

UC Riverside

UC Riverside Previously Published Works

Title

The Socio-Demographic and Environmental Effects of Katrina: An Impact Analysis Perspective

Permalink

<https://escholarship.org/uc/item/5sf2q7gs>

Journal

Open Demography Journal, 2

Authors

Swanson, David A
Wombold, Lynn
McKibben, Jerome
et al.

Publication Date

2009

Peer reviewed

The Socio-Demographic and Environmental Effects of Katrina: An Impact Analysis Perspective

David A. Swanson¹, Jerome N. McKibben², Lynn Wombold³, Richard G. Forgette⁴ and Mark V. Van Boening⁵

¹Department of Sociology, University of California Riverside, Riverside, CA 92521 USA

²McKibben Demographic Research, P.O. Box 2921, Rock Hill, SC USA 29732

³ESRI, 380 New York Street, Redlands, CA 92373-8100 USA

⁴Department of Political Science, University of Mississippi, University, MS 38677-1848 USA

⁵Department of Economics, University of Mississippi, University, MS 38677-1848 USA

Abstract: This paper examines the effect of Hurricane Katrina on the populations of 79 ZIP code areas in Louisiana (55) and Mississippi (24) devastated by the hurricane. We compare pre-Katrina population projections for 2007 with post-Katrina projections for 2007 and 2010 and estimate that Katrina reduced the area's population by 311,150 people (21.2%) from the 1,464,280 expected in the absence of Katrina. We also find a striking difference between Louisiana and Mississippi. In the 55 Louisiana ZIP codes, the black population was reduced both absolutely and relatively more than the white population (loss of 150,032 blacks v. 107,845 whites, or 32.7% v. 19.8%). In contrast, the white population in the 24 Mississippi ZIP codes was reduced both absolutely and relatively more than the black population (28,812 whites or 10.3% v. 5,003 blacks or 6.3%). Our analysis suggests that Katrina's demographic effects are profound, and may persist well beyond the 2010 U.S. Census.

I. INTRODUCTION

At the time of its August 29th, 2005 landfall on the Louisiana and Mississippi Gulf Coast, Hurricane Katrina represented the one of the greatest natural disasters in American history. The geographic impact extended over 90,000 square miles, roughly the size of Great Britain, and at least 1,836 people lost their lives [1]. Swanson *et al.* observe that while such numbers are staggering and generally accurate, they are only estimates of Katrina's actual impact; complete counts in the wake of large-scale disasters are typically impossible due to the ephemeral nature of the data and the high cost of collecting it [2]. Unfortunately, many of these estimates are not informed by on-the-ground research, exceptions to this being those developed by Swanson [3] and Swanson *et al.* [2].

In many ways, Hurricane Katrina represents two distinct disasters, natural and man-made [4, 5]. Van Heerden and Bryan attribute the flooding that affected New Orleans and surrounding areas to a series of human errors [5]. They also argue convincingly that the disastrous waves that hit the coast of Mississippi originated in part along the eastern side of the Mississippi River Levee. As Katrina approached landfall, it pushed massive amounts of water in front of itself. Van Heerden and Bryan contend that these waters were held in place by the levee instead of being allowed to flow back

out into the Gulf of Mexico and that once the hurricane eye moved over Lake Borgne, northwest quadrant winds threw this piled-up water against the coast of Mississippi [5]. If this is true, the most damaging waves may not have been due to storm surge alone, but to effects from man-made structures as well. To the extent that these structures remain in place, future storms that follow a similar path may pose an equally dangerous threat to the Mississippi Gulf Coast population. It may also indicate that building higher and stronger levees in Louisiana – a current plan of action to assist New Orleans – may exacerbate Mississippi's future storm damage even more.

The distinction between natural and man-made damage from Katrina is germane to our study, but it is not our primary focus. Instead, our research has two major aims. First, it complements Frey and Singer, who provided the first comprehensive demographic portrait of the effects of hurricanes Katrina and Rita on Gulf Coast populations in the 117 counties comprising the FEMA-designated disaster area [6]. We contribute to this portrait by examining the twenty-four ZIP code areas in three Mississippi counties (Hancock, Harrison, and Jackson) and the fifty-five ZIP codes in five Louisiana parishes (Jefferson, Orleans, Plaquemines, St. Bernard, and St. Charles) that bore the brunt of Katrina's impact. Similar to Frey and Singer [6], we use a perspective adopted from socio-economic impact analysis [7]. Second, we extend the work of Swanson [3], who examined the effect of Katrina on the populations of twenty ZIP codes that were at the epicenter of Katrina's landfall on the Mississippi

*Address correspondence to this author at the Department of Sociology, University of California Riverside, Riverside, CA 92521 USA; Tel: -----; Fax: -----; E-mail: David.swanson@ucr.edu

the 1990 and 2000 censuses were used to generate preliminary projections. The preliminary projections were, in turn, revised using information that is symptomatic of population change that became available after the 2000 through to July 1st, 2005, which is just prior to the landfall of Katrina.

