

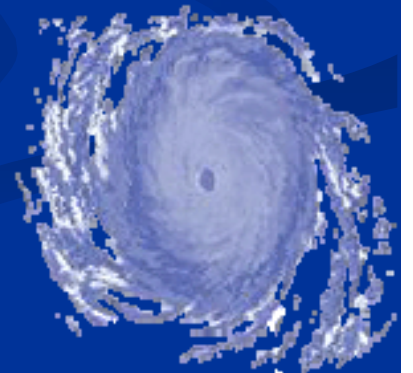
# Tracking Patients Evacuated After Hurricane Katrina: Disease Management with GIS in Louisiana's Public Hospitals

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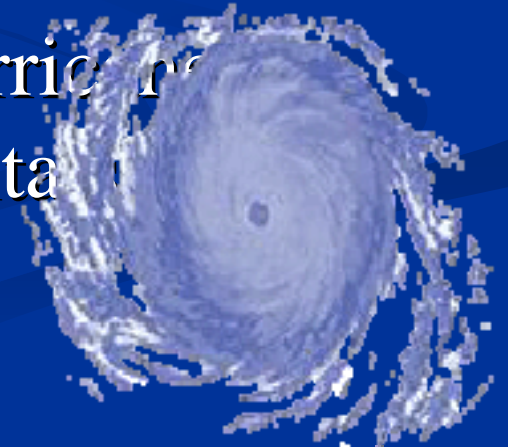
October 9, 2007



# Background

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- Hurricane Katrina made landfall in Plaquemines Parish, Louisiana as a category 3 storm on August 29, 2005.
- Hurricane Rita made landfall near Sabine Pass, Texas as a category 3 storm on September 24, 2005.
- Preliminary data analysis shows Hurricane Rita had no effect on LSU Hospital





**Flooded Area in New Orleans after Hurricane Katrina**



**Flooded Area Near LSUHSC Main Campus after Hurricane Katrina**

**School of  
Public Health**



**Flooded Area Near LSUHSC School of Public Health after Hurricane Katrina**





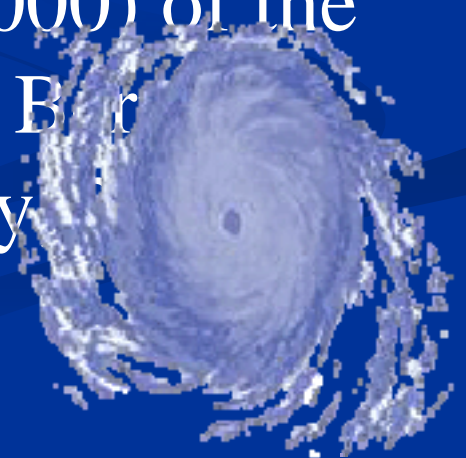
Hurricane Katrina Caused deep  
Flooding in Venice, Louisiana



Hwys I-10/I-610 Flooded  
After Hurricane Katrina

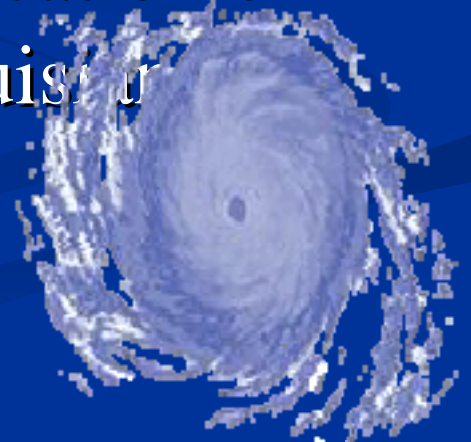
## Background

- Hurricane Katrina in 2005 had a long-term and catastrophic impact on public health in Louisiana.
- Hospitals were damaged; people evacuated from residential areas; patients moved to other hospitals or cities or states.
- Migration estimates show that ½ (278,000) of the residents moved out of Orleans and St. Bernard parishes (Louisiana Recovery Authority)



# Purpose

- Tracking patients, monitoring their active status throughout the State's disease management system, while providing services, are crucial tasks for public health professionals.
- The Disease Management System is a resource that can be utilized for monitoring relocation of patients to better serve residents in Louisiana.





# Objectives

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- To assess the affect of hurricane Katrina on the movement of patients in space and time, using data from the Disease Management System to analyze the impact, and to use GIS as an auxiliary means to map the movement.
- To inform key decision makers about impacts and recommend reallocation of resources and optimal locations to build or rebuild hospitals.

## Data and Methods

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- Data:

Patients' medical records in the Louisiana Public Hospital System (LSU HCSD), including demographic information, and admission dates, both inpatients and outpatients.

Time ranges are from 1/2004 through 8/2005, (20-months before Katrina), and 9/2005 through 4/2007 (20-months after Katrina).

- Methods:

1. Extracted information from DMED database about the number of patients, visits, cost, age, race, and gender, as well as patients' transfer within the system on a monthly basis.

## Data and Methods (cont.)

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2. Using GIS as an auxiliary means to map the distributions and changes of patients before and after Hurricane Katrina to get 'intuitive pictures'.
3. Analyzing the results spatially and temporally.

# LSU Health Care Services Division

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- The Health Care Services Division (HCSD) consists of eight Public hospitals throughout the state of Louisiana.
- It provides quality medical care to residents of Louisiana, regardless of income or insurance coverage; and it also provides for the state's medical and clinical education needs.
- Traditionally, the HCSD facilities cared for the uninsured and the underinsured state residents.

# HCSD (LA Public Hospitals)

## Legend

- BMC
- EKL
- HPL
- LAK
- LJC
- MCL
- UMC
- WOM
- LA Parishes





# FEMA-1603-DR, Louisiana Disaster Declaration as of 10/07/2005



## Disease Management Evaluation Database

- The Disease Management Evaluation Database (DMED) is a data repository of clinical and financial data from the 8 HCSD facilities.
- The majority of the DM data are collected by electronic means at a system level; thus minimizing inconsistency and optimizing comparability across facilities.

