

**EVALUATION OF FORMALDEHYDE LEVELS IN OCCUPIED FEDERAL
EMERGENCY MANAGEMENT AGENCY-OWNED TEMPORARY HOUSING UNITS**

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I. Summary

On August 28 and 29, 2005, Hurricane Katrina made landfall on the US Gulf Coast between New Orleans, LA and Mobile, AL, as a Category 4 storm. Families were evacuated from the US Gulf Coast to return later to severely damaged housing. The Federal Emergency Management Agency (FEMA) provided disaster related housing along the US Gulf Coast starting in October 2005.

Starting in the spring of 2006, several physicians along the US Gulf Coast reported increases in upper respiratory issues in children who lived in FEMA supplied temporary housing units. During this same time period, FEMA became aware of elevated levels of formaldehyde gas in FEMA housing units in Louisiana and Mississippi, specifically in Gulf Coast areas affected by hurricanes Katrina and Rita, and initiated an investigation. This prompted interest from the Department of Homeland Security's Office of Health Affairs (DHS-OHA) in an investigation of potential sources of exposures. DHS-OHA has consulted with Centers for Disease Control and Prevention (CDC) on behalf of FEMA to provide an evaluation of exposures to formaldehyde in temporary housing for hurricane-displaced people. The purpose of this project is to evaluate the levels of formaldehyde and factors such as temperature and humidity that might influence formaldehyde levels in temporary housing units in Mississippi and Louisiana.

II. Collaborators

National Center for Environmental Health (NCEH)

Matthew Murphy, PhD, MS, EISO Primary Investigator. Will participate in all aspects of the response, including project design, data collection and analysis. Will serve as primary author reporting project results.

Jim Lando, MD, MPH Co-Primary Investigator. Will participate in all aspects of the project– including project design, data collection, analysis, and reporting of results – and serve as a senior CDC scientist.

Michael McGeehin, PhD, MSPH Co-Primary Investigator. Will participate in all aspects of the project– including project design, data collection, analysis, and reporting of results – and serve as a senior CDC scientist.

Gary Noonan, MPA Co-investigator. Will participate in response design, data collection, analysis, and reporting of results.

III. Background

On August 28 and 29, 2005, Hurricane Katrina made landfall on the US Gulf Coast between New Orleans, LA and Mobile, AL, as a Category 4 storm. Families were evacuated from the US Gulf Coast region only to return later to severely damaged housing. FEMA provided temporary housing along the US Gulf Coast starting in October 2005 so that families could work on their own home while living in temporary housing or live in temporary rental housing while rental properties were restored.

FEMA addressed disaster-related housing requirements with a combination of travel temporary housing units, manufactured homes and other pre-fabricated housing units. Travel temporary housing units have been used principally for short-term housing needs and are placed on private sites while a homeowner's permanent residence is being repaired, or in group configurations to primarily support displaced renters. Manufactured homes and other pre-fabricated housing units have been used to meet both short and longer-term disaster housing needs, and are typically placed on commercial pads or in group sites developed expressly for this purpose. Along the US Gulf Coast, FEMA provided a mixture of travel temporary housing units and mobile homes in the months following Katrina and Rita. Collectively, these will be referred to as temporary housing units, or THUs.

Over 100,000 THUs were provided to residents along the US Gulf Coast. In Louisiana (LA), over 60% of the THUs provided to state residents are on private property. In Mississippi (MS), over 78% of the THUs are on private properties. The rest of the THUs in both states are in FEMA designated THU parks.

In spring 2006, in response to concerns about possible elevated formaldehyde levels in travel trailers provided as part of Katrina/Rita disaster relief, FEMA engaged the Agency for Toxic Substances and Disease Registry (ATSDR) in a health consultation. ATSDR was asked to provide 1) analysis of EPA supplied measurements of formaldehyde levels in new, unoccupied trailers and 2) specific actions to be taken to reduce formaldehyde levels. ATSDR provided guidance that ventilation coupled with temperature and humidity reduction can result in reduced levels of formaldehyde. However, ATSDR noted that in this setting levels remained high enough to constitute a health concern.