The 2007 Katrina-impacted estimates represent the baseline projections that were informed by additional information specific to Katrina. To quantify the damage to housing and the displacement of population, ESRI applied FEMA data, which included maps of the impacted areas, damage polygons, and summary counts of applicants for FEMA assistance. Beginning with the damage polygons that FEMA compiled from surveys and aerial photographs of damaged areas after the storms, the first step was to assign the damage polygons to census blocks in order to link the damage assessment to demographic data. When a block was linked to multiple damage codes, manual review was used to assign a unique damage code to the block. The block tables were merged with Census 2000 block data (revised), aggregated by damage code and block group, and applied to ESRI's 2005 block group updates to estimate population, households, and housing units by damage code.

Damage assessments from FEMA ranged from “catastrophic” to “limited” or “possible flooding”. To associate the condition of the housing with population displacement, field work was used. “Catastrophic” or “extensive” damage is obvious - homes are destroyed or uninhabitable. However, damage due to “flooding” or “possible flooding” is not as apparent. The homes are still standing. Similarly, “moderate” or “limited” damage do not necessarily imply that homes are uninhabitable or that the residents have left. Neighborhoods in Orleans, St. Bernard and Plaquemines Parishes and Hancock County in Mississippi were surveyed in February 2006 to determine if the damage codes were realistic, the residents had returned, or progress on recovery was evident.

Final estimates of the damage assessments by population, households, and housing units were combined with summary counts from the U.S. Postal Service (USPS) National Change of Address file to estimate the households that left. USPS created special tabulations by ZIP codes specific to the Gulf Coast areas impacted by the 2005 hurricanes. The first file reflected households that had filed change of address forms by October 2005. The second file included change of address forms filed through December 2005.

However, out-migration is only half of the picture. To complete the population and household totals in 2006, the next step was to estimate the destination of evacuees, either returned to their homes or relocated elsewhere. The estimated destination of evacuees was based upon the USPS tabulation of destination from the change of address forms filed through December 2005. In-migration was calculated by county first and then apportioned to ZIP codes. Return migration to impacted areas was assumed to occur first in the areas with limited damage from the storms.

The characteristics of movers were developed from their points of origin, first by block and then by block group. Among the areas that experienced a net loss of population and households, the characteristics were calculated by applying ESRI's standard techniques for updating age, race and

Hispanic origin, income, etc., to the smaller population/household bases [22]. The estimated change in characteristics among destination areas was derived from the characteristics of the movers. Many evacuees tried to settle as close to their homes as possible, which created a major influx of evacuees in nearby towns. Under these circumstances, the evacuees could create significant changes in the profiles of destination communities.

Building from the initial 2006 estimates, the 2007 estimates of the Gulf Coast populations incorporate the usual sources of data, including postal delivery statistics released later in 2006 and 2007, to integrate past and current change in the distribution and characteristics of the population along the Gulf Coast [23].

The difference between the baseline projection interpolated to 2007 and the Katrina-impacted estimate for a given area is used to gauge the impact of Katrina. The authors argue that this is more appropriate than simply comparing post-Katrina population estimates to pre-Katrina population data. A simple empirical example serves to illustrate this point.

Consider Mississippi Zipcode, 39525 (“Diamondhead”). In 2000, there were 5,886 people counted in the decennial census and as of July 1st 2005, a population of 6,853 was estimated by ESRI. This Zipcode gained 967 people, an increase of 16.43% between 2000 and July 1st, 2005. The 2007 Katrina impacted-estimate for this Zipcode was 6,725 while the baseline projection interpolated to 2007 is 7,108. If we subtract the 2005 estimate from the 2007 Katrina-impacted estimate, the result is a decline of 128 people (-1.87 percent), which represents the effect of Katrina terms of the change between the Pre-Katrina 2005 population and the post-Katrina 2007 population. By subtracting the 2007 Katrina-impacted estimate from the 2007 baseline, the result is a decline of 383 people (-5.39 percent), which represents the effect of Katrina relative to what was expected in 2007 in the absence of Katrina. The two measures of difference tell different stories for Zipcode 39525. We are not arguing that the comparison of post-disaster with pre-disaster is not useful; rather, we are pointing out that in many cases it may be useful to compare what is found after a large scale disaster with what could have been instead of only comparing what is found relative to what was. The “impact” comparison we advocate is germane to two types of areas: (1) those that were experiencing population increases prior to a large scale disaster; and (2) those experiencing population losses. For areas that had growth rates of at or near zero prior to a large scale disaster, the two comparisons will result in the same difference. We believe that the impact perspective we use in this paper is particularly useful for areas subject to hurricanes because of the extensive growth these areas have experienced and are expected to continue experiencing [24].

III. RESULTS

III.A. LOUISIANA

As can be seen in Table 1, thirteen of the 55 impacted ZIP code areas in Louisiana experienced a relative loss of more than 50 percent of the population. Four of them are located either within or in direct proximity to New Orleans (70124, 70126, 70127, and 70043) and had more than a 70 percent loss.

