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From: Teresa Ann Morrison MD, MPH, EIS Officer, Air Pollution and Respiratory Health Branch (APRHB), Division of Environmental Hazards and Health Effects (DEHHE), National Center of Environmental Health (NCEH)

Subject: Epi-AID Trip Report: Assessment of health complaints among pediatric residents living in FEMA temporary housing in Hancock County, Mississippi

To: Douglas H. Hamilton, MD, PhD, Director, Epidemic Intelligence Service, Office of Workforce and Career Development (OWCD)

Through: Michael A. McGeehin, PhD, MSPH, Director, EHHE, NCEH;
Paul Garbe, DVM, MPH, Chief, Air Pollution and Respiratory Health Branch (APRHB), EHHE, NCEH

INTRODUCTION

Primary care pediatricians from Hancock County, Mississippi reported an increase in the number of visits for respiratory illnesses among their patients who were then living in Federal Emergency Management Agency (FEMA) temporary housing units following Hurricane Katrina compared with the number of visits for respiratory illnesses of these same patients prior to Hurricane Katrina. These pediatricians questioned whether general indoor air quality issues related to temporary housing unit occupancy might have been a reason for the apparent increase in respiratory visits.

In response to these reports, the Mississippi State Department of Health (MS DOH) contacted CDC on October 5, 2007 to request epidemiologic assistance to determine whether the number of visits for indoor air quality-related illnesses had increased in the pediatric population of Hancock County, Mississippi after Hurricane Katrina compared with the number of visits for indoor air quality-related illnesses in the same pediatric population prior to Hurricane Katrina. Furthermore, MS DOH wanted to determine how the number of visits for indoor air quality-related illnesses among the pediatric population living in FEMA temporary housing units compared with the pediatric population not living in FEMA temporary housing units.

On November 1, 2007, Teresa Morrison, MD, MPH, EIS Officer, Shahed Iqbal, PhD, MPH, EIS Officer, and Colin Ligon, CDC Experience Fellow departed for Hancock County, Mississippi to assist the MS DOH in conducting this epidemiologic investigation. The objectives for this investigation were (1) to characterize the visits for indoor air quality-related illnesses in the pediatric population of Hancock County, Mississippi before and after Hurricane Katrina, and (2) to characterize these visits with regard to temporary housing unit occupancy.

BACKGROUND

On August 29, 2005, the Gulf Coast of Mississippi suffered severe destruction from Hurricane Katrina. After making landfall along the Louisiana/Mississippi state line, the eye wall of the hurricane drove a 27-foot storm surge 6 to 12 miles inland with sustained wind speeds of 120 mph over the coastal cities of Waveland and Bay St. Louis in Hancock County, Mississippi.¹ Beachfront neighborhoods along U.S. Highway 90 in Hancock County, Mississippi were completely destroyed, as were 90% of the structures a half of a mile inland from the coast. The homes of thousands of residents were severely damaged or completely destroyed, creating an unprecedented need for temporary housing.²

In response to the immediate need for temporary housing, FEMA provided temporary housing units in the form of travel trailers or mobile homes. These temporary housing units were placed on public property, in travel trailer/mobile home parks, and on private property in inspector-approved sites.^{3,4} Within 10 months of the storm, nearly 103,000 people were housed in more than 38,000 FEMA-provided travel trailers or mobile homes.⁵ To retain occupancy in these temporary housing units, FEMA and the Mississippi Emergency Management Agency (MEMA) required occupants to (1) demonstrate continued temporary housing needs, and (2) develop and pursue permanent housing plans.⁶ As of April 9, 2008, more than 34,000 temporary housing units have been deactivated. However, approximately 8,000 occupied temporary housing units remain in Mississippi. Of these, 1,472 (1,291 travel trailers, 181 mobile homes) are in Hancock County, Mississippi.⁷

METHODS

Study Design and Inclusion Criteria

The widespread destruction caused by Hurricane Katrina resulted in an unmeasured migration of the population of Hancock County, Mississippi. Hurricane-related flooding caused the loss of

thousands of medical records and destroyed the medical information systems of many health care facilities. Even near the end of 2007, more than two years after the hurricane, the health care facilities in Hancock County were still recovering from this destruction. The lack of pediatric population estimates and a comprehensive sampling frame limited the scope of appropriate epidemiologic study designs. Given these circumstances, we conducted a case series investigation of the pediatric population (2 to 12 years of age) who resided in Hancock County, Mississippi both prior to and following Hurricane Katrina from August 29, 2004 to August 28, 2007 and visited a health care facility in Hancock County, Mississippi to investigate illnesses that might be related to an indoor air quality issue during this period. We selected these indoor air quality-related illnesses based on a scientific literature review by the Institute of Medicine on health outcomes associated with indoor air quality-related issues.⁸

A child was included in the study if:

- 1) Hancock County was their primary residence for the total study period (the year before and through the two years after Hurricane Katrina);
- 2) the child was between 2 and 12 years of age at the start of the study period (August 29, 2004); and
- 3) they had at least one study-related health care visit during the study period before Hurricane Katrina (August 29, 2004 to August 28, 2005).

The data collection for this investigation had two components: 1) a chart abstraction component to obtain medical information from each health care provider on health care visits, and 2) a telephone interview component to obtain information from parents/guardians on temporary housing unit occupancy after Hurricane Katrina and on place of primary residence for the year prior to Hurricane Katrina (August 29, 2004 to August 28, 2005) and for the two years after Hurricane Katrina (August 29, 2005 to August 28, 2007).

Chart Abstractions

Case Definition

A case-patient for the purpose of chart abstractions was defined as any patient 2 to 12 years of age as of August 29, 2004, who was a resident of Hancock County and had been seen in a health care facility in Hancock County, Mississippi the year prior to Hurricane Katrina (August 29, 2004 to August 28, 2005) for an illness that might be related to an indoor air quality issue (as stated above). The medical chart information for the case-patients meeting these requirements was then followed over the three study periods to determine the total number of study-related visits that each case-patient made to health care facilities in Hancock County during each study period and to compare the total number of visits made by all case-patients between study periods.

The three study periods included:

- 1) August 29, 2004 to August 28, 2005 (year prior to Hurricane Katrina)
- 2) August 29, 2005 to August 28, 2006 (first year after Hurricane Katrina)
- 3) August 29, 2006 to August 28, 2007 (second year after Hurricane Katrina)

Chart Acquisition and Sampling

We requested patient queries and medical charts from all health care providers in Hancock County that were routinely seeing pediatric patients during all three study periods. At the onset of chart acquisition, we presented each health care provider with a document from the MS DOH explaining Mississippi's state code that authorizes the MS DOH to collect medical information (Appendix 1). These providers included the only hospital facility in Hancock County (Hospital A) and the four major pediatric practices in Hancock County (Practices A through D). Practice A's query and medical records were provided through Hospital A, and practice C's medical records were provided

through Hospital A. Practice B's and D's queries and records were provided through the management offices of their organizations. However, thousands of medical records/charts were completely destroyed or displaced as a direct result of the devastation caused by Hurricane Katrina. All of these health care facilities with the exception of Practice D lost thousands of records to flooding.

To identify case-patients, medical information specialists from each health care facility were asked to run a query based on the study inclusion criteria for age, residence, date of visit, and diagnosis. Health care visits with these diagnoses were identified using the International Classification of Diseases, Ninth Revision (ICD-9) coding system (Appendix 2). However, each facility's system had unique functionality issues that prohibited one query from including all the requested information. Practice B's and Practice C's medical information systems were destroyed by the effects of Hurricane Katrina. Practice B's new system could query only visits made after Hurricane Katrina by ICD-9 code, patient name, and date of birth. Practice C's new system provided only a list of patients in the practice after Hurricane Katrina. The medical information systems for Hospital A, Practice A, and Practice D had not been destroyed by the storm, but the systems' query could produce only patient's names by ICD-9 codes.