Subsequent findings in the field, including anecdotal reports from area physicians, indicated that trailer occupancy might still be associated with adverse short term health effects. Formaldehyde in travel trailers remained a concern for area residents. Consequently, the DHS-OHA was asked to consult with the CDC to develop a strategy to protect the health and safety of the residents of federal emergency housing. The assessment described in this protocol will provide CDC, FEMA, and DHS-OHA with data on current formaldehyde levels in a sample of occupied THUs. This will be used by risk managers and health officials to provide information and recommendations to guide housing placement priorities and future testing if required.

IV. Goal and Objectives

Goal

Determine the levels of formaldehyde in occupied FEMA-owned THUs in LA and MS.

Objectives

1. To determine the levels of formaldehyde in occupied THUs.
2. To determine factors or characteristics of occupied THUs that could affect formaldehyde measurements.
3. To provide information to assist FEMA in making decisions on relocation of residents

V. Procedures and Methods

Procedures and Methods: Design

General Approach

To evaluate the levels of formaldehyde and to determine potential factors and/or characteristics of occupied THUs that can impact the measured formaldehyde levels, the following data will be collected from each participating THU:

- A one-hour continuous indoor sample measurement of formaldehyde,
- A concurrent sample measurement of indoor temperature and relative humidity;
- A short questionnaire administered to the adult residents to obtain demographic information about current THU residents and typical daily activities,
- A short walkthrough survey to assess the indoor environment and the home exterior.

Study Location

Participating THUs will be randomly selected by CDC from a FEMA-provided list of all occupied THUs in MS and LA as of November, 2007.

Procedures and Methods: Selection of Participating THUs

THU Selection

Disproportionate stratified random sampling will be used to select THUs for participation. The sampling frame is the FEMA-provided census listing of occupied THUs. A statistical software program (Statistical Analysis Software (SAS) or SPSS) will be used to randomly generate a list of sample THUs. Before assigning the random number, the THUs will be divided into 11 strata defined by type (Travel Trailer, Park Home, and Mobile Home) and manufacturers. The Travel Trailer (TT) type is the largest group. It will have seven strata. The first six will be defined by the top six manufacturers (Gulfstream, Forest River, Fleetwood, Fleetwood CA, Pilgrim, and Keystone). The seventh TT strata will include all other TT manufacturers and TT units for which the manufacturer is unknown. Each of the individual manufacturers in the combined “other” group made fewer than 3% of the units. The Park Home (PH) type will have two strata.

The first will be the Silver Creek manufactured PH. The second will include all other PH manufacturers and PH units for which the manufacturer is unknown. Each of the individual manufacturers in the combined “other” group made fewer than 1% of the units. The Mobile Home (MH) type will also have two strata. The first will be the Cavalier manufactured MH. The second will include all other MH manufacturers and MH units for which the manufacturer is unknown. Each of the individual manufacturers in the combined “other” group made fewer than 3% of the units. In addition, Gulfstream TT, the single largest group of units, will be oversampled.

The FEMA census listing will be divided into the 11 strata defined above. Within each of these strata, each THU will be assigned a random number (e.g., SAS: Randval=randuni(number)). Each stratum list will then be sorted in numeric order according to the random number assignment. Contract sampling personnel will follow a specific protocol (Appendix A) and use these ordered active call lists to recruit participants for the study, beginning with number 1 and ending when number 120 for the Gulfstream strata and number 38 for each of the other 10 strata have been successfully sampled. In addition, a reserve list of THUs will be provided for use when a selected THU declines participation, is ineligible, or cannot be contacted.

Up to 3 telephone numbers are provided for each THU. Over a one-week period a total of 15 separate attempts to contact a selected THU will be made. The 15 attempts will include various times of the day and days of the week, as well as each of the one to three contact numbers provided. If unsuccessful after 15 attempts, the THU will be moved to the “unable to contact” list and a new THU from the reserve list will be added to the active call list.

Personnel will follow a phone script (Appendix B) when speaking with the self-identified adult resident and will record each attempt in a phone log (Appendix B). If the self-identified adult resident agrees to participate, the contract sampling personnel will indicate assent by phone (Appendix C) and set up a time to conduct the sampling. If the adult resident declines to participate, the THU will be moved to the “refused to participate” list and a new THU from the reserve list will be added to the active call list.