Table 1. 2007 Total Population Estimates by Parish, Place & Zip Code in Louisiana: Difference Between Impact & Baseline*

PARISH	ZIP CODE	NAME	Total Population Estimate		Difference	
			Impact	Baseline	Absolute	Percent
Jefferson	70001	Metairie	37,205	39,787	-2,582	-6.49%
Jefferson	70002	Metairie	17,953	19,716	-1,763	-8.94%
Jefferson	70003	Metairie	41,351	43,805	-2,454	-5.60%
Jefferson	70005	Metairie	24,082	25,889	-1,807	-6.98%
Jefferson	70006	Metairie	15,419	16,713	-1,294	-7.74%
Jefferson	70036	Barataria	1,278	1,458	-180	-12.35%
Jefferson	70053	Gretna	16,667	17,984	-1,317	-7.32%
Jefferson	70056	Gretna	37,399	41,486	-4,087	-9.85%
Jefferson	70058	Harvey	40,176	43,695	-3,519	-8.05%
Jefferson	70062	Kenner	18,293	19,063	-770	-4.04%
Jefferson	70065	Kenner	51,360	54,937	-3,577	-6.51%
Jefferson	70067	Lafitte	4,395	4,808	-413	-8.58%
Jefferson	70072	Marrero	56,932	58,172	-1,240	-2.13%
Jefferson	70094	Westwego	34,300	34,903	-603	-1.73%
Jefferson	70121	New Orleans	12,556	13,211	-655	-4.96%
Jefferson	70123	New Orleans	26,408	28,232	-1,824	-6.46%
Jefferson	70358	Grand Isle	1,408	1,435	-27	-1.91%
Orleans	70112	New Orleans	3,298	6,441	-3,143	-48.80%
Orleans	70113	New Orleans	6,162	10,204	-4,042	-39.61%
Orleans	70114	New Orleans	28,591	28,300	291	1.03%
Orleans	70115	New Orleans	34,503	38,220	-3,717	-9.72%
Orleans	70116	New Orleans	11,589	16,055	-4,466	-27.82%
Orleans	70117	New Orleans	16,011	50,459	-34,448	-68.27%
Orleans	70118	New Orleans	32,904	35,730	-2,826	-7.91%
Orleans	70119	New Orleans	23,989	48,878	-24,889	-50.92%
Orleans	70122	New Orleans	17,911	43,928	-26,017	-59.23%
Orleans	70124	New Orleans	6,403	21,766	-15,363	-70.58%
Orleans	70125	New Orleans	9,264	22,679	-13,415	-59.15%
Orleans	70126	New Orleans	8,436	38,627	-30,191	-78.16%
Orleans	70127	New Orleans	7,929	29,244	-21,315	-72.89%
Orleans	70128	New Orleans	7,761	20,637	-12,876	-62.39%
Orleans	70129	New Orleans	6,663	14,790	-8,127	-54.95%
Orleans	70130	New Orleans	12,813	14,435	-1,622	-11.24%
Orleans	70131	New Orleans	30,753	27,785	2,968	10.68%
Orleans	70148	New Orleans	0	0	N/A	N/A
Plaquemines	70037	Belle Chasse	16,876	15,344	1,532	9.99%

Table 1. cond...

PARISH	ZIP CODE	NAME	Total Population Estimate		Difference	
			Impact	Baseline	Absolute	Percent
Plaquemines	70040	Braithwaite	3,312	3,404	-92	-2.70%
Plaquemines	70041	Buras	4,340	7,467	-3,127	-41.88%
Plaquemines	70081	Pilottown	4	4	0	0.00%
Plaquemines	70083	Port Sulphur	4,446	4,800	-354	-7.38%
Plaquemines	70091	Venice	188	254	-66	-25.98%
St. Bernard	70032	Arabi	2,713	7,931	-5,218	-65.79%
St. Bernard	70043	Chalmette	8,724	31,513	-22,789	-72.32%
St. Bernard	70075	Meraux	2,868	8,355	-5,487	-65.67%
St. Bernard	70085	Saint Bernard	4,338	7,400	-3,062	-41.38%
St. Bernard	70092	Violet	4,578	10,933	-6,355	-58.13%
St. Charles	70030	Des Allemands	4,832	4,175	657	15.75%
St. Charles	70031	Ama	1,565	1,352	213	15.75%
St. Charles	70039	Boutte	3,267	2,343	924	39.46%
St. Charles	70047	Destrehan	13,013	13,684	-671	-4.90%
St. Charles	70057	Hahnville	4,667	3,479	1,188	34.16%
St. Charles	70070	Luling	12,386	12,403	-17	-0.14%
St. Charles	70079	Norco	3,493	3,826	-333	-8.71%
St. Charles	70080	Paradis	1,520	1,388	132	9.53%
St. Charles	70087	Saint Rose	7,253	6,931	322	4.64%

*Numbers are subject to rounding.

