Epidemiologic Challenges in a Post-Disaster Environment: The New Orleans Healthy Home Project:

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a global commitment to public health

Objectives : N.O. Healthy Home Project

- To obtain prevalence estimates of home health hazards in a sample of homes in New Orleans, Louisiana.

- To identify neighborhood characteristics that are predictive of health and/or environmental hazards, independent of individual characteristics, in order to identify high-risk areas of the city.

Specific Aims

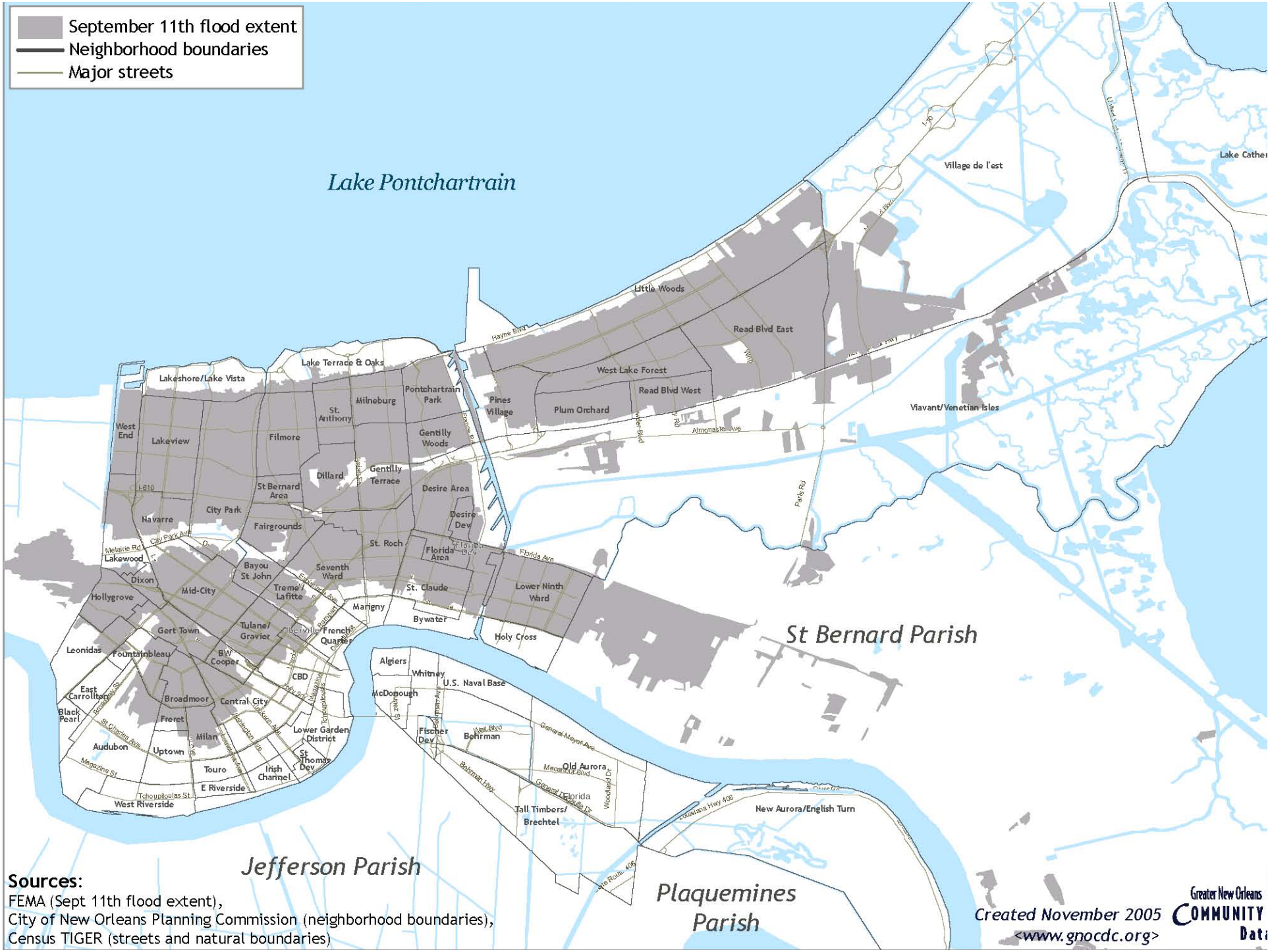
- To quantify the prevalence of allergens, gases and moisture-related health hazards in the home.
- To explore the relationship between housing related health hazards and the presence of asthma and allergies.
- To explore regional differences in home allergen, mold, NO_2, lead, and endotoxin by comparing study results from The National Survey of Lead and Allergen in Housing (NSLAH).