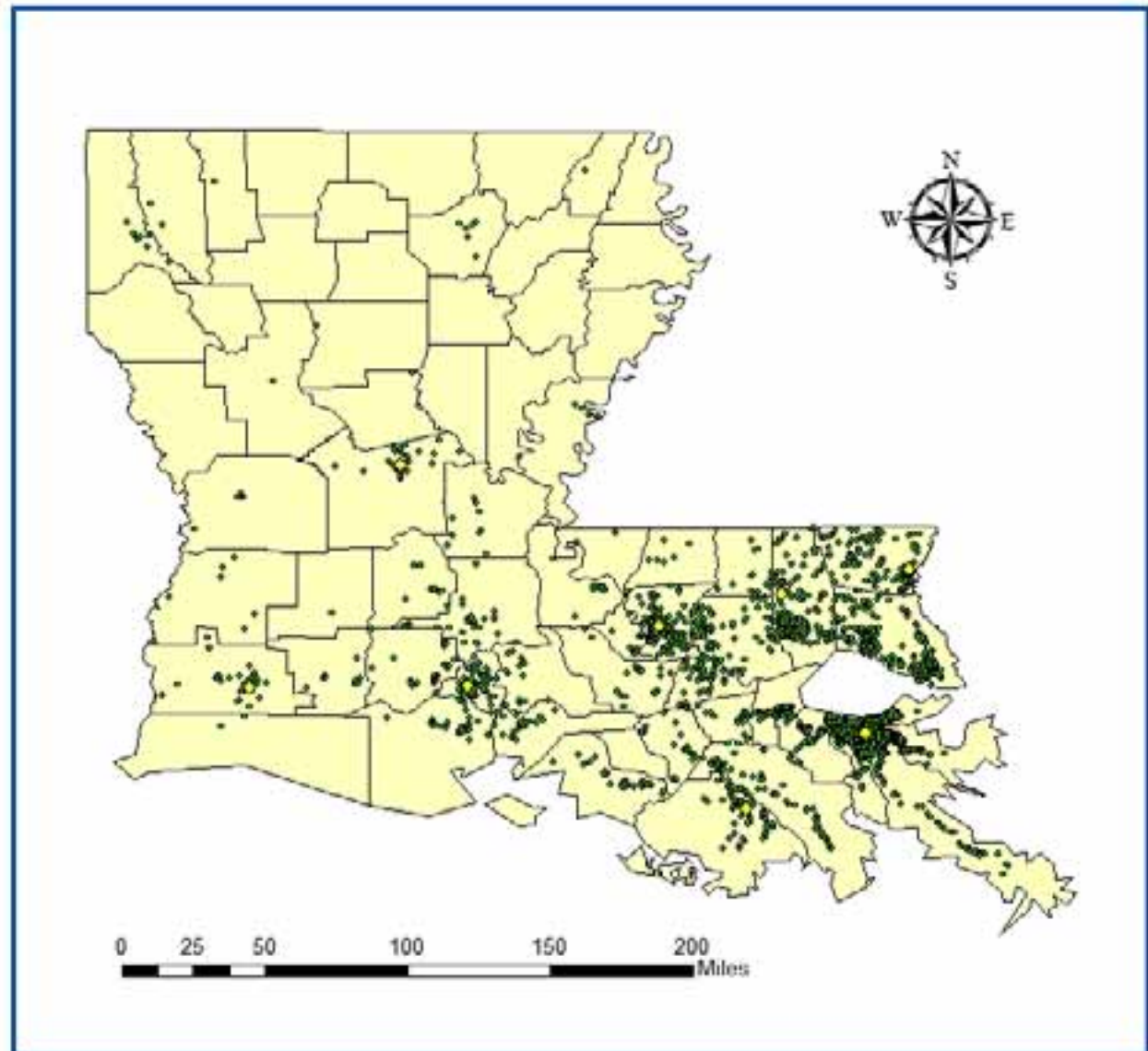
## Results

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- Maps of patients' distribution in MCL for 8/2005, 9/2005, and fiscal year 2007.
- Numbers of patients by month.
- Percentage of inpatients by month.
- Percentage of African-American patients by month.
- Percentage of female patients by month.
- Percentage of elderly patients (age $\geq$ 65) by month.
- Patients' visit by month.
- Patients' cost by month.
- Patients' transfer in the HCSD by month.

