothergill, 2004).

For purposes of this study the definition most relevant is:

"...the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (Wisner et al., 2004, p. 11)."

I chose this definition because it does not intertwine social issues with time, location of hazards, or political processes that influence social vulnerability. The term social vulnerability describes individuals that are marginalized, discriminated against, or otherwise forgotten due to the social construction of our society (Wisner et al., 2004; Peguero, 2006; Fothergill & Peek, 2004).

Inequalities during Disasters

Furthermore, researchers have found inequalities during disasters in many different forms including racism, ageism, sexism, and classism (NCD, 2009; Gaines,

2006; Heinz Foundation, 2002). Additionally, other groups have found themselves neglected due to disability (Brou v. FEMA 2006; Gaines, 2006; NCD, 2009). Researchers have seen neglect for these groups in medical research (Gaines, 2006; Herbert et al., 2006; Williams, 2011), employment (Pager, Western, & Sugie, 2009; Ward & Winstanley, 2006), emergency response (Pincha, 2008; Mitchell et al., 2008; Tierney, Peek, & Hahn, 1988), and disaster recovery (Craemer, 2010; Finch, Emrich, & Cutter, 2010; Dash, Peacock, & Morrow, 1997).

During Hurricane Andrew in 1992, race and gender disparities affected recovery (Morrow & Enarson, 1996; Peacock & Girard, 1997). The response efforts of Hurricane Hugo and the Loma Prieta earthquake revealed inequalities based on the diversity of racial and ethic groups in the area (Fothergill & Peek, 2004; Bolin & Stanford, 1993; NCD, 2009). Additionally, geriatric specialists observed a higher death rate prevalent among older adults in both the Loma Prieta earthquake in 1989 and again during Hurricane Katrina in 2005 (NCD, 2009; Bourque, 2006).

Comerio (1997) researched the impact of housing on tenants, multifamily owners, and single-family homeowners after the impact from the Northridge earthquake. Housing accounted for half of the total disaster costs (Comerio, 1997). One to two years after the disaster, most of the single-family homes were rebuilt or repaired, however, only 50 percent of rental units were completed (Comerio, 1997). Reasons included a downturn in the regional economy but the results were the same: low-income households faced a limited set of options for returning home.

Certain demographic factors may increase a person's exposure to risk. Some researchers attribute this increase risk to an overall lack of resources, lack of social

networks, and limited access to official information (West and Orr, 2007; Morrow, 1999). Limitations are also related to (and inclusive of) economic vulnerability, where people with less financial resources have a higher risk during disasters (Phillips, Metz, & Nieves, 2005; Morrow, 1999; Mileti, 1999). In the United States a high correlation exits between many socially vulnerable groups and income (i.e. minorities, older adults, and people with disabilities) (Mileti, 1999; Zhang & Peacock, 2010).

Some areas impacted by the 2005 Hurricane season had a large number of socially vulnerable communities. The unemployment rate of the areas impacted by Hurricane Katrina was 6.0 percent, 1.1 percentage point higher than the rate for the U.S. at the time (U.S. Department of Labor, 2006). Often residents of lower-income areas tend to have very limited social networks and limited resources (Siedenberg, 2005; Mileti, 1999). This can keep them from accessing a variety of non-government types of assistance (Siedenberg, 2005, p. 7).

One study examined pre-disaster vulnerabilities with respect to recovery efforts in New Orleans, Louisiana after Hurricane Katrina in 2005 (Finch, Emrich, & Cutter, 2010). Using a social vulnerability index and a geographical tool, these researchers mapped out the vulnerability before impact and then mapped the flooding by feet of standing water after the storm passed (Finch, Emrich, & Cutter, 2010). These maps overlapped with government recovery support using Louisiana's Road Home program. Louisiana established The Road Home as a set of four programs to restore the State's housing (GAO # 09-437T, 2009). The program provided help in the areas of homeowner's assistance, affordable rental housing, homeless housing and developer incentives (GAO # 09-437T, 2009). Finch, Emrich, and Cutter's (2003) findings showed that while all

communities studied had significant flooding after the storm, areas that were not high income but also not poor enough to qualify for assistance lagged in recovery. These researchers also found that certain areas of New Orleans did not have a rapid population return as others, specifically, the Lower Ninth Ward, Florida Area, and New Orleans East (Finch, Emrich, & Cutter, 2010). Their findings were significant when they paired high flood levels with high social vulnerability in the community. Given this and other findings, the researchers concluded that clear patterns of disparities had an affect on New Orleans and its residents after Hurricane Katrina (Finch, Emrich, & Cutter, 2010).

Each of the previous studies provides a valid reason for addressing socially vulnerable populations as defined by Wisner et al. (2004). However, the previous studies often combined aspects of vulnerability: income, ethnicity, age, gender, and disability. In the following sections, I review research related to each aspect of vulnerability.

Income

Problems that face members in a community socially and economically are important to understand (Phillips, Metz, & Nieves, 2005). Phillips, Metz, and Nieves (2005) found that low-income populations are overwhelmingly comprised of at-risk populations. The combination of being low-income (economics) and in an at-risk population socially can create a compounding vulnerability. Compounding vulnerability may further impact a community during and after disasters (Phillips, Metz, & Nieves, 2005).

The perception, preparation, and response for disasters are often different for low-income populations as well (Fothergill & Peek, 2004). During recovery, some rebuilding efforts such as neighborhood rehabilitation programs, neglect low-income populations

(Tierney, 2007). Often disasters create profitable rebuilding opportunities, which can drive these rehabilitation programs (Tierney, 2007). Specifically after Hurricane Katrina, one politician expressed thanks to the disaster for getting rid of the "low-income housing problem (Tierney, 2007)."

Hurricane Katrina seriously impacted the low-income community even forcing some into homelessness (Abramson, Garfield & Redlener, 2007). The low-income population was less likely to be homeowners and may have missed out on Federal assistance due to the limited amount of programs targeting non-homeowners (Abramson, Garfield, & Redlener, 2007). Of those that received a FEMA trailer following Hurricane Katrina only 50 percent owned a checking account (Abramson, Garfield, & Redlener, 2007). Furthermore only 16 percent had access to a credit card (Abramson, Garfield, & Redlener, 2007).

Several of those who become homeless following a disaster come from lower socioeconomic statuses (Vaughan, 1995). Individuals from higher income households are often more savvy with regards to filling out the proper forms and applying for the financial aid they need (Rovai, 1994; Dash, Peacock, & Morrow, 1997). Meanwhile lower-income households often lack the necessary resources (financial or otherwise) to cope after a disaster (Fothergill & Peek, 2004; Bolin & Stanford, 1991).

While researching the impacts of Hurricane Andrew, Dash, Peacock, and Morrow (1997) found that after the disaster the "poor tend to get poorer." In the United States, a statistically significant relationship between race and income exists (Dash, Peacock, & Morrow, 1997). Oftentimes low-income communities are overwhelmingly comprised of racial and ethnic minorities (Dash Peacock, & Morrow, 1997).

Race and Ethnicity

Issues surrounding race and ethnicity during disasters have been of concern among several researchers (Bolin & Bolton, 1986; Peguero, 2006; Sharkey, 2007; Craemer, 2010).

Bolin and Bolton (1986) researched race, religion, and ethnicity in the context of disaster recovery. They had several findings. After a tornado in Texas, Bolin and Bolton (1986) found a correlation between damage to housing structures and race. They also found that racial, ethnic, and religious minorities have harder experiences during recovery (Bolin & Bolton, 1986). The researchers attributed the difficult experiences of minorities to lack of finances, savings, and insurance prior to the disaster (Bolin & Bolton, 1986). Bolin and Bolton (1986) found that African Americans and Latinos are often neglected in the disaster aid process. Similarly, Aguirre (1988) found that access to and effectiveness of warning messages where highly correlated with the culture of the location.

Peguero (2006) researched Latino disaster vulnerability in Florida. He used a phone survey in 1999 of over 1500 Florida households. He found that Latinos were 46 percent more likely to seek information from friends and family members as an important source (Peguero, 2006). This population was also less likely to view government reports as an important source of information, only 35 percent (Peguero, 2006). Peguero (2006) findings could affect how the Latino population receives information about disaster recovery aid and therefore the amount of disaster aid this demographic would receive. His findings are congruent with other researchers (Perry & Lindell, 1991; Perry &

Greene, 1982). Perry and Lindell (1991) and Perry and Greene (1982) found that minorities often prefer to receive information from their family and friends.

Other researchers studied race and ethnicity following Hurricane Katrina in 2005 (Sharkey, 2007; Craemer, 2010). Craemer (2010) discussed the disparities among different races regarding recovery efforts. He counted Federal aid dollars and FEMA temporary housing trailers (Craemer, 2010). Even though the study was inconclusive with regards to trailer counts (due to the inability to distinguish private trailers from FEMA provided ones), the researcher found an overall discrepancy (Craemer, 2010). Aerial views of the New Orleans area showed more trailers in areas with less damage (Craemer, 2010).

Sharkey (2007) studied the numbers of African Americans that died during the storm. In this study the findings showed that the impact of the storm, measured by death, was considerable in specific areas of the city (Sharkey, 2007). Additionally, African Americans had higher numbers of individuals die among the general population and when controlled for older adults (Sharkey, 2007). From Sharkey's research it is apparent that not only race but age as well may be a factor in social vulnerability.

Age

Research regarding the impact of one's age on disaster preparedness and recovery takes on two paths: children and older adults. These two groups seem to be the most vulnerable with respect to age alone. Several researchers have examined children during disasters (Peek, Sutton, & Gump, 2008; Wachtendorf, Brown, & Nickel, 2008; Reich & Wadsworth, 2008). Others have examined the older adults during disasters (Wachtendorf & Tierney, 2001; Klinenberg, 2002).

Children

It is important that disaster education target children in impacted areas in order to build resistant communities (Wachtendorf & Tierney, 2001; Norris & Edwards, 2008). Researchers found a sense of displacement felt by children after Hurricane Katrina in 2005 (Reich & Wadsworth, 2008; Peek, Sutton, & Gump, 2008; Abramson, Garfield, & Redlener, 2007).

Researchers specifically examined recovery for children and families in Mississippi after Hurricane Katrina (Abramson, Garfield, & Redlener, 2007). Abramson and colleagues (2007) gathered information from State and local government on the health and social service needs and used a sampling strategy of the FEMA trailer parks (Abramson, Garfield, & Redlener, 2007). Their study included 576 random households. They found the pre-disaster poor had extra stress (Abramson, Garfield, & Redlener, 2007). Emotional and behavioral stress was found in at least one child in over half of the households studied (Abramson, Garfield, & Redlener, 2007). Furthermore, mental strain and possible psychological disability was found among the parents and caregivers (Abramson, Garfield, & Redlener, 2007).

Older Adults

Reaching out to older adults is also important (Friedsam, 1962; Wachtendorf & Tierney, 2001; Klinenberg, 2002). Friedsam (1962) asserts that older adults often die in greater numbers during disasters. More recent research continues to see this pattern. After Hurricane Katrina, one researcher found that older adults were by far the most vulnerable as determined by number of deaths (Sharkey, 2007). Similarly after the Chicago Heat

wave in 1995, older adults were again the most vulnerable being the number one indicator of those that passed away (Klinenberg, 2002).

FEMA recommends that people with disabilities and older adults maintain supportive social networks. For older adults, supportive social networks are key to survival during disasters (Klinenberg, 2002; Simpson 2002; McGuire & Ford, 2007). Those without strong social networks often live in isolation, making it difficult for them to fully recover after a disaster (Klinenberg, 2002; McGuire & Ford, 2007).

Disability also increases with age, meaning that seniors will experience both age-related and disability-related vulnerabilities. Within the older adult population alone approximately 41 percent have some type of physical, sensory, or cognitive disability, most with most of those reporting experiencing two or more of these types of disabilities (Brault, 2008; U.S Census, 2006). In 2010, 70 percent of people 80 years or older were living in the U.S. with a disability (Brault, 2010). For children under the age of 15, 62.2 percent had some kind of disability (Brault, 2010). Disability increases with age, meaning that seniors will experience the intersection of both age-related vulnerability coupled with disability issues.

Disabilities

According to the 2010 U.S. Census, more than 56 million people have with a disability (Brault 2012). Many live with more than one disability. Nearly 37 million adults have trouble hearing, 21.2 million have varying vision impairments and over 20 million have a cognitive disability (Mobility Future, 2010).

Addressing the needs of socially vulnerable individuals has been of interest in the emergency management community. Concerns for socially vulnerable populations could

impact planning, evacuation, sheltering, transportation, recovery, and communications for disasters. Often these populations are left out of State emergency plans (Bennett, 2009; Gooden et al., 2009). As seen during Hurricane Katrina, evacuation, and transportation could be problematic for those with low-income, the older adult population, and people with disabilities. Sheltering may become an issue for ethnic minorities and people with disabilities as well (Spence, Lachlan, & Griffin, 2007).

Additionally, noting the culture of certain populations could guide practitioners on how to communicate with, include, and gain information from their constituents. An example is with the Deaf and hard of hearing community who have infused wireless communications and text messaging into their culture (Baker & Moon, 2010; Mitchell, Bennett, & LaForce, 2011). Including this form of communication could encourage participation among this group.

Researchers found problems with regards to sheltering people with disabilities (NCD, 2009; Fjord & Manderson 2009; McGuire & Ford, 2007). Among the various issues were a lack of coordination and communication between emergency managers and the community (McGuire & Ford, 2007; NCD, 2009; Twigg et al., 2011). Another issue was a lack of interaction with disability organizations to fully understand the needs of this community and provide support (Twigg et al., 2011). Research has indicated that public agencies may not intentionally leave out people with disabilities but oftentimes they do (Twigg et al., 2011).

People with disabilities have had a difficult time during recovery (Twigg et al., 2011; NCD, 2009). They have had problems finding suitable temporary housing and gaining insurance for disability specific needs. Additionally, researchers have reported

gaps in the ability of people with disabilities to secure Federal assistance (NCD, 2009). People with disabilities filed a lawsuit after Hurricane Katrina claiming that FEMA failed to provide accessible trailers (Brou v FEMA, 2006). During Hurricane Katrina an advocacy group found that approximately 25 percent of those evacuating had a disability. However, by the time the lawsuit was filed (nearly a year after the storm) only 1-2 percent of those with disabilities had been provided an accessible trailer (National Center for Law and Economic Justice, 2006).

Gender

Preparing and planning for recovery efforts after impact often over simplifies the needs and inner-workings of communities (Fordham, 1999). Planning activities often neglects the subtle differences of many groups, including gender. Not all women are neglected and sometimes other factors influence the disparity such as race/ethnicity and income.

Lawson compared the resiliency of older African American adults following Hurricane Katrina (2010). Using focus group interviews she identified the coping strategies used by each gender for individuals aged 55 years or older. Regardless of gender, each participant in this study mentioned connection with a higher power to help him or her through the storm (Lawson, 2010). However, with regard to African Americans, the researcher found that only women tend to seek out personal, family, and community resources (Lawson, 2010). The women provided extensive help and adopted strangers into their family if only for the duration of the storm (Lawson, 2010). The men tended to be the providers of important information (Lawson, 2010).

Through previous research it was apparent that domestic violence tended to rise during response and recovery efforts after Hurricane Katrina (Jenkins & Phillips, 2008). Jenkins and Phillips (2008) used pre-disaster information from law enforcement, hospitals, and shelters to give context for the area. They used interviews, meetings, and focus groups to gather data on domestic violence in Louisiana after the storm (Jenkins & Phillips, 2008). Among their findings was that finding suitable housing after a disaster is important for a woman wanting to leave an abusive situation (Jenkins & Phillips, 2008). The researchers advocated that officials fairly distribute Federal funding for housing, as one way to help alleviate the problem.

Other research found gender differences in housing after disasters (Enarson, 2006). Most renters, mobile home residents, and public housing residents are women (Enarson, 2006). In research about women and girls after Hurricane Katrina, Enarson (2006) found " [in] the poorest of the poor before Katrina, socially marginalized women of color will be the last to escape the confines of FEMA tent cities and other encampments (para 6)."

Many of the differences in gender often have more to do with the social rather than the physical or biological distinctions between male and female (Enarson & Phillips, 2008). While we have come a long way in our society with regards to gender equality, an intersection between social class and gender still exists (Fordham, 1999). On average women often make less money than men and have more dependents (Fordham, 1999). Women are more likely to be the caretakers in a household and also more likely to seek aid after disaster (Enarson & Morrow, 2000).

The Newcomb College Center for research on Women produced a report of key findings with regards to women after Hurricane Katrina (Willinger, 2008). The report found effects on the earning potential and employment of women after the storm (Willinger, 2008). Additionally, other researchers found an increase in domestic violence (Jenkins & Phillips, 2008) after the storm and the overall demographic profile of women changed post-disaster (Willinger & Gerson, 2008). Oddly enough, disasters often provide women the potential for demonstrating their leadership abilities (Laska et al., 2008).

Summary

Previous research into the CDBG program showed some inconsistency with the way States disburse funds under normal conditions, as well as, following a disaster (GAO 2010; Lowe, 2012). Under non-disaster conditions, HUD created formulas to determine the overall CDBG allocation for entitlement communities (Walker, 2002; Richardson, 2005). Richardson proposed several alternative formulas in 2005 (Richardson, 2005). These new formulas could offer a better assessment for a city or county's entitlement status. The State government was responsible for disbursement of the funds by which they use a multitude of measures; formula, competition, open application, or a combination thereof. Researchers found similar inconsistencies at the State-level with the CDBG disaster recovery program (Gotham & Greenberg 2008; Lowe, 2012; GAO # 09-437T, 2009; GAO #10-0404, 2010). At least two researchers have studied the disbursement process at the State-level using the neoliberalism ideology (Lowe 2012; Gotham & Greenberg, 2008). Using the neoliberalism approach, both studies revealed an uneven distribution of resources for needy communities (Lowe 2012; Gotham &

Greenberg, 2008). McCarty and colleagues (2006) stated that money given CDBG program distributed at the exo-level could have a serious impact on families at the micro level.

The CDBG program distributed supplemental funding for hurricanes Katrina, Rita, and Wilma during the 2005 hurricane season and for Hurricanes Gustav and Ike during the 2008 Hurricane season (Fellowes, Liu, & Mabanta, 2006; Federal Register, 2006; Federal Register, 2009). Due to the lump allocation no means exits to determine which portion of the funds were used specifically for Hurricane Katrina and not Rita or Wilma (Federal Register, 2006). Similarly it is difficult to determine funds allocated for Ike and not Gustav (Federal Register, 2009). This is due to the timing and proximity of location in which the disasters occurred during the same season. Combining the storms together could impact the methods States used to disburse funds (Fellowes, Liu, & Mabanta, 2006). Therefore this study focused on the CDBG disbursements made to the affected States following both the 2005 and 2008 Hurricane Season. Each State submitted quarterly performance reports to HUD. The quarterly performance reports were used to identify how much, where, and for what purpose the States distributed the CDBG disaster recovery funds.

Previous social inequities and current financial resources at the micro-level also shape disaster recovery (Peacock, Dash, & Zhang, 2007). Those in low-income households or neighborhoods tend to have a harder time receiving financial assistance (Peacock, Dash, & Zhang, 2007; Jopling, 2008). Jopling (2008) has attributed the impact on low-income and their inability to receive finance assistances to the distribution of

CDBG program in Mississippi. The dissemination process in Mississippi focused on the homeowners and not the renters (Jopling, 2008).

Previous research on social vulnerabilities provides the basis to study the demographics of the county. The overwhelming consensus was that regardless of the compounding vulnerability, income is a significant factor in being able to recover. Other demographic factors include gender, ethnicity, age, and disability. Based on the literature review my research questions and hypotheses were the following:

(1) Do statistically significant variations appear in the distribution of CDBG disaster recovery program funds at the (a) State and (b) County level?
   - H_0: There will be no significant variations in the distribution of CDBG disaster recovery program funds at the State or County level.
   - H_1: There will be significant variations in the distribution of CDBG disaster recovery program funds at the State or County level.

(2) Do statistically significant variations appear in the distribution of CDBG disaster recovery program funds by program type at the (a) State and (b) County Level?
   - H_0: There will not be significant variations in the distribution of CDBG disaster recovery program.
   - H_2: Variations will appear in the distribution of the CDBG disaster recovery program at the county level and that these variations will occur based on program type.

(3) Given that certain populations experience differential effects of disasters, do meso-level actors equally distribute funds to counties/parishes with such populations?
   - H_0: There is an equitable distribution of CDBG funds to counties/parish despite differential effects of disasters in certain populations.
   - H_3: Socioeconomic factors of a county predict the disbursement of CDBG funds.

(4) Does statistically significant variation occur between the 2005 and 2008 hurricane seasons?
   - H_0: Despite exo-level policies no changes will appear in the distribution of funds in 2008.
   - H_4: Changes in exo-level policies will result in the more equitable distribution in 2008 than in 2005

The order of my research questions is significant. First, I verified and established variance in the distribution of CDBG funds. Then, I established a variation in the funds disbursed by program type given the population of each county examined. For each hurricane season, I ascertained if an equitable distribution of CDBG funds exits despite differential effects for disasters. Finally, I compared the two hurricane seasons with each other. While the existing literature is not robust enough to state directionality, my hypotheses expect significant variation.

CHAPTER III

METHODOLOGY

The purpose of this study was to examine, describe, and analyze funding disbursement from the Community Development Block Grant (CDBG) program when allocated for specific hurricane seasons. The U.S. Department of Housing and Urban Development (HUD) gives CDBG funds to rebuild slum or neglected areas across the United States (Gotham & Greenberg, 2008; GAO # 09-437T, 2009; Lowe, 2012). Occasionally, the Federal Emergency Management Agency (FEMA) uses this program as a conduit to deliver funds to rebuild after a disaster (GAO # 09-437T, 2009). In the past, disasters have been extraordinary in their scope, magnitude, and economic loss. The most devastating of these disasters (determined by economic loss) received funds through the CDBG program (Federal Register, 2009). Only those disasters with losses that totaled than $2 Billion dollars have had supplemental relief efforts funded through the CDBG disaster recovery program (Federal Register, 2009).