Hurricane Katrina

- Hurricane Katrina made landfall near New Orleans on August 29, 2005.

- 80% of the city and 120,000 homes flooded.[1]

1Solomon GM, Hjelmroos-Koski M, Rotkin-Ellman M, Hammond SK. Airborne mold and endotoxin concentrations in New Orleans, Louisiana, after flooding, October through November 2005. Environ Health Perspect 2006;114(9):1381-6. 2The Brookings Institution Metropolitan Policy Program. Summary of Findings: January 2007. The Katrina Index. (Accessed January 24, 2007, at http://www.gnocdc.org.)



Specific Aims

- Additional Aims:
- To describe environmental health risk perceptions of New Orleans residents after Hurricane Katrina.
- To describe individual and neighborhood levels of psychosocial stressors.

Study Design

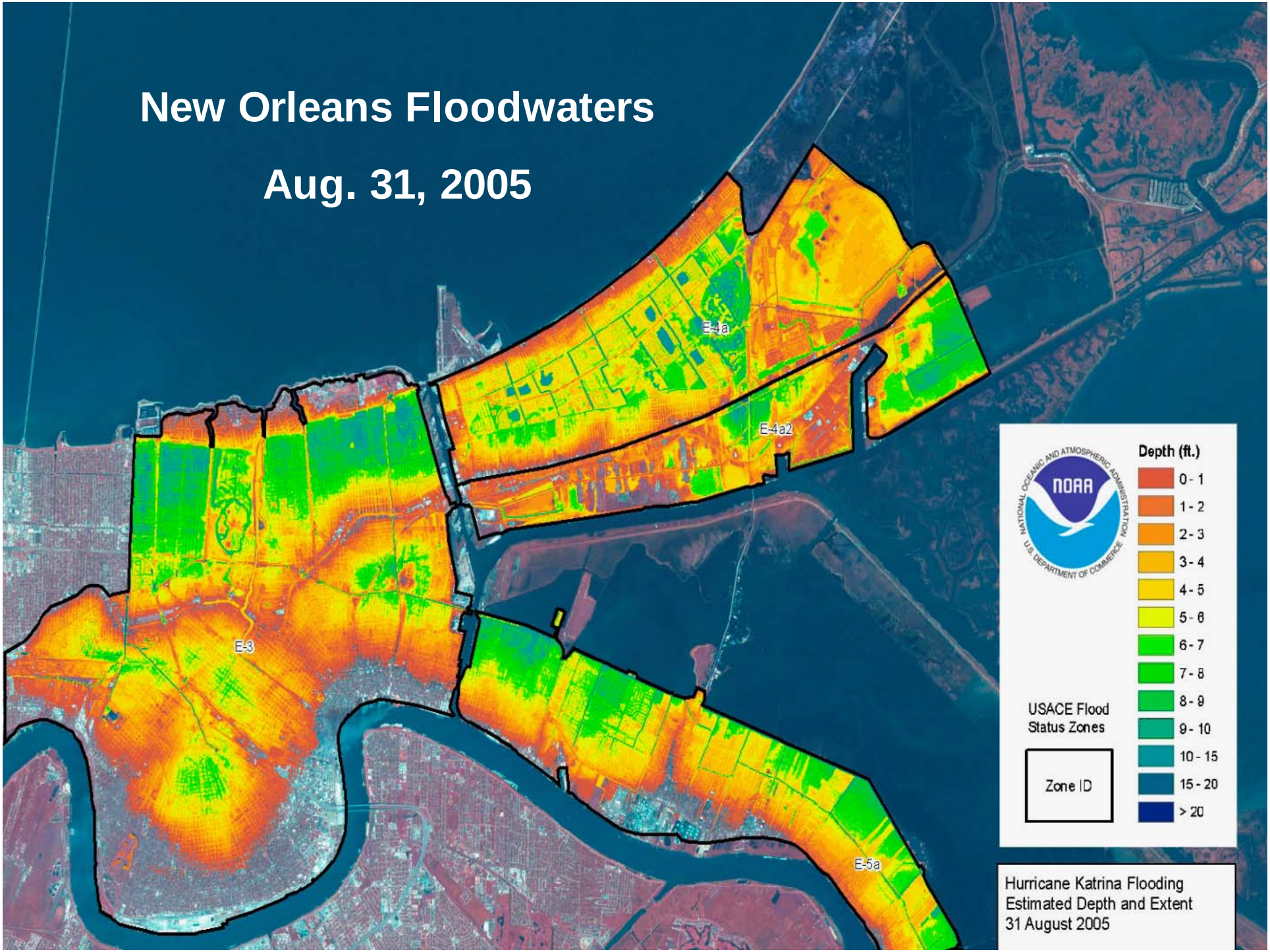
- 3 year cross-sectional study of residential-based health and environmental hazards.