In addition to the limitation of identifying case-patients, it was uncertain at the start of the study as to when these charts would be available to us and whether all of the patients' records generated by electronic queries could be located. We therefore adopted a non-probability convenience sampling strategy. Because the lists generated by each practice contained a large number of patients ineligible for the study, we manually reviewed each available chart to determine if the patient was eligible for participation. From Hospital A, 305 potential participants were identified and 112 charts could be retrieved. We included all patients who met the inclusion criteria (n=53). From Practice D, 473 potential participants were identified by an electronic query that included duplicate names as part of

the count; we included all eligible patients (n=108). Medical records from Practice A, Practice B, and Practice C were not available to us until the end of our three weeks on site, and hence, a comprehensive review of every single chart was not possible. From Practice A's electronic records, we identified more than 600 patients as potential participants based on their visit dates. We sampled every fifth record from the list, and replaced an ineligible patient with the next patient on the list. This process was repeated once the list was exhausted. A total of 71 patients were eligible and included from the sampled charts from Practice A. From Practice B, 151 potential participants were identified. We sampled every fifth record without replacement. A total of 18 patients were eligible and included from Practice B. Since no query result based on our inclusion criteria was available from Practice C, we randomly selected charts not destroyed by Hurricane Katrina for review. We reviewed 66 charts from Practice C and included a total of 14 patients. In all, a total of 264 case-patients were included for call back-interviews. We cross-referenced electronic data from each facility to identify all case-patients within and between facilities for duplicates or missed visits.

Data Collection, Integrity, Confidentiality

We used a standardized chart abstraction form (Appendix 3) to collect information on demographics, residential history, health care visits, hospitalizations, comorbidities, prescribed medications, and diagnostics. We used separate chart abstraction forms for each study period and recorded date and visit type for both primary diagnoses and secondary symptoms. We manually checked twenty percent of entered data for completeness and correctness. We kept all abstraction forms in a locked area with key-limited access and entered all questionnaire results into a password-secured ACCESS database with daily computer drive back-up. We conducted all data analysis in ACCESS using study identification numbers to ensure confidentiality.

Call-Back Interviews

After completing the chart abstractions, we attempted to contact each case-patient's parent/guardian to conduct a telephone interview. To maximize the number of completed interviews, we made every attempt to accommodate the schedules of the parents/guardians for the case-patient. Before considering possible participants unreachable and thus excluded from the investigation, each interview was attempted on at least 12 separate occasions unless the parent/guardian declined the interview, or all contact numbers had been disconnected. Contact numbers attempted included all phone numbers for parents/guardians (home, work, and cell) and all emergency contacts for other family members or friends listed on the charts. Interviews were attempted at different times of day and on different days of the week when parents/guardians were likely to be available, such as late in the afternoon and on weekends. Interviews were postponed and re-attempted on specific days and at specific times to accommodate the respondent's schedule. Frequently, interviews were completed late in the evening or on weekends.

Data Collection, Integrity, Confidentiality

All interview attempts and outcomes were recorded on a daily telephone log (Appendix 4). We conducted each interview using a standardized questionnaire (Appendix 5) to collect information on place of residence, type of housing, and number of visits for illnesses and location of health visits outside Hancock County for each study period. Interviews were conducted in English or Spanish based on the respondent's preference. We manually checked twenty percent of entered data for completeness and correctness. We kept all questionnaires locked in a file drawer with key limited access. We conducted all data analyses using study identification numbers to ensure the case-patient's confidentiality and entered all questionnaire results into a password secured ACCESS database with daily computer drive back-up.

Data Analysis

Data on case-patients having complete information on both chart abstraction and call-back interviews were included for final analysis. Each case-patient's information obtained from the chart abstraction form was merged with the call-back interview form, and final eligibility as a study participant was determined based on the verification of all inclusion criteria.

Visit and Symptom Frequencies

We grouped the 28 symptom categories identified by ICD-9 codes on the chart abstraction form (Appendix 3) into five general categories for analysis by primary diagnosis and secondary symptoms:

- upper respiratory (symptoms 4, 5, 12, 13, 15, 22, and 23)
- lower respiratory (symptoms 2, 9, 11, 18, 20, and 28)
- allergy (symptoms 3, 6, 7, 8, 10, 14, 16, 21, 24, 25, and 26)
- abdominal (symptoms 1, 19, and 27), and
- headache (symptom 17).

Cough (symptom 15) is a general respiratory symptom that can result from either upper or lower respiratory tract conditions. Inclusion of cough in either group did not alter the findings.

Only the primary diagnoses from physician's office/clinic/hospital visits are included in this report because secondary symptoms were not consistently recorded in all the medical charts.

Sociodemographic characteristics of all potential participants (N=264), all participants who completed the study (N=144), and participants living in temporary housing units (N=96) were reported. We calculated frequency distributions for all symptom categories and mean, median and ranges for days of evacuation and number of visits for all periods. Symptom and visit frequencies were stratified by temporary housing unit occupancy and asthma status. In order to determine whether findings are consistent when similar inclusion criteria are applied to visits that occurred

after Katrina (i.e. study participants were required to have had at least one visit during the year before Hurricane Katrina), we also conducted subgroup analyses on study participants who had at least one visit for both the pre- and second year post-Katrina periods (N=120).

Statistical Testing

Although all the required assumptions for random sampling and independence of samples were likely not met, for completeness, we conducted statistical significance testing between subgroups. Stratifying by temporary housing unit occupancy, Chi-square statistics were used to compare frequency of each study participant's visits in the year before Hurricane Katrina to the second year after Hurricane Katrina. Using non-parametric methods (Wilcoxon rank sum test), we also compared the distributions of change in frequency of visits from the year before and the second year after Hurricane Katrina stratified by temporary housing unit occupancy.

RESULTS

Study Participation

Chart Abstractions

After reviewing 934 charts collectively from Hospital A and the four pediatric practices, we collected data for 264 (28.3%) case-patients that met all inclusion criteria for chart abstractions.

Call Back Interviews

We attempted to contact by telephone the parents/guardians for all 264 case-patients. Among these, 168 (63.6%) completed interviews, 16 (6.1%) declined interviews, 44 (16.7%) had disconnected phone lines, and 36 (13.6%) could not be contacted after 12 attempts.

Data Analyses

Among the 168 case-patients with completed call-back interviews, 24 case-patients (14.3%) were reported by their parents/guardians not to be primary residents of Hancock County, Mississippi for both the year prior to Hurricane Katrina and for the two years following Hurricane Katrina. These 24 case-patients were excluded from analysis. Accordingly, this report includes analyses of data for 144 study participants (85.7%) who met all inclusion criteria for age, date of visit, type of visit and place of residence.

At the beginning of the study, an estimated 31.9% of study participants were 2 to 4 years of age, 45.1% were 5 to 8 years of age, and 22.9% were 9 to 12 years of age; 56.3% were male; 93.1% were white; and 55.6% had private insurance. The study participants had a mean age of 69.6 months (standard deviation 33.2 months). In comparison with the overall group of participants in the study, a greater proportion of those who had lived in temporary housing units had Medicaid (vs. private insurance) (50.0% vs. 40.3%) (Table 1).

Among the 144 study participants, 116 (80.6%) evacuated due to Hurricane Katrina and remained evacuated for a median duration of 21 days (range 1 to 319 days). Thirty-seven (25.7%) study participants lived in a hurricane-affected house for a median duration of 91 days (range 1 to 729 days) before it was repaired. Ninety-six (66.7%) study participants lived in a temporary housing unit. Among the 96 study participants who lived in temporary housing units, 87 (90.6%) participants lived in a travel or park model trailer at some time and 15 (15.6%) participants lived in a mobile home at some time during their temporary housing unit occupancy. Among the 87 study participants who lived in a travel or park model trailer at some time during their temporary housing unit occupancy, the median duration of occupancy was 13 months (range 1 to 23 months); and among the 15 study participants who lived in a mobile home at some time during their temporary

housing unit occupancy, the median duration of occupancy was 12 months (range 5 to 22 months) (Table 2).

All 144 study participants had at least one study-related visit in the year before Hurricane Katrina (a study criterion), and 120 (83.3%) participants had at least one visit in the second year after Hurricane Katrina. The total number of study-related visits went down the year after the hurricane but returned to before-hurricane levels by the second year. The median number of visits for each study participant was 2.0 (range 1 to 19) in the year before Hurricane Katrina, 1.0 (range 0 to 9) in the first year after Hurricane Katrina, and 2.0 (range 0 to 15) in the second year after Hurricane Katrina (Table 3).