Over the years, these disasters have included: Hurricane Andrew in 1992, Northridge Earthquake in 1994, Oklahoma City Bombing in 1995, the Midwest floods of 1997, the terrorist attacks of September 11th, Hurricanes Katrina, Rita, and Wilma in 2005, and Hurricanes Ike and Gustav in 2008 (GAO # 09-437T, 2009; McCarty, Perl, & Foote, 2006). This study examined the funds disbursed to State governments after Hurricanes Katrina, Rita, and Wilma in 2005 and Hurricanes Gustav and Ike in 2008. Both hurricane seasons were chosen for two reasons: (1) impacted States along the gulf coast region received CDBG funding from both storms and (2) previous research has indicated that discrepancies in the relief efforts may exist for at least one of these disasters (Abramson, Garfield, & Redlener, 2007).

Context

In 2006, the U.S. Congress funneled supplemental funding through HUD for purposes of disaster aid after the effects of the 2005 hurricane Season (McCarty, Perl, & Foote, 2006; GAO # 09-437T, 2009). This supplemental funding provided a total of $11.5 billion dollars to the HUD-led CDBG program to distribute to the States significantly impacted by the storms (Federal Register, 2006). Only the most impacted counties or parishes in each State received funds from this allocation.

In 2009, the U.S Congress allocated grant funds through HUD to assist in recovery efforts under the declaration of major disaster from the 2008 hurricane season (Federal Register, 2009). CDBG funds totaling $6.5 billion dollars were set aside for use in disaster relief, long-term recovery, restoration of infrastructure, housing, and economic revitalization for areas affected by Ike, Gustav, and other storms during 2008. The first disbursement totaled $2.1 billion (Federal Register, 2009). Again, only the most impacted

counties or parishes in each State received funds from this allocation.

Research Questions

The research questions in this study evaluated the distribution of Federal aid after a disaster, specifically the CDBG program funds. Research questions included:

1) Do statistically significant variations appear in the distribution of CDBG disaster recovery program funds at the (a) State and (b) County level?
   - H_o: There will not be significant variations in the distribution of CDBG disaster recovery program funds at the State or County level.
   - H_1: There will be significant variations in the distribution of CDBG disaster recovery program funds at the State or County level.

2) Do statistically significant variations appear in the distribution of CDBG disaster recovery program funds by program type at the (a) State and (b) county level?
   - H_o: There will not be significant variations in the distribution of CDBG disaster recovery program.
   - H_2: Variations will appear in the distribution of the CDBG disaster recovery program at the county level and that these variations will occur based on program type.

3) Given that certain populations experience differential effects of disasters, do meso-level actors equally distribute funds to counties/parishes with such populations?
   - H_o: There is an equitable distribution of CDBG funds
   - H_3: Socioeconomic factors of a county predict the disbursement of CDBG funds.

4) Does statistically significant variation occur between the 2005 and 2008 hurricane seasons?
   - H_o: Despite exo-level policies no changes will appear in the distribution of funds in 2008.
   - H_4: Changes in exo-level policies will result in the more equitable distribution in 2008 than in 2005.

The dependent variable was the State distribution of funds from the Community Development Block Grant program (CDBG). The CDBG funds activities related to

public sector rebuilding, infrastructure reconstruction, and individual assistance (Federal Register 2006; 2009). In a previous study about the CDBG disaster recovery program, researchers found that Mississippi authorities chose to spend on lower-income targeted programs last (Steps Coalition 2009; Lowe 2012). I determined the type of programs the State governments funded with the CDBG disaster recovery assistance and amount financial assistance targeted to low-income counties.

Socioeconomic status has had an effect on disaster recovery and relief assistance in the past, substantiated in chapter 2 (Finch, Emrich, & Cutter, 2010; Zhang & Peacock, 2010). Finch, Emrich, and Cutter (2010) noted that socioeconomic stratification and its distribution in the city [New Orleans] continued to influence the long-term recovery and mitigation efforts after [Hurricane Katrina]. Zhang and Peacock (2010) found that "housing recovery trajectories depended on neighborhood demographic, socioeconomic, and housing characteristics." Specifically, low income and minority populations have a difficult time during recovery.

Presumably, a relationship exists between aid disbursement and variables that usually characterize social vulnerability. This dissertation examined that connection. Therefore, relevant independent variables in this study included measures of vulnerability: age, gender, ethnicity, disability, and income. In Table 4, I provide the dependent and independent variable descriptions assessed at the county and parish levels. In short, does a relationship exist between county-level attributes of vulnerability and aid disbursement?

Table 4: Definition, Measure, and Data Source for Each Variable

	Variable	Definition	Operationalization	DATA source
DV	CDBG Funds	"The CDBG Program is used to provide disaster relief funds, many of the statutory and regulatory provisions governing the use of CDBG funds may be waived or modified, thereby providing states with even greater flexibility and discretion (GAO, 2010, p. 8)."	Amount of money distributed to county or parish	HUD Progress reports from State to HUD
	Program type	"Grantees may use CDBG Disaster Recovery funds for recovery efforts involving housing, economic development, infrastructure, and prevention of further damage to affected areas (HUD, 2013)."	Housing, economic development, infrastructure, public sector services	HUD Quarterly Progress Reports
IV	Income	"Income received on a regular basis (exclusive of certain money receipts such as capital gains) before payments for personal income taxes, social security, union dues, Medicare deductions, etc. ("About Income", n.d.)."	Median household income at county and parish levels	U.S. Census 2000
	Race	"These data are based on self-identification. The racial categories included in the census questionnaire generally reflect a social definition of race recognized in this country and not an attempt to define race biologically, anthropologically, or genetically ("What is Race", n.d.)."	Percent of non-white residents in the county or parish	U.S. Census 2000
	Sex	"For the purpose of Census Bureau surveys and the decennial census, sex refers to a person's biological sex ("Age and Sex", n.d.)."	Number of female residents in the county or parish	U.S. Census 2000
	Disability	"Conditions that include blindness, deafness, a severe vision, or hearing impairment or a condition that substantially limit basic physical activities ("Disability", n.d)."	Number of people 21 to 64 years old with a disability	U.S Census 2000

Data

Census data collected in this study focused on social and economic attributes (i.e., population demographics) for each of the counties/parishes from the U.S. Census Bureau (2000). These secondary data included the household income and population characteristics. The U.S. Census Bureau defines income as gross earnings and does not include non-monetary benefits such as subsidized housing, or food stamps ("About Income", n.d., para 1). The U.S. Census Bureau notes that while people tend to underreport their household earnings, respondents do report wages and salaries, such as from employment, nearly accurately ("About Income", n.d., para 2). Some studies have used median household income as the primary way to measure household income (e.g., Zhang & Peacock, 2010; Smith et al., 2006). This research used the median household income to provide a more accurate assessment for potentially skewed distributions. Outliers do not significantly influence the median household income as they do with the mean household income.

In addition to household income, I collected demographic population characteristics from U.S. Census Bureau data (2000). Each respondent identifies their race for themself ("What is Race?" , n.d., para. 1). The U.S. Census provides categories to respondents that reflect of the social definition of race in the United States rather than identification the basis of genetics or biology ("What is Race?", n.d., para. 2). Therefore, people who identify as Hispanic may in fact be of any race. Similarly, some people may report more than one race to indicate a racial mixture ("What is Race?", n.d., para. 2). "The sex of a person is determined by their biological sex ("Age and Sex", n.d.)."

An additional population characteristic is disability. The data provided by the U.S. Census is based on the answers to two questions. The first question asks about any

long-lasting conditions the respondent my have including blindness, deafness, physical limitations and severe vision or hearing impairments. The second question asks about physical, mental or emotional condition lasting longer than 6 months ("Disability," n.d., para. 2). Similar to other U.S. Census data, the response to the question about disability is subject to the interpretation of the question by the respondent.

A number of disaster-related research studies have used data from the U.S. Census Bureau and the CDBG; see in table 5 (Smith & McCarty, 1996; Assaf et al., 1997; Smith et al., 2006; Plyer, Bonaguro, & Hodges, 2010; Zhang & Peacock, 2010; Xiao, 2011).

To determine the amount of aid (and percentage of aid) given to each county this dissertation research used the FEMA approved State allocation information. The HUD supplemental CDBG disaster recovery program determines Federal aid for each State affected. States devastated after the 2005 hurricane season, as well as after the 2008 hurricane season, received aid from this program. To determine how the States disbursed these allocations I used the quarterly progress reports. HUD required each State to send quarterly progress reports to HUD, which included a record of performance.
The performance reports depict the amount of money approved, see appendix 1. State governments submitted a total of 26 reports for the 2005 hurricanes, representing 1st quarter 2006 to 2nd quarter 2012, Similarly, State governments submitted a total of 16 reports for the 2008 hurricanes, representing the 1st quarter 2009 to 4th quarter 2012. Included in each report is information about specific disbursements. Each performance report detailed the location of the CDBG disbursement, the amount of money used, and the type of project being funded.

Table 5: Variables Previously Used to Assess Disaster Effects.

U.S. Census		
Rossi et al. 1978	Migration patterns, economic and housing changes after disaster	"percent non-white, median family income, median age of population, percent unemployed (p. 123).
Smith & McCarty, 1996	Race, income effects of Hurricane Andrew	"Percent < Age 15, Percent Age 65+, Percent Black, Percent Hispanic, Per Capita Income (p. 266)"
Smith et al., 2006	People and housing response to disasters	"White, Black, and Hispanic Owner occupied housing, White, Black, and Hispanic Renters, Income distributions (p. 46)"
Plyer, Bonaguro, & Hodges, 2010	Migration analysis using census data and population changes following catastrophes	"Population estimates, School district boundaries (p. 160, 168)"
Zhang & Peacock, 2010	Race, income assessment of varying measure of housing recovery	"Median household income, Percent Hispanic, percent non-Hispanic Black (p. 12)"
Xiao, 2011	Per capita income level at aggregate level to assess economic impacts	"per capita income (p. 816)"
CDBG		
Collins & Gerber, 2008	Social equity of CDBG under non-disaster conditions	"Non-entitlement grant program (p.1129), Social Equity- entails the objective to equalize some situation by providing unequal outputs to obtain more equal outcomes (Cooper, 2000) (p. 1129)"
Gotham & Greenberg, 2008	9/11 and Hurricane Katrina CDBG use	"CDBG waivers scope and scale (p.1046)"
Gotham & Campanella, 2011	Federal funding programs providing support to victims in Hurricane Katrina	"History of the CDBG supplemental appropriations for hurricane Katrina (p. 16)"
Lowe, 2012	CDBG use in Mississippi following Hurricane Katrina	

These reports were quite lengthy ranging from 25 to over 2000 pages each. I gathered information from these reports then combined and connected to the data collected from the U.S. Census reports, see appendix 2.

Statistical Analysis

The type of statistical analysis performed varied slightly depending on the research question. This research uses four types of analysis. First, I performed a descriptive analysis on the distribution of CDBG funds to States and counties (or parishes). By performing the descriptive analysis I collected, organized and summarized the data (Singleton & Straits, 2005). I synthesized the vast amount of data gathered and described the association between the distribution of CDBG funds and the counties (or parishes) that received CDBG funds (Ott & Longnecker, 2001; Singleton & Straits, 2005). Johnson, Olson-Allen, Collins (2002) used descriptive analysis to summarize pre-disaster conditions at the county level to justify Federal disaster declarations (p. 85). Peña et al. (2010) used descriptive analysis to summarize and accurately display their findings in discrimination after Hurricane Katrina.

I used a descriptive analysis on the distribution of CDBG disaster recovery funds by program type, as well. In my second research question, 5 separate variables are created to represent each program type. Data was collected and organized to describe the association between the types of programs funded and the counties (or parishes) that received CDBG funds. The types of programs funded was found on each progress report and coded to as housing, infrastructure, economic development, administration, or public facilities. I gave each item on the progress reports one of the aforementioned labels, depending on the description of the work. I labeled CDBG monies used to fund police

'public sector'. Similarly for funds used for repair of government buildings. Money used for tourism or to assist private sector was labeled economic development. Money used for administration was appropriately labeled administration. I labeled other CDBG monies used to fund roads, bridges, or utility repair, 'infrastructure'. Finally, I labeled money used for relocation or housing (public or private) 'housing'. Anything not able to be placed in one of the three categories was labeled 'other'.

For my independent variables I used income, race, age, sex, and disability. Each of the independent variables are quantitative, see table 4. The linear combination of these independent variables allowed me to predict the types of disaster recovery programs funded through the CDBG program.

Second, I used Geographic Information System (GIS). Researchers use GIS to connect disparate data together spatially (Finch, Emrich, & Cutter, 2010; Gotham & Campanella, 2011). I visually depicted the types of programs were funded using the spatial information identified by this research. Finch, Emrich, and Cutter (2010) used GIS to map social vulnerability and the level of flood exposure due to Hurricane Katrina. Zhang and Peacock (2010) used GIS to map tax appraisal data and census demographic data (race and income) after Hurricane Andrew.

Third, I used multiple regression analysis to estimate the affects of the social vulnerability on CDBG disbursement after disaster. Researchers use multiple regression analysis with multiple independent variables to analyze against a single dependent variable (Stock & Watson, 2007; Zhang & Peacock, 2010; Smith et al., 2006; O'Brien & Mileti, 1992; Yeo, 2003). Zhang and Peacock (2010) used regression analysis to expose patterns in housing recovery for minority areas after Hurricane Andrew. Smith and

colleagues (2006) used regression analysis to expose patterns in minority migration also after Hurricane Andrew. O'Brien and Mileti (1992) used regression analysis to determine the effects of community integration, disaster damage, pre-disaster experience, respondent ethnicity, socio economic status on pubic involvement in response after the Loma Prieta Earthquake.

Table 6: Source and Analysis Used for Each Research Question.

Research Question	Source	Analysis
1) Do statistically significant variations appear in the distribution of CDBG disaster recovery program funds at the (a) State and (b) County level?	HUD Reports 2005 and 2008 Hurricane season	Descriptive Analysis, GIS
2) Do statistically significant variations appear in the distribution of CDBG disaster recovery program funds by program type at the (a) State and (b) county level?	HUD Reports 2005 and 2008 Hurricane season	Descriptive Analysis
3) Given that certain populations experience differential effects of disasters, do meso-level actors equally distribute funds to counties/parishes with such populations?	HUD Reports 2005 and 2008 Hurricane season; U.S. Census Bureau;	Multiple linear regression
4) Does statistically significant variation occur between the 2005 and 2008 hurricane seasons?	HUD Reports 2005 and 2008 Hurricane season; U.S. Census Bureau; Federal Register	ANOVA

Fourth, I used analysis of variance (ANOVA) to identify the difference in the way

CDBG funds were disbursed after the two hurricane seasons Previous disaster research has also used an ANOVA (Paul, 2003; Spence, Lachlan, & Griffin 2007; Peña et al., 2010). Paul (2003) used an ANOVA to assess the amount of NGO and Government aid received by respondents and the occupation of the respondents after the 1998 flood in Bangladesh, India. Spence, Lachlan, and Griffin (2007) used a series of one-way ANOVAs to examine the perceived importance Hurricane Katrina victims had on a number of items including: concerning storm damage, government response, and food and water distribution. Peña and colleagues (2010) used an ANOVA to reveal any perceived discrimination based on the respondent's ethnicity after Hurricane Katrina. Table 6 displays the types of analysis employed for each research question.

Research Design

For the first research question, I performed a descriptive analysis to synthesize the amount of money States and counties (or parishes) received. This analysis made it easier to plainly describe any variations that exist with regard to the CDBG disbursements. Program type variables were the dependent variables represented in the second research question, shown in table 6.

For the third question, the single dependent variable is the amount of funding given to each county or parish. The functions that will be estimate will look like the following:

$$CDBG_{2005} \sim bo + Female_{2005} + Income_{2005} + White_{2005} + Age_{2005} + Disability_{2005} \quad (3)$$

$$CDBG_{2008} \sim bo + Female_{2008} + Income_{2008} + White_{2008} + Age_{2008} + Disability_{2008} \quad (4)$$

This research also used multiple regression analysis to determine the type of

program for which CDBG funds are disbursed related to the overall socioeconomic status of the county.

$$CDBG_{2005} \sim bo + Female_{2005} + Income_{2005} + White_{2005} + Age_{2005} + Disability_{2005} \quad (5)$$

$$Infrastructure_{2005} \sim bo + Female_{2005} + Income_{2005} + White_{2005} + Age_{2005} + Disability_{2005} \quad (6)$$

$$Housing_{2005} \sim bo + Female_{2005} + Income_{2005} + White_{2005} + Age_{2005} + Disability_{2005} \quad (7)$$

$$EconomicDev_{2005} \sim bo + Female_{2005} + Income_{2005} + White_{2005} + Age_{2005} + Disability_{2005} \quad (8)$$

$$Public\ Facilities \sim bo + Female_{2005} + Income_{2005} + White_{2005} + Age_{2005} + Disability_{2005} \quad (9)$$

$$Administration \sim bo + Female_{2005} + Income_{2005} + White_{2005} + Age_{2005} + Disability_{2005} \quad (10)$$

Several assumptions are adopted when using multiple regression analysis (Ott & Longnecker, 2001; Stock & Watson, 2007). First, the error is random and not correlated with the independent variables. Second, the independent variables cannot be significantly correlated with each other. If the independent variables are correlated, then that suggests collinearity (Ott & Longnecker, 2001). Collinearity among the variables suggests that it is likely that either variable alone will be able to explain any correlation between both (Ott & Longnecker, 2001). Third, errors of each independent variable are also uncorrelated. Finally, the variance is constant among all observations.

I used an analysis of variance (ANOVA) test to identify correlation among the dependent variables based on the hurricane season (Paul, 2003; Spence, Lachlan, & Griffin, 2007, Peña et al., 2010). An ANOVA generalizes a t-test for several variables not just between two variables (Ott & Longnecker, 2001). It tests whether the means of the variables are equal or if a relationship between the two exist (Ott & Longnecker, 2001).

CHAPTER IV

FINDINGS

The purpose of this chapter is to present the findings of the analyses performed for each of the research questions. The first section describes all of the variables used in this study. The subsequent sections are segmented by each research question. For review, the research questions are as follows:

1) Do statistically significant variations appear in the distribution of CDBG disaster recovery program funds at the (a) State and (b) County level?
    - H_o: There will not be significant variations in the distribution of CDBG disaster recovery program funds at the State or County level.
    - H_1: There will be significant variations in the distribution of CDBG disaster recovery program funds at the State or County level.
2) Do statistically significant variations appear in the distribution of CDBG disaster recovery program funds by program type at the (a) State and (b) county level?
    - H_o: There will not be significant variations in the distribution of CDBG disaster recovery program.
    - H_2: Variations will appear in the distribution of the CDBG disaster recovery program at the county level and that these variations will occur based on program type

3) Given that certain populations experience differential effects of disasters, do meso-level actors equally distribute funds to counties/parishes with such populations?

   H_o: There is an equitable distribution of CDBG funds

   H_3: Socioeconomic factors of a county predict the disbursement of CDBG funds.

4) Does statistically significant variation occur between the 2005 and 2008 hurricane seasons?

   H_o: Despite exo-level policies no changes will appear in the distribution of funds in 2008.

   H_4: Changes in exo-level policies will result in the more equitable distribution in 2008 than in 2005.

Descriptive Analysis

In this research, the Community Development Block Grant (CDBG) disaster recovery disbursements after two hurricane seasons were evaluated; the 2005 and 2008 hurricane season. In this section the descriptive analysis of the data is presented. The descriptive analysis presents data in an organized and summarized manner (Singleton & Straits, 2005). The analysis synthesized the vast amount of data gathered to describe the association between the distribution of CDBG funds and the counties (or parishes) that received these funds (Ott & Longnecker, 2001; Singleton & Straits, 2005).

The average amount of money funded by the three States observed (Louisiana, Mississippi, and Texas) for the 2005 hurricane season was $302,212,755.30 and is shown in Table 7. The average for the 2005 hurricane season represents the amount funded between the 3rd Quarter of 2006 – 2nd Quarter of 2012. The average amount of money funded by the three States observed (Louisiana, Mississippi, and Texas) for the 2008 hurricane season was significantly higher $8,938,010.00, also shown in Table 7.

Table 7: Descriptive Analysis of the Variables

Year	Factor	Variable	N	Mean	SD	Min - Max
2005	Dependent Variables	CDBG disbursements	86	$302,212.76 (in thousands)	620797243	($17,992,277.20) - $3,292,507,892.00
		Administration	86	-$9,013.90 (in thousands)	51380899.81	($274,727,968.50)- $52,288,113.40
		Infrastructure	86	$28,975.87 (in thousands)	93864560.74	($18,597,482.00) – 483,131,958.60
		Economic Development	86	$4,094.50 (in thousands)	11692631.31	$0.00 - $92,151,111.00
		Housing	86	$109,949.05 (in thousands)	458936498.7	$0.00 - $223,6148,273.00
		Public Facilities	86	$18,941.87 (in thousands)	70088569.42	($0.60) - $546,522,167.5
	Independent Variables	Population	86	127,295	378,958.09	8,448 - 3,400,578
		Income	86	$33,002.58	7,808.51	$17,235 – $63,831
		perFemale	86	50.49%	4.28	16.60% - 53.70%
		perDisability	86	23.66%	4.17	14.80% - 33.90%
		perWhite	86	67.48%	18.08	9.70% - 94.3%
		perOver65	86	12.91%	5.29	5.70% - 52.00%
2008	Dependent Variables	CDBG disbursements	131	$8,938.01 (in thousands)	24090689.60	($3,680,414.35) – $17,379,245.04
		Administration	131	$760.31 (in thousands)	4351617.51	$0.00 – $46,403,154.8
		Infrastructure	131	$5,015.23 (in thousands)	24090689.60	($3,680,414.35) – $141,127,958.30
		Economic Development	131	$81.42 (in thousands)	497003.88	$0.00 - $4,884,112.20
		Housing	131	$490.10 (in thousands)	2214404.42	$0.00 - $23,258,247.70
		Public Facilities	131	$2,590.89 (in thousands)	7313886.19	$0.00 - $42,340,496.4
	Independent Variables	Population	131	102660	314203.66	5,281 - 3,400,578
		Income	131	$32,305.18	$7,117.72	$16,504 – $63,831
		perFemale	131	49.41%	6.22	8.20% - 53.70%
		perDisability	131	23.37%	3.49	12.20% - 35.20%
		perWhite	131	69.34%	17.79	9.70% - 94.30%
		perOver65	131	14.24%	6.80	5.70% - 52.10%

Source: HUD CDBG Progress Reports for the 2005 and 2008 Hurricane season, U.S. Census Bureau 2000 data set; in the min-max column, negative numbers are shown in parentheses.