Challenges

1. Target Population
2. Sampling Frame
3. Sampling Procedure
4. Response Rates
5. Interpretation

1. Target Population

- Issues to consider:
  - Areas to exclude
  - Repopulation is dynamic and unpredictable
- Decision:
  - All homes in repopulated areas of NOLA
    - (occupied housing in New Orleans)
    - Recruit using a “wave-in” pattern to capture dynamic nature of repopulation
    - Exclude –
      - New Aurora/English Turn, Venetian Islands, and Village de L’est
      - FEMA trailers



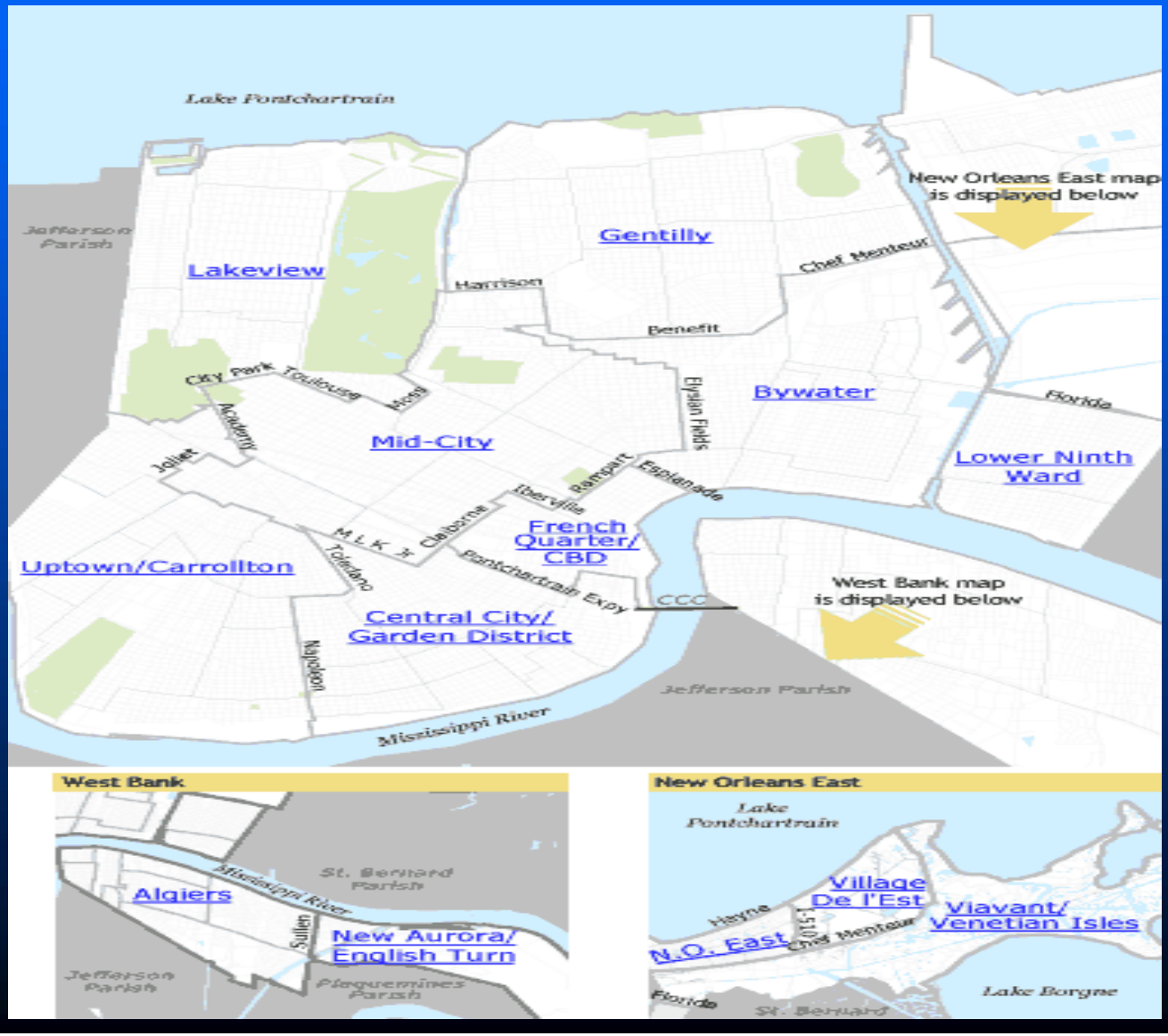
2. Sampling Frame

- Sewage and Water Board (SWB) Database
  - Obtained from the Louisiana Public Health Institute (LPHI)
- Advantages
  - Completeness
    - One water provider
    - Universal coverage
- Disadvantages
  - Errors, errors and more errors
  - Other options?
  - Time frame

3. Sampling Procedure

- Sample size
  - n = 100 households – based on funding
    - Estimated precision based on p (with detectable mold) = 20/80: ± 8.0 %
- Sampling Strategy
  - Stratified Random Sample (probability sampling)
- Population occupancy rate estimates, stratified by ten Planning Districts (PD), were provided by the Rapid Population Estimate (RPE) (LPHI, January 2006)

3. Sampling Procedure: Stratification Unit



3. Sampling Procedure

- SWB database was geocoded to census tract, then assigned to a Planning District.