# MCL Patients Distribution in Aug. 2005

- Legend**
- HC SD Facilities
  - MCL Patients
  - LA Parishes



# MCL Patients Distribution in Sept. 2005

## Legend

◆ HCSD Facilities

◆ MCL Patients









■ LA Parishes

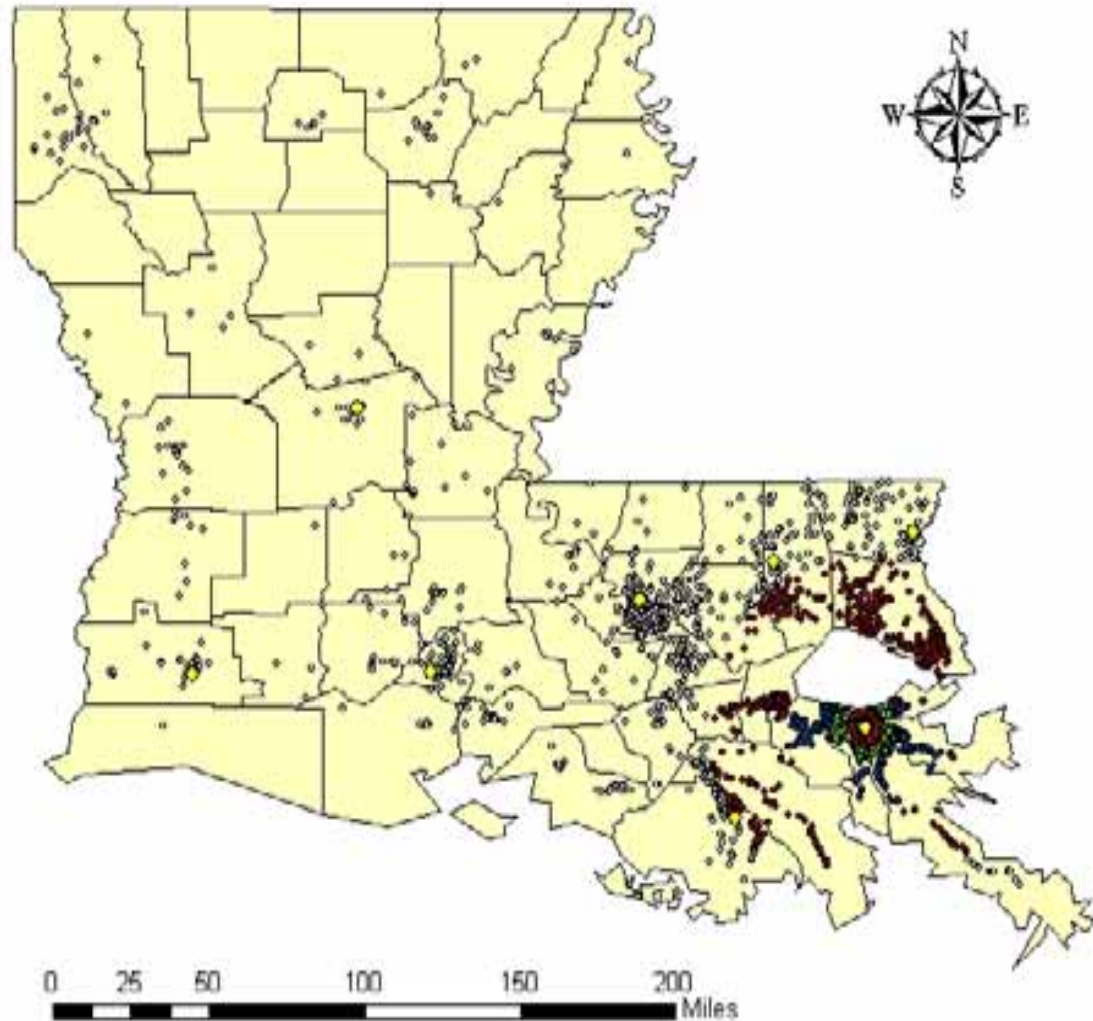




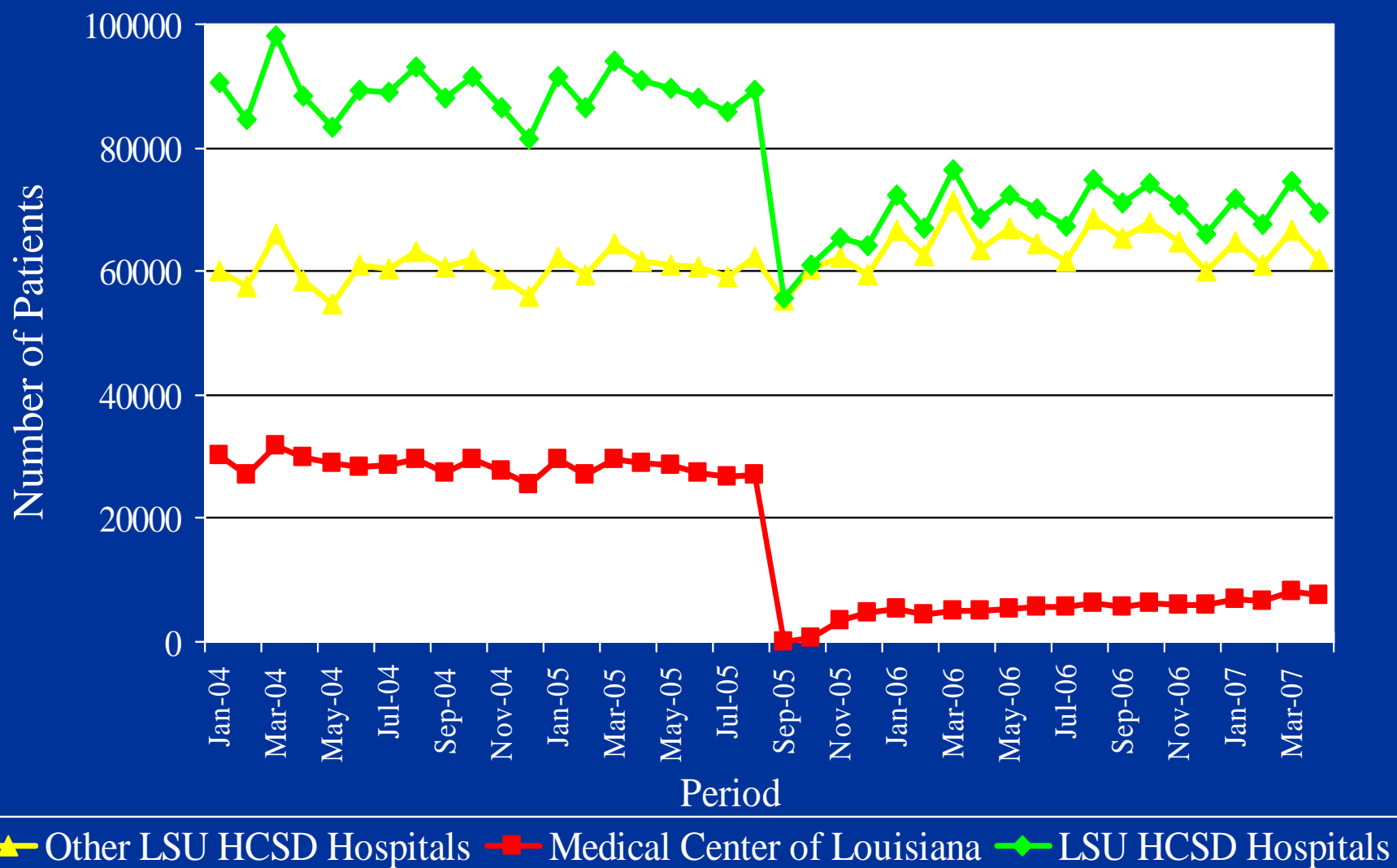
# MCL Patients Distribution in Fiscal 2007