Contract sampling personnel will call down the list, adding THUs from the reserve list each time one is moved to the refusal list or the unable to contact list until 120 THUs in the Gulfstream strata and 38 THUs in each of the other 10 strata and are successfully enrolled. A total of 500 THUs will be recruited. (See sample size section below.)

It is expected that some enrolled THUs will not complete the study for a number of reasons. Each time it is determined that an enrolled THU is to be removed from the list of participants, a new THU from the reserve list will be substituted and recruitment procedures as described above will be followed. The dropped THU will be placed on an “unable to follow-up” list.

Eligibility Criteria

The adult resident who agrees to participate will be enrolled in the study, for a total of 500 participating THUs (See Sample size and Statistical Power). Eligibility criteria for participation in the study are below:

- The consenting adult resident is ≥ 18 years of age.
- The adult resident resides in a FEMA-issued trailer in MS or LA at the time of phone recruitment.
- The adult respondent spends at least 6 hours each day in their FEMA-issued trailer.

Exclusion Criteria

Potential participants will be excluded from the study if:

- The adult resident declines to participate.
- The adult resident is < 18 years.
- The adult resident no longer resides in a FEMA-issued trailer at the time of the phone call.

Consent/Assent Process

Informed assent will first be obtained from the contacted adult resident during the scripted recruitment phone call; contract personnel will indicate on the call form (Appendix C) that assent was received. A second informed consent form will be provided to the participant and signed in person prior to sample collection (Appendix D). No study data are collected during the telephone interview.

Sample Size and Statistical Power

With a level of significance of 5% (95% confidence) and power of 80%, a minimum sample size of 38¹ trailers is needed in order to detect an average difference of 30 ppb for each of the 11 strata. The following assumptions were made in generating this sample size estimate:

- Sample standard deviation is believed to be 0.071 ppm or 71 ppb
- 11 strata defined by type (Travel, Park, Mobile) and Manufacturer.
- Equal variances among strata.
- Strata variances are less than the overall variance due to homogeneity of subgroups. Strata standard deviations are estimated to be 51 ppb.
- Strata population size varies, disproportionate sampling (equal group n) will be used
- Multiple comparisons of group means for 11 strata requires Bonferroni correction, but for each group against the mean for the entire sample rather than against all other groups. Increasing the number of comparisons from 1 to 10 more than doubles the following sample sizes.
- The sample sizes were calculated as tests for each strata mean against the mean for the entire sample.

¹ http://www.dssresearch.com/toolkit/sscalc/size_a1.asp

The sample size was estimated based only upon testing mean differences. Range and quartile values for manufacturer and trailer type should be examined as well. However, the sample size estimates stated above will not allow for those comparisons with the same level of precision.

The 11 sample strata are defined in Table 1. The following considerations were addressed:

- The largest TT manufacturer was over sampled (increased to 120 units) to allow for additional comparisons within that stratum.
- Because the strata population sizes vary, disproportionate stratified random sampling was used.
- Each sample stratum will have varying sample fractions and related sample weights.
- Sample record weights must be used to estimate the parameters for the entire population.

Table 1: Sample Strata

<u>Type</u>	<u>Strata</u>	<u>Manufacturer</u>	<u>Units in</u>		<u>Units in</u>	<u>Sample</u>	<u>Record</u>
			<u>N</u>	<u>Percent</u>			
<u>Travel</u> <u>Trailer</u>	1	Gulfstream	14,624	31.1%	120	0.0082	121.8667
	2	Forest River	3,220	6.9%	38	0.0118	84.7368
	3	Fleetwood	2,371	5.0%	38	0.0160	62.3947
	4	Fleetwood CA	1,699	3.6%	38	0.0224	44.7105
	5	Pilgrim	1,584	3.4%	38	0.0240	41.6842
	6	Keystone	1,395	3.0%	38	0.0272	36.7105
	7	other/unknown TT	15,637	33.2%	38	0.0024	411.5000
<u>Park</u> <u>Home</u>	8	Silver Creek	224	0.5%	38	0.1696	5.8947
	9	other/unknown PH	809	1.7%	38	0.0470	21.2895
<u>Mobile</u> <u>Home</u>	10	Cavalier	921	2.0%	38	0.0413	24.2368
	11	other/unknown MH	4,486	9.6%	38	0.0085	118.0526
		subtotal	46,970		500	0.0106	93.9400
		unknown type	1,519				
		total units	48,489				
		n of strata	11				

Procedures and Methods: Study and Sampling Instruments

Variables

The primary outcome variable will be the one-hour concentration of formaldehyde measured in the occupied trailer. To determine potential factors of occupied THUs that can affect the measured formaldehyde levels, other variables collected will include indoor temperature, indoor relative humidity, physical characteristics of the THU, and activities recently conducted in the

THU. Demographic information and limited additional exposure information will also be collected. Two study instruments will be used to obtain the variable information.