Table 2. 2007 Total Population Estimates by Parish in Louisiana: Difference Between Impact & Baseline*

PARISH	Total Population Estimate		Difference	
	Impact	Baseline	Absolute	Percent
Jefferson (17 zipcodes)	437,182	465,294	-28,112	-6.04%
Orleans (18 zipcodes)	264,980	468,178	-203,198	-43.40%
Plaquemines (6 zipcodes)	29,166	31,273	-2,107	-6.74%
St. Bernard (5 zipcodes)	23,221	66,132	-42,911	-64.89%
St. Charles (9 zipcodes)	51,996	49,581	2,415	4.87%
TOTAL (55 zipcodes)	806,545	1,080,458	-273,913	-25.35%

* Parish values may not sum precisely to TOTAL because of rounding.

In total, we estimate that Katrina reduced the population of the 55 ZIP codes in Louisiana by 273,913 people, from the 1,080,456 expected as of July 2007 in the absence of Katrina to the 806,545 estimated as of July 2007 after Katrina struck (Table 2). This is a 25.35 percent reduction.

As can be seen by comparing tables 3 and 4, the black population (Table 3) of these 55 ZIP codes was reduced both

absolutely and relatively more than the white population (Table 4). The black population experienced a 32.68 percent loss (from 459,116 to 309,084, a loss of 150,032) compared to a 19.78 percent reduction in the white population (from 545,133 to 437,288, a loss of 107,845).

Although we do not show the tables due to space limitations, we note some results by gender and age (data available

Table 3. 2007 Black Population Estimates by Parish in Louisiana: Difference Between Impact & Baseline*

PARISH	Black Population Estimate		Difference	
	Impact	Baseline	Absolute	Percent
Jefferson (17 zipcodes)	127,352	112,021	15,331	13.69%
Orleans (18 zipcodes)	153,269	320,413	-167,144	-52.17%
Plaquemines (6 zipcodes)	5,837	7,769	-1,932	-24.87%
St. Bernard (5 zipcodes)	6,913	5,457	1,456	26.67%
St. Charles (9 zipcodes)	15,713	13,457	2,256	16.77%
TOTAL (55 zipcodes)	309,084	459,116	-150,032	-32.68%

* Parish values may not sum precisely to TOTAL because of rounding.

Table 4. 2007 White Population Estimates by Parish in Louisiana: Difference Between Impact & Baseline*

PARISH	White Population Estimate		Difference	
	Impact	Baseline	Absolute	Percent
Jefferson (17 zipcodes)	268,108	311,047	-42,939	-13.80%
Orleans (18 zipcodes)	96,958	121,270	-24,312	-20.05%
Plaquemines (6 zipcodes)	21,870	20,866	1,004	4.81%
St. Bernard (5 zipcodes)	15,457	57,275	-41,818	-73.01%
St. Charles (9 zipcodes)	34,895	34,675	220	0.64%
TOTAL (55 zipcodes)	437,288	545,133	-107,845	-19.78%

* Parish values may not sum precisely to TOTAL because of rounding.

upon request). Males and females were reduced at about the same level as the total population, about 25 percent. Similarly, other than the youth dependent and frail elderly populations, which both experienced a 27 percent reduction, the relative losses by age group were also around 25 percent.

III.B. MISSISSIPPI

As can be seen in Table 5, three ZIP code areas containing low-lying areas along the Gulf Coast bore the brunt of Katrina's landfall in Mississippi and its demographic impact. ZIP code 39520 (Bay Saint Louis, Hancock County) is estimated to have been hit the hardest in terms of its relative population loss, which was 8,366 people (44.7%), from 18,760 to 10,374. Four of the twenty-four Mississippi ZIP codes experienced population gains in terms of what was expected as of July 2007 in the absence of Katrina.

Table 6 provides the summary effects of Katrina by examining the difference between the Katrina-impacted estimate of the total population and the estimate in the absence of Katrina we examined for the six ZIP codes in Hancock County, the eleven ZIP codes in Harrison County, and the seven ZIP codes in Jackson County, respectively. We estimate that Hurricane Katrina led to a reduction of 13,111 people in the six ZIP codes in Hancock County, which is 31.73 percent less than the 41,324 expected in these five ZIP codes in the absence of Katrina as of 2007. For the 11 ZIP

codes in Harrison County, the effect is estimated to be a reduction of 22,323 people, which is 10.55 percent less than the 211,537 expected in these ZIP codes in the absence of Katrina. The effect of Katrina on the seven ZIP codes in Jackson County is less than in Hancock and Harrison counties, both absolutely and relatively: a reduction of 1,803, which is 1.38 percent less than the 130,961 expected in these ZIP codes in the absence of Katrina. Over all of the 24 ZIP codes in Mississippi, Katrina is estimated to have reduced the population by 37,237 people, from 383,633 to 346,545 as of July of 2007. This represents a 9.70 percent reduction.

As can be seen by comparing tables 7 and 8, the white population (Table 8) of the twenty-four ZIP codes examined in Mississippi was reduced both absolutely and relatively more than the black population (Table 7), with a 10.28 percent loss (from 280,187 to 251,735 or a loss of 28,812) compared to a 6.26 percent reduction (from 79875 to 74,872 or a loss of 5,003).