Among the 120 study participants in the case series who had one or more visits both in the year before Hurricane Katrina as well as in the second year after Hurricane Katrina, there was a tendency for study participants to have more visits overall and more visits resulting in lower respiratory diagnoses in the second year after Hurricane Katrina compared to the year before Hurricane Katrina. Sixty-two study participants had more visits, in contrast to 22 study participants with no change in number of visits and 36 study participants with fewer visits in the second year after Hurricane Katrina ($p = 0.003$) relative to the year prior to Katrina (Table 4).

Among all study participants, the highest proportion of visits resulted in upper respiratory diagnoses, with the highest proportion (62.8%) occurring in the year before Hurricane Katrina (August 29, 2004 to August 28, 2005). The proportion of visits resulting in lower respiratory (bronchitis-like) diagnoses increased in the second year after Hurricane Katrina (31.2%; August 29, 2006 to August 28, 2007), but not in the first year (22.4%; August 29, 2005 to August 28, 2006). Overall, the number of physician's office visits went down the year after the hurricane but returned to before-hurricane levels by the second year (Table 5).

Ninety-six (66.7%) study participants lived in or had lived in a temporary housing unit after Hurricane Katrina at the time of the interview; the remainder (33.3%) had not lived in a temporary housing unit after Hurricane Katrina. The pattern of visits for upper respiratory and lower respiratory symptoms followed the same pattern among study participants living in temporary housing units compared with those who had not lived in temporary housing units; namely, the proportion of visits for upper respiratory symptoms decreased in the second year following the hurricane compared to the previous two years and the proportion of visits for lower respiratory symptoms increased in the second year following the hurricane compared to the previous two years. Although study participants living in temporary housing units had higher proportions of emergency room visits for the year prior to the hurricane and for the second year following the hurricane compared with study participants not living in temporary housing units for the same time periods, the proportions for the first year following the hurricane were similar for study participants living in temporary housing units compared with study participants not living in temporary housing units (Table 6).

We studied participant-specific visit frequencies for the year before and the second year after Hurricane Katrina to estimate differences in number of visits. The proportion of participants in this case series with more visits in the second year after Katrina tended to be higher among those living in temporary housing units, than among those study participants not living in temporary housing units, but the difference (46.9% vs.35.4%) lacked statistical significance ($p=0.064$) (Table 7).

Wilcoxon rank sum tests were conducted to compare the distributions of change in frequency of visits from the year before and the second year after Hurricane Katrina. No significant differences were observed overall and for the number of visits with upper respiratory, lower respiratory, and allergy diagnoses. The results were similar when the sample was restricted to study participants who had at least one visit in both periods ($N=120$).

Thirty-six study participants (25%) were diagnosed with asthma prior to the study date of August 29, 2004 as reported from parents/guardians during call-back interviews. Among study participants diagnosed with asthma prior to the hurricane, the proportions of visits with a primary diagnosis for lower respiratory and allergy symptoms increased in the second year following the hurricane. Specifically, the proportion of visits with lower respiratory diagnoses increased from 32.5% to 41.5%, and the proportion of visits with allergy diagnoses increased from 11.4% to 19.5% when comparing the proportion of visits before the hurricane with the proportion of visits the second year after the hurricane. The proportion of visits with upper respiratory diagnoses among these study participants increased the first year after Katrina but decreased the second year after Katrina to below pre-Katrina proportions (the year before Katrina: 53.5%; the year after: 61.7%; second year after: 35.6%). The proportion of emergency room visits for these study participants increased the first year after Katrina compared with the year prior and with the second year after Katrina (Table 8).

Among the 36 study participants diagnosed with asthma before the study, twenty-four (66.7%) lived in or had lived in a temporary housing unit after Hurricane Katrina; 12 (33.3%) of these study participants had not lived in a temporary housing unit after Hurricane Katrina. Among the 24 study participants with asthma who lived in or had lived in a temporary housing unit after Hurricane Katrina, the proportion of visits with upper respiratory diagnoses increased the first year following the hurricane (63.2%) and decreased the second year (32.9%) following the hurricane compared with the year before the hurricane (50.7%), while the proportion of visits with lower respiratory and the proportion of visits with allergy diagnoses increased in the second year after the hurricane compared with the year before the hurricane (43.9% for the 2nd year after, and 39.0% for the year before the hurricane for lower respiratory diagnoses; 20.7% for the 2nd year after, and 9.1% for the year before the hurricane for the allergy diagnoses). While most of the visits over the three study

periods (87.7%-96.1%) were made to physician's offices, the proportion of visits made to emergency rooms did increase in the first and second years following Hurricane Katrina (12.3% the 1st year after, and 7.3% the 2nd year after) (Table 9).

Among the 12 study participants with asthma who did not live in a temporary housing unit after Hurricane Katrina, the proportion of visits for upper respiratory diagnoses decreased the second year following the hurricane compared with the year before and the first year after the hurricane (41.7% for the 2nd year after, 59.5 % for the year before and 58.3% for the 1st year after Katrina) and the proportion of visits for lower respiratory diagnoses increased in the first and second years after Katrina compared with the year before Katrina (37.5% for the 1st year after, 36.1% for the 2nd year after, and 18.9% for the year before Katrina). The proportion of visits with allergy diagnoses in these 12 study participants declined the first year after Katrina but returned to the pre-Katrina proportion by the second year after Katrina (4.2 % for the 1st year after, 16.2% for the year before Katrina, and 16.7% for the 2nd year after) (Table 9).

Fifty-one parents/guardians (35.4%) reported that their child made one or more health care visits outside of Hancock County during one of the three study periods (Table 10). Of these, most parents/guardians reported 1 to 3 visits for upper and lower respiratory illnesses at physician's offices outside of Hancock County during the first year after Katrina.

Parents/guardians reporting that some aspect of their study participant's health related to respiratory, skin, allergy, or stomach illnesses was different after Hurricane Katrina (n=122) said that in most cases (91%) it was worse (Table 11). Although we asked parents/guardians about their perception of their child's health after leaving the temporary housing unit, the parents/guardians interpretation of the question (e.g., leaving for the day or moving out of the unit) was uncertain; therefore, these data were not reported.

DISCUSSION

In response to reports from primary care pediatricians of an increase in the number of visits for respiratory illnesses among their patients who were then living in FEMA temporary housing units following Hurricane Katrina, we conducted a case series investigation of the pediatric population who resided in Hancock County, Mississippi both prior to and following Hurricane Katrina and visited a health care facility in Hancock County for an illness that might be related to an indoor air quality issue. We compared the proportion of visits for indoor air quality-related illnesses after Hurricane Katrina with the proportion of visits prior to the hurricane and characterized these visits with regard to temporary housing unit occupancy.

During the first year after Hurricane Katrina, the children in the case series had fewer visits for all diagnoses compared with the other two study periods. The overall decrease in the number of health care visits among these study participants may be attributed to the closure of health care facilities in Hancock County for a period of time for hurricane-related repairs and to the evacuation of most (80.6%) of the 144 study participants from 1 to 319 days after the hurricane. During this time, parents/guardians reported that their children visited health care facilities outside of Hancock County primarily for upper and lower respiratory symptoms. These self-reported health care visits could not be accounted for in the same manner as the health care visits documented in the medical records. Therefore, although we considered the clinical history and the frequency of visits among study participants to be informative with regard to the circumstances surrounding health care access during this period of recovery, we acknowledge these limitations and focus our comparisons of relative proportions of health care visits by diagnoses to the year prior to Katrina and to the second year after Katrina.

Among all children in the study, a decrease in the proportion of upper respiratory diagnoses and an increase in the proportion of lower respiratory diagnoses were observed in the second year after Hurricane Katrina, compared with the year before Hurricane Katrina. This pattern was consistent among subgroups of study participants when stratified by temporary housing unit occupancy or asthma status. This increase in the proportion of lower respiratory diagnoses may be due to the individual pre-dispositions of study participants, to sampling, or to some other factor and warrants further investigation.