Exposure Assessment Questionnaire

A short questionnaire (Appendix E) will be administered to the adult resident by the trained contract study personnel during the one-hour sample collection process. The questionnaire will inquire about the demographics of the THU occupants as well as the average number of hours spent inside and outside the trailer. They will also inquire about factors that can influence the indoor environment of the THU including occupant smoking status, and frequency of air conditioning, heating and window use. Daily and recent activities in the THU will also be recorded, such as cooking, vacuuming, and smoking.

Environment Walk Through Survey

For the walk through survey (Appendix E), the study personnel will survey the interior and exterior of the THU. The contractor-trained study personnel will observe the exterior and interior of the THU for factors including presence of holes and leaks, mold, type of cooking fuel, and working smoke detectors.

Formaldehyde Sample Collection

A one-hour sample of formaldehyde will be collected in the center of the THU primary living room in each participating THU using the NIOSH Manual of Analytical Methods (NMAM) Method 2016² with Supelco S10 LpDNPH cartridges (St. Louis, MO). Residents will be asked to configure doors and windows as they would have them while they slept. Samples will be collected using standard industrial hygiene pumps and samples will be drawn at a flow rate of 500±50 milliliters per minute for one hour, and will be placed at a height of four feet which is comparable to a person's breathing zone while sitting. Sample collection will be under observation by one of the contractor trained personnel at all times. Sampling will occur between 10:00 AM – 8:00 PM for all THUs. No cooking or smoking in the THU will be allowed during the one-hour sample collection period.

Study personnel will follow all quality assurance and quality control (QA/QC) standards as outlined in the standard operating procedures for field collection (Appendix F). These include the collection of duplicate samples, media blanks, and field blanks. All sample tubes will be stored in a freezer or in a cooler on ice at all times (i.e., upon receipt, while not being used for sampling and during shipment to the laboratory). At the end of each sampling day, the samples will be shipped in coolers to the designated analytical laboratory either overnight, or if collected after the last overnight drop-off time, the next morning.

Temperature and Relative Humidity Sample Collection

A concurrent one-hour reading of temperature and relative humidity (RH) will also be collected in the center of the THU primary living room using a HOBO® brand temperature and RH logging instrument manufactured by Onset Computer Corporation (Bourne, MA). The instrument will be set to collect data at 5 minute intervals. Data will be collected during the site visits for a minimum of 5 minutes before and 5 minutes after the collection of the formaldehyde sample at each THU.

² <http://www.cdc.gov/niosh/nmam/pdfs/2016.pdf>

Sample Collection Data Sheet

The contract trained study personnel will complete a data sheet (Appendix G) for the formaldehyde, temperature, and RH sample collection. Information including the sample start and finish time, location of sample collection, and flow calibration results before and after sample collection will be recorded. The data sheet will accompany the questionnaire and the walk through survey (Appendix E) and will be returned to CDC. Training of contractors will occur at the beginning of the study and ongoing monitoring will occur through-out the duration of the study, though not on a full-time basis. Study personnel will be continuously available for consultation.

Procedures and Methods: Data Handling and Analyses

Data Collection

All questionnaire, survey, and field data collection will be conducted by contract study personnel. The study personnel will label all samples and documentation with a unique alphanumeric identifier assigned by CDC to the participant and will then log in all paperwork and samples as they complete each THU. Strict quality assurance/quality control (QA/QC) procedures will be observed. All field data will be entered into an electronic dataset at the end of each day by the contract study personnel. Information provided in advance, such as THU type and manufacturer (VIN), will be verified in the field to ensure proper categorization of THUs.