Similar to what was found for the white population, in spite of the overall loss of the black population, seven ZIP codes experienced gains in their black populations relative to what was expected in the absence of Katrina.

As with the Louisiana data, we do not show tables by gender and age in the interest of brevity, but we do provide some summary statistics (data available upon request). In Mississippi, males and females were reduced at about the

Table 5. 2007 Total Population Estimates by County, Place & Zip Code in Mississippi: Difference Between Impact & Baseline*

County	ZIP Code	Name	Total Population Estimate		Difference	
			Impact	Baseline	Absolute	Percent
Hancock	39520	Bay Saint Louis	10,374	18,760	-8,386	-44.70%
Hancock	39525	Diamondhead	6,725	7,108	-383	-5.39%
Hancock	39529	Stennis Space Ctr.	0	0	N/A	N/A
Hancock	39556	Kiln	5,790	6,433	-643	-9.99%
Hancock	39572	Pearlington	1,198	1,887	-689	-36.52%
Hancock	39576	Waveland	4,126	7,137	-3,011	-42.19%
Harrison	39501	Gulfport	23,930	26,090	-2,160	-8.28%
Harrison	39503	Gulfport	43,128	40,462	2,666	6.59%
Harrison	39507	Gulfport	16,349	19,975	-3,626	-18.15%
Harrison	39530	Biloxi	7,886	13,902	-6,016	-43.28%
Harrison	39531	Biloxi	18,416	20,980	-2,564	-12.22%
Harrison	39532	Biloxi	25,852	28,763	-2,911	-10.12%
Harrison	39534	Biloxi	3,273	3,396	-123	-3.61%
Harrison	39540	Diberville	7,221	8,172	-951	-11.64%
Harrison	39560	Long Beach	17,042	20,491	-3,449	-16.83%
Harrison	39571	Pass Christian	13,144	16,313	-3,169	-19.43%
Harrison	39574	Saucier	12,973	12,995	-22	-0.17%
Jackson	39553	Gautier	18,504	17,732	772	4.35%
Jackson	39562	Moss Point	18,158	17,443	715	4.10%
Jackson	39563	Moss Point	15,734	16,101	-367	-2.28%
Jackson	39564	Ocean Springs	35,003	35,611	-608	-1.71%
Jackson	39565	Ocean Springs	18,014	16,742	1,272	7.60%
Jackson	39567	Pascagoula	12,470	14,130	-1,660	-11.75%
Jackson	39581	Pascagoula	11,275	13,203	-1,928	-14.60%

*Numbers are subject to rounding.

Table 6. 2007 Total Population Estimates by County in Mississippi: Difference Between Impact & Baseline*

COUNTY	Total Population Estimate		Difference	
	Impact	Baseline	Absolute	Percent
Hancock (6 zipcodes)	28,213	41,324	-13,111	-31.73%
Harrison (11 zipcodes)	189,214	211,537	-22,323	-10.55%
Jackson (7 zipcodes)	129,158	130,961	-1,803	-1.38%
TOTAL (24 zipcodes)	346,585	383,822	-37,237	-9.70%

* County values may not sum precisely to TOTAL because of rounding

same level as the total population, about 10 percent. Similarly, other than the youth dependent and frail elderly populations, which both experienced a 10 and 13 percent reduction, respectively the relative losses by age group were around 9 percent. Basically the same ZIP codes experiencing gains in the total population and the black and white populations also experienced gains by gender and in these age

groups, while the remaining ZIP codes experienced losses by gender and in all of the same age groups.

III.C. SUMMARY EFFECTS

Over all 79 ZIP codes, Katrina is estimated to have reduced the “expected” population by 311,150 people, from 1,464, 280 to 1,153,130 as of July 2007. This represents a

Table 7. 2007 Black Population Estimates by County in Mississippi: Difference Between Impact & Baseline*

COUNTY	Black Population Estimate		Difference	
	Impact	Baseline	Absolute	Percent
Hancock (6 zipcodes)	1,672	3,350	-1,678	-50.09%
Harrison (11 zipcodes)	43,263	45,801	-2,538	-5.54%
Jackson (7 zipcodes)	29,937	30,723	-786	-2.56%
TOTAL (24 zipcodes)	74,872	79,875	-5,003	-6.26%

* County values may not sum precisely to TOTAL because of rounding

Table 8. 2007 White Population Estimates by County in Mississippi: Difference Between Impact & Baseline*

COUNTY	White Population Estimate		Difference	
	Impact	Baseline	Absolute	Percent
Hancock (6 zipcodes)	25,717	36,328	-10,611	-29.21%
Harrison (11 zipcodes)	132,208	149,589	-17,381	-11.62%
Jackson (7 zipcodes)	93,450	94,270	-820	-0.87%
TOTAL (24 zipcodes)	251,375	280,187	-28,812	-10.28%