## Legend

-  HCSD Facilities
-  Patients Within 2 Miles
-  Patients Between 2 and 5 Miles
-  Patients Between 5 and 10 Miles
-  Patients Between 10 and 25 Miles
-  Patients Between 25 and 50 Miles
-  Patients Beyond 50 Miles
-  LA Parishes

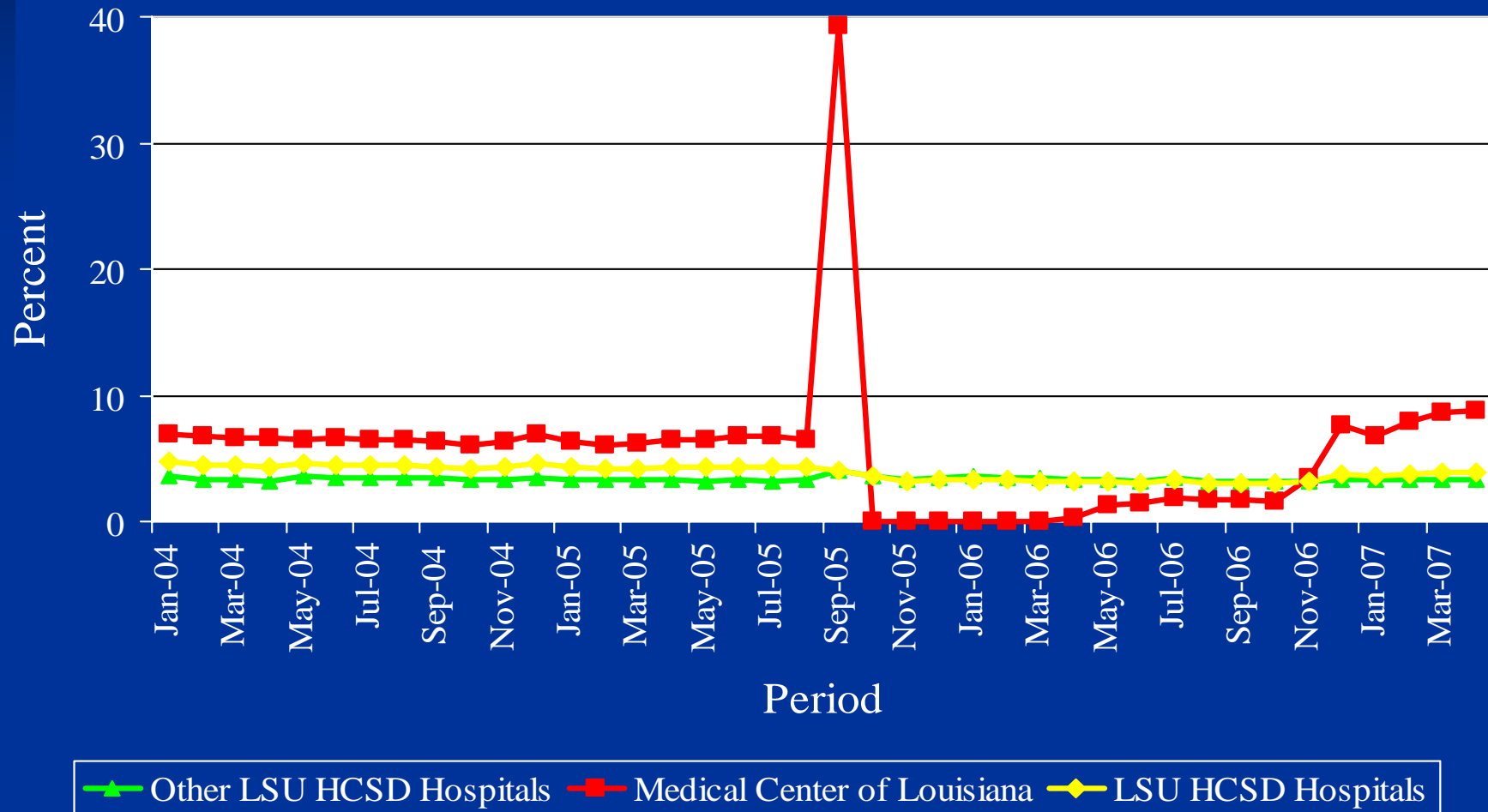