Data Analysis Plan

A team of epidemiologists and statisticians from CDC will analyze the data using descriptive statistics and arithmetic and geometric means. Multivariate statistical analyses will also be performed and covariates that will be considered in the analyses include: demographics, size of household, presence of smoking in household, age of trailer, window and/or air conditioning use, cooking frequency, and estimated duration of time spent in trailer. Data analysis will be stratified by type of THU (i.e., travel trailer, park, and mobile home) and by manufacturer/model to better characterize exposure.

Information Management and Analysis Software

A database will be created for data entry of all data. A final SAS (v.9.1) dataset including all study parameters will be provided to CDC for data analysis.

Data Entry, Editing, and Management

All participant information will be kept private and each THU will be assigned a unique alphanumeric identifier by CDC that will be used throughout the study. A list that links the identification codes will be securely stored by CDC and will only be used by members of the research team who require information to assess the data. This list will be destroyed upon completion of the study. All questionnaire and survey data will be entered into a database. A 100% manual edit will be conducted to ensure accuracy of entry. Any entry errors will be recorded and corrected. After the edits are complete, all data will be imported into SAS (version 9.1) for analysis.

Data from the laboratory will undergo specific QA/QC procedures and when delivered, will be organized by the participant's unique identifier. Only unique IDs will be provided to the laboratory. After evaluation of the data for samples that are below detection limit, the laboratory data will be merged into the master SAS dataset by participant ID. All stored records will comply with CDC guidelines in that they will be locked in a file cabinet for the duration of the analysis and will be archived in a locked facility upon publication of the data. Personally identifying data will be destroyed by the CDC, but left at the LA and MS Departments of Public Health at the completion of the study.

All information provided by participants will be kept private and used only for the purposes of the study. Access to data will be restricted to only those persons involved in the study. In addition, all reports, published or internal, will be based on aggregate data only. Contractors will either return or destroy all data sources upon delivery of the final approved database to the CDC.

VI. Dissemination, Notification, and Reporting of Results

All testing will be conducted at no cost to the participants. The one-hour formaldehyde concentration, temperature, and RH will be summarized in a letter that will also have an explanation describing the results (Appendix H-1). This letter will be hand delivered to each participant by a risk management and health official so that there is opportunity for the participant to ask any questions regarding the findings.

The results of the formaldehyde air sampling at the THU level will be provided to DHS-OHA/FEMA to allow them to arrange alternative housing for those who may be at elevated health risk. Recommendations for resident relocation will be based on the results of the air sampling and other factors about the trailer and the residents.

VII. Handling of Adverse Events

Anticipated health risks to the participant are minimal. Serious or unexpected findings or changes in the study environment will be reported to the LA and MS Departments of Public Health and CDC Institutional Review Boards within 48 hours.

VIII. Risk/Benefit Information

Participants will be advised of risk and benefits of participating in the study, however, potential risks are minimal other than minor discomfort from questions about personal habits (e.g. if people smoke in the household). The study findings have direct implications for FEMA THU residents; participants may benefit by receiving information about formaldehyde levels in their homes. Some residents may be given higher priority than others for relocation based on the results.

IX. Informed Consent Procedures

The purpose of the project will be explained to all participants at the time of the initial contact. A copy of the informed consent form will be given to each participant. All information provided by participants will be kept private and used only for the purposes of the study. The informed

consent form is at or below an eighth grade reading level using the Flesch-Kincaid grade readability score. The assent form is on a fourth grade reading level using the Flesch-Kincaid grade readability score.

X. Estimated Time Frame

December 2007	Data collection
January 2008	Data collection
February 2008	Data collection and data analysis Notification of test results begins
March 2008	Data analysis Notification of test results continue
April 2008	Notification of test results to the residents completed

XI. Compensation

Study participants will be compensated \$50 for their time and inconvenience with a check or check card.

XII. Confidentiality

The purpose of the project will be explained to all participants at the time of initial contact. A copy of the informed consent form will be given to each participant. All information provided by participants will be kept private and used only for the purposes of the study and determining housing placement priorities. Again, to ensure privacy of the persons and to safeguard the data, each study participant will be assigned a unique study ID number which will be the only link to personal data recorded on paper interview and abstraction forms. The electronic database will contain only coded data. Access to data will be restricted to only those persons directly involved in the study. Electronic data will be stored on a computer protected by password and any paper forms will be kept in a locked file cabinet. All personal identifiers will be left at the Louisiana and Mississippi Departments of Public Health after notification of the residents and FEMA of the test results. All reports, published or internal, will be based on aggregate data only.