Table 7 also reports the number of observations (N), mean, standard deviation (SD), the minimum, and the maximum. The number of observations (N), represents the number of counties that received access to funds as listed in the progress reports. The mean represents the average money accessible per season. The standard deviation (SD) along with the minimum and maximum are presented to display the dispersion for each of the variables (Berman, 2002). The minimum values for several of the dependent variables are negative. The negative numbers appear due to the adjustments made in the quarterly progress reports. As of 2nd Quarter 2012 the average disbursement was negative for the money used on administration. Appendix 3 and 4 lists the negative balances by State for funds used for the 2005 and 2008 hurricane season, respectively.

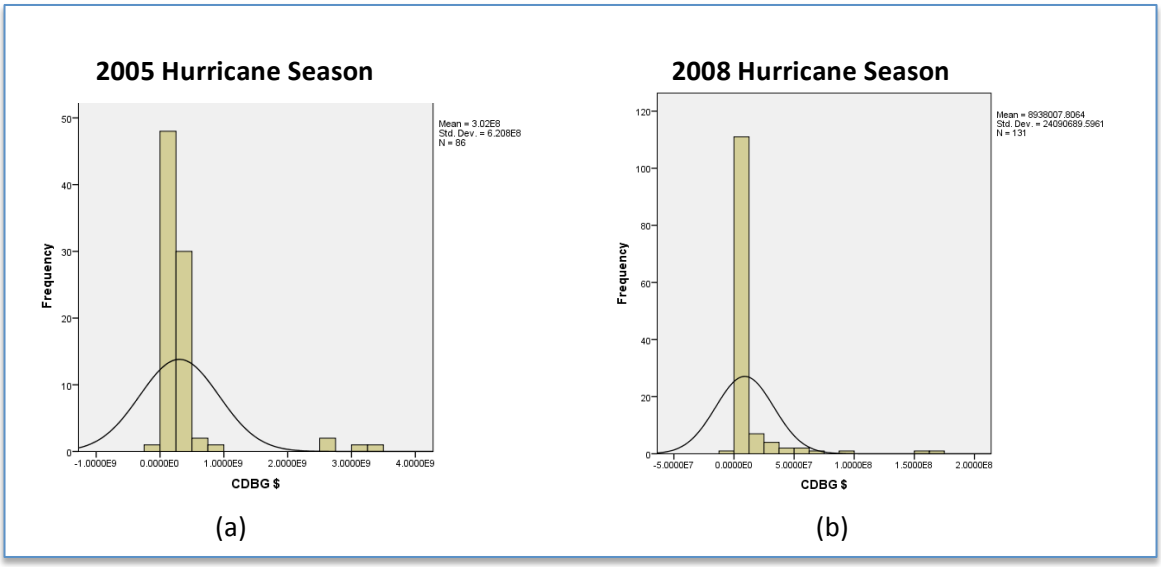


Figure 2: Histograms of the CDBG raw variable for both hurricane seasons.

Table 7 systematically outlines the broad dispersion that exists for each of the dependent variables. The histograms below depict this dispersion. In Figure 2, on each of the graphs, the mean, standard deviation, and number of observations are shown in the

upper right hand corner. The frequency (y-axis) represents the number of counties that have received access to the CDBG funds (x-axis).

As shown, the CDBG distributions from both hurricane seasons have a wide range of dispersion. The distributions also show a few outliers. Due to the dispersion and number of outliers, a grouped variable (CDBG_levels) was created to accurately display the amount of money distributed, Figure 3. The CDBG _levels variable represents the total amount of money each county had access to use as determined by the state government.

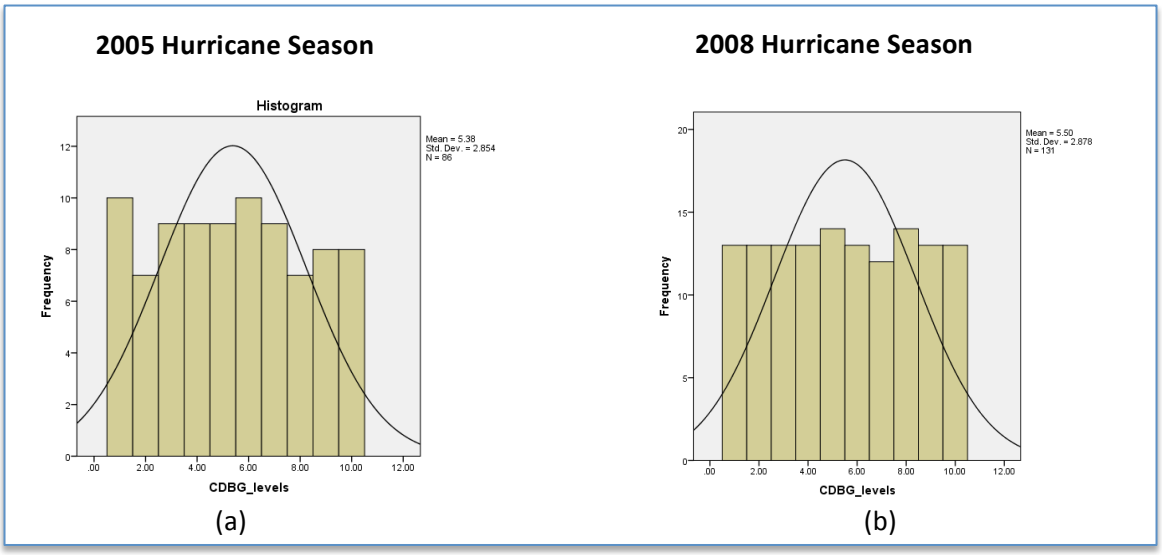


Figure 3: Histograms of the CDBG percentile variable for both hurricane seasons

The grouped CDBG variable was segmented into 10 percentiles using IBM SPSS Statistics version 20 and incorporated the outliers. Each percentile was given a number from 1 to 10. The ranked variable used 1 to represent the lowest amount of funding and 10 to represent the highest amount of funding. The percentiles for the grouped variable were created separately using the original CDBG variable for each hurricane season.

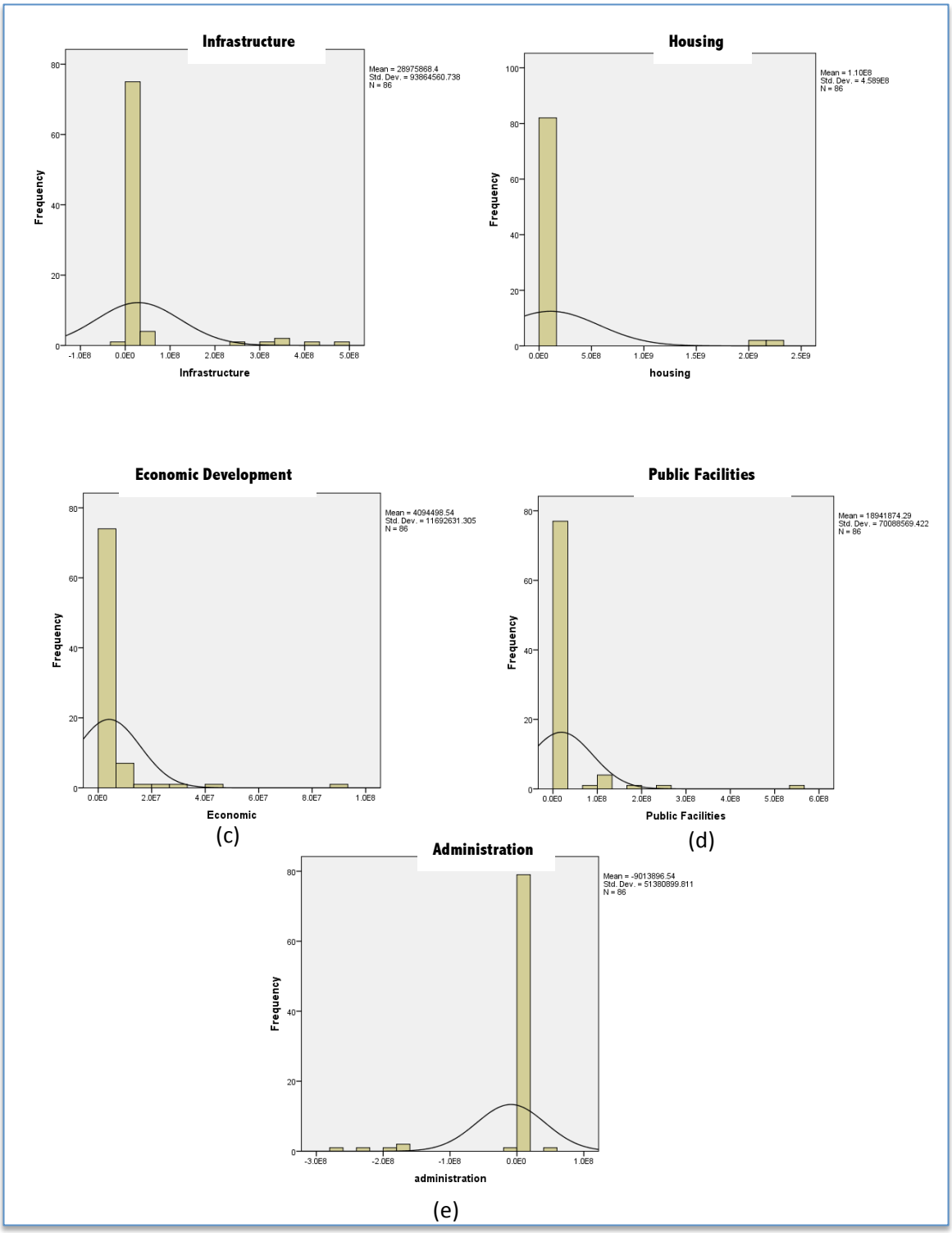


Figure 4: Histograms of the CDBG program type variables for the 2005 hurricane season.

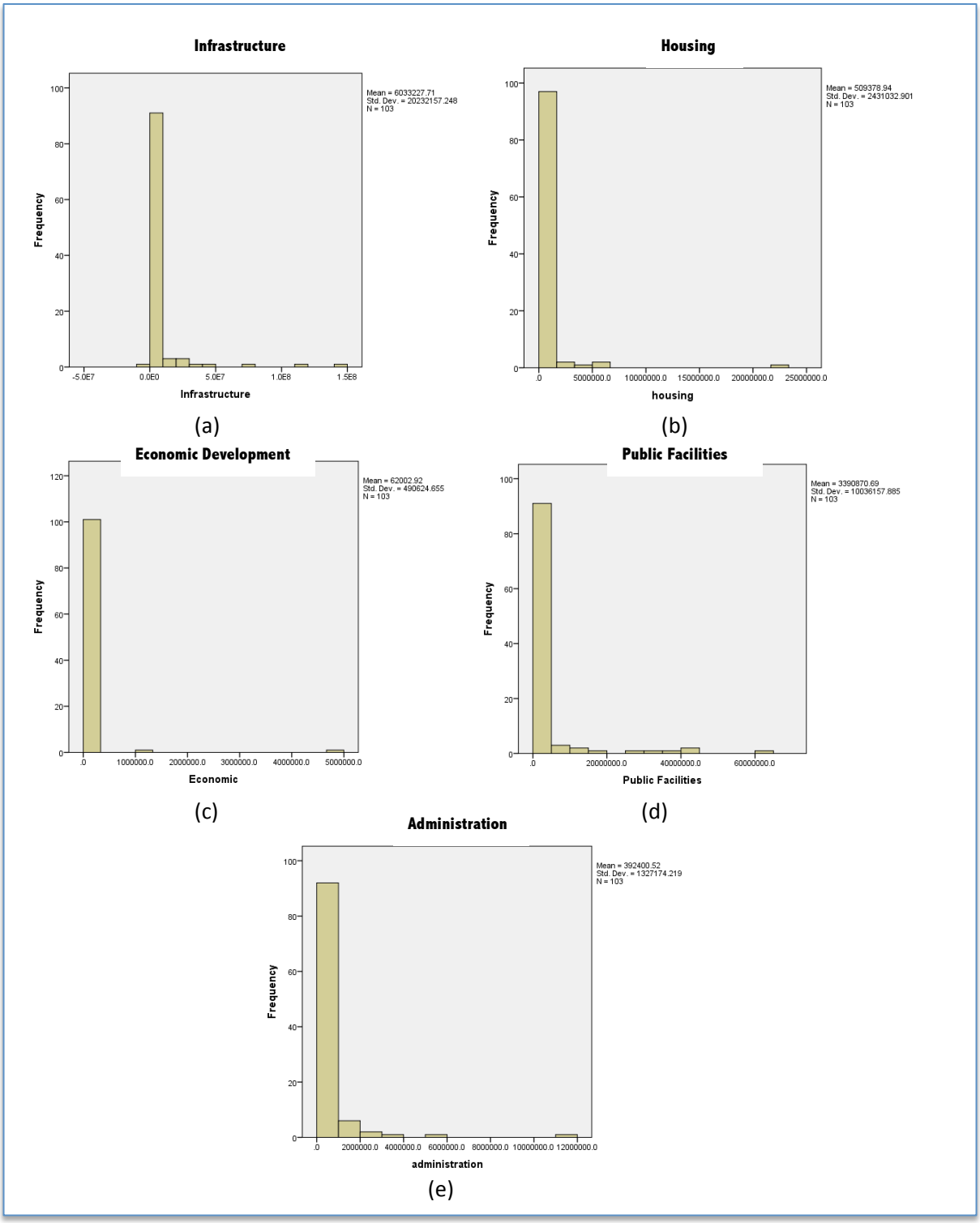


Figure 5: Histograms of the CDBG Program Type Variables for the 2008 Hurricane Season.

The CDBG program type variables were also widely dispersed. In figure 4, the histograms for each program type variable are displayed. In the graphs above, the majority of the counties received funds around closer to zero. Each graph shows outliers that skew the distribution. All program types were negatively skewed except administration, which was positively skewed. The results were similar and in the histograms of the same variables for the 2008 hurricane season, shown in figure 5.

Therefore the group variables for each program type were created to account for the dispersion and number of outliers. The creation of the grouped variables was necessary for each hurricane season. Again the percentiles were determined separately for each program type using IBM SPSS Statistics version 20. The number of percentiles was different for each program type. The resulting histograms are found in appendix 5 for the 2005 hurricane season and appendix 6 for the 2008 hurricane season.

Summary

The descriptive table shows a wide dispersion in the dependent variables for both hurricane seasons. In total more money was allocated by the U.S. Congress during the 2005 hurricane season than the 2008 hurricane season. However, by the analysis performed in this research, the money disbursed by the State governments in 2008 was larger than in 2005. The only funds accounted for in this study were those that could be easily tracked to the county level. After the 2005 hurricane season, $4,608,146,408.96 was disbursed by the Louisiana, Mississippi, and Texas State governments and approved by HUD but did not indicate the location where the money was to be used. Similarly after the 2008 hurricane season, $61,620,237.92 was disbursed by the Louisiana, Mississippi,

and Texas State governments and approved by HUD but did not indicate the location where the money was to be used.

Additionally, a number of counties had a negative balance. The negative balance was due to the adjustments made at the State-level for projects implemented at the city or county-level. Each State government had number of reasons listed in the progress reports for removing some of the funding. An example would be in 4rd Quarter of 2011 when Mississippi took away funding in Hancock County slated for the development of 80 affordable housing units in Bay St. Louis. The project had been completed and closeout was pending. Another example is when in 2nd Quarter 2012 Texas took away funding from Hardin county slated for infrastructure repair in Lumberton. The money removed in Lumberton was due to posted vouchers.

The descriptive analysis in this section displays the data in total for both hurricane seasons. It gives the reader a basic familiarity with all of the variables in this study. In the following sections the data are explored in more detail. Each section discusses one of the four research questions mentioned in the beginning of this chapter.

Research Question I

Do statistically significant variations appear in the distribution of CDBG disaster recovery program funds at the (a) State and (b) County level?

To answer the research question above, descriptive statistics on the CDBG recovery program funds were employed. The table below lists the variations of the dependent variables for each State per hurricane season. Included are the mean values for the CDBG distributions and standard deviation below.

Table 8: CDBG Disaster Recovery Program Distribution.

Year	State	N	CDBG
2005	Louisiana	25	$87,000,825.50 (165496978.50)
	Mississippi	36	$661,193,942.90 (828549441.00)
	Texas	25	$491,775.08 (4195300.68)
2008	Louisiana	50	$4,533,869.77 (9735874.70)
	Mississippi	7	$296,428.72 (349473.50)
	Texas	74	$12,731,223.42 (30575385.45)

Source: HUD CDBG Progress Reports for the 2005 and 2008 Hurricane season; standard deviation shown in parentheses.

The State with the most counties that received access to CDBG funds was Texas after the 2008 hurricane season. While Louisiana was allocated the most funds (out of the States examined) after the 2005 hurricane season, only 25 parishes were specifically named to receive access to funds in the progress reports. The State with the least amount of counties that received access to CDBG funds was Mississippi in 2008. However, the overall allocation to Mississippi after the 2008 hurricane season was least amount examined in this research study.

The variations for the disaster recovery program funds can be shown using boxplots. Boxplots are graphical tools that show display the dispersion of the data (Berman, 2002). Figure 6 depicts the variation of CDBG funds at the State-level for the 2005 hurricane season. The grouped CDBG variable was used.

In the figure, the bold dark line in each box shows the median values for each distribution. The median CDBG funding for Texas was 2, which represented the 20th

percentile for funding. The median for Louisiana was a 5 and was an 8 for Mississippi representing the 50th and 80th percentile of funding, respectively.

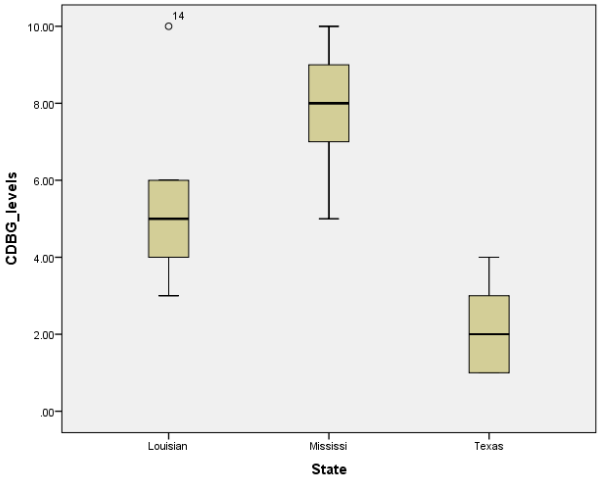


Figure 6: Boxplots of the CDBG distributions for the 2005 hurricane season

The boxes in Figure 6 represent the dispersion of the distribution of funds. While the medians are different, the boxes appear similar in size. The figure below depicts the variation of CDBG funds at the State-level for the 2008 hurricane season. Again, to show the dispersion in the distribution of funding boxplots are used.

The variation of funding for the 2008 season differs from the 2005 season. In Figure 7 the median values are similar for Louisiana and Texas. However, the size of the boxes (spread of the data) differs. Additionally, the spread of the distribution in Texas is larger than the previous hurricane season.

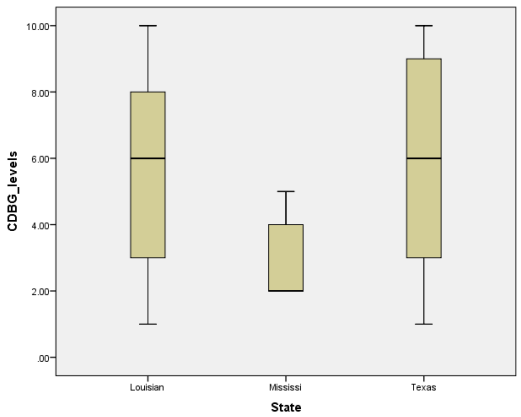


Figure 7: Boxplots of the CDBG distributions for the 2008 hurricane season.

To display the variation of funding at the county level a bar chart was used. The bar charts show the frequency (or count) of occurrences (Berman, 2002). Here the count (or y-axis) represents the frequency of counties and the CDBG_levels (or x-axis) represents the range of funding grouped into 10 percentiles.