* County values may not sum precisely to TOTAL because of rounding

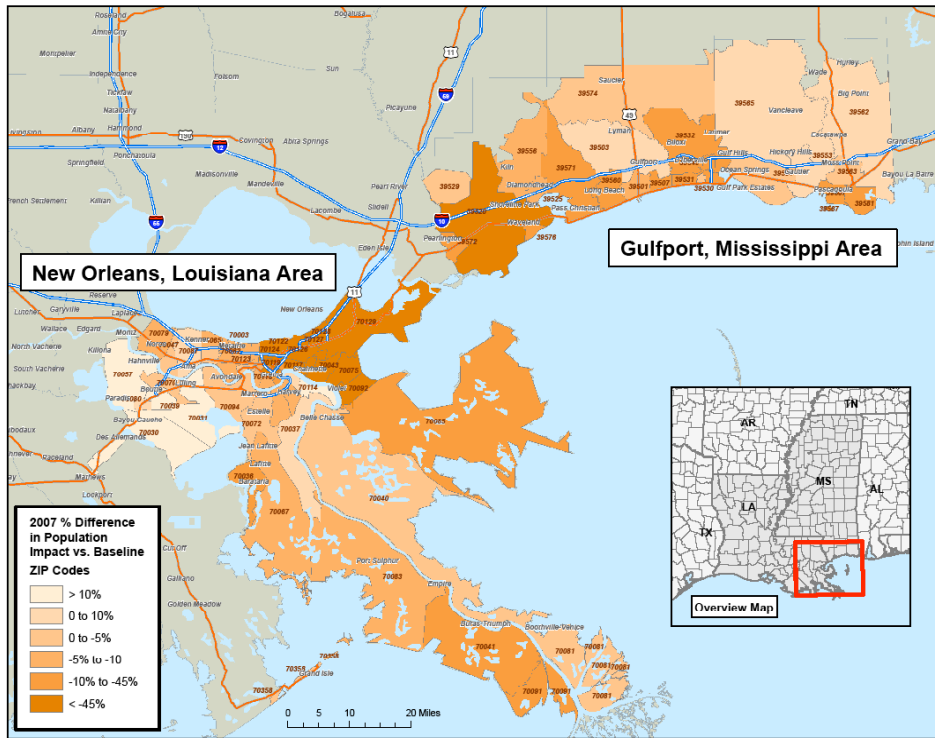


Fig. (2). Total population reduction (%) in the study area due to Katrina.

21.25 percent reduction. Fig. (2) displays this in visual form. The black population is estimated to have been reduced by 155,035 in these 79 ZIP codes, from 538,991 to 383,956, a 28.76 percent loss (Fig. 3). The white population is estimated to have been reduced by 136,657, from 825,320 to 688,663, a 16.56 percent reduction (Fig. 4).

Males and females are estimated to have been reduced by about 21 percent, the same rate as the total population. With the exceptions of the youth dependent age group (ages 0 to 14) and the frail elderly age group (85 years and over), age groups of interest also experienced around a 20 to 21 percent reduction. The youth dependent population and frail elderly

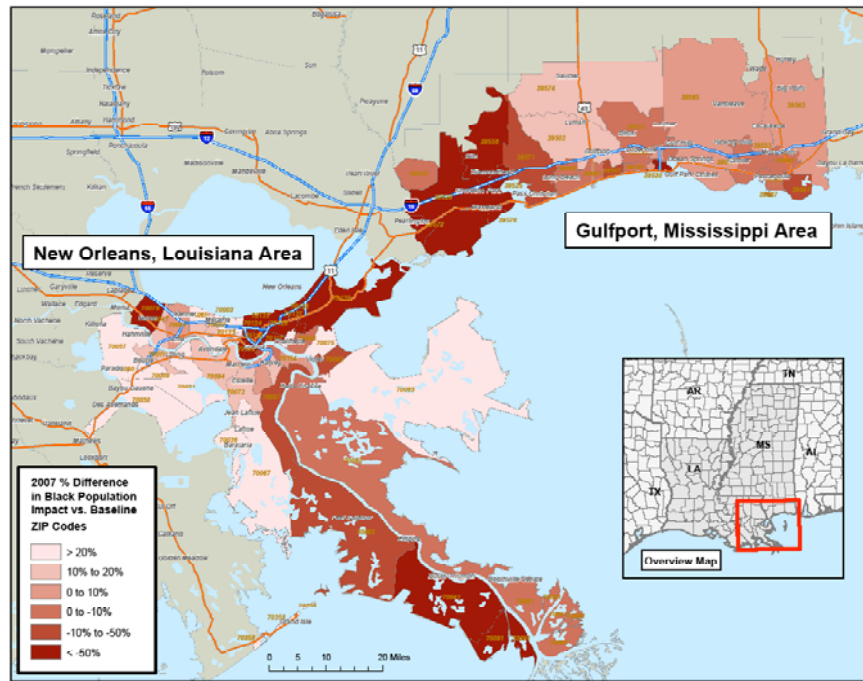


Fig. (3). Black population reduction (%) in the study area due to Katrina.