- US Census 2000 data and post-Katrina occupancy estimates (from the Rapid Population Estimate) were combined to develop sampling parameters.

e2 To be more accurate - didn't we do proportionate stratification in most areas, and disproportionate sampling in heavily flooded areas (ie 1 from the 9th ward when there would have been 0) proportionate stratification - strata sample sizes are proportionate to strata population sizes.
eholt, 10/24/2007

3. Sampling Procedure

- Assumption: The repopulation of N.O. will (eventually) be a function of both pre-Katrina occupancy patterns and the amount of devastation.

- Allocation fraction per PD = Total # occupied housing units in PD / Total # occupied housing units Orleans Parish

  - Total # occupied housing units in PD = Proportion overnight occupancy per PD (LPHI) times the number of pre-K housing units (2000 Census) per PD.

3. Sampling Procedure

- EXAMPLE: 56% of French Quarter (FQ) is occupied (RPE).
- Total # occupied housing units in FQ ~ 3,267 units (.56 x 5881 total occupied units (2000 Census)).
- Total # occupied housing units Orleans Parish ~ 64481 (RPE)
- Allocation fraction for FQ = 3267/64481 = .0507
- FQ has 5% of total occupied HU. So, 5% of our sample will come from the French Quarter.

3. Sampling Procedure : Results
Sample size stratified by Planning District

- Sample size needed per PD based on PD population estimates from the Summer 2006 Rapid Population Estimate Survey and 2000 New Orleans census data.

Planning District (Number)	House to be enrolled
French Quarter/CBD (1)	5
Garden District/Central City (2)	20
Uptown/Carrolton (3)	26
Mid city (4)	11
Lakeview (5)	3
Gentilly (6)	3
Bywater (7)	6
Lower 9th (8)	1
New Orleans East (9)	1
Algiers (12)	24
Total Sample Size	**100**

Sampling Procedure :
Number of Addresses Pulled from the Sampling Frame

- In order to achieve the required sample size (n=100), the number of addresses pulled for recruitment took into account anticipated non-response and vacancies. The following formula was used.

$$N_t = \sum_{k=1}^{10} n_k o_k r$$

Where,

N_t = Total number of addresses pulled

n_k = Required sample size per stratum

o_k = Stratum - specific occupancy indicator

r = 5 (20% response rate)

3. Sampling Procedure
Recruitment

- To enroll 5 housing units from FQ, we need 45 randomly selected addresses from the sampling frame. This is determined by taking the occupancy rate in FQ (inverse occupancy indicator = 1/56=1.8) and a 20% response rate (e.g. 5*1.8*5 =45).
- A total of 1638 addresses were randomly selected to achieve the sample size of 100. We sampled without replacement.
- The areas with negligible occupancy (lower 9th ward, NO East) were over-sampled to ensure representation.
- Households will be recruited dynamically in five quarterly waves.

4. Response Rates
Determining the denominator

- Sampling frame was a flat file of all housing units receiving water service in Orleans Parish. Pre-K dataset (occupied and unoccupied).

- Occupancy Status had to be determined.
  - All study materials were hand delivered.
  - At the time of drop off, field staff determined the occupancy status of each house
  - Each household's occupancy was determined based on a 21-item occupancy criteria.
  - Based on those criteria, occupancy was designated 1 – 7
  - Denominator for response rates are based on this designation.

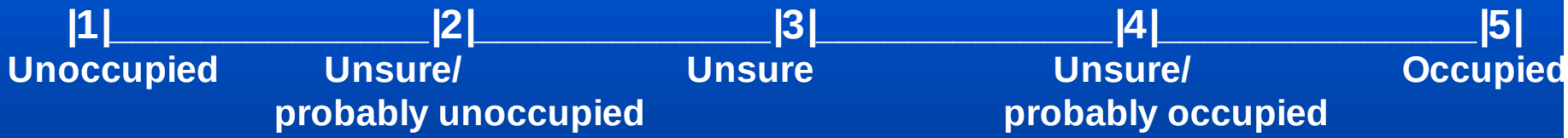
Occupancy (circle one)
1- Unoccupied
2-Unsure/Unocc.
3-Unsure
4-Unsure/Occ.
5-Occupied
6-No address
7-Business