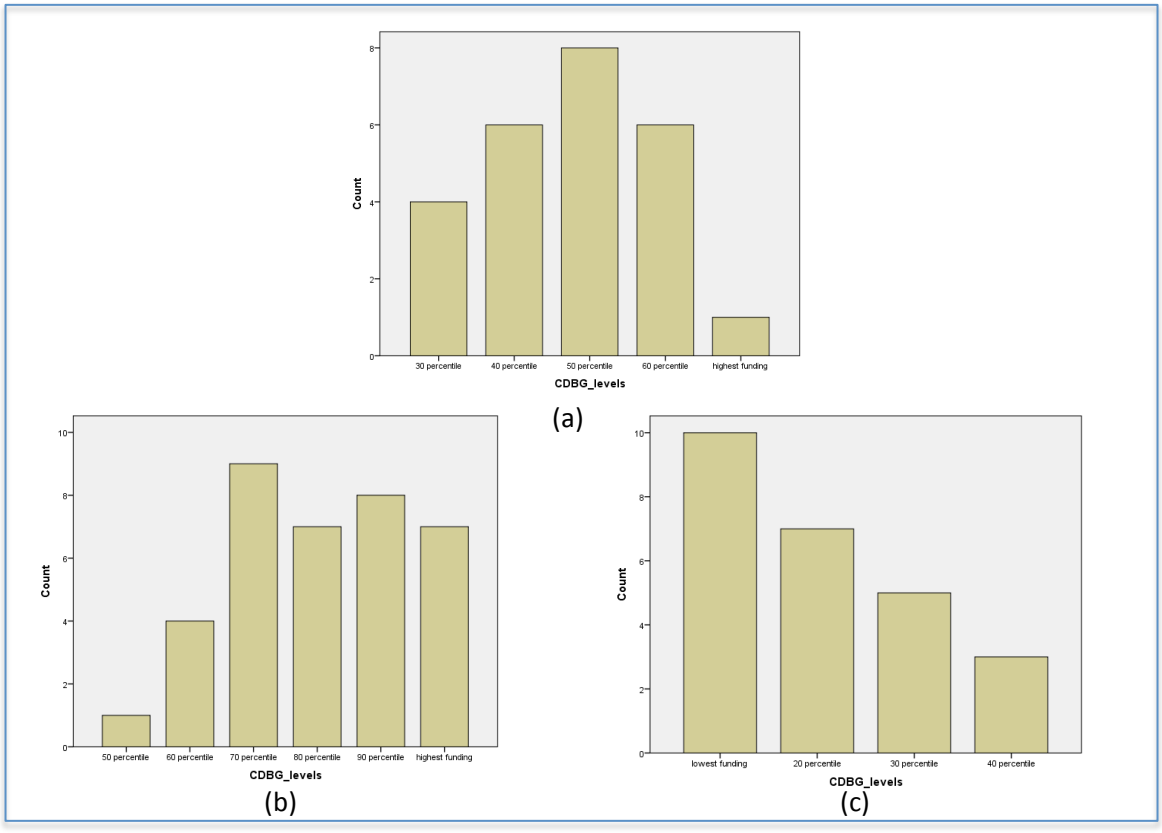


Figure 8: County-level variation of CDBG funds for the 2005 hurricane season

The percentiles are arranged from lowest to highest in that '1' represents the lowest amount of funding given and '10' represents the highest. Figure 8 contains three bar graphs that show the variation of funding at the county level for each State after the 2005 hurricane season. The variations in the CDBG dispersion at the county level are shown in the following three figures. The figure below graphically depicts the variation by plotting the percentiles of CDBG funding by county.

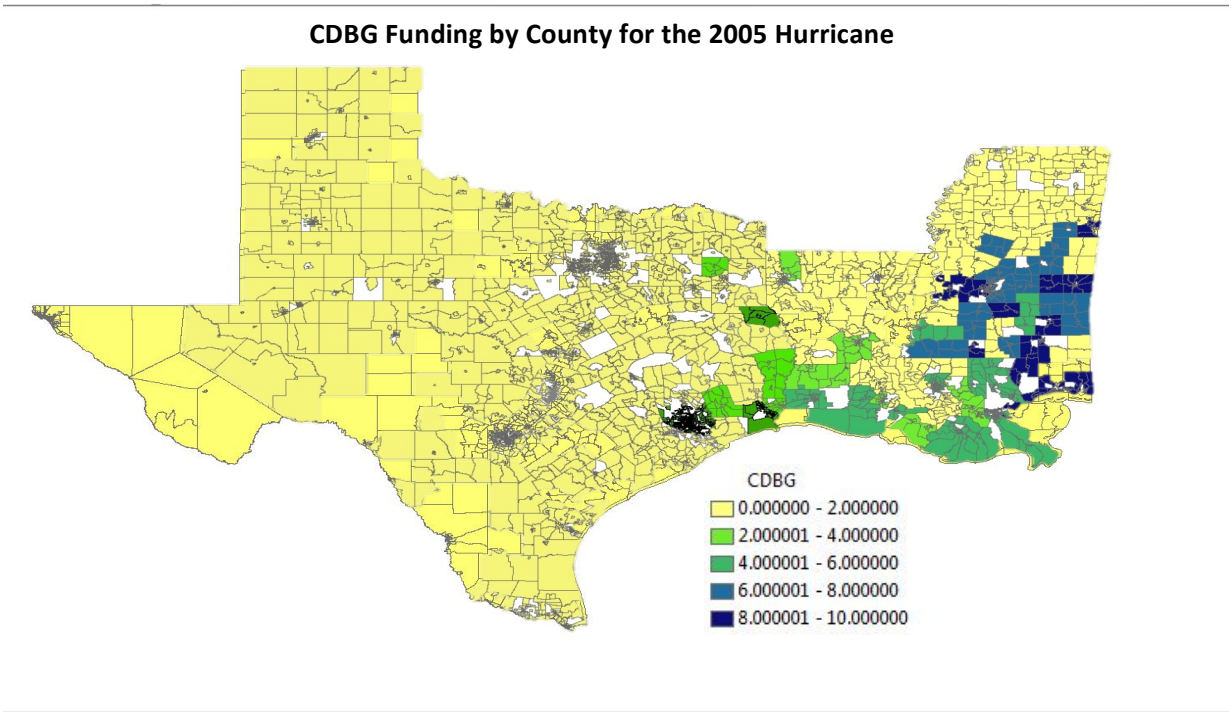


Figure 9: Geographical display of the CDBG funding by county after 2005 hurricane season.

Figure 9, above shows the distribution of CDBG funds allocated after the 2005 hurricane season. It uses the aforementioned grouped variable (CDBG_levels) and maps the distribution scale per county over Louisiana, Mississippi and Texas. The shades represent the amount of money accessible to each county. The darker shades indicate a larger amount of money distributed to that county (or parish).

The distribution of funding in Louisiana closely resembles a normal distribution with most of the money allocated closely around the mean. The distribution of funding in Mississippi and Texas are more heavily skewed. Mississippi gave several large distributions at the county level while Texas distributed smaller amounts to counties.

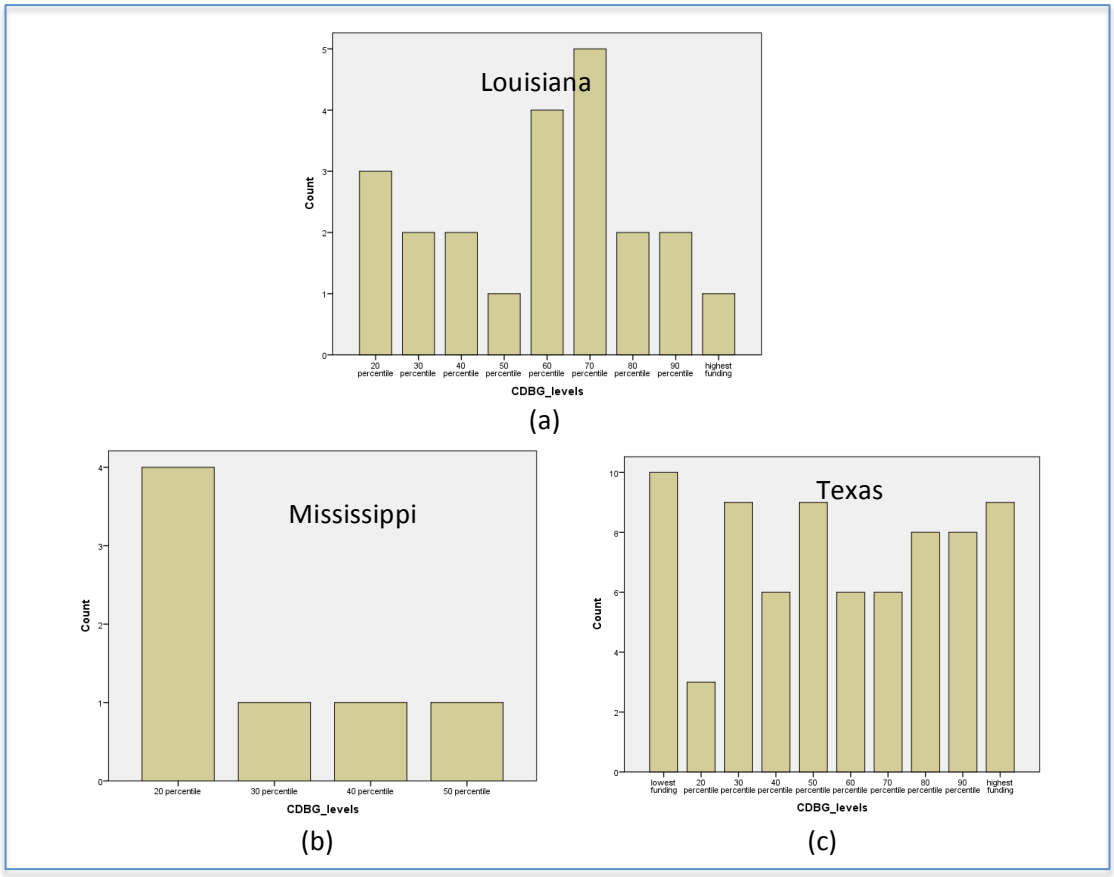


Figure 10: County-level variations of CDBG funds for the 2008 hurricane season.

The variation of funding for the 2008 hurricane season was very different. Louisiana and Texas distributed funds across a wider range. The data collected from Mississippi is only valid for the 7 observations found between the 3rd Quarter of 2009 – 2nd Quarter of 2012. The 7 observations represent the counties that specifically received access to funding from the CDBG program; Adams, Bolivar, Hinds, Jackson, Warren,

Washington, and Wilkinson. Figure 10 contains three bar graphs that show the variation of funding at the county-level for each State for the 2008 hurricane season.

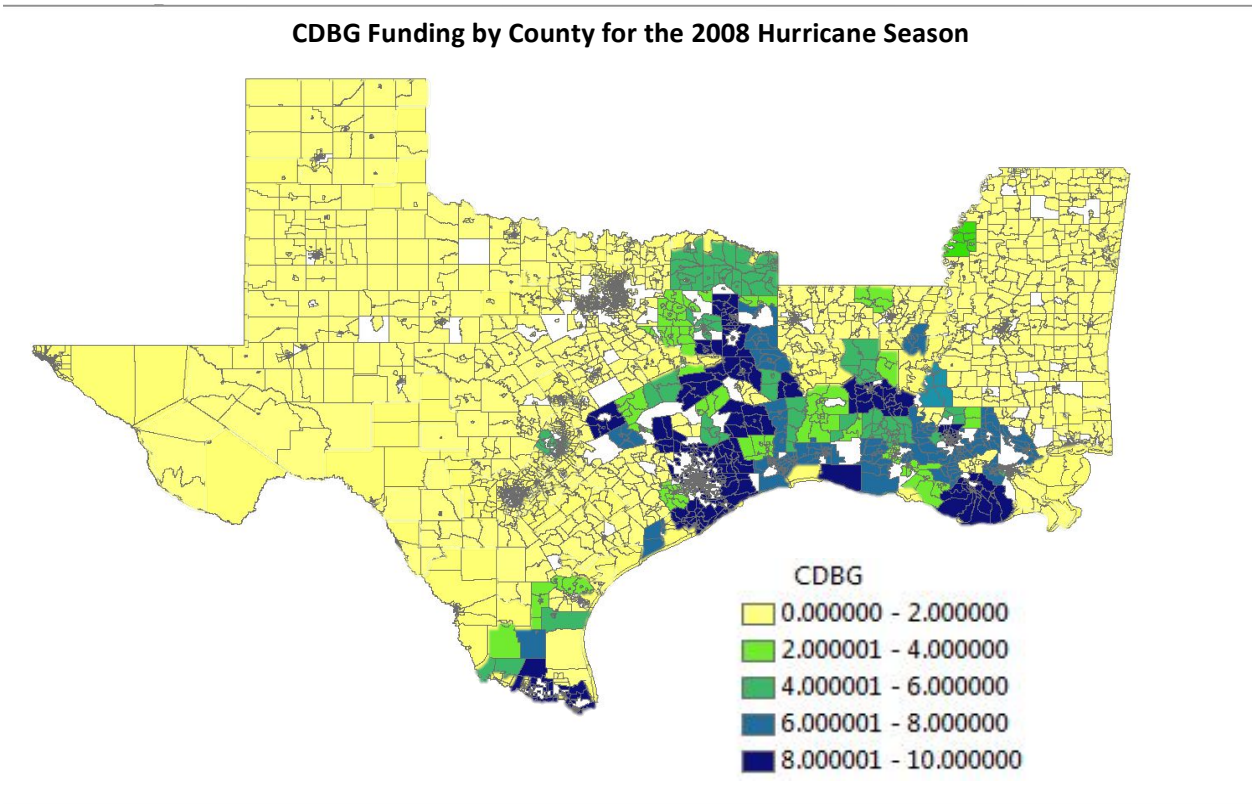


Figure 11: Geographical display of the CDBG funding by county after 2008 hurricane season.

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Research Question II

Do statistically significant variations appear in the distribution of CDBG disaster recovery program funds by program type at the (a) State and (b) county level?

To answer the research question above descriptive statistics are employed again. Table 9 lists the variations of the program type variables for each State per hurricane season. Included are the mean values for the CDBG distribution for each program type and the standard deviation.

Table 9: CDBG Disaster Recovery Distribution by Program Type.

Year	State	Infrastructure	Housing	Public Facilities	Economic Development	Administration
2005	Louisiana	$22,768,356.52 (49197724.55)	$27,831,044.63 (36621541.87)	$17,234,078.15 (49846751.79)	$4,970,773.32 (6452839.00)	$8,549,781.88 (11364140.33)
	Mississippi	$53,801,703.74 (135804083.50)	$242,782,904.4 (692180436.30)	$33,274,476.18 (98777375.46)	$6,329,376.16 (16906069.35)	-$27,523,530 (75439388.47)
	Texas	-$565,822.60 (3776691.91)	$786,315.38 (1455562.98)	$10,723.70 (48913.14)	$0.00 (0.00)	$76,297.39 (42121.75)
2008	Louisiana	$715,495.79 (2531821.98	$304,707.12 (879285.88)	$1,696,668.69 (3006138.18)	$86,762.59 (395281.00)	$1,730,235.57 (6928251.13)
	Mississippi	$64,814.00 (95135.27)	$37,442.24 (99062.86)	$191,789.86 (275003.65)	$0.00 (0.00)	$2,382.63 (4754.91)
	Texas	$8,388,818.65 (23494165.33)	$658,189.17 (2853212.00)	$3,422,043.65 (9348231.87)	$85,513.53 (578217.55)	$176,658.45 (676970.38)

Source: HUD CDBG Progress Reports for the 2005 and 2008 Hurricane season; standard deviation shown in parentheses

In the table above the median distribution for each program is given per State. The standard deviation is in parentheses, located below the median distribution. In 2005 hurricane season allotment, Texas did not distribute a significant amount of money to a named county for purposes of economic development. The same is true for Mississippi in the 2008 hurricane season allotment. Also note both Texas and Mississippi have a negative median in 2005,for infrastructure and administration respectively. The progress reports between the 3rd Quarter of 2006 – 2nd Quarter of 2012 included several adjustments. During each quarter a county may have had funds allocated or deducted as

necessary. At the time of the last progress report observed in this research, a county may have had a negative balance due to the adjustments made at the State-level. The counties observed in this research question are the same from the previous research question and shown in Table 8.

The variations in CDBG funds by program type are also displayed using box plots. Figure 12 contains five boxplots using the grouped variables. Each boxplot represents the amount of CDBG money (by percentile) used for administration, economic development, housing, infrastructure, or public facilities graphed by State. In Figure 12 an obvious variation in the types of programs each State government chose to fund is shown. The boxplots are used to identify cutoff points where observations could be considered outliers (Berman, 2002). In the housing boxplot (Figure 12(b)) several outliers are apparent for Mississippi and Texas, even though the grouped variables are used.

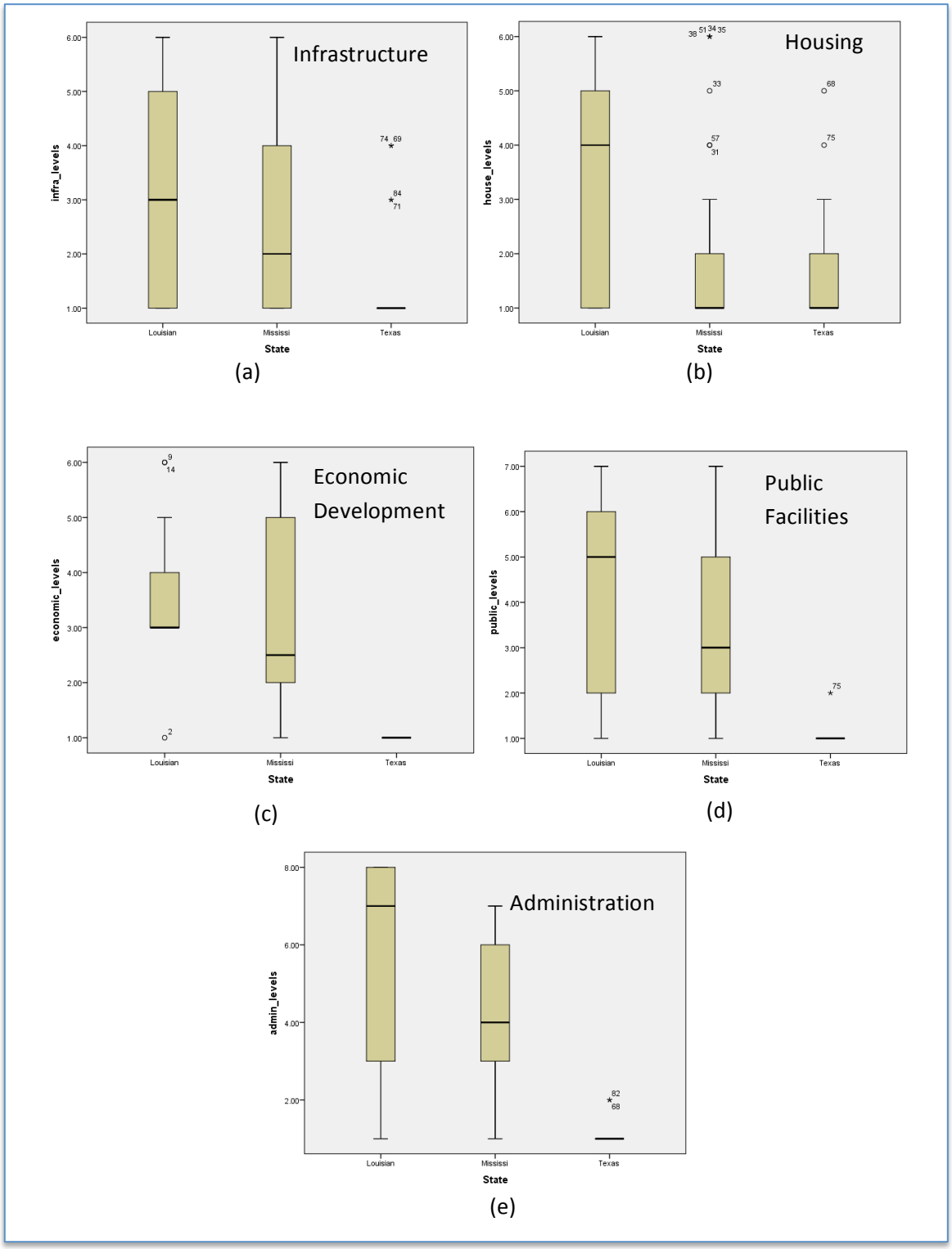

Figure 12: Variations in distribution by program type for each State after the 2005 hurricane season.

The distribution of funds for the 2008 hurricane season was quite different. Figure 13(a) displays the distribution of funds for infrastructure purposes after the 2008 hurricane season. Louisiana distributed very little funds as shown by the median and number of outliers in Figure 13(a). The same is true for Mississippi with regards to housing in Figure 13(b) and all States with regards to economic development in Figure 13(c). The distributions of funds for the 2008 hurricane season were used primarily for public facilities and administration in Louisiana and infrastructure in Texas. The median values and size of the boxes differ significantly for infrastructure, housing, public facilities and administration.

The county level distributions for each State by program type are shown in figures (14-18). Each figure represents one State and displays five graphs depicting the range of distributions per program type. For the 2005 hurricane season there are three figures displaying Louisiana, Texas and Mississippi. However, for the 2008 hurricane season there are only 2 figures displaying Louisiana and Texas. Since Mississippi only had seven counties, the figure was omitted in this chapter and placed in the appendix.

Figure 14 shows the variation in funding per program type for Louisiana parishes. As shown, several parishes received a minimum amount of fund for infrastructure and housing. Conversely, several parishes received relatively high amount of funding for restoration of public facilities and administration.