# Figure 1. Patients in LSU Hospitals



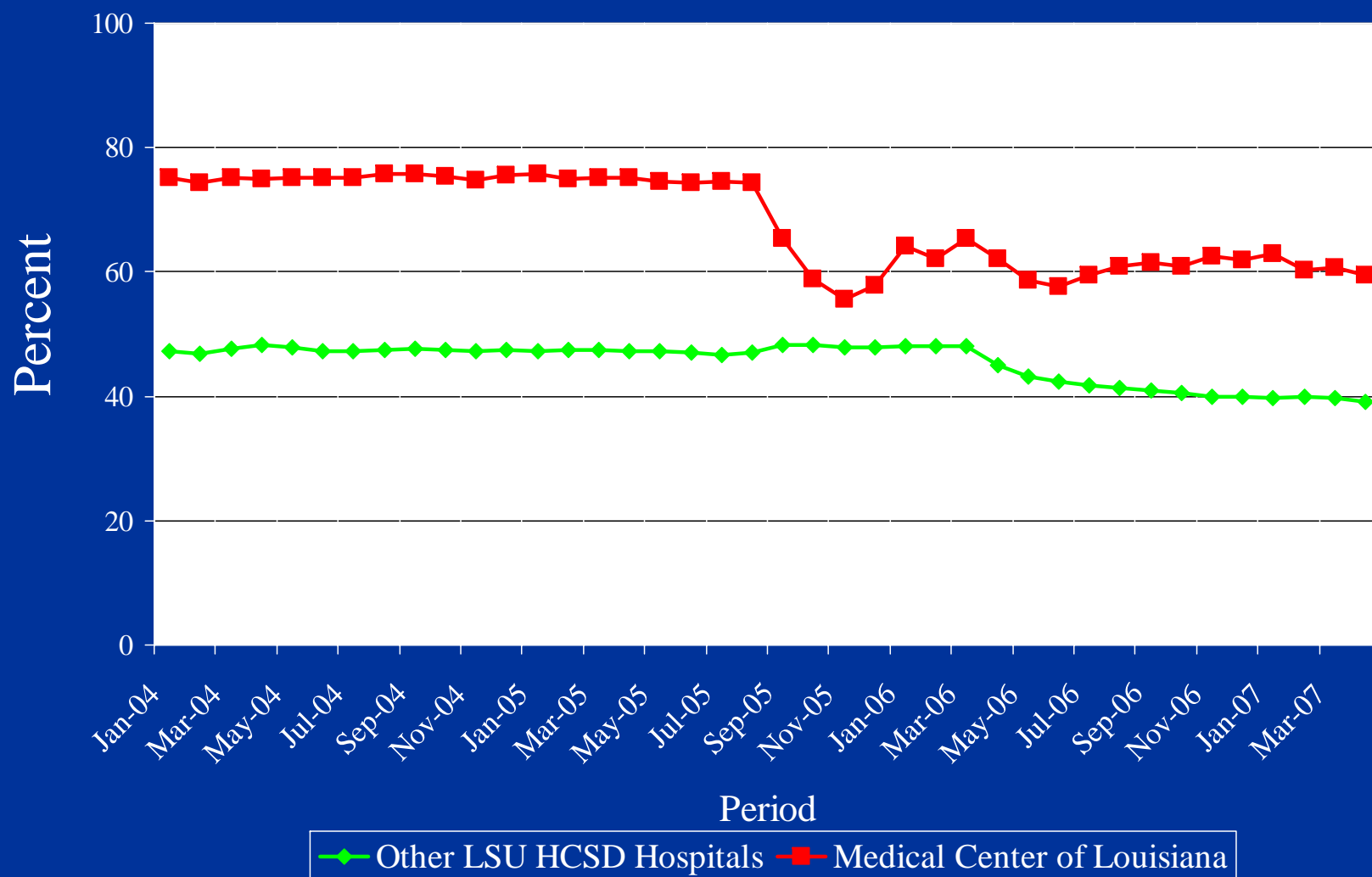
Source: LSU Hospitals, Health Care Services Division.

## Figure 2. Percent In-Patients in LSU Hospitals



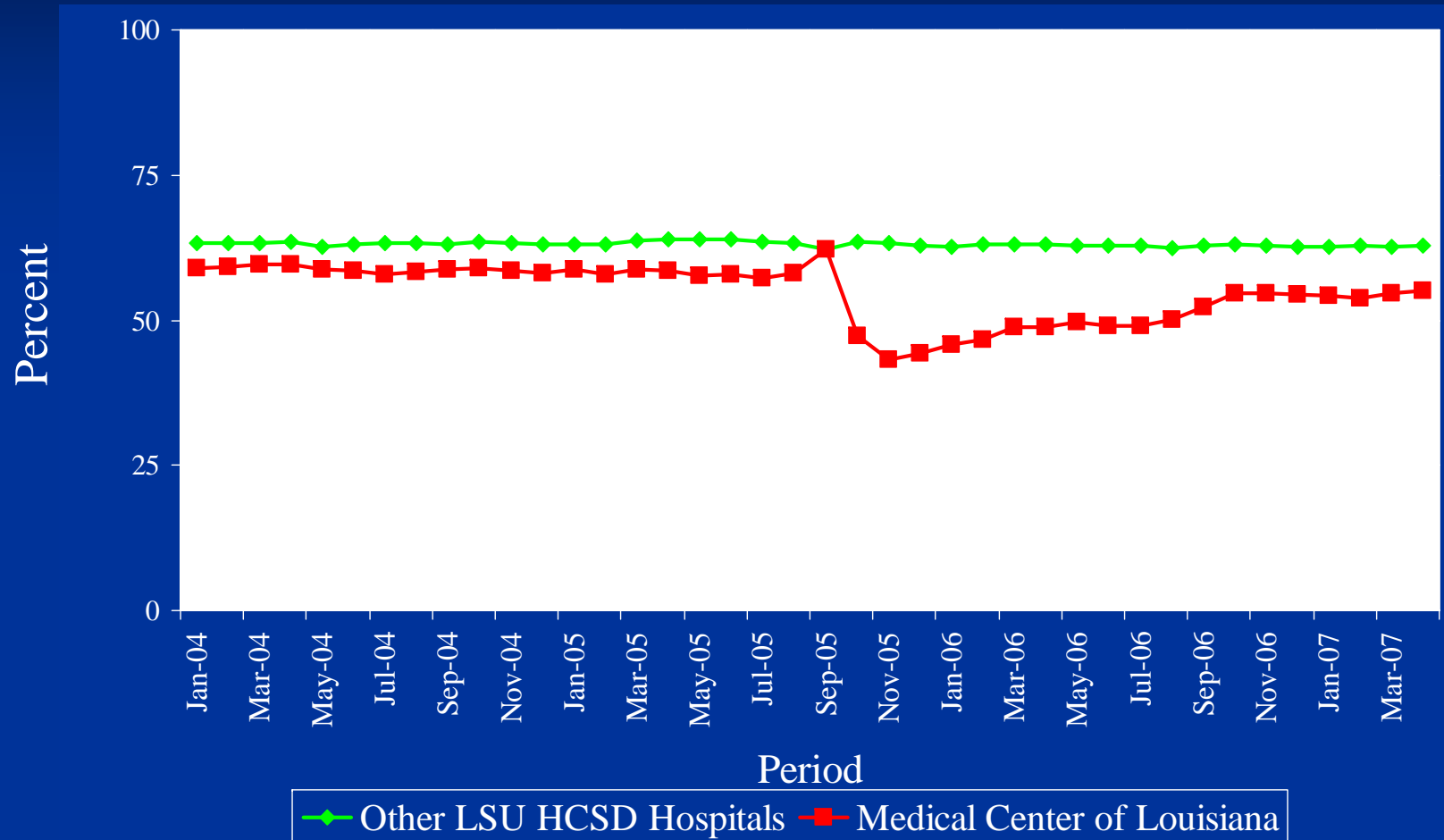
Source: LSU Hospitals, Health Care Services Division.