Study participants who lived in temporary housing units tended to have more visits overall and for all symptom categories in the second year after Hurricane Katrina compared to study participants who did not live in temporary housing units, although none of the differences were statistically significant. However, sociodemographic factors may have contributed to these differences in number of visits as suggested by the high proportion of study participants with Medicaid insurance who lived in temporary housing units (Table 1).

Compared with the year before Hurricane Katrina, study participants with asthma who lived in temporary housing units had a higher proportion of visits with allergy diagnoses and a higher proportion of visits with lower respiratory diagnoses in the second year after Hurricane Katrina. Although study participants with asthma who did not live in temporary housing units had a higher proportion of visits for lower respiratory diagnoses, they did not have the increase in the proportion of visits with allergy diagnoses in the second year after Hurricane Katrina compared with the year before Hurricane Katrina as did the study participants with asthma who lived in temporary housing units. However, the duration of living in temporary housing units varied for these study participants, and a temporal relationship between living in temporary housing units and symptoms could not be established.

The strength of this analysis was our ability to obtain a comprehensive history of health care visits made by each study participant for the year prior to Katrina and the second year after Katrina. Despite the damage to medical information systems, we were able to cross-reference each study participant within and between the health care facilities to obtain medical information on all visits made to these health care facilities. To supplement the information obtained through chart abstractions, we also conducted telephone interviews with a parent/guardian of each study participant to determine the number of visits that each study participant made to other health care providers inside and outside Hancock County during these years.

Because of the circumstances related to the aftermath of Hurricane Katrina, this investigation had several limitations which must be considered when discussing and interpreting the results. First, destroyed records and disrupted information systems prevented inclusion of a large number of otherwise eligible children and the representativeness of included children relative to those not included is uncertain. Second, unknown factors likely influenced a family's decision to return to Hancock County after Hurricane Katrina, a criterion for eligibility, and could be associated with health outcomes potentially biasing comparisons. Third, only sick children who visited one of the five health care facilities at least once in the year prior to Hurricane Katrina were included, potentially biasing comparisons; however, these sick visits were presumably for acute illnesses in otherwise healthy children. Fourth, children were required to have at least one health care visit during the year before Hurricane Katrina and allowed to have no health care visits after Hurricane Katrina, potentially artificially creating an appearance of more visits before Hurricane Katrina than after Hurricane Katrina. On the other hand, concerns about environmental issues and respiratory symptoms among parents may have resulted in increased health care visits after Hurricane Katrina, another possible reason that may explain the observed pattern of visits. The nature and quantitative effects resulting from these issues are unmeasured and remain unknown. Fifth, the analysis was based on the primary diagnosis for each health care visit because secondary symptoms were not

always recorded, potentially leading to an underestimation of visits for other, more minor conditions. Sixth, the possibility of some degree of confounding by age exists because the 2 year age difference between the first and last study periods may have influenced the patterns. Seventh, absence of denominator information on the population at risk coupled with the unknown number of missing records, prevented calculation of population based rates; therefore, we focused our analysis on the distribution of proportion of visits. Eighth, some of the assumptions for the statistical testing were likely not met.

Some of the potential pitfalls in attempting to draw too many conclusions from this case series investigation are illustrated by an association seen in the data. Among study participants with asthma, the proportion of visits for lower respiratory diagnoses during the year before Katrina was higher (39.0%) for the 24 children who lived in temporary housing units after Katrina, than for the 12 children who did not live in temporary housing units (18.9%) (Table 9). This association could not be an effect of having lived in a temporary housing unit, as the visits had already occurred. If not due to chance or small numbers, it suggests the possibility of confounding or bias and underscores the difficulties in studying causal relationships in this situation. Therefore, we interpret the pattern of visits, and in particular differences between residents of temporary housing units and others, with caution.

SUMMARY AND CONCLUSIONS

1. Basic medical information systems in Hancock County were severely compromised by the effects of Hurricane Katrina, creating a particularly challenging environment for performing a retrospective investigation. The hurricane had a substantial impact on all aspects of the local health infrastructure, from physical structures to displacement of health care personnel to destruction of paper and electronic medical records. Two and a half years after the event, the area's medical capacity is still recovering. Even as services come back on line, including establishment of new record systems, reconstituting damaged records has not been (nor,

- given limited resources, should it be) a priority.
2. The number of health care visits per child remained the same for the two main periods, the year before Katrina and the second year after Katrina.
 3. The pattern of visits for upper and lower respiratory symptoms followed the same pattern for study participants living in temporary housing units as those who had not lived in temporary housing units.
 4. The proportion of health care visits for lower respiratory complaints increased in the second year following Hurricane Katrina. This pattern was seen in children living (or having lived) in temporary housing units as well as in children who had never lived in temporary housing units. This descriptive, retrospective case series investigation precludes a confident comparison of the proportions in both groups.
 5. The effects of living through Hurricane Katrina and the sequelae that continue to affect Gulf Coast communities are multifaceted and have affected children's health. Public health efforts during the community's continued recovery from Hurricane Katrina should address those that affect the health of the population and the health systems that serve them. Health care providers should continue to follow existing guidelines when evaluating and treating children with respiratory and allergy symptoms while remaining vigilant for indoor and outdoor environmental exposures related to disaster recovery.

Sincerely,



Teresa Ann Morrison MD, MPH
EIS Officer
Air Pollution and Respiratory Health Branch
Division of Environmental Hazardous and Health Effects
National Center of Environmental Health, CDC

REFERENCES

1. National Hurricane Center [Internet]. Tropical cyclone report Hurricane Katrina 23-30 August 2005; 2005 Dec 20 [updated 2006 Aug 10; cited 2008 Jan 8]; [43 p.]. Available from: http://origin.www.nhc.noaa.gov/pdf/TCR-AL122005_Katrina.pdf
2. Greater New Orleans Community Data Center [Internet]. Current housing unit damage estimates Hurricanes Katrina, Rita, and Wilma; 2006 Feb 12 [updated 2006 Apr 07; cited 2008 Feb 14]; [45 p.]. Available from: http://www.gnocdc.org/reports/Katrina_Rita_Wilma_Damage_2_12_06___revised.pdf
3. FEMA: Federal Emergency Management Agency [Internet]. Understanding the FEMA provided manufactured housing process; 2005 Oct 14 [cited 2008 Jan 8]; [about 2 screens]. Available from: <http://www.fema.gov/news/newsrelease.fema?id=19773>
4. FEMA: Federal Emergency Management Agency [Internet]. More than 5,000 families now housed in FEMA travel trailers; 2005 Oct [cited 2008 Jan 8]; [about 2 screens]. Available from: <http://www.fema.gov/news/newsrelease.fema?id=19620>
5. FEMA: Federal Emergency Management Agency [Internet]. Hurricane Katrina recovery update; 2006 Jun 9 [cited 2008 Jan 9; [about 2 screens]. Available from: <http://www.fema.gov/news/newsrelease.fema?id=26923>
6. FEMA: Federal Emergency Management Agency [Internet]. FEMA temporary housing occupants must have housing plan; 2006 Mar 27 [cited 2008 Jan 8]; [about 2 screens]. Available from: <http://www.fema.gov/news/newsrelease.fema?id=24523>
7. FEMA: Federal Emergency Management Agency [Internet]. FEMA continues to make progress in closing temporary housing sites; 2008 Apr [cited 2008 Apr 24]; [about 2 screens]. Available from: <http://www.fema.gov/news/newsrelease.fema?id=43179>
8. Institute of Medicine (U.S.), Committee on Damp Indoor Spaces and Health. Damp indoor spaces and public health. Washington DC: The National Academies Press; c2004. Chapter 5, Human health effects associated with damp indoor environments; p.183-255.