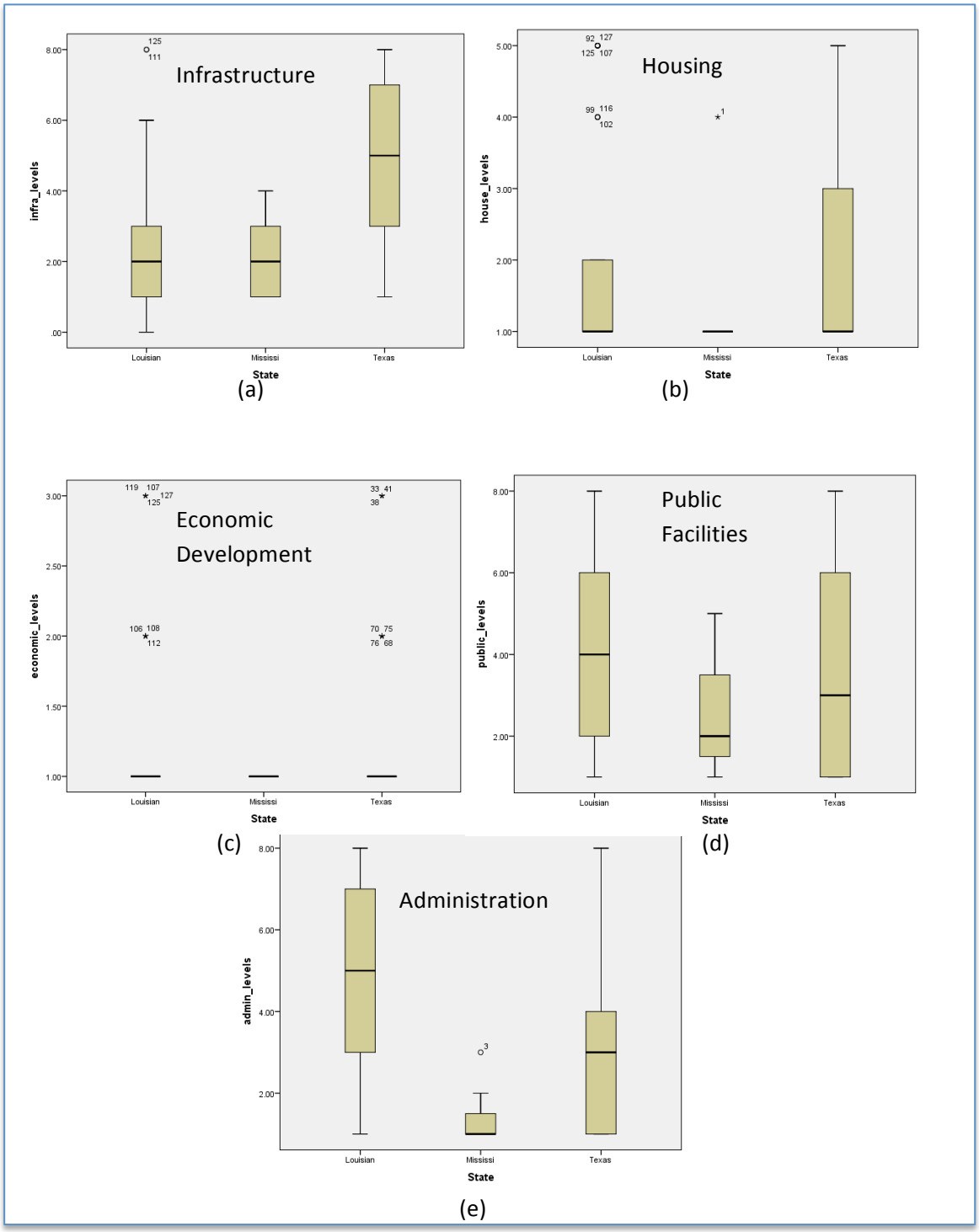

Figure 13: Variations in distribution by program type for each State after the 2008 hurricane season.

The distributions are varied; the same amount of funding was not given to equal numbers of parishes. However, out of the 25 parishes observed nearly half received the

lowest amount of funding for economic development and only 4 received the highest amount. Pairing the data from Figure 12 with Figure 14, gives an overall description of the distribution of funds and how the outliers affect the core distribution.

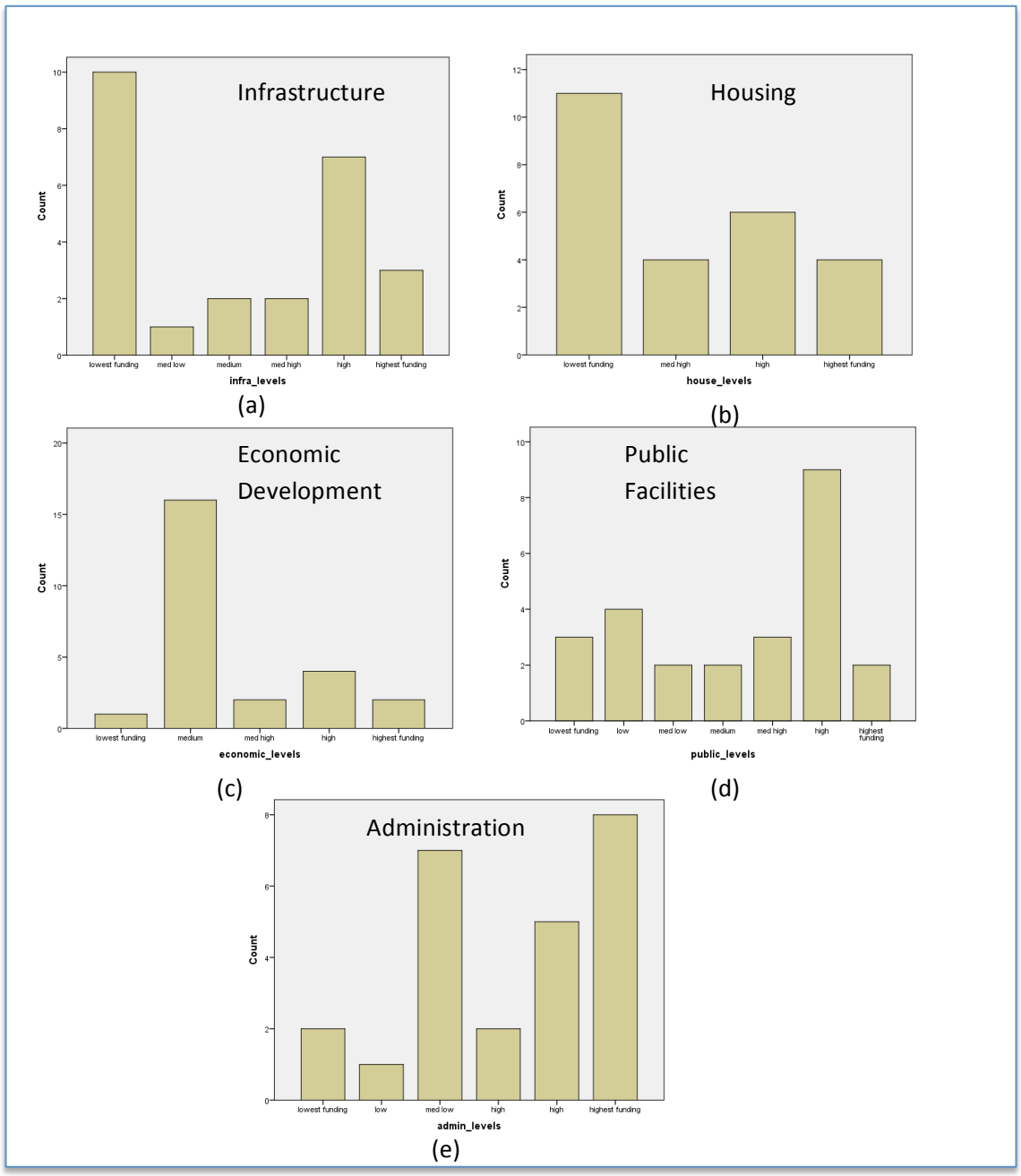

Figure 14: Louisiana parish-level distributions by program type for the 2005 hurricane season.

Figure 15 shows the county-level distribution by program type for Mississippi. As shown, very little funding was used for housing related activities. Comparatively, a significant amount of funding was used for economic development, public facilities and administration activities.

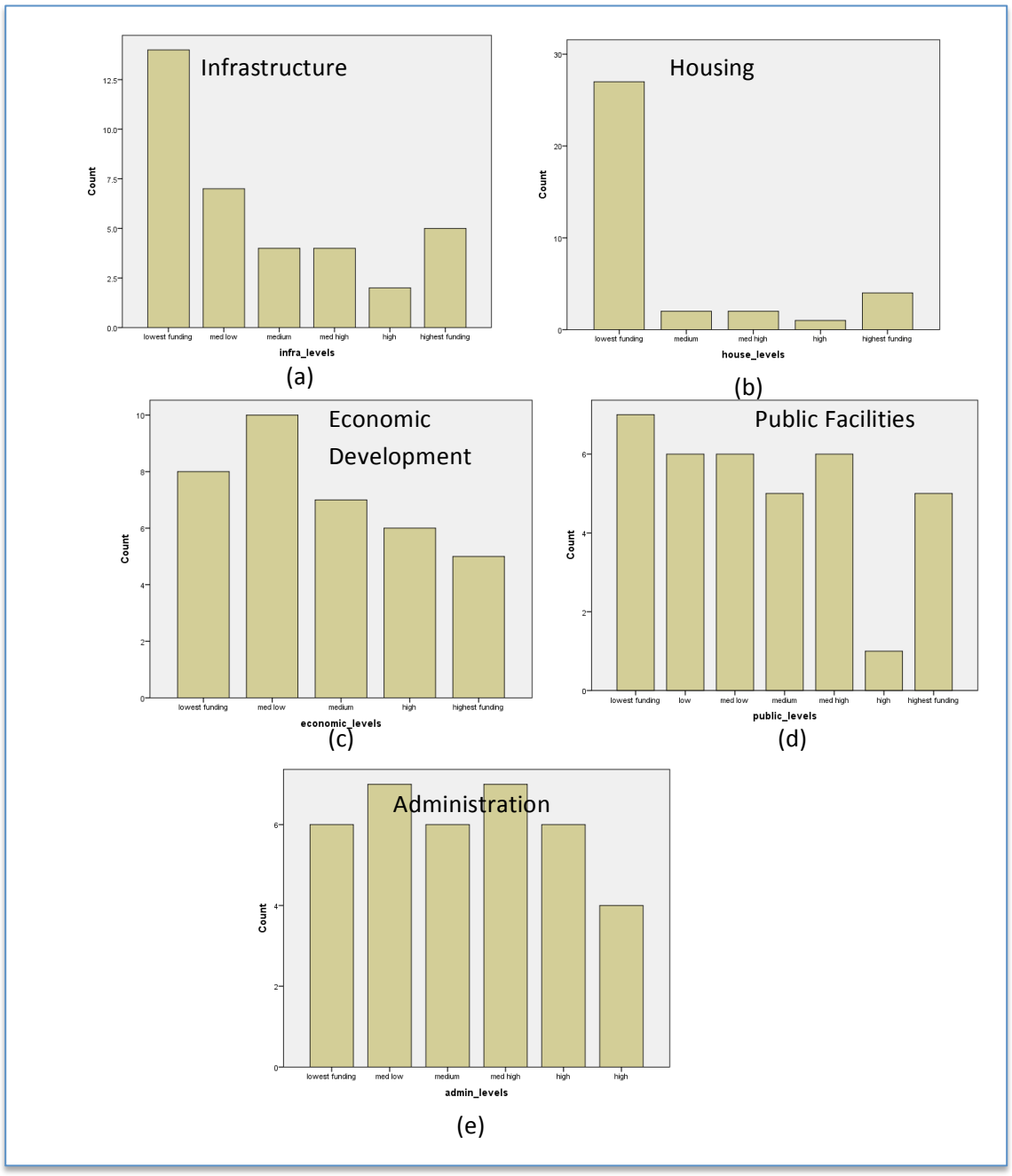

Figure 15: Mississippi county-level distributions by program type for the 2005 hurricane season.

Figure 16 displays the county-level CDBG distributions by program type for Texas. All 25 counties received the lowest level of funding in economic development; see Figure 16(c).

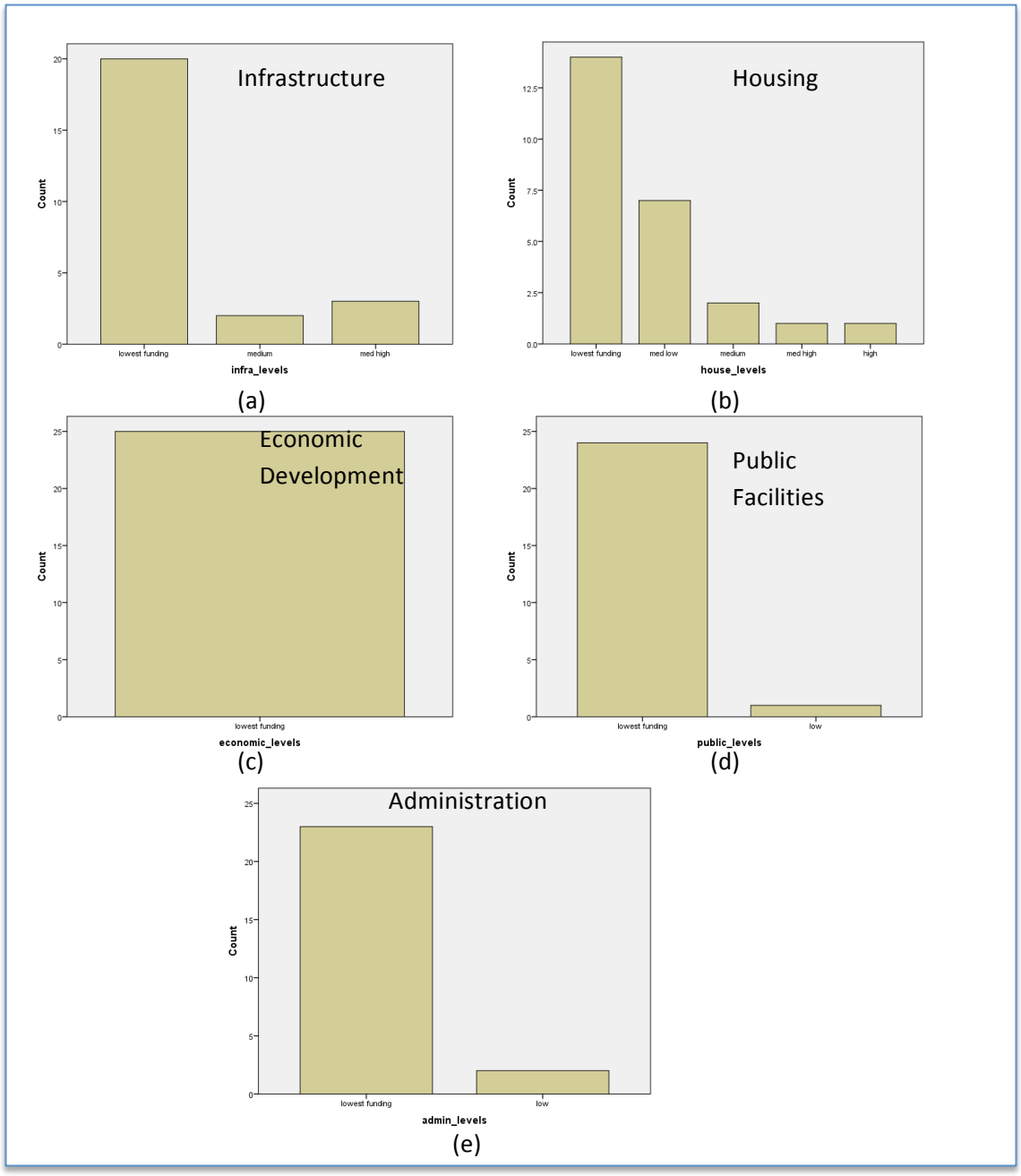

Figure 16: Texas county-level distributions by program type for the 2005 hurricane season.

Majority of the 25 counties received the lowest level of CDBG funding earmarked for public facilities or administration as shown in graphs 16(d) and (e), respectively. Slight variations can be found in the distributions of CDBG funding used for infrastructure and housing as shown in graphs 16(a) and (b).

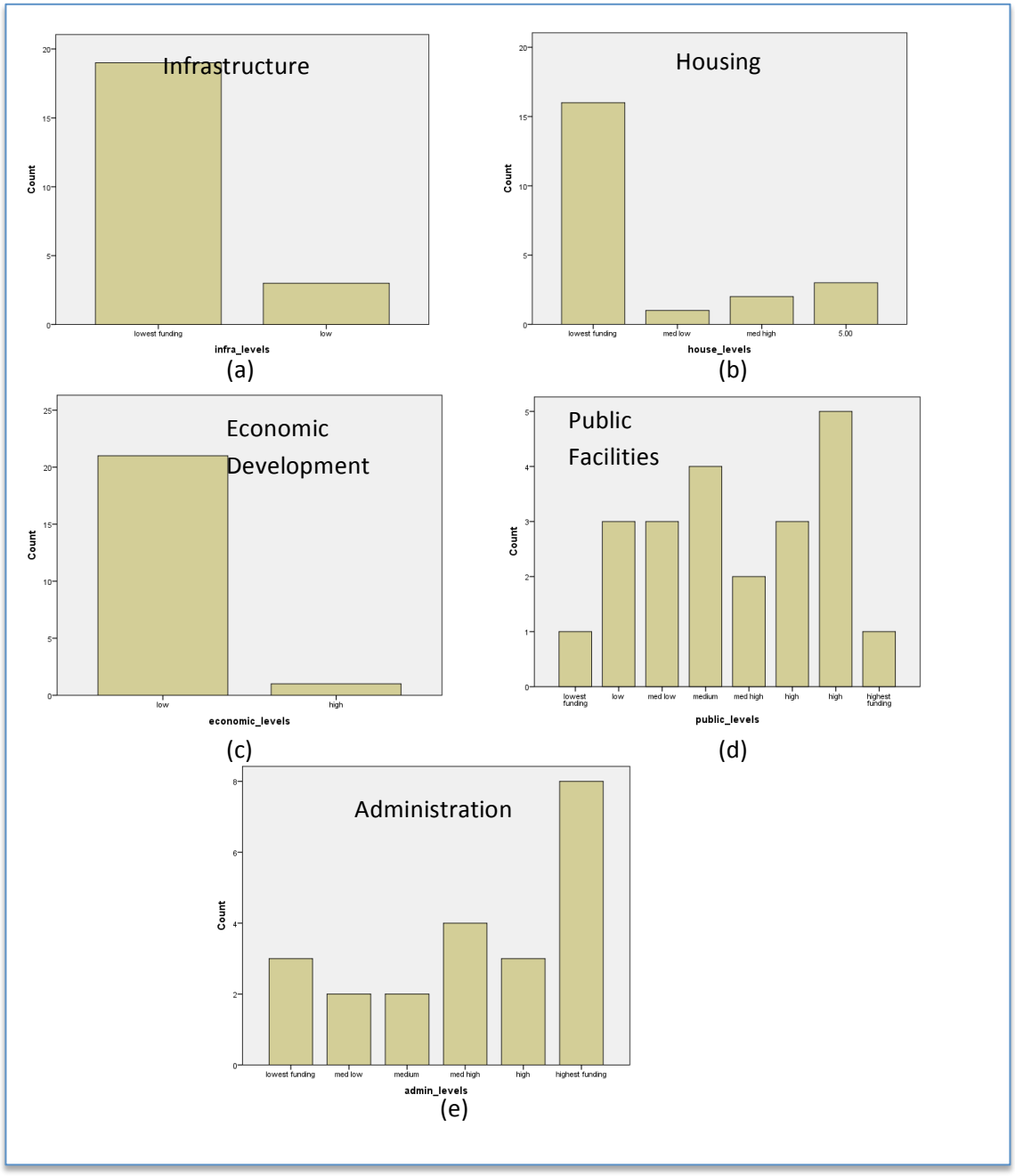

Figure 17: Louisiana parish-level distributions by program type for the 2008 hurricane season.

The CDBG funds by program type for Louisiana and Texas after the 2008 hurricane season are shown in Figures 17 and 18 respectively. The figure for Mississippi was omitted because only 7 counties were observed but are included in the appendix.

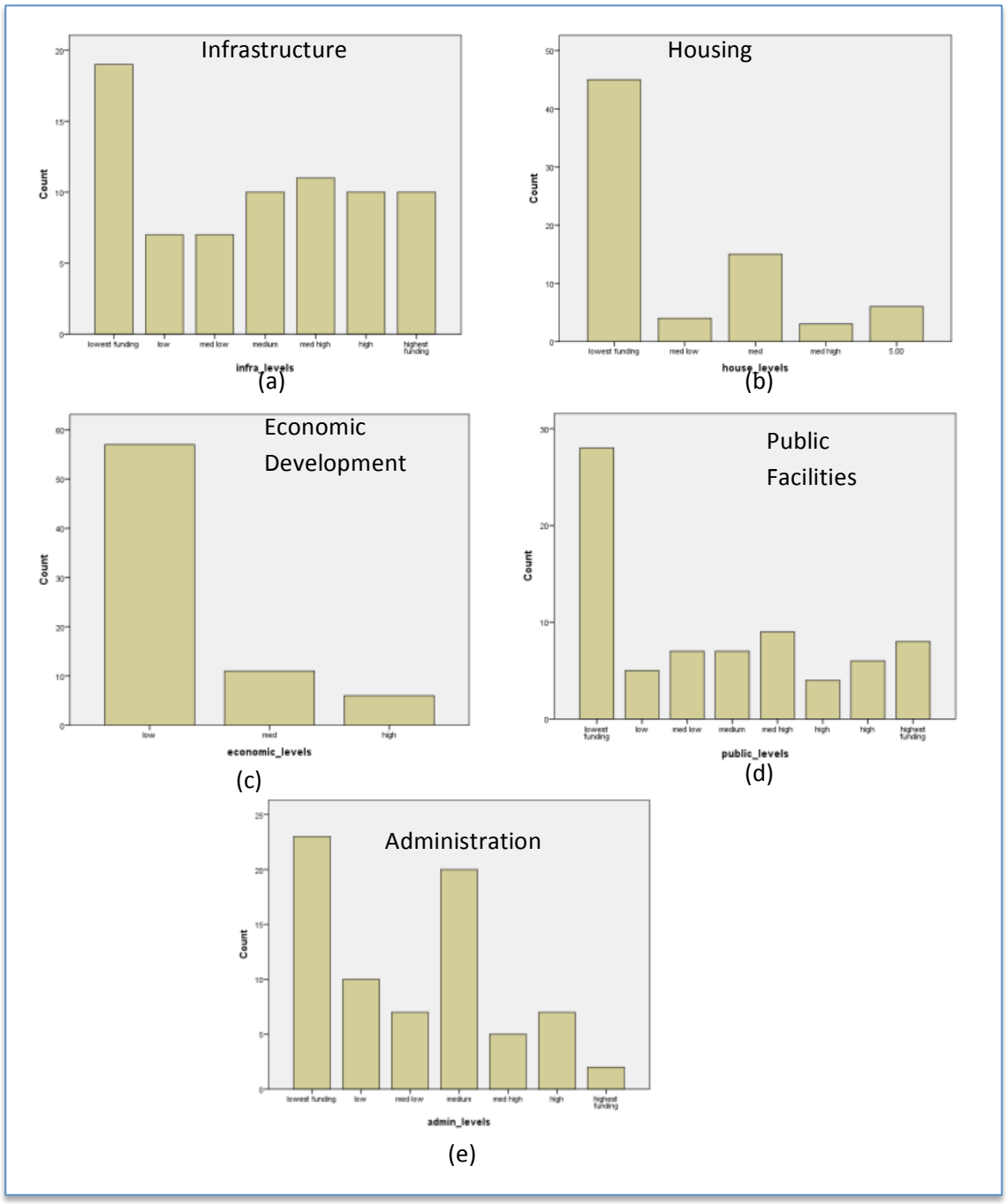

Figure 18: Texas county-level distributions by program type for the 2008 hurricane season.