4. Response Rates
Occupancy Protocol

1. Knocked on door, received an answer
2. People seen living in the house
3. Pets seen in the house
4. A/C running
5. Hear TV/radio or people inside
6. Confirmation of occupancy from neighbor
7. Water/electricity meter running
8. Curtains/blinds in windows and doors/windows intact
9. Lights/fans/furniture visible from windows and looks like occupied
10. Lawn/garden maintained, live plant on porch, porch furniture looks to be un use
11. Mail in box (no pile up)
12. Newspaper outside (no pile up)
13. Car in driveway
14. Garbage can new & filled not w/ renovation debris
15. Other evidence of inhabitance or recent activity
16. Neighbor unsure of occupancy but thinks there may be residents
17. There is a blue phone box outside
18. There is a cable connection line going towards the house
19. It is obviously unoccupied
20. Looks abandoned or unremediated
21. House not there

4. Response Rates Occupancy Protocol

Do you believe the house is:



*** DROP A LETTER IF YOU BELIEVE THE HOUSE IS 2-5***

Occupancy Protocol: Example

Uptown		
Occupied	**Frequency**	**Percent**
Unoccupied	58	41.43
Unsure/Probably Unoccupied	0	0.00
Unsure	7	5.00
Unsure/Probably Unoccupied	0	0.00
Occupied Residence	**56**	**40.00**
No address	15	10.71
Business	4	2.86

Gentilly		
	Frequency	**Percent**
Unoccupied	81	74.31
Unsure/Probably Unoccupied	0	0.00
Unsure	8	7.34
Unsure/Probably Unoccupied	0	0.00
Occupied Residence	**13**	**11.93**
No address	6	5.50
Business	1	0.92

How are we doing?