TABLES

Table 1: Demographic characteristics of study children

Characteristics	Charts abstracted (N=264)	Completed Study (N=144)	FEMA or Temporary Housing Unit Occupancy (N=96)
	n (%)	n (%)	n (%)
Age, yrs			
2 – 4	79(29.9)	46(31.9)	31(32.3)
5 – 8	123(46.6)	65(45.1)	40(41.7)
9 – 12	62(23.5)	33(22.9)	25(26.0)
Sex, boys	142(53.8)	81(56.3)	52(54.2)
Race			
White	229(86.7)	134(93.1)	90(93.8)
Black or others	26(9.8)	7(4.9)	4(4.2)
Missing	9(3.4)	3(2.1)	2(2.1)
Health insurance			
Medicaid	96(36.4)	58(40.3)	48(50.0)
Private or others	140(53.0)	80(55.6)	45(46.9)
Uninsured	26(9.9)	6(4.2)	3(3.1)
Missing	2(0.8)	0(0.0)	0(0.0)
Age, months (mean ±sd)	70.4(33.0)	69.6(33.2)	70.5(35.5)

Table 2: Duration of evacuation and housing occupancy for study participants (N=144)

Characteristics	Evacuated (n=116)	Lived in hurricane affected house before remediation (n=37)	Lived in temporary housing unit*	
			Trailers (n=87)	Mobile homes (n=15)
Duration		Days	Months	
Mean (\pm SD)	44.7 (61.2)	183.5 (194.0)	13.3 (6.9)	13.9 (5.5)
Median	21.0	91.0	13.0	12.0
Range	1-319	1-729	1-23	5-22

*Total of 96 people lived in temporary housing unit after Hurricane Katrina, and a few people lived in both trailers and mobile homes; numbers may not add up to 96

Table 3: Visits in Hancock County per study participant, by study periods

Characteristics	Year before Katrina (8/29/04 – 8/28/05) (n=144)	First year after Katrina (8/29/05 – 8/28/06) (n=144)	Second year after Katrina (8/29/06 – 8/28/07) (n=144)
Total visits	411 visits	272 visits	414 visits
Visits per study participant			
Mean	2.9	1.9	2.9
Median	2.0	1.0	2.0
Range	1-19	0-9	0-15

Table 4: Number of study participant's grouped according to whether they had more, the same, or fewer visits in the year before Katrina than in the second year after Katrina, restricted to study participants who had at least one visit in both periods (N=120)*

Characteristics	Children with more visits after Katrina n (%)	Children with no change in number of visits after Katrina n (%)	Children with less visits after Katrina n (%)	p-value[†] (more vs. less)
Overall	62 (51.7)	22 (18.3)	36 (30.0)	0.003 [§]
Primary diagnosis				
Upper respiratory	45 (37.5)	33 (27.5)	42 (35.0)	0.750
Lower respiratory	52 (43.3)	41(34.2)	27 (22.5)	0.005 [§]
Allergy	26 (21.7)	73 (60.8)	21 (17.5)	0.470

*Comparing pre-Katrina (8/292004 – 8/28/005) visits to visits during the second year after Katrina (8/292006 – 8/28/2007)

[†]Based on a binomial test with the null hypothesis that the proportion of children with more visits after Katrina equals the proportion of children with less visits after Katrina

[§]p-value<0.05

Table 5: Primary diagnosis and visit types for study participants (N=144), by study periods in Hancock County

Characteristics	Year before Katrina (8/29/04 – 8/28/05) n (%)	First year after Katrina (8/29/05 – 8/28/06) n (%)	Second year after Katrina (8/29/06 – 8/28/07) n (%)
Total visits	411 visits	272 visits	414 visits
Primary diagnosis			
Upper respiratory	258 (62.8)	162 (59.6)	217 (52.4)
Lower respiratory	92 (22.4)	61 (22.4)	129 (31.2)
Allergy	44 (10.7)	32 (11.8)	50 (12.1)
Abdominal	14 (3.4)	12 (4.4)	15 (3.6)
Headache	3 (0.7)	5 (1.8)	3 (0.7)
Visit type			
Physician's office	360 (87.6)	232 (85.3)	374 (90.3)
ER	46 (11.2)	36 (13.2)	37 (8.9)
Hospitalization	5 (1.2)	4 (1.5)	3 (0.7)

Table 6: Primary diagnosis and visit type, by temporary housing unit occupancy and study periods

Characteristics	Temporary Housing Unit Occupancy*					
	Yes (N=96)			No (N=48)		
	782 visits			315 visits		
	Year before Katrina ¹ (n=288)	First year after Katrina ² (n=195)	Second year after Katrina ³ (n=299)	Year before Katrina ¹ (n=123)	First year after Katrina ² (n=77)	Second year after Katrina ³ (n=115)
n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Primary diagnosis						
Upper respiratory	187 (64.9)	116 (59.5)	158 (52.8)	71 (57.7)	46 (59.7)	59 (51.3)
Lower respiratory	63 (21.9)	41 (21.0)	89 (29.8)	29 (23.6)	20 (26.0)	40 (34.8)
Allergy	25 (8.7)	22 (11.3)	36 (12.0)	19 (15.5)	10 (13.0)	14 (12.2)
Abdominal	12 (4.2)	12 (6.2)	13 (4.3)	2 (1.6)	0 (0.0)	2 (1.7)
Headache	1 (0.4)	4 (2.1)	3 (1.0)	2 (1.6)	1 (1.3)	0 (0.0)
Visit type						
Physician's office	244 (84.7)	166 (85.1)	263 (88.0)	116 (94.3)	66 (85.7)	111 (96.5)
ER	40 (13.9)	27 (13.9)	34 (11.4)	6 (4.9)	9 (11.7)	3 (2.6)
Hospitalization	4 (1.4)	2 (1.0)	2 (0.7)	1 (0.8)	2 (2.6)	1 (0.9)

*People who lived in temporary housing of FEMA trailers for any period after Hurricane Katrina

¹8/29/2004 – 8/28/2005; ² 8/29/2005 – 8/28/2006; ³ 8/29/2006 – 8/28/2007

Table 7: Comparing frequency of study participant's visit in the year before Katrina to the second year after Katrina, by temporary housing unit occupancy

	Temporary Housing Unit Occupancy*						p-value [†] (more vs. less)
	Yes (N=96)			No (N=48)			
Characteristics	Children with more visits after Katrina n (%)	Children with no change in number of visits after Katrina n (%)	Children with less visits after Katrina n (%)	Children with more visits after Katrina n (%)	Children with no change in number of visits after Katrina n (%)	Children with less visits after Katrina n (%)	
Overall	45 (46.9)	10 (10.4)	41 (42.7)	17 (35.4)	12 (25.0)	19 (39.6)	0.064
Primary diagnosis							
Upper respiratory	31 (32.3)	25 (26.0)	40 (41.7)	14 (29.2)	10 (20.8)	24 (50.0)	0.620
Lower respiratory	37 (38.5)	38 (39.6)	21 (21.9)	15 (31.3)	22 (45.8)	11 (22.9)	0.675
Allergy	21 (21.9)	59 (61.5)	16 (16.7)	5 (10.4)	34 (70.8)	9 (18.8)	0.241

*People who lived in temporary housing units for any period after Hurricane Katrina

†Based on a Chi-squared test with the null hypothesis that the proportion of children with more or less visits after Katrina was the same for both strata of temporary housing unit occupancy.