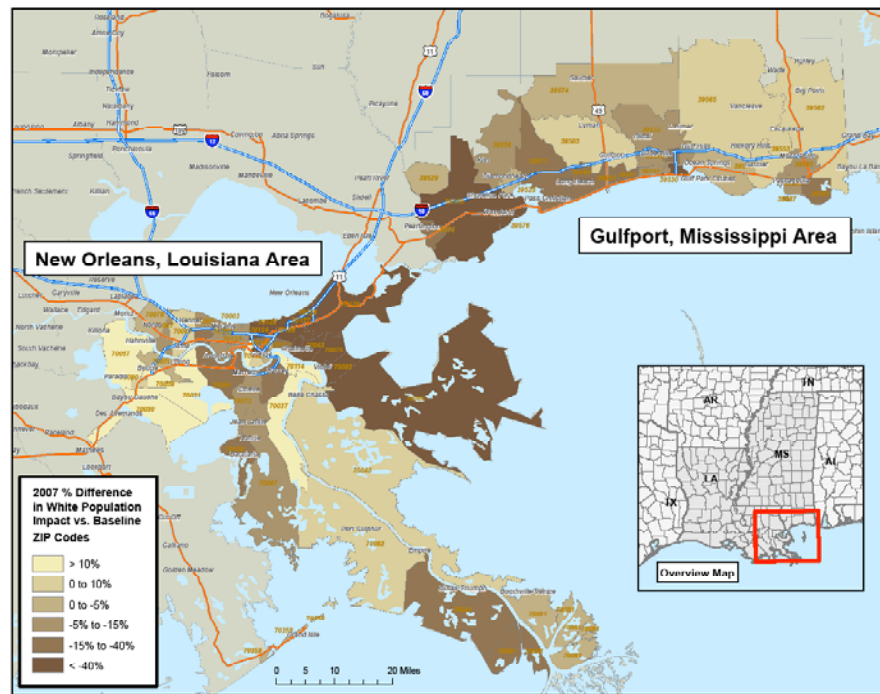


Fig. (4). White population reduction (%) in the study area due to Katrina.

were slightly higher with reductions of 23 and 25 percent, respectively.

The most striking difference between Louisiana and Mississippi is in terms of race. The black population of the 55 ZIP codes examined in Louisiana was reduced both absolutely and relatively more than the white population, with a 32.68 percent loss (from 459,116 to 309,084, a loss of 150,032) compared to a 19.78 percent reduction (from

545,133 to 437,288, a loss of 107,845). In Mississippi, however, the losses by race are very different, where the white population in the 24 ZIP codes examined in Mississippi was reduced both absolutely and relatively more than the black population, with a 10.28 percent loss (from 280,187 to 251,735 a loss of 28,812) compared to a 6.26 percent reduction (from 79,875 to 74,872, a loss of 5,003). Again, these results can be seen in Figs. (3 and 4).

IV. DISCUSSION

We believe that the ‘impact’ perspective we employ is particularly useful for purposes of assessing the effects of a large scale disaster into the future. Using this perspective in this paper suggests that in the case of Katrina’s impact on the New Orleans area and the Mississippi Gulf coast, the effects of a disaster can be long-lasting. The demographic impacts of Katrina on the Mississippi Gulf coast will be apparent when data from the 2010 U.S. Census are released; it is our belief that they could well extend into the 2020 decennial census. Together with previous research [6], our research suggests that the demographic effects of Katrina (and Rita) are likely to be felt not only in the 79 ZIP codes we examined, but in areas of extended proximity like the parishes in the area of Baton Rouge, Louisiana, and the counties around Houston, Texas. We estimate a population loss of 311,000 people in our study area; these human lives did not simply disappear. Cossman finds that “agents of delay” have served to extend Katrina’s effects on this same area and he argues that these same agents will be associated with future disasters, both natural and man-made [26]. This is a perspective that, like our empirical findings, appears to run contrary to the post-disaster “recovery machine,” a hypothesis described by Pais and Elliot [27] that has roots in the growth machine hypothesis advanced by Molotch [28] and Logan and We also believe that the “impact” perspective employed in this paper provides a useful way to analyze the demographic effects of a disaster. We have compared the estimated demographic effects of Katrina with estimates that are made in the absence of this disaster. Our use of the impact perspective is novel because socio-economic and environment impact analyses are typically done in advance of a planned impact, not after-the-fact as we have done here. We believe that concepts, perspectives, and tools of impact assessment of can be extended to unplanned natural disasters like Katrina, and we hope that this research is a useful first step. Using these tools would, for example, fit squarely within a recommendation made by Saenz and Peacock about the need to develop more comprehensive and meaningful mitigation planning relative to large scale disasters [30].

ENDNOTE

A critical review of the growth machine hypothesis is found in Jonas and Wilson [31].

ACKNOWLEDGEMENTS

We thank Kyle Watson at ESRI for GIS support and both the editor and reviewers for their helpful comments and suggestions.