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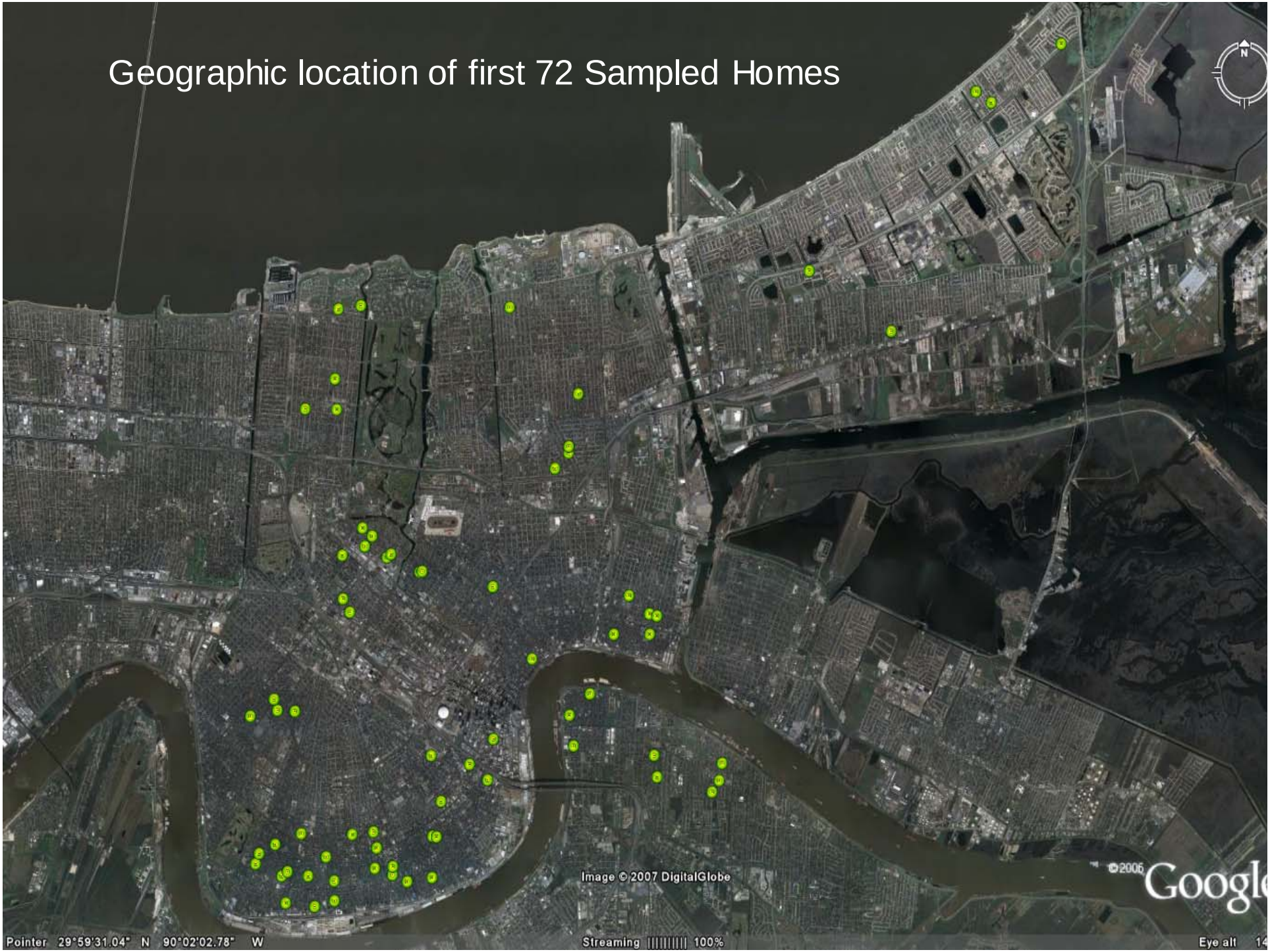
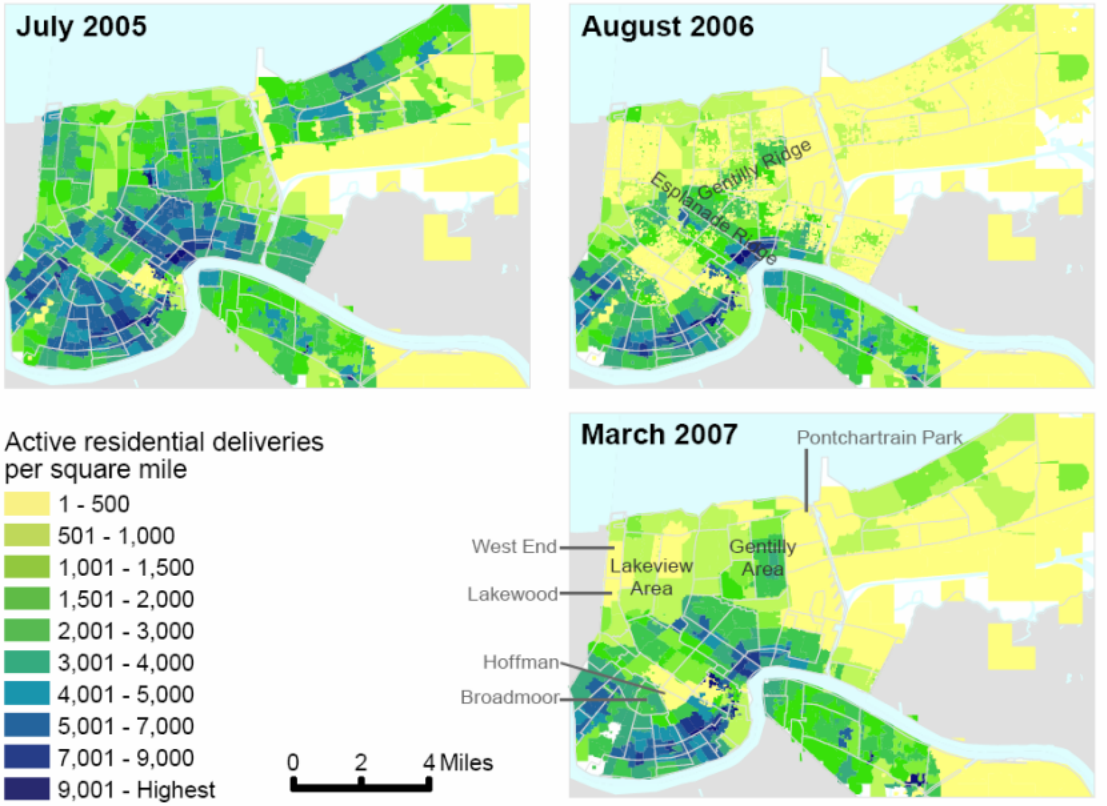
- The good news:
  - We have enrolled 77 households