Table 8: Primary diagnosis and visit type for study participants diagnosed with asthma prior to the study (N=36), by study periods

Characteristics	Year before Katrina¹ (n=114 visits)	First year after Katrina² (n=81 visits)	Second year after Katrina³ (n=118 visits)
	n (%)	n (%)	n (%)
Primary diagnosis			
Upper respiratory	61 (53.5)	50 (61.7)	42 (35.6)
Lower respiratory	37 (32.5)	22 (27.2)	49 (41.5)
Allergy	13 (11.4)	6 (7.4)	23 (19.5)
Abdominal	1 (0.9)	2 (2.5)	3 (2.5)
Headache	2 (1.8)	1 (1.2)	1 (0.9)
Visit type			
Physician's office	110 (96.5)	70 (86.4)	110 (93.2)
ER	3 (2.6)	9 (11.1)	6 (5.1)
Hospitalization	1 (0.9)	2 (2.5)	2 (1.7)

¹8/29/2004 – 8/28/2005; ²8/29/2005 – 8/28/2006; ³8/29/2006 – 8/28/2007

Table 9: Primary diagnosis and visit type for study participants diagnosed with asthma prior to the study (N=36), by temporary housing unit occupancy and study periods

Characteristics	Temporary Housing Unit Occupancy*					
	Yes (N=24)			No (N=12)		
	216 visits			97 visits		
	Year before Katrina ¹ (n=77)	First year after Katrina ² (n=57)	Second year after Katrina ³ (n=82)	Year before Katrina ¹ (n=37)	First year after Katrina ² (n=24)	Second year after Katrina ³ (n=36)
n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Primary diagnosis						
Upper respiratory	39 (50.7)	36 (63.2)	27 (32.9)	22 (59.5)	14 (58.3)	15 (41.7)
Lower respiratory	30 (39.0)	13 (22.8)	36 (43.9)	7 (18.9)	9 (37.5)	13 (36.1)
Allergy	7 (9.1)	5 (8.8)	17 (20.7)	6 (16.2)	1 (4.2)	6 (16.7)
Abdominal	1 (1.3)	2 (3.5)	1 (1.2)	0 (0.0)	0 (0.0)	2 (5.6)
Headache	0 (0.0)	1 (1.8)	1 (1.2)	2 (5.4)	0 (0.0)	0 (0.0)
Visit type						
Physician's office	74 (96.1)	50 (87.7)	74 (90.2)	36 (97.3)	20 (83.3)	36 (100.0)
ER	2 (2.6)	7 (12.3)	6 (7.3)	1 (2.7)	2 (8.3)	0 (0.0)
Hospitalization	1 (1.3)	0 (0.0)	2 (2.4)	0 (0.0)	2 (8.3)	0 (0.0)

*People who lived in temporary housing of FEMA trailers for any period after Hurricane Katrina

¹8/29/2004 – 8/28/2005; ²8/29/2005 – 8/28/2006; ³8/29/2006 – 8/28/2007

Table 10: Self-reported illness categories and visit type made outside of Hancock County reported from 51 study participants, by review period

	Study Participants		
	n=51		
Characteristics	Year before Katrina ¹	First year after Katrina ²	Second year after Katrina ³
Symptom class			
Upper respiratory			
1-3 visits	6	17	7
4-7 visits	0	3	2
>8 visits	0	0	0
Lower respiratory			
1-3 visits	5	12	6
4-7 visits	1	2	1
>8 visits	2	1	0
Allergy			
1-3 visits	3	6	4
4-7 visits	1	0	0
>8 visits	0	1	0
Abdominal			
1-3 visits	6	3	4
4-7 visits	0	0	0
>8 visits	0	0	0
Visit type			
Physician's office			
1-3 visits	9	29	15
4-7 visits	1	4	2
>8 visits	2	2	0
ER			
1-3 visits	8	3	2
4-7 visits	1	1	1
>8 visits	0	0	0
Hospitalization			
1-3 visits	3	6	4
4-7 visits	0	0	0
>8 visits	0	0	0

¹8/29/2004 – 8/28/2005; ²8/29/2005 – 8/28/2006; ³8/29/2006 – 8/28/2007

Table 11: Parental perception of children's health status change after Hurricane Katrina (N=144)

Symptoms	A little or a lot worse n (%)	A little or a lot better n (%)
Respiratory	46 (31.9)	4 (2.8)
Skin	14 (9.7)	1 (0.7)
Allergy	24 (16.7)	2 (1.4)
Stomach	14 (9.7)	1 (0.7)
Non-specific	13 (9.0)	3 (2.1)



MISSISSIPPI STATE DEPARTMENT OF HEALTH

October 31, 2007

Dear Health Care Provider,

In accordance with Miss. Code Ann. § 41-3-15(4)(d), the Mississippi State Board of Health has broad statutory authority to collect information "as may be useful in the discharge of its duties or may contribute to the prevention of disease or the promotion of health" in Mississippi. With respect to hospital records, Miss. Code Ann. § 41-9-65 provides that access to hospital records will not be denied to representatives of the State Department of Health, and Miss. Code Ann. §41-41-11 provides that patient consent for access to records is not required for disclosure of medical information "for the cooperation with the furnishing of information to the State Department of Health, its representative or employees in the discharge of their official duties."

Pursuant to these legal requirements, this letter authorizes the personnel listed below - from the Centers for Disease Control and Prevention - to act with and on behalf of the Mississippi State Department of Health in the investigation of health complaints among residents of Hancock County living in temporary housing units.

Teresa Morrison, MD MPH
Shahed Iqbal, PhD
Colin Ligon

The purpose of this investigation is to characterize the population most at risk for indoor air quality related illnesses to help protect public health now and in response to future disasters. As provided under Mississippi laws and the Regulations Governing Reportable Diseases and Conditions, all reports and data collected under this authority shall be completely confidential and may be released only to the extent permitted by applicable state and federal laws. This letter, and the authority provided to you and your staff is valid through April 30, 2008, and is non-transferable. Please contact me at 601-576-7725 if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "Mary Currier".

Mary Currier, MD, MPH
Interim State Epidemiologist
Mississippi State Department of Health

570 East Woodrow Wilson Post Office Box 1700 Jackson, Mississippi 39215-1700
601/576-7634 Fax 601/576-7931 www.HealthyMS.com

Equal Opportunity In Employment/Service

Appendix 2

Targeted List of ICD-9CM Codes Likely Linked to IAQ-Related Exposures

Allergy

Acute atopic conjunctivitis	372.00-372.05
Allergic rhinitis	477
Allergy, other than to medicinal agents	V15.0
Allergy, unspecified	995.3
Atopic dermatitis and related skin d/o	691.8
Contact dermatitis and other eczema	692
Extrinsic allergic alveolitis	495.7
Redness or discharge of eye	379.93
Unspecified allergic alveolitis and pneumonitis	495.9
Upper respiratory tract hypersensitivity reaction	478.8
Urticaria	708

Upper Respiratory

Acute nonsuppurative otitis media	381
Acute Respiratory infections	460-466
Chronic rhinitis, pharyngitis, and nasopharyngitis	472
Chronic sinusitis	473
Cough	786.2
Respiratory conditions due to chemical fumes and vapors	506.
(Includes pulmonary edema 2° vapors 506.1)	
Suppurative and unspecified otitis media	382

Lower Respiratory

Abnormal chest sounds	786.7
Asthma (includes all extrinsic)	493
Bronchitis	490
Hemoptysis (pulmonary hemorrhage)	786.3
Pneumonia/influenza	480-487
Wheezing	786.07

Abdominal

Abdominal pain	789.0
Nausea	787.0-787.02
Vomiting	078.82, 536.2, 578.0, 787.0, 787.01, 787.03

Other

Headache	784.0
----------	-------

Please include all decimal point extensions unless otherwise noted.

Example: 487 for influenza includes 487.0, 487.1, and 487.8

493 for asthma includes 493.0, 493.1, 493.2, and 493.9

786.07 for wheezing does not include 786.09

Source: Institute of Medicine (U.S.), Committee on Damp Indoor Spaces and Health. Damp indoor spaces and public health. Washington DC: The National Academies Press; c2004. Chapter 5, Human health effects associated with damp indoor environments; p.183-255.