Of the 25 parishes in Louisiana that received funds, the lowest amount was accessible for infrastructure and economic development activites, as seen in Figure 17(a) and (b). Graphs (d) and (e) in Figure 17 display a wide variation in the distribution of funds used for public facilities and administration. In Texas, the funds used for infrastructure, public facilities and administration were widely distributed among the 74 counties as seen in Figure 18 (a), (d), and (e), respectively. Very little variation was observed in funds dispersed for housing or economic development programs as seen in graphs 18(b) and 18(c), respectively.

Research Question III

Given that certain populations experience differential effects of disasters, do meso-level actors equally distribute funds to counties/parishes with such populations?

The diagram in Figure 19 is used to guide the analysis of this research question. A standard linear regression analysis was performed using county-level aggregate data. Percent older adults, percent of white population, median household income, percent of people with a disability (between the ages of 18 to 64), and percent female were used as independent variables for both hurricane seasons. The results of the regression analysis for the 2005 and 2008 hurricane seasons are shown in Tables 10 and 11, respectively. The top row of Tables 10 and 11 list the dependent variables, which were analyzed separately. The dependent variables were the total distribution of CDBG funds, as well as the distribution of CDBG funds separated by the five program types.

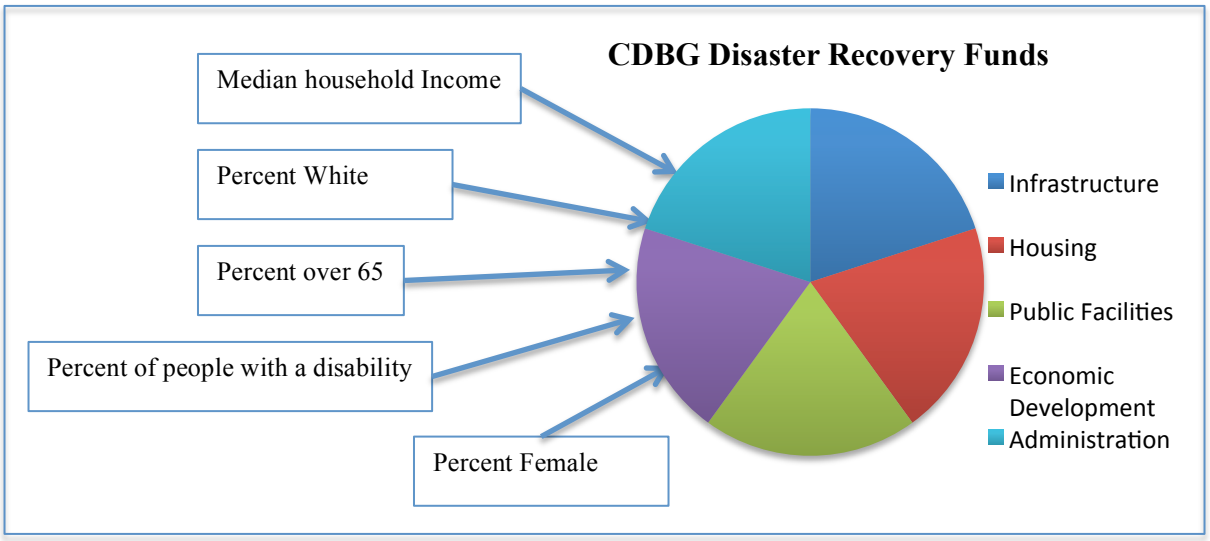

Figure 19: Diagram of the prediction model.

The results of the regression model indicate that the independent variables based on demographics in the county accounted for 20 percent of the variability of the distributions of the total CDBG disaster recovery funds and the specific money earmarked for administration for the 2005 hurricane season. The model was also found to be statistically significant for money used for administration and the total CDBG disaster recovery funds with p-values of .003 and .002, respectively. However, the model was not found to be statistically significant to predict the amount of funding used for infrastructure, housing, public facilities, or economic development.

The population of White individuals had a statistically significant negative relationship with amount of CDBG disaster recovery funds distributed in the county. Also note that the along with the percentage of White individuals, the median household income, and percentage of people with a disability had a statistically significant relationship with the amount of CDBG disaster recovery funds used for administration.

Table 10: Linear Regression for the 2005 Hurricane Season

	CDBG	Infrastructure	Housing	Public Facilities	Economic Development	Administration
Constant	4.078	.302	1.014	2.161	1.131	8.604
	(6.695)	(4.700)	(4.555)	(5.479)	(4.176)	(5.939)
Older	-.063	-.020	-.067	-.036	-.021	-.004
Adults	(.086)	(.061)	(.059)	(.071)	(.054)	(.076)
White	-.031*	.003	-.004	-.007	-.012	-.039**
	(.017)	(.012)	(.012)	(.014)	(.011)	(.015)
Income	-7.28e-5	3.54e-6	6.44e-5*	-1.85e-5	-2.57e-5	.000**
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Disability	.082	.001	.056	-.050	-.017	-.198**
	(.110)	(.078)	(.075)	(.090)	(.069)	(.098)
Female	.092	.042	-.021	.072	.075	.120
	(.096)	(.067)	(.065)	(.078)	(.060)	(.085)
R-squared	.204	.021	.84	.058	.095	.200
P-value	.002***	.882	.211	.431	.151	.003***
N	86	86	86	86	86	86

Standard errors are reported in parentheses.
*,**,*** indicates significance at the 90%, 95%, and 99% level, respectively

The same model was used to analyze the CDBG disaster recovery funds distributed after the 2008 hurricane season, see table 11. The results of the regression analysis performed on funds distributed after the 2008 hurricane season did not result in a statistically significant prediction model.

The regression analyses shown in Tables 10 and 11 are based on all counties that received CDBG funds after the 2005 and 2008 hurricane seasons, respectively. However, in the subsequent research question the means of the distributions are compared for the money disbursed after each hurricane season. To accurately assess the variability, only the counties that received money after both hurricane seasons will be compared. CDBG funds were distributed to 51 counties after both hurricane seasons. A regression analysis for the 51 'matched' counties was performed for the distributions after each hurricane season.

Table 11: Linear Regression for the 2008 Hurricane Season

	CDBG	Infrastructure	Housing	Public Facilities	Economic Development	Administration
Constant	2.029	-1.462	.718	-.234	.192	6.120
	(5.008)	(4.274)	(2.624)	(4.336)	(1.010)	(4252)
Older	-.039	.011	.031	-.046	.024*	-.066
Adults	(.065)	(.055)	(.031)	(.056)	(.013)	(.055)
White	.014	.012	-.012*	.011	-.009***	-.010
	(.015)	(.013)	(.007)	(.013)	(.003)	(.013)
Income	7.37e-5	.000**	4.20e-5*	3.46e-5	1.47e-5	-3.63e-5
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Disability	.123	.126	-.006	.080	.003	-.032
	(.108)	(.092)	(.051)	(.093)	(.022)	(.091)
Female	-.044	-.036	.005	.019	.017	-.055
	(.063)	(.054)	(.034)	(.054)	(.013)	(.053)
R-squared	.030	.067	.058	.030	.080	.034
P-value	.562	.119	.186	.570	.062	.503
N	131	131	131	131	131	131

Standard errors are reported in parentheses.
*,**,*** indicates significance at the 90%, 95%, and 99% level, respectively

Table 12 displays the regression analysis of the 51 'matched' counties, which received CDBG distributions after the 2005 hurricane season. Isolating the matched counties provides slightly different results. Three of the models are significant at least to the 95 percent level. The demographic-related independent variables account for 28 percent of the variability in the distribution of CDBG funds. Similarly the independent variables account for 24, and 25 percent of the variability in the distribution of CDBG funds used for public facilities, economic development and administration, respectively.

Table 12: Linear Regression for the Matched Counties After the 2005 Hurricane Season

	CDBG	Infrastructure	Housing	Public Facilities	Economic Development	Administration
Constant	14.040*	5.755	3.828	8.307	8.864	15.502*
	(7.479)	(6.296)	(6.299)	(7.233)	(5.036)	(8.834)
Older	-.049	.005	.006	.017	.006	-.026
Adults	(.086)	(.072)	(.072)	(.083)	(.058)	(.101)
White	-.059***	-.025*	-.028**	.034**	-.024**	-.052**
	(.017)	(.014)	(.014)	(.017)	(.012)	(.020)
Income	-8.99e-5	4.57e-5	1.144e-5	-9.33e-5	-9.75e-5**	.000**
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Disability	-.095	.114	-.108	.226	-.193*	-.276
	(.146)	(.123)	(.123)	(.141)	(.098)	(.173)
Female	-.002	.053	.052	.019	.060	-.069
	(.097)	(.081)	(.081)	(.054)	(.065)	(.114)
R-squared	.281	.108	.148	.190	.244	.249
P-value	.009***	.379	.191	.081*	.023**	.020**
N	51	51	51	51	51	51

Standard errors are reported in parentheses.
*,**,*** indicates significance at the 90%, 95%, and 99% level, respectively

However, each of the models varies in significance. The relationship between the overall CDBG distribution and the aggregate demographic data was significant to the 99 percent level. Where as, the models to predict the variability of funds used for economic development and administration were both significant to the 95 percent level. Finally, the model used to predict the variability of funds used for public facilities was significant to the 90 percent level. To determine if all variables are necessary in the significant models more efficient models were created. Only those providing significant results are shown in Table 13.

The efficient models shown below were created by focusing on the significant variables in each of the original models. For example, in the original model used to predict the overall distribution of CDBG funds the only significant variable was the aggregate data for the percentage of White people in the county. Therefore, the efficient

model for the distribution of CDBG funds only took into account the percentage of White people in the county. The new model with one variable still accounts for 23 percent of the variability in the distribution of funds for the 51 matched counties. The model is also still significant to the 99 percent level. The results of this model are interpreted as an increase in the minority population was correlated with an increase in distribution of CDBG funds at the county level.

Table 13: Efficient Models for the Matched Counties After the 2005 Hurricane Season

	CDBG	CDBG (efficient)	Economic Development	Economic Development (efficient)	Administration	Administration (efficient)
Constant	14.040*	8.275***	8.864	12.842***	15.502*	10.878***
	(7.479)	(1.179)	(5.036)	(3.44)	(8.834)	(2.376)
Older	-.049		.006	____	-.026	-.108*
Adults	(.086)	____	(.058)		(.101)	(.060)
White	-.059***	-.062***	-.024**	-.026**	-.052**	-.045*
	(.017)	(.016)	(.012)	(.011)	(.020)	(.020)
Income	-8.99e-5		-9.75e-5**	.000**	.000**	8.52e-5*
	(.000)	____	(.000)	(.000)	(.000)	(.000)
Disability	-.095		-.193*	-.226**	-.276	
	(.146)	____	(.098)	(.092)	(.173)	____
Female	-.002		.060	____	-.069	
	(.097)	____	(.065)		(.114)	____
R-squared	.281	.233	.244	.201	.249	.204
P-value	.009***	.000***	.023***	.014**	.020**	.013**
N	51	51	51	51	51	51

Standard errors are reported in parentheses.
*,**,*** indicates significance at the 90%, 95%, and 99% level, respectively

The efficient models for the distribution of economic development and administration funds were created similarly. The new models were also significant and accounted for 20 percent of the variability in the distribution of funds. Additionally, the efficient model for the distribution of funds for public facilities did not improve the original model.

Table 14: Linear Regression for the Matched Counties After the 2008 Hurricane Season

	CDBG	Infrastructure	Housing	Public Facilities	Economic Development	Administration
Constant	-5.569*	-11.718	9.765*	-3.40	-1.103	17.418**
	(10.336)	(8.764)	(5.492)	(9.20)	(2.554)	(7.99)
Older	.151	.156	.061	.031	.058**	-.046
Adults	(.114)	(.096)	(.060)	(.101)	(.028)	(.088)
White	.012	.001	.034***	.017	-.014**	-.003
	(.023)	(.019)	(.012)	(.020)	(.006)	(.018)
Income	5.95e-5	.000	1.37e-5	2.06e-6	-1.66e-5	9.06e-5
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Disability	.015	.124	-.193*	.096	.013	-.206
	(.203)	(.174)	(.108)	(.181)	(.056)	(.157)
Female	-.136	.143	.023	.082	.040	-.086
	(.129)	(.109)	(.068)	(.115)	(.032)	(.100)
R-squared	.057	.090	.204	.042	.196	.060
P-value	.745	.496	.060*	.850	.071*	.719
N	51	51	51	51	51	51

Standard errors are reported in parentheses.
*,**,*** indicates significance at the 90%, 95%, and 99% level, respectively

Table 14 displays the regression analysis of the 51 'matched' counties, which received CDBG distributions after the 2008 hurricane season. Isolating the 'matched' counties provided only very slight differences. Two of the predictive models were significant to the 90 percent level, for funds distributed for public facilities and economic development. Meanwhile all of the other models were significant for funds distributed after the 2008 hurricane season. To determine if all variables are necessary in the significant models more efficient models were created. Only those providing significant results are shown in Table 15.

The only efficient model that produced significant results was in the distribution of funds for housing. Focusing on the aggregated data for the percent of White, older adults, and people with disabilities accounted for 20 percent of the variability in the

distribution of funds for housing. Additionally, the efficient model was significant to the 99 percent level.

Table 15: Efficient Model 2008 Hurricane Season

	Housing	Housing
Constant	9.765*	7.555***
	(5.492)	(1.817)
Older	.061	.077**
Adults	(.060)	(.037)
White	.034***	-.034***
	(.012)	(.012)
Income	1.37e-5	
	(.000)	____
Disability	-.193*	-.177**
	(.108)	(.072)
Female	.023	____
	(.068)	
R-squared	.204	.201
P-value	.060*	.014***
N	51	51

Standard errors are reported in parentheses.
*,**,*** indicates significance at the 90%, 95%, and 99% level, respectively

Research Question IV

Does statistically significant variation occur between the 2005 and 2008 hurricane seasons?

An Analysis of Variance (ANOVA) was conducted to compare the effect of the year of the hurricane season with the amount of money disbursed through the CDBG disaster recovery program. An ANOVA is used to show the statistical significance in the variance between means of two or more variables (Ott & Longnecker, 2001). Only the 51 counties that received money for recovery efforts after both hurricane seasons were used in the ANOVA.

An ANOVA was also performed on each of the program types after the 2005 hurricane season and the 2008 hurricane season. Table 16 displays the results of each ANOVA by dependent variable used in the analysis. The amount of CDBG funds distributed and those used specifically for economic development show a statistically significant difference. No statistically significant difference appears between the two hurricane season in amounts of CDBG funding distributed for infrastructure, housing, public facilities, or administration.

Table 16: ANOVA for CDBG Funds Distributed Across the Counties and the Hurricane Season

Dependent Variable	N	F	Sig.
CDBG	102	3.371	.069*
Infrastructure	102	1.178	.280
Housing	102	1.713	.134
Economic Development	102	8.166	.005***
Public Facilities	102	1.329	.252
Administration	102	.050	.824

*,*** indicates significance at the 90% and 99% level, respectively

Summary

The descriptive analysis on the amount of funding accessible at the State and county-level shows that the variations in the amount of funding distributed were significant after the 2008 season. The median value for the amount of funding distributed after the 2005 hurricane season were different, however, the size of the boxes in figure 6 indicate similar dispersion.

The descriptive analysis on the amount of CDBG disaster recovery funding by program-type shows significant variation among the States in each of the 5 program types for the 2005 hurricane season. Of note, Texas distributed most of the CDBG funds for housing programs. Mississippi distributed the least of the CDBG funds in housing programs. For the 2008 hurricane season each State distributed very little funds for economic development programs. Louisiana distributed the lowest amount of funding for infrastructure programs. Mississippi distributed the least amount of funds for housing programs and administration.

For the 2005 hurricane season (at the parish-level) Louisiana had little dispersion in the way funds were distributed for economic development. Many parishes receive a medium amount of funding (as determined by percentiles). Similarly in Mississippi, majority of the counties received the lowest amount of funding for housing programs. Texas had little or no dispersion of funds for infrastructure, economic development, public facilities, or administration.

For the 2008 hurricane season, Louisiana showed very little variation in the way the funds were distributed for infrastructure or economic development, at the parish level. Texas showed little variation for economic development programs. The analysis for Mississippi after the 2008 hurricane season was placed in the appendix because only 7 counties were observed in this study.

The results of the GIS analysis show that the distribution of funding varied in location. After both hurricane seasons the distributions in CDBG funding was not correlated with the proximity of a county to the shoreline. The distributions were also

slightly spread apart, meaning that between two heavily funding counties were counties that received little or no funding.

The linear regression analysis for funds allocated after the 2005 hurricane season show the model is statistically significant for predicting the overall amount of CDBG funds a county received access to and the specific amount of funds accessible for administration. Both models account for 20 percent of the variability in the distributions. Median household income, percent White, and percent people with a disability were determined to be statistically significant variables in the models. The linear regression model used to predict the distribution of CDBG funds was not found to be statistically significant.

The linear regression analyses were performed for the 51 counties that received money after both hurricane seasons. The results show that the variable related to race alone accounted for 23 percent of the variation in CDBG funding among the 51 counties after the 2005 hurricane season. Income, percent of people with a disability and race accounted for 20 percent of the variation in the amount of CDBG funding distributed for economic development. The variable related to race alone was found statistically significant in each model.

The linear regression analysis was also performed on the same counties for money distributed after the 2008 hurricane season. The results show that only one efficient model was statistically significant, accounting for 20 percent of the variation of funds. The finding for housing related activities was correlated with the percent of older population, race, and the number of people with disability at the county-level.

Comparison of the regression analyses shows that the prediction model (based on county-level demographics) accounts for more of the variability in the distribution funds after the 2005 hurricane season than the 2008 hurricane season. An ANOVA was performed for both hurricane seasons on the overall amount of CDBG funding, as well as each individual program type. A statistically significant variation of the CDBG distribution and the amount of funding used for economic development purposes was found between the two hurricane seasons. No other statistically significant variation exists between the two hurricane seasons.

CHAPTER V

CONCLUSION

Overview

Previous research has indicated that disasters often disproportionally affect the lives of some segments of the population more than others (Barton, 1969; Quarantelli 1998; Waugh 2006). Socially vulnerable populations such as older adults, racial and ethnic minorities, low income households and people with a disabilities tend to have a more difficult time recovering due to the lack of resources. The socio-political ecology theory states that scarce resources available after disaster creates a competitive environment in which socially vulnerable populations fail to secure adequate recovery resources (Peacock & Ragsdale 1997; Tierney 2007; Peguero, 2006). Consistent with this theory, several researchers have found that inequalities in disaster recovery with respect to housing and infrastructure (Peacock & Ragsdale, 1997). Important factors in the socio-political ecology theory are financial, medical, material, and information resources available at the micro-level (Peacock & Ragsdale, 1997). In the research presented here

the socio-political ecology theory was tested with regards to the distribution of the Community Development Block Grant (CDBG) disaster recovery funds and compared to aggregate micro-level data.

The assumption was if socially vulnerable people fail to secure adequate recovery resources after disasters, locations with large concentrations of socially vulnerable people would fail to receive access to CDBG disaster recovery funds after devastating disasters. Using the ecosystem framework, the dependent variable (CDBG disaster recovery funds allocated at the exo-level) was tracked to the county-level (or parish-level) for Louisiana, Mississippi, and Texas after the 2005 and 2008 hurricane seasons. The tracked money was analyzed with the independent variables; aggregate county (or parish) level demographic information after the two devastating hurricane seasons. The following sections of this chapter interpret the findings, outline the limitations and discuss the implications for theory, policy and research based on the following research questions and hypotheses:

1) Do statistically significant variations appear in the distribution of CDBG disaster recovery program funds at the (a) State and (b) County level?
   - H_o: There will not be significant variations in the distribution of CDBG disaster recovery program funds at the State or County level.
   - H_1: There will be significant variations in the distribution of CDBG disaster recovery program funds at the State or County level.
2) Do statistically significant variations appear in the distribution of CDBG disaster recovery program funds by program type at the (a) State and (b) county level?
   - H_o: There will not be significant variations in the distribution of CDBG disaster recovery program.
   - H_2: Variations will appear in the distribution of the CDBG disaster recovery program at the county level and that these variations will occur based on program type.

3) Given that certain populations experience differential effects of disasters, do meso-level actors equally distribute funds to counties/parishes with such populations?

   H_o: There is an equitable distribution of CDBG funds

   H_3: Socioeconomic factors of a county predict the disbursement of CDBG funds.

4) Does statistically significant variation occur between the 2005 and 2008 hurricane seasons?

   H_o: Despite exo-level policies no changes will appear in the distribution of funds in 2008.

   H_4: Changes in exo-level policies will result in the more equitable distribution in 2008 than in 2005.

Interpretation of findings

Overall, the disbursements of the CDBG disaster recovery funds differed for each State after both hurricane seasons. The findings suggest that most of the CDBG disaster recovery funds distributed after the 2005 hurricane season was correlated to some degree with aggregate demographic data at the county-level. For the 2008 hurricane season, the findings suggest that the aggregate county-level demographic data did not account for much of the variation in CDBG funding. Comparison between the two hurricane seasons suggests that the CDBG funds were distributed differently. The difference was more than would be expected by chance alone. The following subsections interpret the findings segmented by each research question.

Research Question I*: Do statistically significant variations appear in the distribution of CDBG disaster recovery program funds at the (a) State and (b) County level?*

After the 2005 hurricane season, the dispersion of funding among the three observed States was similar. Similar dispersion indicates a similar variation of funding

disbursement even though the average amount of funding for each State was dissimilar. At the county-level, the amount of funding disbursed in Mississippi and Texas was skewed in the positive and negative direction, respectively. The positively skewed distribution indicates that majority of the counties observed received access to a large disbursement of funding. Conversely the negatively skewed distribution indicates majority of the counties observed received access to the least amount of funding. The parishes in Louisiana received access to the median amount of funding, indicating a more normally distribution of funds. For the first research question, the null hypothesis cannot be rejected at the State-level. There was a similar disbursement of CDBG funds at the State-level even though the average amount distributed differed. However, the null hypothesis can be rejected at the county-level. Variations appeared in the distributions of CDBG disaster recovery funds at the county-level.