# Figure 3. Percent AA Patients in LSU Hospitals



Source: LSU Hospitals, Health Care Services Division.

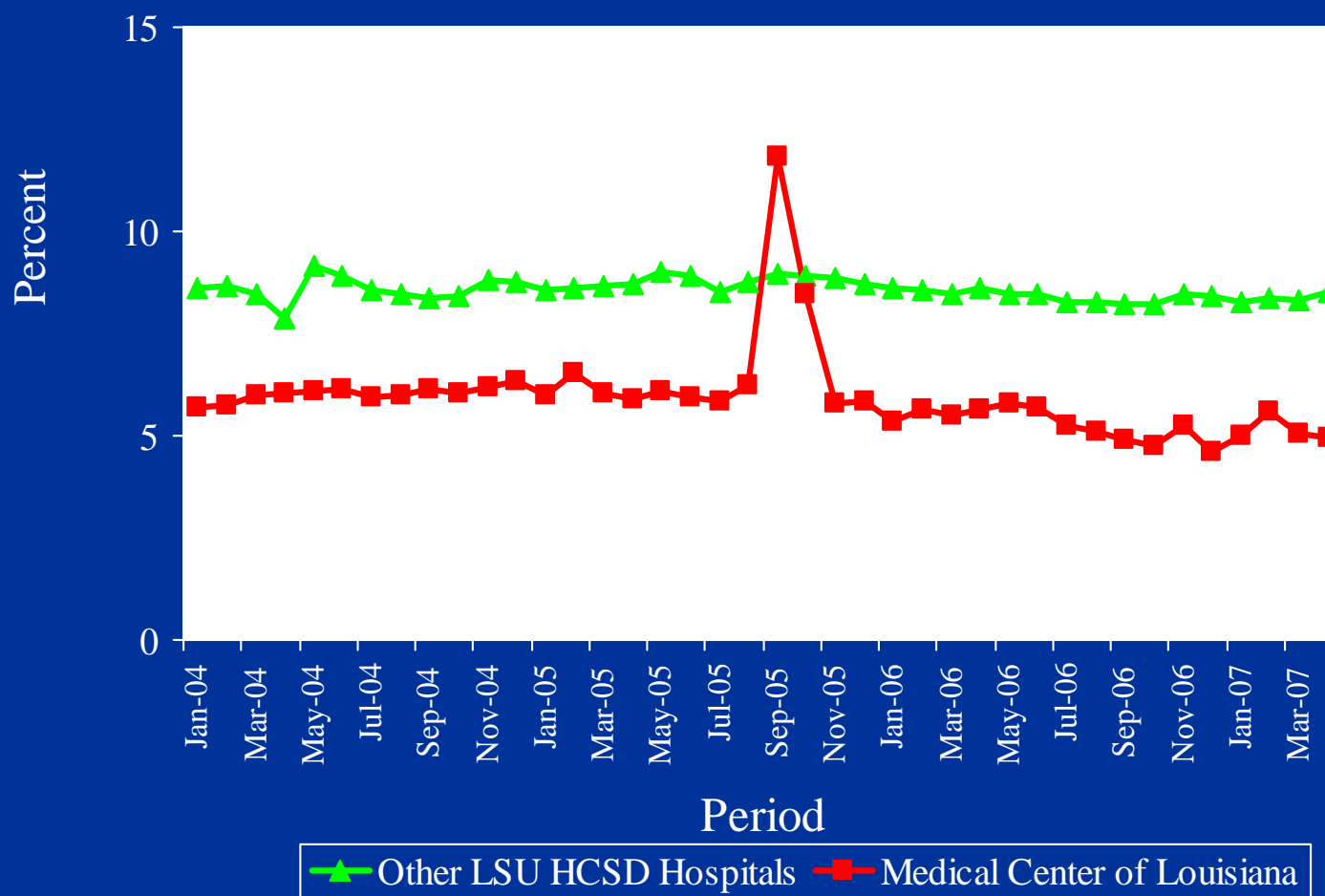
# Figure 4. Percent Female Patients in LSU Hospitals



Source: LSU Hospitals, Health Care Services Division.