Appendix 3

CHILDREN RESPIRATORY HEALTH STUDY, HANCOCK COUNTY, MISSISSIPPI CHART ABSTRACTION FORM

a. Chart abstraction information:

Abstractor's initials: _____ Date (mm/dd/yy): ___/___/___

Review period: 1 8/29/04-8/28/05 2 8/29/05 – 8/28/06 3 8/29/06-8/28/07

b. Service provider's information: 1 HCMC 2 Bay Plaza Pediatric Clinic (BPPC)

Hospital/Doctor's Name: _____ Address: _____
_____ Zip: _____ Phone: _____ Fax: _____ email: _____

c. Patient Information:

Medical ID: _____ Child's Name: _____ Contact

name: _____ Address: _____ City _____

Zip Code _____ Phone: Home: _____

Cell: _____ Work: _____ Email: _____

Address changed: 1 YES 2 NO (Note: List in the comment section with date)

DOB (mm/dd/yy): ___/___/___ Sex: 1 Male 2 Female

Height at first visit: _____ (cm/inch) Weight at first visit: _____ (lbs/kg)

Race-ethnicity:

1 non-Hispanic white 2 non-Hispanic black 3 Mexican-American

4 Native Hawaiian or other Pacific Islander 5 American Indian or Alaskan native

6 Asian 7 multi-racial 8 not indicated

88 Others (specify): _____

Insurance: 1 Medicaid 2 Private _____ 3 uninsured

88 Others (specify) _____

d. Symptoms

Review Period
1. <input type="checkbox"/> 8/29/04 - 8/28/05
2. <input type="checkbox"/> 8/29/05 - 8/28/06
3. <input type="checkbox"/> 8/29/06 - 8/28/07

Visit type
1. Physician/clinic
2. ED visit
3. Hospitalization

Dates (mm/dd/yy) – Type of visit Example: 04/30/05 (1)	Symptoms	ICD-9-CM
	1. Abdominal pain	789
	2. Abnormal chest sounds	786.7
	3. Acute atopic conjunctivitis	372.00-372.05
	4. Acute nonsuppurative otitis media	381
	5. Acute respiratory infections	460-466
	6. Allergic rhinitis	477
	7. Allergy, other than to medicinal agents	V15.0
	8. Allergy, unspecified	995.3
	9. Asthma (includes all extrinsic)	493
	10. Atopic dermatitis and related skin d/o	691.8
	11. Bronchitis	490
	12. Chronic rhinitis, pharyngitis, and nasopharyngitis	472
	13. Chronic sinusitis	473
	14. Contact dermatitis and other eczema	692
	15. Cough	786.2
	16. Extrinsic allergic alveolitis	495.7
	17. Headache	784
	18. Hemoptysis (pulmonary hemorrhage)	786.3
	19. Nausea	787.0-787.02
	20. Pneumonia/influenza	480-487

Dates (mm/dd/yy) – Type of visit Example: 04/30/05 (1)	Symptoms	ICD-9-CM
	21. Redness and discharge of eye	379.93
	22. Respiratory conditions due to chemical fumes and vapors (includes 506.1)	506
	23. Suppurative and unspecified otitis media	382
	24. Unspecified allergic alveolitis and pneumonitis	495.9
	25. Upper respiratory tract hypersensitivity reaction	478.8
	26. Urticaria	708
	27. Vomiting	078.82, 536.2, 578.0, 787.0, 787.01, 787.03
	28. Wheezing	786.07

e. Hospitalization

Dates (mm/dd/yy)	Location
__/__/__ to __/__/__	1. HCMC 2. BPPC 88.Other: _____
__/__/__ to __/__/__	1. HCMC 2. BPPC 88.Other: _____
__/__/__ to __/__/__	1. HCMC 2. BPPC 88.Other: _____
__/__/__ to __/__/__	1. HCMC 2. BPPC 88.Other: _____
__/__/__ to __/__/__	1. HCMC 2. BPPC 88.Other: _____

f. Co-morbidities:

1. **Ever** diagnosed with asthma: 1 YES 2 NO **Age at onset:** _____
2. Family Hx of asthma or atopy: 1 YES 2 NO 3. ETS : 1 YES 2 NO
4. **Ever** diagnosed with other chronic conditions: 1 YES 2 NO
- (if 'YES', please specify) : _____
5. Is the child Immuno-suppressed (**lifetime**): 1 YES 2 NO Specify: _____
6. Any congenital anomalies: 1 YES 2 NO Specify: _____

g. Prescribed medications: (If 'yes', list ALL)

1. _____ 2. _____
3. _____ 4. _____
5. _____ 6. _____
7. _____ 8. _____
9. _____ 10. _____

Others: _____

h. Diagnostics:

Serum IgE:

1. Serum IgE (total): _____ 2. Serum (IgE): _____ for _____
3. Serum (IgE): _____ for _____ 4. Serum (IgE): _____ for _____
5. Serum (IgE): _____ for _____ 6. Serum (IgE): _____ for _____
7. Serum (IgE): _____ for _____ 8. Serum (IgE): _____ for _____
88. Others (specify): _____

Skin test positive for (check **All** that apply):

- 1 dust mites 2 cat dander 3 dog dander 4 cockroach
5 mouse 6 mold 7 Outdoor (pollen, grass, etc.) 8 not done
88 Others (specify): _____

Carboxyhemoglobin levels: _____

Lung function test (% of predicted): FEV₁ _____ FVC _____ FEV₁/FVC _____

Other tests: _____

(Record highest levels)

i. Residence:

1. Lived in a flooded/hurricane affected house **before** remediation: 1 **YES** 2 **NO**

Duration (in months): _____ **Location**: _____ **Dates**: __/__/__ to __/__/__

2. Lived in a flooded/hurricane affected house **after** remediation: 1 **YES** 2 **NO**

Duration (in months): _____ **Location**: _____ **Dates**: __/__/__ to __/__/__

3. Lived in a FEMA trailer: 1 **YES** 2 **NO**

Duration (in months): _____ **Location**: _____ **Dates**: __/__/__ to __/__/__

Appendix 4

Participant ID HC _____

Caller Name _____

Response Codes
1. No answer
2. Number disconnected
3. Busy signal
4. Wrong number
5. Answering machine/left message/Call back #
6. Answering machine/did not leave message
7. Spoke with somebody other than contact
8. Spoke with contact

Outcome Codes
1. Declined participation
2. Incomplete/Interrupted
3. Postponed-Call Back Later
4. Completed

Verbal Consent
1. Yes 2. No
Name: _____

Attempt	Date & Time	Response	Outcome	When To Call Back & Number	Other Info (ie Different Caller, Person Spoken To)
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

Comment:

**CHILDREN RESPIRATORY HEALTH SURVEY,
HANCOCK COUNTY, MISSISSIPPI**

CALL BACK FORM

Flesch-Kincaid Reading Level = 8.8

Date of Call (mm/dd/yy): _____

Hello. My name is _____, and I am calling on behalf of the Mississippi Department of Health.

May I speak with _____ (name of an adult individual identified by the medical chart as the child's parent or guardian)?

If this person is not available, then ask for another parent or guardian who is familiar with this child's residence after Hurricane Katrina. If there is a language barrier, ask what the primary language spoken at home is. If primary language at home is Spanish or Haitian Creole inform the respondent that you will call back with an interpreter.

(IF 'NO') ► When would be a better time to call?

► **Schedule date/time on CALL LOG**

The Mississippi Department of Health and the Centers for Disease Control and Prevention (CDC) are conducting a survey to learn more about illnesses in children who lived in or are living in temporary housing units following Hurricane Katrina. To do this, we are talking to parents and caregivers of children who were seen by health care providers in Hancock County following Hurricane Katrina.

I would like to ask you a few questions about the type of housing that you have resided/reside in since Hurricane Katrina and about illnesses that _____ (child's name) may have experienced both prior to and following Hurricane Katrina. This will take about 10 minutes. Would you have time to speak with me right now?

(IF 'NO') ► When would be a better time to call?

► **Schedule date/time on CALL LOG**

Let me take a moment before we begin to explain that your participation is entirely voluntary. You can refuse to answer any question or stop the interview at any time. All the information that you provide will be kept confidential. All records with your name and address will be destroyed once we have completed our survey and analysis.

This survey will be used by the Mississippi Department of Health to help protect public health now and in response to future disasters. Your answers may also help us find ways to improve the health of children in your area today.

**If you have questions about this survey, I would be glad to answer them at anytime
You can also call Dr. Allison Stock at (404) 498 - 1034 or Dr. Teresa Morrison at (404) 498 - 1005.**

**If you have any questions about your rights as a participant, or you feel that you have been harmed, you may call
Dr. Mary Currier at the Mississippi Department of Health
(601) 576 -7725.**

Are you interested in participating in this survey today?

Verbal Consent: 1. YES _____ 2. NO _____

(IF 'NO') ► Record their name, that they declined and date/time on CALL LOG

We may need to contact you later to confirm some information or send you educational information. What is your full name and mailing address?