The number of counties observed after the disbursement for the 2008 hurricane season was important. In Mississippi, only 7 counties were observed and therefore were not counted in the individual State- or county-level analyses. The amount of funds disbursed differed for Louisiana and Texas in terms of the average amount distributed and the dispersion of the funds. At the county-level, the disbursement of CDBG funds in Louisiana and Texas did not show a significant skew or obvious normal distribution. Therefore, for the first research question the null hypothesis can be rejected at the State- and county-level.

Significant variations in the distribution of CDBG disaster recovery program funds were observed at the State- and county-level after the 2005 hurricane season. The variations here are consistent other findings in Louisiana and Mississippi after Hurricane

Katrina (GAO #09-437T, 2009; Lowe 2012). However, Lowe (2012) and the GAO report (#09-437T, 2009) indicate variations in funding may be correlated with the type of activities funded by the CDBG disaster recovery program. The second research question addresses this concern.

> ***Research Question II:*** *Do statistically significant variations appear in the distribution of CDBG disaster recovery program funds by program type at the (a) State and (b) county level?*

A more accurate account of the variations in the CDBG distribution was found when analyzed by program type. After the 2005 hurricane season, the means and dispersion of funds differed for each program type except housing. Mississippi and Texas had a similar distribution (mean and dispersion) of CDBG funds used for housing. Initially, Mississippi and Texas received very different allocations of funding at the exo-level, $5.06 Billion and $74.5 Million respectively (Federal Register 2006, 2009). The different allocations indicate the difference in the amount of destruction that occurred in each State. Therefore, having a similar amount of funding distributed for housing is significant. Of the programs examined, housing and infrastructure directly influence the individual (or the micro-level). The other programs (public facilities, economic development and administration) indirectly influence micro-level activities. Another important finding in the funds distributed after the 2005 hurricane season was significant amount of money used for economic development. In Mississippi an average $6.3 Million was used for economic development compared to Louisiana and Texas, average $4.9 Million and $0, respectively. Since Louisiana received the largest allocation ($6.2 Billion) after the 2005 hurricane season, it is of interest when the distributions of funding in Louisiana are not the highest amount the States observed. For the second research

question, the null hypothesis was rejected for each program type except housing. Variations in the distribution of funding at the State-level appear in the distribution of funds used for infrastructure, economic development, public facilities, and administration. However, a significant variation in funding for housing was not found between Mississippi and Texas. According to previous research, Federal (or exo-level) guidance was insufficient to address the approach to housing recovery in Louisiana (GAO #09-437T, 2009). The variation in the funding for housing in Louisiana can be explained by the 2009 GAO report. Other reports indicated that Louisiana focused more on tourism in previous disasters (Gotham & Greenberg, 2005; Fothergill & Peacock, 2004). According to the findings of this research more tourism activities, coded as economic development, were funding in Mississippi than in Louisiana.

At the county-level, the distribution of CDBG funds was varied with regard to some program types. For funds used for public facilities, the distribution was positively skewed in Louisiana and more evenly disbursed across counties in Mississippi. However, in Texas almost all counties observed received a similar amount of funding for public facilities. The findings were similar for funds used for administration; positively skewed in Louisiana, evenly disbursed in Mississippi and the same amount in Texas. For funds used for economic development the money was negatively skewed in Louisiana and Mississippi. However, all money used for economic development in Texas was disbursed in the same increment to 25 counties observed, relative to the other States. The distributions of funds used for infrastructure and housing were less varied. In all three States the money most influential at the micro-level was negatively skewed, indicating that several counties received the lowest amount of funding disbursed. For the second

research question, a significant variation of funding was not found among the counties in Texas for any program type. Therefore, the null hypothesis cannot be rejected for Texas. However, for both Mississippi and Louisiana, the null hypothesis can be rejected. Variation in the distribution of CDBG funding based on program type at the county-level appeared in both Mississippi and Louisiana. The variation is consistent with previous research findings. The 2009 GAO (#09-437T, 2009) report indicated difficulties were faced in the administration of housing recovery program and in the allocation of CDBG funding in Mississippi and Louisiana. Lowe (2012) also found an uneven distribution of money from the CDBG funds occurred at the State-level, specifically in Mississippi.

With regards to housing and economic development, both States (Louisiana and Texas) had similar variation in funding after the 2008 hurricane season. The average amount of funding in both States for housing and economic development was less than $90,000.00 and 700,000, respectively. More money was used for infrastructure in Texas than in Louisiana. Conversely, for administrative purposes, more money was distributed in Louisiana than in Texas. After the 2008 hurricane season, more money was allocated at the exo-level to Texas than to Louisiana. In the first allocation alone, Texas and Louisiana received $1.3 Billion and $438 Million, respectively. Since the amount of allocation at the exo-level is correlated with the level of destruction and resources needs in the State it is of interest anytime the distribution of funds within the State does not correspond to the allocation. A higher amount of destruction in the State and the more money allocated would appear to necessitate more money spent on the administration of the funds. For the second research question the null hypothesis can be rejected for funds used for infrastructure, public facilities and administration. Significant variations in

funding were found in this research at the State-level. However, the null hypothesis cannot be rejected for money used for housing and economic development at the State-level. Significant variations did not occur in the distribution of funding used for housing or economic development programs.

At the county-level, the distribution of CDBG funds used for housing was negatively skewed in both States, indicating many counties received a low amount of funding. In Louisiana, nearly all parishes received the same range of funding for infrastructure and economic development. In Texas, the distribution for each program type was negatively skewed. Majority of the counties in Texas received a relatively low amount of funding relative to the variation in funding of all States. For the second research question, the null hypothesis cannot be rejected. Little variation appeared in the distributions of CDBG funds at the county-level within the States observed. The findings here are inconsistent with previous research that found Louisiana focuses more on tourist activities, coded as economic development in past disasters (Gotham & Greenberg, 2005).

However, the descriptive analysis at the county-level indicate that majority of the money distributed in Louisiana was used for programs that indirectly influence micro-level activities such as public facilities and administration. In Texas, majority of the money allocated was used for infrastructure programs and public facility programs.

Several researchers have theorized that certain populations have a harder time during disaster recovery (Barton, 1969; Quarantelli, 1998; Waugh, 2006). Specifically, the socio-political ecology theory posits that scarce resources available after disaster creates a competitive period in which socially vulnerable populations fail to secure

adequate recovery resources (Peacock & Ragsdale 1997; Tierney 2007; Peguero, 2006). Using CDBG disaster recovery funds as the competitive resource, the third research question challenges whether the observed variations can be in part attributed to the proportion of social vulnerable populations in the county.

> ***Research Question III:*** *Given that certain populations experience differential effects of disasters, do meso-level actors equally distribute funds to counties/parishes with such populations?*

Using the prediction model shown in Figure 19, a regression analysis of the distribution of CDBG funding for Louisiana, Mississippi, and Texas was performed. The results of the regression analysis show that the overall distribution of funding significantly favored counties that had a higher percentage of minorities. However, the significant prediction model only accounted for 20 percent of the variability in the funding. Additionally, the regression analysis showed that the distribution of funding used for administration significantly favored areas with the least amount of people with disabilities, more minority groups and was correlated to the amount of income in the county. Again, the significant prediction model accounts for 20% of the variability of distribution of funds. The results indicate that meso-level actors distributed CDBG funds to areas with a higher concentration of minority groups. Therefore, for the third research question the null hypothesis can be rejected for the overall distribution of CDBG funds and for the distributions specifically for administration purposes. The results of the regression analysis shows that up to 20% of the variability of the distribution of CDBG funds and funds used for administration can be predicted using socioeconomic factors. The variation of CDBG funds based on socioeconomic factors was inconsistent with previous research findings. Researchers have typically found fewer resources available to

areas with higher concentrations of minority groups (Bolin & Bolton, 1986; Dash, Peacock, & Morrow, 1997).

Funds used for housing, public facilities, and economic development was different and the null hypothesis cannot be rejected. The findings are not consistent with previous research with regard to housing. In this research, resources were given to areas with higher concentrations of minorities. Several researchers found inequalities in disaster recovery with heavy emphasis on housing (Green, Bates, & Smyth, 2007; Peacock, Dash, & Zhang, 2007; Jopling 2008).

However, of interest was the type of funds that influenced the overall distribution. Administration funds are arguably the least influential to individuals at the micro-level. The results of the regression analysis also indicate that other variables might have more significance in the model. The results of the descriptive analysis are consistent with the findings of the regression analysis except that the uneven disbursements of funds are more pronounced in Mississippi when the funds are analyzed by program-type.

Using the prediction model shown in Figure 19, a regression analysis of the distribution of CDBG funding for Louisiana, Mississippi, and Texas was performed for funds distributed after the 2008 hurricane season. The regression analysis model uses aggregate county-level demographic information based on socially vulnerable populations to predict the amount of CDBG funding accessible to the counties. The results of the regression analysis performed indicate that the model was not significant for predicting the variability in the distribution of funds after the 2008 hurricane season. Therefore, the null hypothesis in the third research question cannot be rejected. The socioeconomic factors used in this research were unable to predict the disbursement of

CDBG funds. The change proposed in the 2009 GAO report could have influenced the way funds were distributed rendering the prediction model as no longer significant (GAO #09-437T, 2009).

The results of the prediction model differed only when the counties that received money after both hurricane seasons were observed. The efficient model used to predict CDBG funds distributed for housing activities was able to account for 20 percent of the variability in funds. The null hypothesis would be rejected. The percentage of older adults, minority and people with disabilities in the county was able to predict the amount of funding used for housing. The findings were consistent with previous research studies. Several researchers found inequalities in disaster recovery with heavy emphasis on housing (Green, Bates, & Smyth, 2007; Peacock, Dash, & Zhang, 2007; Jopling 2008).

Research Question IV: *Does statistically significant variation occur between the 2005 and 2008 hurricane seasons?*

An Analysis of Variance (ANOVA) was used to compare the means of the CDBG disbursements made during each hurricane seasons. The ANOVA was also performed for each program type. Only 51 counties received funds after each hurricane season, for a total of 102 observations. The results of the ANOVA indicate a significant difference in the amount of overall CDBG funding and funding used specifically for economic development at the 90% and 99% significance level, respectively.

The results of the comparison show that the distributions of CDBG funds differed between the two hurricane seasons more than what would be expected if it was just coincidence. Similarly (and of most significance), the distribution of CDBG funds used specifically for economic development differs between the two hurricane seasons and is

not coincidence. For the last research question, the null hypothesis is rejected. The ANOVA can only identify that there was a difference in the distribution but not why. As mentioned in the literature review, for the 2005 hurricane season, U.S. Congress allocated CDBG funds under the following criteria: (1) funds were to be used expressly for the most severely impacted areas, (2) maximum feasible priority should have been given to benefit low- and moderate- income families, (3) at least 50 percent of the funding should have benefit low-and moderate-income families, and (4) the State should not have attempt to recover capital costs of public sector improvements with CDBG funds (Federal Register, 2009).

For the 2008 hurricane season the funds were allocated specifically based on two criteria, unmet housing needs and concentrated damage (Federal Register, 2009). Furthermore, in 2009, the GAO proposed a change in the way funds were distributed at the Federal and State-level based on observations made during the 2005 hurricane season disbursements (GAO #09-437T, 2009). Changes in the exo-level policies may have resulted in a more equitable distribution of CDBG funds used for economic development and in CDBG funds overall after the 2008 hurricane season.

However, the proposed change was not the only difference between the two hurricane seasons. The leadership was different during each disbursement. During the 2005 hurricane season, President of the United States George W. Bush a Republican was office. Additionally, the Governor in Louisiana was Kathleen B. Blanco (Democrat) during the 2005 hurricane season and subsequent distribution of recovery funds. During the 2008 hurricane season a new U.S. President and Governor of Louisiana took office and political affiliations changed. For the distribution of Federal recovery funds after the

2008 hurricane season the President of the United Sates Barack H. Obama (Democrat) was in office. In Louisiana, Governor Bobby Jindal (Republican) took office in January of 2008. Both Mississippi and Texas retained the same Republican Governors over both hurricane seasons, Haley Barbour and Rick Perry respectively. The political changes may have also influenced changes in the distributions of disaster recovery funds.

Limitations

The limitations are listed in this section to help frame the reader's view and further understanding of the scope of this research. While the over arching goals of the research study were met, certain limitations were unavoidable. Two types of limitations were present in this research study, methodological and practice.

The methodological limitations were related to interpretations of the regression analysis, data sample and the use of secondary data. First, regression is not causation. The findings of the regression analysis cannot be used to determine why the variations are pronounced. Second, the data sampled in this research was not random. The counties were determined based on the FEMA disaster declarations and the HUD quarterly progress reports. Finally, the use of secondary data has disadvantages. Some data could not be included due to availability issues. In the progress reports, the time period observed was just a snapshot of the on-going distributions of CDBG funds. Several millions of dollars have yet to be allocated or expended at the county-level, especially with regards to funds allocated after the 2008 hurricane season. Additionally a few progress reports were missing for Texas after 2005 hurricane season. With regards to the U.S. Census Bureau data, the specific data sheets used were from the 2000-year estimates. The Census collects demographic and economic information every 10 years.

The particular data sheets chosen were because the next available comprehensive data sets were created in 2010, after both storms.

The practice limitations were related to the proximity of the hurricane seasons and the data collection methods. The close proximity of the devastating storms may influence the disbursement. Money allocated after the 2008 hurricane season may have been used to supplement the funding concurrently distributed after the 2005 hurricane season. Additionally, data could not be analyzed for funds distributed without the location as listed in the quarterly progress reports. For example, of the money distributed after the 2008 hurricane season nearly $51,000,000.00 was expended without listing the location in which the funds were to be used.

Implications for theory, policy and research

The findings of this research study have implication on theory policy and research. The following section is divided into subsections. The first subsection discusses the implications this research will have on theory. The second subsection discusses the implication of this research on policy. The third subsection discusses the implication this research study will have on future research.

Theory

This research tested the socio-political ecology theory with respect to the distribution of CDBG disaster recovery funds. The socio-political ecology theory states that scarce resources available after disasters create a competitive environment. Often during this competitive period socially vulnerable populations fail to secure adequate resources, i.e. Federal assistance (Peacock, Dash, & Zhang, 2007; Peacock & Ragsdale 1997). Socially vulnerable populations include minorities, older adults, and low-income

populations. The interest of socio-political ecology theory is in the analysis of socially vulnerable populations at all phases of disaster. With regard to the ability of socially vulnerable populations to secure adequate financial resources this research examined the distribution of CDBG disaster recovery funds. The findings indicated that counties with a higher concentration of low-income households received less funds related to economic development. However, overall areas with higher concentrations of minorities received a larger percentage of CDBG funds as well as funds related administration.

The findings suggest that the socio-political ecology theory may not be the sole theory accountable for the variation in CDBG funds during each hurricane season. A more robust theory would capture elements of socioeconomic status, voting patterns and education/literacy levels of the individual victims as well as the media influence and public opinions of society for the specific disaster.

Platt (1999) mentions that "disaster gerrymandering" occurred in California after floods in 1995 and Pennsylvania after flooding in 1996. Including the voting patterns for the counties may assist in accounting for the variations found in the distribution of funding. When the resources are guided by at the exo- and meso-levels the voting patterns of a location combined with the demographics might illuminate new variations in the distributions.

Other research has indicated that the savviness of the individual (at the micro-level) may influence his or her overall access to resources (Rovai, 1994;Dash, Peacock, & Zhang 1997). Including measures of savviness such as education level and literacy can capture the ability of the individual to seek out resources, properly fill out forms and understand the verbiage of official documents.

News media and interest groups can also influence disaster policy decisions (Sylves, 2008; Lindsay, 2010). Media can influence how disasters are viewed, as shown after Hurricane Katrina (Tierney, 2006). The way disaster response and recovery efforts are portrayed may influence policy decisions (Sylves, 2008; Tierney, 2006). Assessing the broadcast and newspaper coverage of each hurricane season may assist in accounting for the variations found in the distribution of funding. Similarly, interests groups shape disaster policy, often in waves depending on the political climate (Sylves, 2008).

Policy

The results of this study builds the overall understanding and implementation of disaster based-polices, increases the knowledge base and gap of the CDBG disaster recovery distributions, and highlights the need for improving the distribution of aid to targeted areas. A suggested recommendation, based on this research, include exo- and meso-level monitoring of thoroughness and accuracy of the quarterly reports. Another suggestion is to consider using a formula based metric to standardize the process at the meso-level.

The findings and limitations in this research study highlight the need for increase monitoring of the contents in the quarterly progress reports. Within the reports submitted for funds used after the 2008 hurricane season over $51 Million dollars cannot be tracked to the specific location. Stronger more specific criteria is needed on how, where, when and why to use the CDBG funds. Lindsay (2010) found similar policy issues when describing the overall process of disaster relief funding in the United States. Currently, at the State-level there is no indication that formulas are used when distributing disaster

funds. During non-disaster times the CDBG funds are distributed using a formula (Walker et al, 2002; Richardson 2002).

Other researchers found clear and consistent methods were lacking in regard to the distribution of funds (Fellowes, Liu, & Mabanta, 2006). Some of the limitations of this study are in part due to the inconsistencies in the progress report. The analysis presented in this research is consistent with previous research findings. Funds without locations or detailed activity information were unable to be tracked in this research. It stands the reason that these funds were unable to be monitored at the exo-level.

The analysis presented in this study highlights inconsistencies in the types of programs funded based on the location and demographics of county after the 2005 hurricane season. After the 2005 hurricane season, much of the significance in the prediction model was related to the racial profile of the county. The preliminary results of analyzing the funding after the 2008 hurricane season suggests that the inconsistencies were not as prominent. However, the slight significance of the prediction model indicates a continued correlation with certain types of funding and the racial profile of the county.

Future Research

The result of this research has implications for future research. The data collected in this study created interesting questions for a replication study and a qualitative study. Including other variables could expand the scope of this research. Additionally, the interview process that would accompany a qualitative study could answer the 'why' questions.

Lowe (2012) indicates in his article on Mississippi post-hurricane Katrina that the timing of funds disbursed may be of interest. For example, does the timing of the funds

distributed at the State-level correspond to the needs of the particular county at that time? A replication study could use the quarters represented in the progress reports as the equal time periods.

Another replication study could take into account the physical attributes of the counties. Comerio (1997) and Peacock, Dash, and Zhang (2007) indicated that the types of housing dwellings might influence the amount of financial resources individually available. Including a variable to describe the amount of rental and single-family homes in the county may also assist in the variations found in the distribution of funding. Taking into account the number of single-family homes and rental property at the county level may also have an impact on the amount of Federal dollars received.

Individuals from higher income households are often more savvy with regards to filling out the proper forms and applying for the financial aid they need (Rovai, 1994; Dash, Peacock, & Morrow, 1997). Applying for financial aid and understanding the procedures for filling out the proper forms can be captured by one's education level. Perhaps including a variable that captures the average education level and literacy of the county would assist in accounting for the variations found in the distribution of funding.

The data collected in this research study also created interesting qualitative questions. A qualitative document analysis of each specific funding project in a State would give a more detailed overview of how the CDBG grant was distributed. For example, there were interesting finds in economic development in Mississippi. Mississippi heavily focused on economic development projects, while Louisiana focused mostly on all the other types of programs. The typical programs funded by Mississippi included specific road improvements to benefit businesses such as Lowes, MAC LLC,

PLS North America. Other economic development programs in Mississippi included tourism projects such as creating a deep sea fishing rodeo, crawfish festival and opening several museums.

Finally, this quantitative study did not take into account the macro-level of the ecosystem framework. A qualitative study could capture the U.S. culture of distributing Federal aid after disasters. Birkland (2006) mentions that disasters often act as 'focusing events.' Agenda setting and the disaster policy process often occur after the last disaster (Birkland, 1997; 2006). The change in the focus of FEMA after 2001 may have impacted the response and recovery efforts of the 2005 hurricane season (Birkland, 2006). Similarly, the change in focus of FEMA after 2005 may have impacted the response and recovery efforts of 2008 hurricane season.

Additionally, the overall culture and composition of the U.S. are changing. In California, the percentage of minorities has for the first time surpassed the percentage of Whites in the State (U.S. Census Bureau, 2012). Hawaii, New Mexico, Texas and the District of Columbia have all seen minority populations exceed 50 percent in the State. With the increase in minorities, the overall culture of the U.S. may change to meet the needs of majority minority populations. While the sociopolitical ecology theory will still maintain validity, distribution of disaster resources may change to meet the needs of the new voting public.

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APPENDICES

Appendix 1: An entry in a HUD Performance Report from Louisiana (1st Quarter 2010).

Grantee Activity Number:	**01PAAD1000 - Acadia Parish**
Activity Title:	**Admin Alloc to Acadia Parish (PAAD)**

Activitiy Category:	**Activity Status:**
Administration	Under Way
Project Number:	**Project Title:**
3081	Allocation to Parishes
Projected Start Date:	**Projected End Date:**
03/01/2009	12/31/2013
Benefit Type:	**Completed Activity Actual End Date:**
N/A	
National Objective:	**Responsible Organization:**
N/A	Acadia Parish Police Jury

Overall	Jan 1 thru Mar 31, 2010	To Date
Total Projected Budget from All Sources	N/A	$12,568.00
Total CDBG Program Funds Budgeted	N/A	$12,568.00
Program Funds Drawdown	$6,905.84	$6,905.84
Program Funds Obligated	$12,568.00	$12,568.00
Program Funds Expended	$6,905.84	$6,905.84
Acadia Parish Police Jury	$6,905.84	$6,905.84
Match Contributed	$0.00	$0.00
Program Income Received	$0.00	$0.00
Program Income Drawdown	$0.00	$0.00

Activity Description:

These funds will be used to pay reasonable administration costs from the parishes related to the execution of disaster recovery community development activities. Program administration costs will include staff and related costs required for overall program management, coordination, monitoring, reporting and evaluation.

Appendix 2: Example of the U.S. Census and HUD Report data combined.