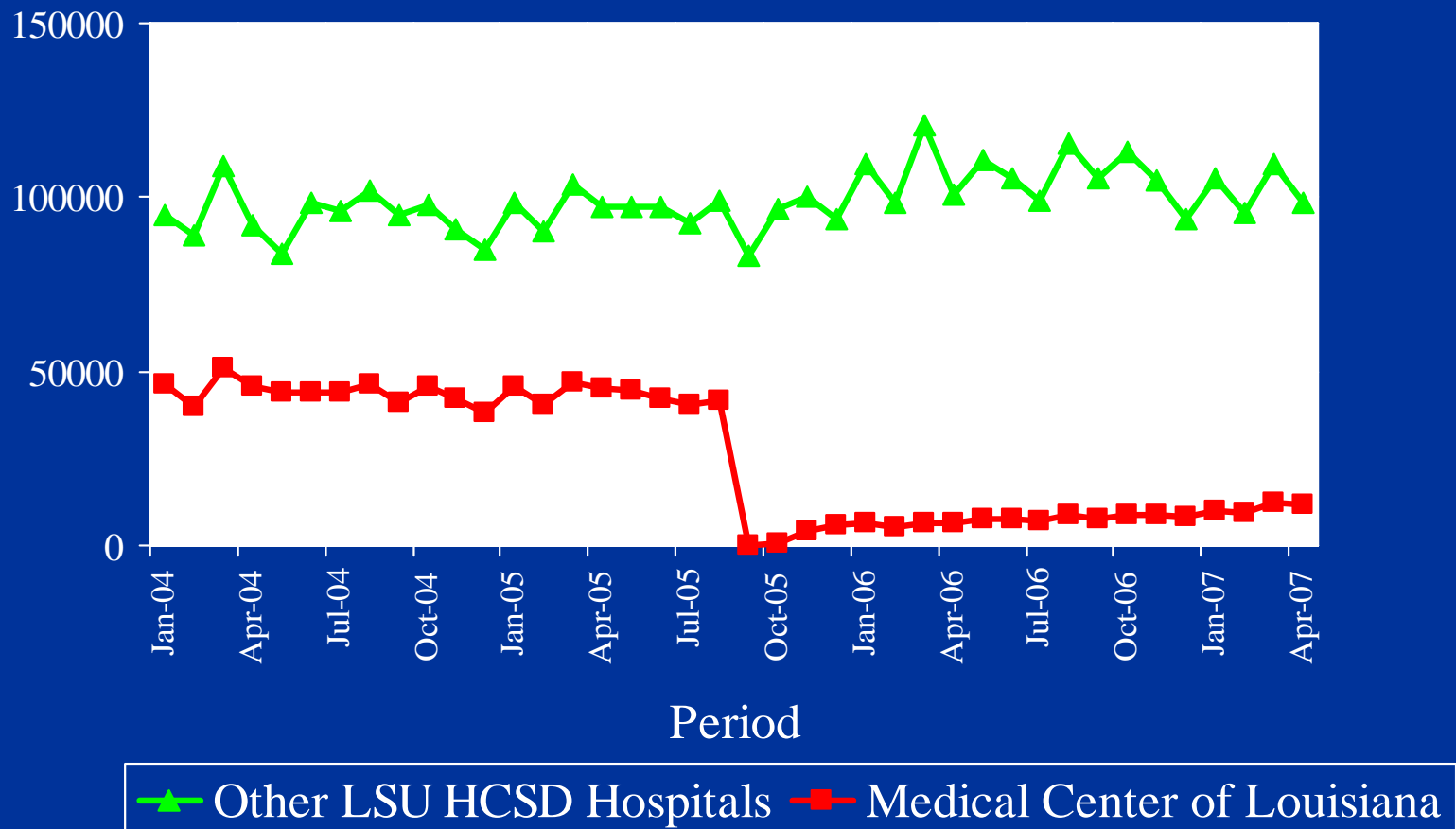


# Figure 5. Percent Elderly Patients (age $\geq$ 65 years) in LSU Hospitals



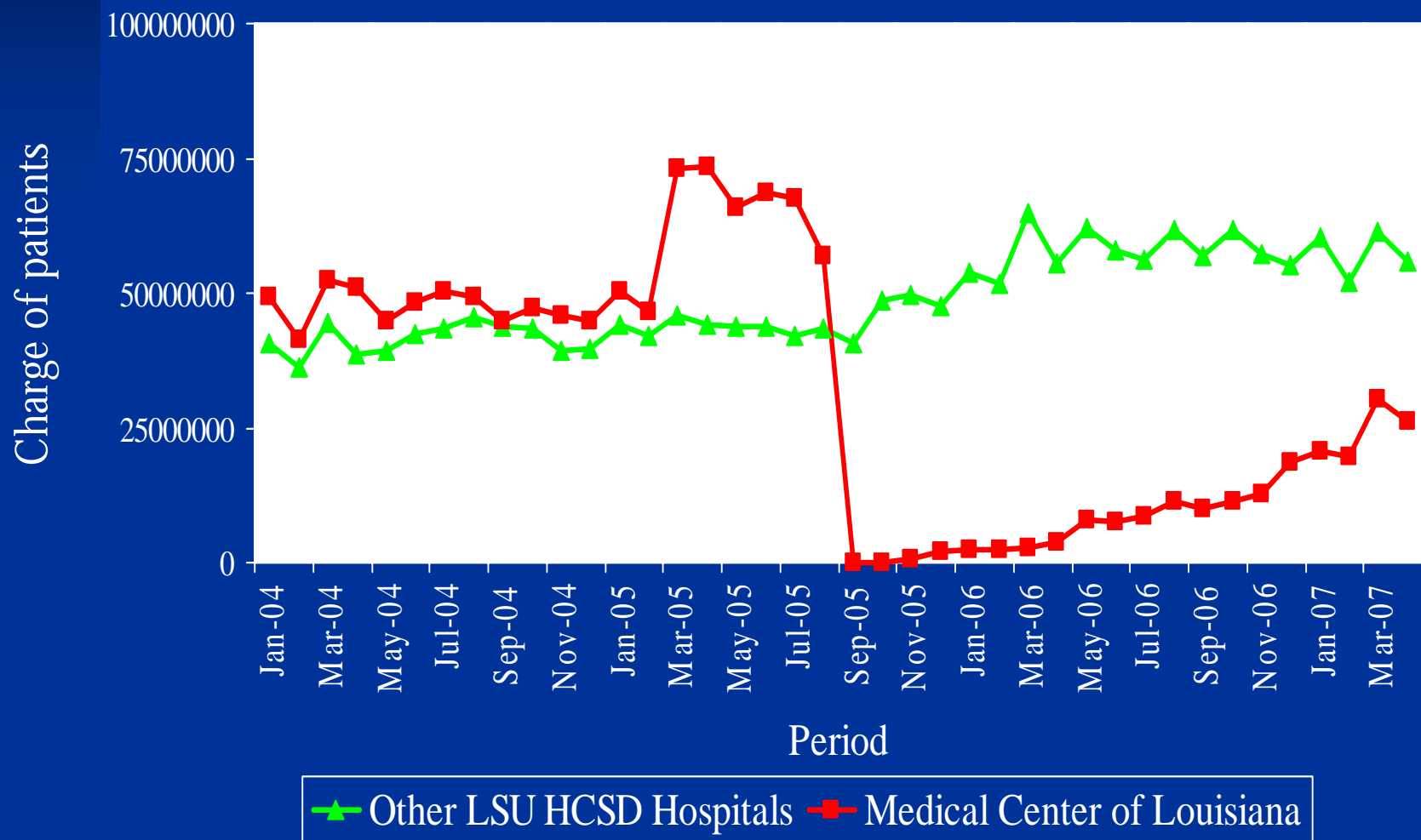
Source: LSU Hospitals, Health Care Services Division.