1) Name: First _____ Middle _____ Last _____

2) Physical Address (No PO Box):

Street _____ Apt No. _____

City _____ State _____ Zip _____

3) Phone: (one *best contact number*) Home (_____) _____

Work (_____) _____ Cell (_____) _____

Date of Interview: _____ Interviewer's initials _____

1. For the entire year **before** Hurricane Katrina (**8/29/04 - 8/29/05**), was your primary residence in Hancock County, Mississippi?

1. YES _____ 2. NO _____

(If 'No' specify when moved in and where from. Then skip to question 3 if they would not have evacuated)

_____ Date: __/__/__ or month/year: _____

2. Did your family evacuate out of Hancock County, Mississippi due to Hurricane Katrina?

If **YES**, when did you evacuate and when did you return?

Dates __/__/__ to __/__/__

Duration (in days or months): _____

3. For the entire two years **after** Hurricane Katrina (**8/29/05 - 8/29/07**) (*other than the time you were evacuated*), has your primary residence been in Hancock County?

1. YES _____ 2. NO _____

(If 'No' specify other areas by zip code / county / state and dates. List chronologically, if more than one residence outside Hancock County.)

_____ Date: __/__/__ or month/year: _____

_____ Date: __/__/__ or month/year: _____

4. **After** Hurricane Katrina, did/do you live in a flooded/hurricane affected house **before** it was repaired or remediated?

1. YES _____ 2. NO _____

If **YES**, what were/are the dates that you had/have resided there?

Dates: __/__/__ to __/__/__

Duration (in months): _____

And where was/is your home located (address)?

Address: _____

City: _____ Zip: _____

5. **After** Hurricane Katrina, did/do you live in a flooded/hurricane affected house **after** it was repaired or remediated?

1. YES _____ 2. NO _____

If **YES**, what were/are the dates that you had/have resided there?

Dates: ___/___/___ to ___/___/___

Duration (in months): _____

And where was/is your home located (address)?

Address: _____

City: _____ Zip: _____

6. **After** Hurricane Katrina, did/do you live in a temporary housing unit or a FEMA trailer?

1. YES _____ 2. NO _____

If **YES**, what were/are the dates that you had/have resided there?

Dates: ___/___/___ to ___/___/___

Duration (in months): _____

And where was/is your temporary housing unit located (address)?

Address: _____

City: _____ Zip: _____

Was this location on your own private property, on other private property, in a trailer park area or on another type of public property?

1. Own private property _____
2. Other private property _____
3. Trailer park area _____
4. Public property _____
5. Other _____

What type of temporary housing unit did/do you reside in?

1. Travel trailer _____ 2. Mobile home _____ 3. Park Model _____

(Travel trailers can be towed by a truck, SUV, van or car. Mobile homes have multiple rooms, are handicap accessible, and are sometimes provided for large families in a disaster response. Park Models are like travel trailers, but they don't have wheels.)

Was this temporary housing unit provided by FEMA?

1. YES _____ 2. NO _____

7. Have you ever been told by a health service provider that your child has asthma?

1. YES _____ 2. NO _____

If **YES**, how old was your child when you were first told that he/she had asthma?

Age (in months if possible): _____

Does your child currently have asthma?

1. YES _____ 2. NO _____

Next, I will ask you some questions about _____ (child's name) health care visits to different providers, ERs and hospitals outside of Hancock County for specific illnesses during three specific time periods. These illnesses include: upper respiratory conditions other than strep throat, asthma, bronchitis, pneumonia, flu, skin disorders such as eczema, contact dermatitis and urticaria, allergies and abdominal pain or vomiting not due to acute gastroenteritis.

For each illness that you answer "Yes," I will ask you the number of visits to and location for each Health Care Provider or ER and the number and location of hospitalizations, if any, for that illness.

(Only for those who live / lived in a temporary housing unit or FEMA trailer.)

Then, I am going to ask if the illness got better or went away after your child leaves / left the trailer.

8. In the year **before Katrina - from 08/29/2004 until 08/28/2005**, had you seen any health care provider other than _____ or was your child seen at an ER or admitted to a hospital anywhere other than Hospital A for these illnesses?

List chronologically if more than one provider.

If not an exact number of visits, use the following categories:

a. None b. 1-3 c. 4-7 d. 8-12 e. 13-16 f. >16

Symptom	Health Care Provider		ER		Hospitalizations	
	# of visits	Name & Location	# of visits	Name & Location	Location & Reason	Dates __/__/__ to __/__/__
Upper respiratory illnesses (other than strep throat) <input type="checkbox"/> Yes <input type="checkbox"/> No						
Asthma / Bronchitis <input type="checkbox"/> Yes <input type="checkbox"/> No						
Pneumonia <input type="checkbox"/> Yes <input type="checkbox"/> No						
Influenza "Flu" <input type="checkbox"/> Yes <input type="checkbox"/> No						
Skin disorders (such as eczema, contact dermatitis or urticaria) <input type="checkbox"/> Yes <input type="checkbox"/> No						
Allergies <input type="checkbox"/> Yes <input type="checkbox"/> No						
Abdominal pain (for reasons other than acute gastroenteritis) <input type="checkbox"/> Yes <input type="checkbox"/> No						
Vomiting (for reasons other than acute gastroenteritis) <input type="checkbox"/> Yes <input type="checkbox"/> No						

9. In the first year **after Katrina - from 08/29/2005 until 08/28/2006**, had you seen any health care provider other than _____ or was your child seen at an ER or admitted to a hospital anywhere other than Hospital A for the following illnesses?

List chronologically if more than one provider.

If not an exact number of visits, use the following categories:

a. None b. 1-3 c. 4-7 d. 8-12 e. 13-16 f. >16

Symptom	Health Care Provider		ER		Hospitalizations		Did his/her symptoms get better or go away completely when he/she left the FEMA trailer?
	# of visits	Name & Location	# of visits	Name & Location	Location & Reason	Dates _/_to_/_/	
Upper respiratory illnesses (other than strep throat) <input type="checkbox"/> Yes <input type="checkbox"/> No							<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Asthma / Bronchitis <input type="checkbox"/> Yes <input type="checkbox"/> No							<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Pneumonia <input type="checkbox"/> Yes <input type="checkbox"/> No							<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Influenza "Flu" <input type="checkbox"/> Yes <input type="checkbox"/> No							<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Skin disorders (such as eczema, contact dermatitis or urticaria) <input type="checkbox"/> Yes <input type="checkbox"/> No							<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Allergies <input type="checkbox"/> Yes <input type="checkbox"/> No							<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Abdominal pain (for reasons other than acute gastroenteritis) <input type="checkbox"/> Yes <input type="checkbox"/> No							<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Vomiting (for reasons other than acute gastroenteritis) <input type="checkbox"/> Yes <input type="checkbox"/> No							<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A

10. In the second year **after Katrina - from 08/29/2006 until 08/28/2007**, had you seen any health care provider other than _____ or was your child seen at an ER or admitted to a hospital anywhere other than Hospital A for the following illnesses?

List chronologically if more than one provider.

If not an exact number of visits, use the following categories:

a. None b. 1-3 c. 4-7 d. 8-12 e. 13-16 f. >16

Symptom	Health Care Provider		ER		Hospitalizations		Did his/her symptoms get better or go away completely when he/she left the FEMA trailer?
	# of visits	Name & Location	# of visits	Name & Location	Location & Reason	Dates __/__/__ to __/__/__	
Upper respiratory illnesses (other than strep throat) <input type="checkbox"/> Yes <input type="checkbox"/> No							<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Asthma / Bronchitis <input type="checkbox"/> Yes <input type="checkbox"/> No							<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Pneumonia <input type="checkbox"/> Yes <input type="checkbox"/> No							<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Influenza "Flu" <input type="checkbox"/> Yes <input type="checkbox"/> No							<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Skin disorders (such as eczema, contact dermatitis or urticaria) <input type="checkbox"/> Yes <input type="checkbox"/> No							<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Allergies <input type="checkbox"/> Yes <input type="checkbox"/> No							<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Abdominal pain (for reasons other than acute gastroenteritis) <input type="checkbox"/> Yes <input type="checkbox"/> No							<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Vomiting (for reasons other than acute gastroenteritis) <input type="checkbox"/> Yes <input type="checkbox"/> No							<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A