State	Year	County/Parish	Population	perFemale	perWhite	Disability	Income	perOver65	CDBG $	Infrastructure	housing	Economic	Public Facilities	administration
Louisiana	2005	Acadia	55,861	51.70	80.70	25.6	26,684.00	12.30	$9,586,366.00	$50,445.00	$5,199,439.54	$2,148,087.18	$441,985.61	$1,746,408.67
Louisiana	2005	Allen	25,440	44.20	71.90	28.9	27,777.00	11.80	$557,390.71	$40,011.80				$517,378.91
Louisiana	2005	Beauregard	32,986	49.80	84.20	225	32,582.00	11.90	$2,701,706.25	$327,527.96		$2,148,087.18	$226,091.11	
Louisiana	2005	Bossier	93,310	51.00	74.70	20.7	39,203.00	10.40	$8,514,838.35			$2,148,087.18	$5,559,238.76	$807,512.41
Louisiana	2005	Calcasieu	183,577	51.30	73.60	20.5	35,372.00	11.90	$145,088,265.90	$33,308,610.17	$80,905,957.11	$2,148,087.18	$12,759,569.43	$15,966,042.01
Louisiana	2005	Cameron	9,991	49.80	93.70	19.3	34,232.00	10.60	$122,766,079.83	$41,324,368.71	$54,561,149.66	$2,148,087.18	$12,187,033.37	$12,545,440.91
Louisiana	2005	East Baton Rouge	412,852	52.10	56.20	19.3	37,224.00	9.90	$92,374,762.53	$29,570,570.17	$49,809,277.53	$3,079,970.76	$5,559,238.76	$4,355,705.31
Louisiana	2005	Iberia	73,266	51.90	65.10	22.4	31,204.00	11.40	$22,301,178.01	$1,193,284.62	$4,074,210.08	$2,148,087.18	$747,957.95	$14,137,638.18
Louisiana	2005	Jefferson	455,466	52.00	69.80	20.8	38,435.00	11.90	$146,368,836.43	$39,985,177.46	$59,018,177.43	$10,822,690.27	$20,393,360.91	$16,149,430.36
Louisiana	2005	Jefferson Davis	31,435	51.90	80.60	23.2	27,736.00	13.30	$4,451,872.89			$2,148,087.18	$557,377.04	$1,746,408.67

Source: HUD CDBG Progress Reports for the 2005 and 2008 Hurricane season, U.S. Census Bureau 2000 data set

Appendix 3 (a): List of negative amounts of funding for Louisiana after the 2005 hurricane season

County	Amount Expended	Category
Orleans	$(573,411.17)	public services
Orleans	$(195,512.00)	housing
Orleans, Jefferson, Plaquemine, East Baton Rouge, Lafayette, Bossier, St. Bernard, Rapides, St. Tammany and Calcasieu	$(110,387.49)	public services
Orleans	$(49,312.16)	infrastructure
Orleans	$(36,300.00)	housing
Orleans	$(22,000.00)	housing
Orleans	$(14,216.92)	economic Development
Orleans	$(14,100.00)	housing
Orleans	$(1,710.12)	housing
St Bernard	$(630.58)	public services
Vermilion	$(0.09)	infrastructure

Appendix 3 (b): List of negative amounts of funding for Mississippi after the 2005 hurricane season

County	Amount Expended	Category
Hancock, Harrison, Jackson, Pearl River, stone	$(327,662,908.24)	administration
Hancock, Harrison, Jackson, Pearl River	$(102,222,611.34)	housing
Hancock, Harrison, Jackson, Pearl River	$(44,587,323.35)	housing
Hancock, Harrison, Jackson, Pearl River	$(40,068,437.89)	housing
Hancock, Harrison, Jackson, Pearl River	$(34,537,548.55)	housing
Hancock, Harrison, Jackson, Pearl River	$(31,628,049.95)	housing
Hancock, Harrison, Jackson, Pearl River	$(22,979,077.13)	administration
Hancock, Harrison, Jackson, Pearl River	$(20,385,265.92)	housing
Hancock, Harrison, Jackson, Pearl River	$(20,037,291.73)	housing
Hancock, Harrison, Jackson, Pearl River, George, stone	$(16,163,844.87)	administration
Jackson County	$(14,955,996.05)	administration
Hancock, Harrison, Jackson, Pearl River	$(10,877,308.23)	housing
Hancock, Harrison, Jackson, Pearl River	$(8,843,357.62)	housing
Hancock, Harrison, Jackson, Pearl River	$(7,300,128.11)	housing
Hancock, Harrison, Jackson, Pearl River	$(6,663,916.42)	housing
Hancock, Harrison, Jackson, Pearl River	$(4,946,544.69)	housing
Hancock, Harrison, Jackson, Pearl River, George, stone, Lamar, Forrest and Jones	$(2,937,361.04)	administration
Harrison County	$(2,387,351.43)	administration
Hancock, Harrison, Jackson, Pearl River, George, stone	$(1,704,356.13)	administration
Harrison County	$(1,637,029.24)	housing
Hancock, Harrison, Jackson, Pearl River	$(1,570,209.24)	administration
Hancock, Harrison, Jackson, Pearl River, George, stone	$(1,404,128.70)	infrastructure
Hancock, Harrison, Jackson, Pearl River, George, stone	$(1,092,080.20)	administration
Hancock, Harrison, Jackson, Pearl River	$(815,188.26)	housing
Hancock	$(748,108.33)	housing
Harrison County	$(514,048.19)	housing
Hancock	$(484,611.72)	housing
Hancock	$(250,000.00)	housing
Hancock, Harrison, Jackson, Pearl River, George, stone	$(179,282.07)	administration

Hancock, Harrison, Jackson, Pearl River	$(171,391.80)	housing
Hancock, Harrison, Jackson, Pearl River, George, stone	$(156,771.43)	administration
Hancock, Harrison, Jackson, Pearl River, George, stone	$(124,912.98)	administration
Harrison County	$(116,152.50)	housing
Harrison County	$(111,597.50)	housing
Hancock, Harrison, Jackson, Pearl River, George, stone	$(109,729.13)	housing
Hancock, Harrison, Jackson, Pearl River	$(107,486.91)	housing
Hancock, Harrison, Jackson, Pearl River	$(106,447.69)	housing
Harrison County	$(99,047.10)	housing
Harrison County	$(95,162.88)	housing
Hancock, Harrison, Jackson, Pearl River	$(84,371.05)	housing
Hancock, Harrison, Jackson, Pearl River	$(71,325.37)	housing
Hancock, Harrison, Jackson, Pearl River	$(70,254.03)	housing
Hancock, Harrison, Jackson, Pearl River	$(66,948.62)	housing
Hancock, Harrison, Jackson, Pearl River	$(65,661.19)	housing
Pearl River coast	$(46,608.48)	housing
Harrison County	$(35,390.55)	housing
Hancock, Harrison, Jackson, Pearl River	$(26,541.47)	housing
Hancock, Harrison, Jackson, Pearl River	$(25,292.70)	housing
Harrison County	$(24,185.24)	administration
Hancock, Harrison, Jackson, Pearl River	$(16,111.68)	housing
Hancock	$(15,388.28)	housing
Hancock, Harrison, Jackson, Pearl River, George, stone	$(15,000.00)	Public Services
Hancock, Harrison, Jackson, Pearl River	$(14,582.78)	housing
Hancock, Harrison, Jackson, Pearl River	$(9,022.43)	housing
Hancock, Harrison, Jackson, Pearl River	$(8,759.78)	housing
Hancock	$(6,438.44)	administration
Hancock, Harrison, Jackson, Pearl River, George, stone	$(4,250.00)	Public Services
Hancock, Harrison, Jackson, Pearl River	$(3,471.52)	housing
Hancock, Harrison, Jackson, Pearl River	$(3,309.38)	housing
Hancock, Harrison, Jackson, Pearl River	$(1,452.56)	housing
Hancock, Harrison, Jackson, Pearl River	$(1,343.34)	housing
Hancock, Harrison, Jackson, Pearl River	$(699.46)	housing

Harrison County	$(633.04)	infrastructure
Harrison County	$(508.24)	housing
Hancock	$(500.00)	Public Services
Harrison County	$(468.51)	economic development
Harrison County	$(450.70)	housing
George	$(338.71)	administration
Hancock	$(322.63)	administration
Harrison County	$(314.72)	economic development
Hancock, Harrison, Jackson, Pearl River	$(256.66)	housing
Adams	$(231.00)	economic development
Marion	$(193.59)	economic development
Harrison County	$(30.00)	infrastructure
Winston	$(20.48)	economic development
Jackson	$(10.00)	administration

Appendix 3(c): List of negative amounts of funding for Texas after the 2005 hurricane season

County	Amount Expended	Category
Hardin	$(21,615,663.00)	infrastructure
Angelina, Brazoria, Chambers, Fort Bend, Galveston, Hardin, Harris, Jasper, Jefferson, liberty, Montgomery, Nacogdoches, newton, orange, Polk, Sabine, San Augustine, San Jacinto, Shelby, Trinity, Tyler, Walker	$(3,879,821.28)	housing
Jefferson	$(168,221.57)	administration
Orange	$(3,765.49)	infrastructure
Orange	$(1,990.62)	infrastructure
Newton	$(632.22)	infrastructure
Orange	$(539.24)	infrastructure
Orange	$(4.82)	infrastructure
San Jacinto	$(0.56)	public facilities
Harris	$(0.10)	public facilities
Jefferson	$(0.05)	housing

Appendix 4(a): List of negative amounts of funding for Louisiana after the 2005 hurricane season.

County	Amount Expended	Category
LaSalle	$(5,400.00)	public services

Appendix 4(b): List of negative amounts of funding for Mississippi after the 2008 hurricane season.

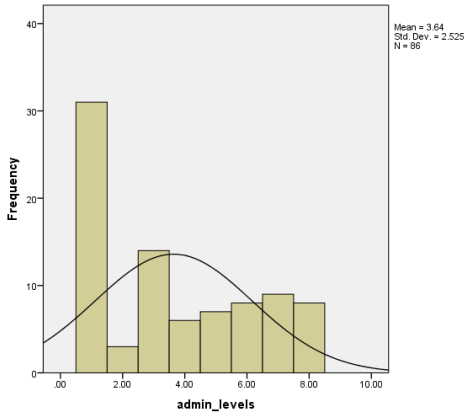
County	Amount Expended	Category
Jackson	$(47,339.08)	administration
Jackson	$(10,204.04)	administration

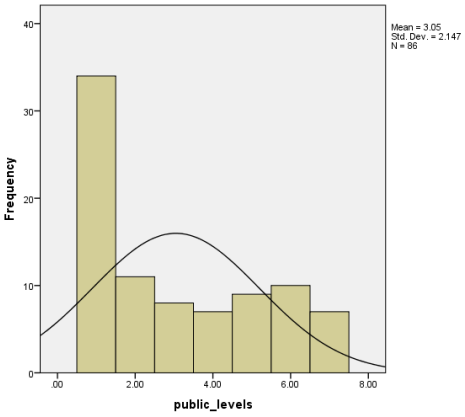
Appendix 4(c): List of negative amounts of funding for Texas after the 2008 hurricane season.

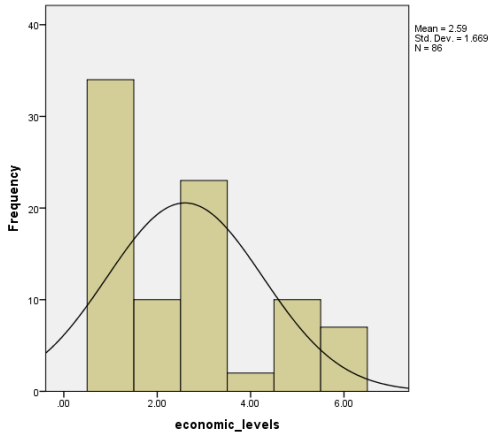
County	Amount Expended	Category
Galveston	$(69,995,541.03)	infrastructure
Cameron	$(5,016,864.10)	infrastructure
Galveston	$(2,839,883.18)	infrastructure
Cameron	$(2,066,061.62)	infrastructure
Galveston	$(769,227.97)	infrastructure
Cameron	$(448,096.54)	infrastructure
Hardin	$(403,828.90)	infrastructure
Starr	$(326,001.19)	infrastructure
Hidalgo	$(280,699.00)	infrastructure
Gregg and Harrison	$(150,049.02)	infrastructure
Willacy	$(130,462.30)	infrastructure
Tyler	$(110,054.90)	public services
Hardin	$(108,161.20)	infrastructure
Smith	$(91,054.68)	infrastructure
hidalgo	$(90,426.70)	infrastructure
Hardin	$(77,694.84)	infrastructure
orange	$(71,088.08)	public services
Upshur	$(70,283.23)	infrastructure
Anderson	$(61,749.98)	public services
Galveston	$(48,593.97)	infrastructure
Harris	$(45,000.00)	housing
Galveston	$(43,961.91)	infrastructure
Galveston	$(39,519.62)	public services
Galveston	$(36,863.10)	infrastructure

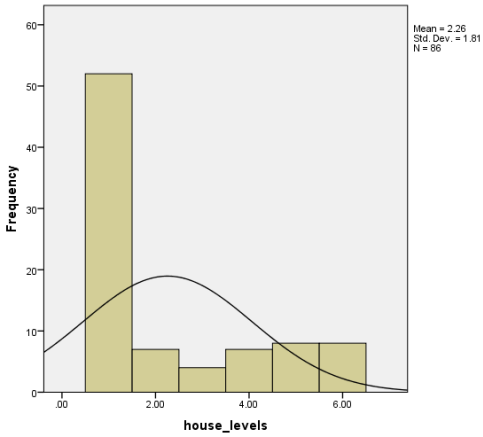
Hidalgo	$(36,158.06)	infrastructure
Burleson	$(34,226.30)	infrastructure
Hidalgo	$(33,388.80)	infrastructure
Montgomery	$(16,012.53)	public services
Hidalgo	$(15,577.58)	infrastructure
Cameron	$(12,529.40)	public services
Galveston	$(10,989.66)	public services
Harris	$(7,827.22)	public services
Galveston	$(6,932.00)	public services
Harris	$(6,043.72)	infrastructure
Cameron	$(5,812.22)	administration
Jefferson	$(5,627.36)	infrastructure
Harris	$(4,786.17)	public services
Galveston	$(3,742.75)	administration
Harris	$(3,250.00)	administration
Galveston	$(2,850.91)	administration
Burleson	$(1,922.40)	public services
Galveston	$(1,868.50)	public services
Harris	$(1,582.75)	public services
San Jacinto	$(1,444.20)	infrastructure
Hidalgo	$(49.48)	infrastructure
	$(9.00)	public services

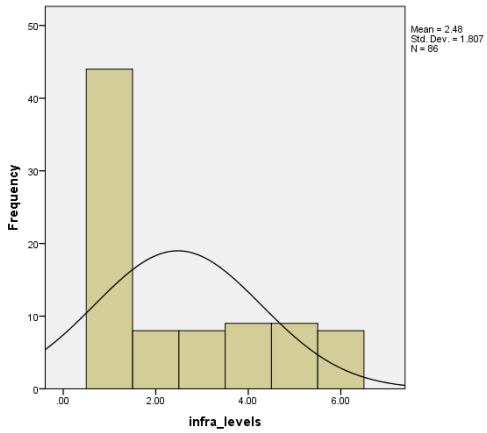
Appendix 5: Histograms of the grouped program type variables for the 2005 hurricane season distribution.



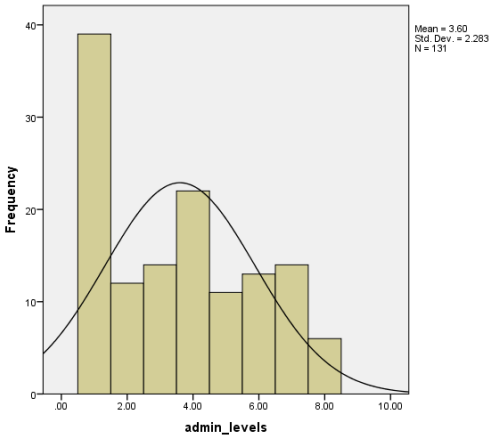


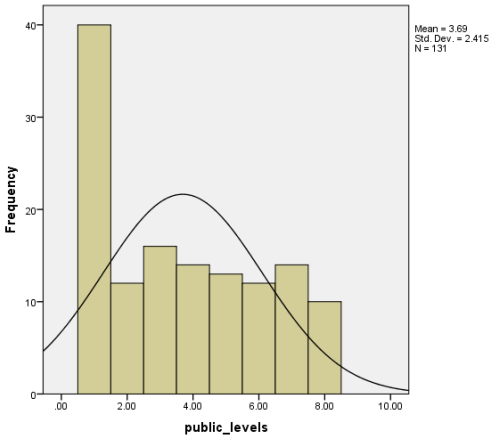


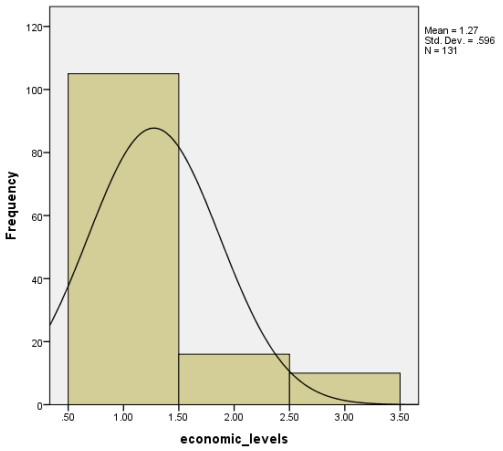


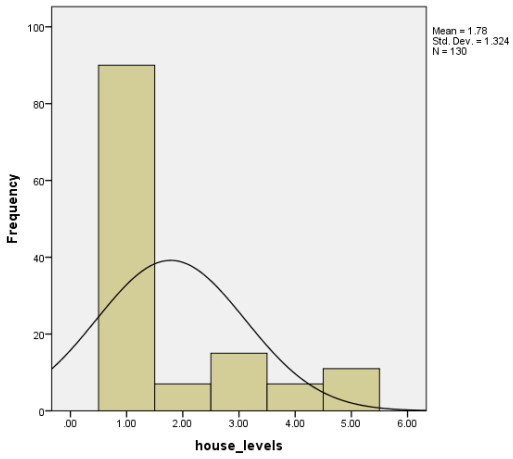


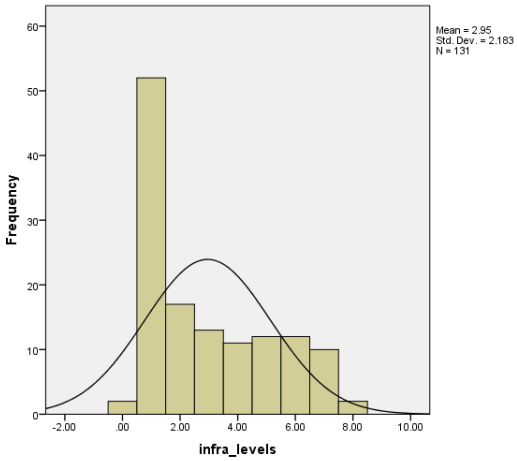
Appendix 6: Histograms of the grouped program type variables for the 2008 hurricane season distribution.



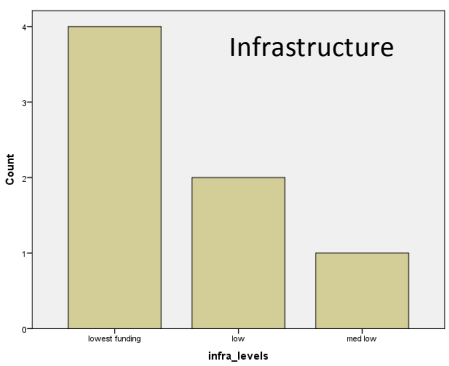


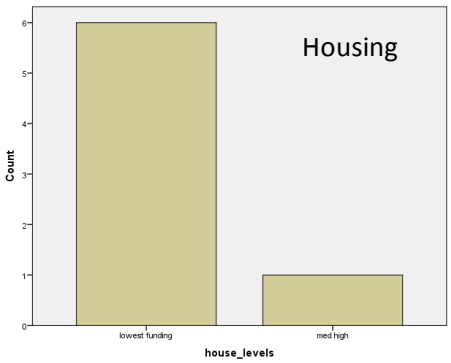


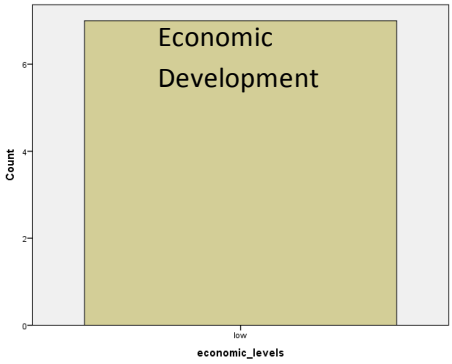


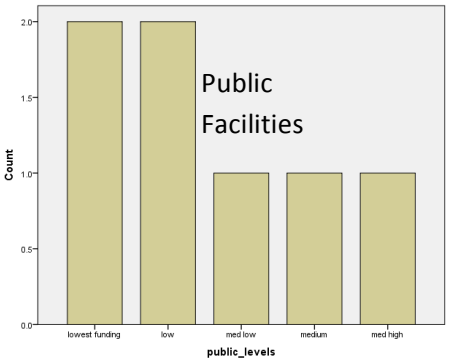


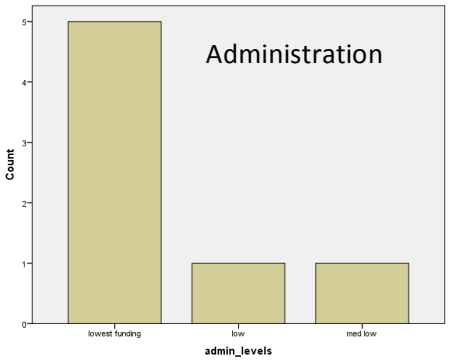
Appendix 7: Mississippi County-level distributions by Program type for the 2008 Hurricane Season.











VITA

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