Geographic location of first 72 Sampled Homes



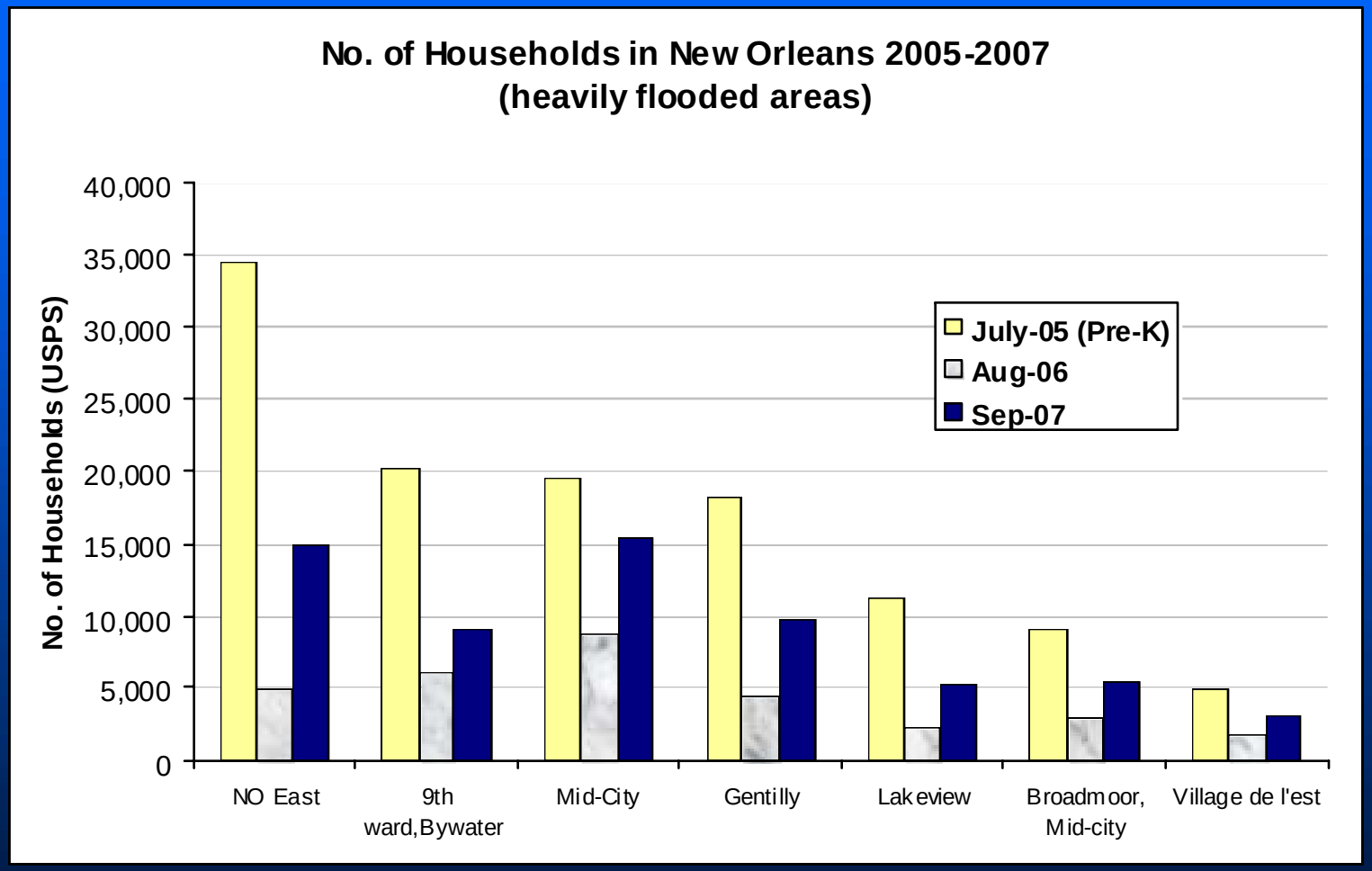
AND THE NOT SO GOOD NEWS…..