REFERENCES

- [1] Chappell W, Forgette R, Swanson D, and Van Boening M. Determinants of government aid to Katrina survivors: evidence from survey data. *South Econ J* 2007; 74 (2): 344-62.
- [2] Swanson DA, Forgette R, Van Boening M, Holley C, and Kinnell A. Assessing Katrina’s demographic and social impacts on the Mississippi gulf coast. *J Mississippi Acad Sci* 2007; 52(4): 228-42.
- [3] Swanson DA. The demographic effects of hurricane katrina on the mississippi gulf coast: an analysis by ZIP Code. *J Mississippi Acad of Sci* 2008; 53(4): 213-31.
- [4] Brinkley D. The great deluge: hurricane katrina, New Orleans, and the Mississippi gulf coast. New York, NY: Morrow/HarperCollins 2006.
- [5] Van Heerden I ,Bryan M. The storm: what went wrong and why during Hurricane Katrina – the inside story from one Louisiana scientist. New York, NY: Viking 2006.
- [6] Frey WH and Singer A. Katrina and rita impact on gulf coast populations: first census findings. Washington, DC: The Brookings Institution; 2006.
- [7] Burdge R. The concepts, process, and methods of social impact analysis. Middleton, WI: Social Ecology Press 2006.
- [8] Pol L , Thomas R. Demography for business decision making. New York, NY: Quorum Books; 1997.
- [9] Pol L, Thomas R. The demography of health and health care, 2nd ed. New York: Plenum 2000.
- [10] Siegel J. Applied demography: applications to business, government, law, and public policy. San Diego, California: Academic Press 2002.
- [11] Swanson DA. Hurricane Katrina: a case study of its impacts on medical service providers and their client populations. *Open Demogr J* 2009; 2: 8-17.
- [12] Thomas R. Marketing health services. Chicago, Inois: Health Administration Press 2005.
- [13] Carlson J, Williams C, and Swanson D. The development of small area socioeconomic data to be utilized for impact analysis: rural southern Nevada. In: High level radioactive waste management: proceedings of the 1990 international conference, American Nuclear Society and American Society of Civil Engineers, New York, NY; 1990: pp 985-990.
- [14] Erickson PA. A practical guide to environmental impact assessment. San Diego, California: Academic Press 1999.
- [15] Finsterbusch K, Wolf C. (Eds.). Methodology of social impact assessment. Stroudsburg, Pennsylvania: Dowden, Hutchinson, and Ross, Inc 1981.
- [16] Leistritz F, Murdock S. The socio-economic impact of resource development: methods for assessment. Boulder, Colorado: Westview Press 1981.
- [17] Schmidt R, Swanson D, Barr C. Socioeconomic impacts of the proposed federal gaming Tax. *Int J Pub Admin* 1997; 20: 1675-98.
- [18] Asian Disaster Reduction Center. Total disaster risk management: good practices. Kobe, Japan: Asian Disaster Reduction Center; 2005. (Available from http://www.adrc.or.jp/publications/TDRM2005/TDRM_Good_Practices/Index.html).
- [19] Wombold L. ESRI demographic update methodology: 2005/2010. ESRI white paper. Redlands, California: ESRI 2005
- [20] Wombold L. 2006a. ESRI Gulf Coast Updates Methodology: 2006/2011. ESRI white paper. Redlands, California: ESRI 2006
- [21] Smith S, Tayman J, Swanson D. Population projections for states and local areas: methodology and analysis. New York: Kluwer Academic /Plenum Press 2001.
- [22] Wombold L. ESRI demographic update methodology: 2006/2011. ESRI white paper. Redlands, California: ESRI; 2006
- [23] Wombold L. ESRI demographic update methodology: 2007/2012. ESRI white paper. Redlands, California: ESRI; 2007.
- [24] Pielke R, Gratz J , Landsea C, Collins D, Saunders M, and Musulin R. Normalized hurricane damage in the United States: 1900-2005. *Nat Hazard Rev* 2008; 9 (1): 29-42.
- [25] Cossman R. Hurricane Katrina as a natural experiment of ‘creative destruction’. *J Mississippi Acad Sci* 2007; 52(4): 281-85.
- [26] Pais J, Elliot J. Places as recovery machines: vulnerability and neighborhood change after major hurricanes. *Soc Forces* 2008; 86 (4): 1415-53.
- [27] Molotch H. The city as a growth machine. *J Am Soc* 1976; 82 (2): 309-30.

- [29] Logan J, Molotch H. *Urban fortunes*. Berkeley, CA: University of California Press 1987.
- [30] Saenz R, Peacock W. Rural people, rural places, and the hidden costs of hurricane Katrina. *Rural Realities* 2006; 1 (2).
- [31] Jonas A, Wilson D (Eds.). *The urban growth machine: critical perspectives, two decades later*. New York, NY: State University of New York 1999.

Received: October 10, 2008

Revised: November 06, 2008

Accepted: December 24, 2008

© Mohammad Afzal; Licensee *Bentham Open*.

This is an open access article licensed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>) which permits unrestricted, non-commercial use, distribution and reproduction in any medium, provided the work is properly cited.