## Figure 6. Patient Visits in LSU Hospitals



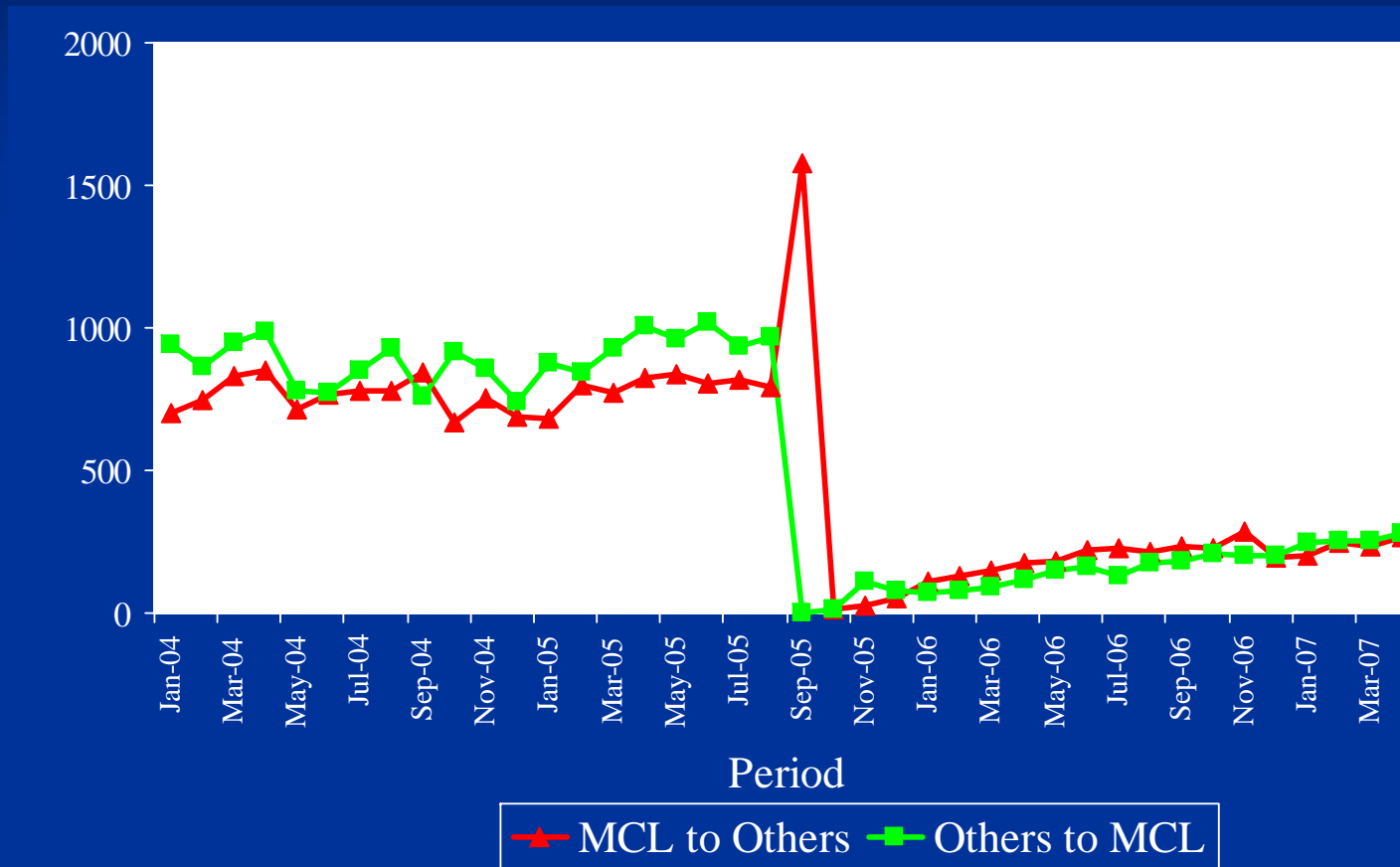
Source: LSU Hospitals, Health Care Services Division.

## Figure 7. Patient Charges in LSU Hospitals



Source: LSU Hospitals, Health Care Services Division.

## Figure 8. Patient Transfers in LSU Hospitals



Source: LSU Hospitals, Health Care Services Division.

## Conclusions

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- The results show that the impact of Hurricane Katrina to public health is severe and lasted a long time (until now).
- No effect on LSU Hospitals was found for Hurricane Rita.
- African-American, elderly, and women are most vulnerable;
- MCL (New Orleans) had more impact than other hospitals.
- Solutions to problems may follow from analyses, such as short-term reallocation of key resources and the long-term selection of optimal locations to build or re-build hospitals.
- Solutions to the problems are not only related to the hospital system, but also to the process of re-building New Orleans.



# Potential Work for Future

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- The results from data extraction can be drilled down to get specific and detailed information, such as on key diseases and/or how the patient movements may be caused by evacuations.
- Data from other sources should be applied to track the patients' movement and in-system transfers, so that locating and re-building the LSU HCSD Hospitals can be optimized.

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- USGS. (2005). Hurricane and Extreme Storm  
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