Figure 3: Density of postal counts across New Orleans neighborhoods



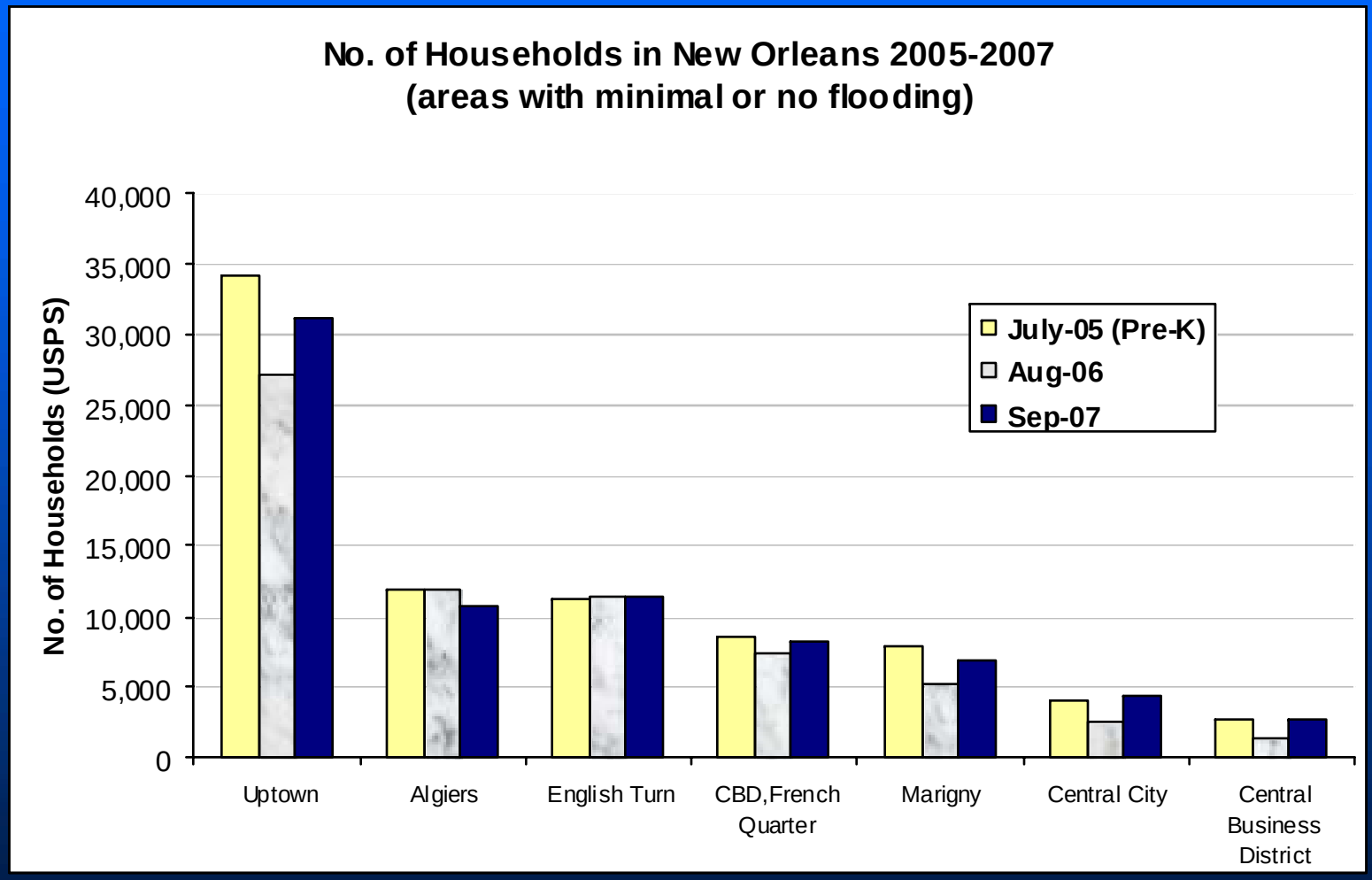
Sources: Postal counts and carrier routes (Sammamish DataSystems compiled from the USPS Delivery Statistics Product), neighborhoods (New Orleans City Planning), other boundaries (Census TIGER)

Dynamic Population



SOURCE: Greater New Orleans Community Data Center www.gnocdc.org

Dynamic Population, cont'd



SOURCE: Greater New Orleans Community Data Center www.gnocdc.org

How are we doing?
Response Rates

PD	# dropped	Response Rate(2-5)	Response Rate(5)	# needed	# Recruited
French Quarter	10	10.0%	11.00%	5	1
Central City/Garden	57	28.0%	29.60%	20	16
Uptown/Carrolton	63	26.9%	29.30%	26	17
Mid-City	66	16.7%	21.10%	11	11
Lakeview	14	28.6%	30.70%	3	4
Gentilly	17	35.2%	40.00%	3	6
Bywater	26	19.2%	22.70%	6	5
9th Ward	2	0.0%	0.00%	1	0
N.O. East	54	9.2%	13.90%	1	5
Algiers	80	12.5%	15.10%	24	10
Total	**389**			**100**	**75**

How are we doing?
Response Rates

- Next Step: Analyzing non-response
  - Target recruitment to non-responders, new letters
  - Compare sample characteristics to known population characteristics (socio-demographic)
  - Interview respondents
  - Interview non-responders……..

5. Interpretation

- If interviews with responders reveal there is systematic respondent selection, then the sample we derive may be closer to a convenience sample than a probability sample.

- Interpretation:
  - preliminary results
  - Approximation of the truth

Summary

- Probability sampling in a post-disaster environment poses unique challenges. We developed a probabilistic method to obtain a representative sample. This approach may help ensure greater representation of New Orleans households with a smaller sampling error.
- However, dynamic repopulation coupled with low response rates, makes representativeness questionable.
- Other options are less time consuming and less expensive. These include:
  - Cluster sampling
  - Non-probability sampling methods

Acknowledgements

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