APPENDIX A: PROTOCOL FOR THU SELECTION AND RECRUITMENT

CONTACTING PARTICIPANTS: Materials needed

1. You will receive a stratified list of names and up to 3 phone numbers of residents in THUs from a CDC representative. This list represents the people whom you will contact for participation in the study.
2. For each THU, you will need one clean phone log form (Appendix B) to log all attempted and successful calls.
3. You will need a copy of the telephone script (Appendix B) to ensure that each conversation is consistent.
4. You will need a clean copy of the “Obtaining Assent” form (Appendix C) for each THU contacted.

CONTACTING PARTICIPANTS: Conducting the phone calls

1. You will need to make the calls from the provided spreadsheet.
2. Begin with the first name on the list and call them using the first number provided.
3. If you are unable to get an answer, try the next phone number provided.
4. After each attempt, record the information in the phone log (Appendix B).
5. **Fifteen attempts** using each provided number must be made before ending the recruitment of the person from the contact list. **Over half** of these attempts should be made after 5 pm in the event that the contacts are not at home to receive the call during the day.

If you are unable to reach a contact:

6. If you are unable to contact a THU after making fifteen attempts for each provided phone number, the majority of which attempted after 5 pm, file the recorded phone log into a folder labeled “Unable to Contact”.

If you are able to contact a person in the THU:

7. When someone answers the phone, use the phone script (Appendix B) to guide the conversation.
8. If the adult resident is not available, you will need to continue efforts to make contact with him/her.
9. If the adult resident is NOT interested in participating, note refusal in the phone log. File the phone log into a folder labeled “Refused”.
10. If the adult resident is interested in participating, ensure that they are eligible using the criteria outlined in the phone script.
11. If the adult resident agrees to participate, obtain verbal assent (Appendix C) and set up an appointment date and time with the adult resident.
12. Record “Agreed” in the phone log and file the phone log AND assent form in a folder labeled “Agreed”.

RECRUITMENT COMPLETION

1. Recruitment is complete when all 11 strata have been completed. This will consist of 500 THUs total.

PARTICIPANT FOLLOW-UP: Appointment reminder

1. Prior to their appointment, call the adult resident to confirm the sampling date and time
2. If the respondent can no longer make the appointment, reschedule the appointment.

APPENDIX B, con't:

TELEPHONE SCRIPT FOR PARTICIPANT RECRUITMENT

IF CHILD ANSWERS THE PHONE:

Hi, may I speak with your mother or father please?

IF NO ADULT IS HOME:

Okay. Could you please tell me what would be a good time to call back?

[NOTE IN PHONE LOG]

Thank you, I'll try calling back later.

IF AN ADULT ANSWERS THE PHONE:

Hello, this is _____ calling for the Centers for Disease Control and Prevention. Is this the _____ (NAME) residence? I am working with FEMA and the Louisiana and Mississippi Departments of Public Health to find out if there is formaldehyde (a potentially harmful chemical) in the trailers in which people are living. We have picked some trailers at random, like flipping a coin. May I ask if you are an adult resident living in a FEMA-owned trailer?

IF NO,

Okay, we will be working with all adult residents who are 18 years or older. What is a good time to call back to speak with him or her? And is this the best number to reach him/her?

[NOTE NAME AND TIME IN PHONE LOG]

Thank you, I'll try calling back later.

IF YES,

We are asking the people who live in the trailers to let us test the indoor air for formaldehyde. We have picked your trailer as one that we would like to test. What we learn will help the federal government make decisions about if some people need to be moved out of their trailers to protect their health. For your inconvenience, a \$50 gift card will be given to you at the completion of the study. Participation is voluntary. Do you think you may be interested in participating?

IF NO

Thank you. I appreciate you taking time out to talk.

IF YES

Great. I would like to first ask you a few questions about yourself and your trailer. GO TO CRITERIA (below)

CRITERIA

1. Are you, as an adult resident, 18 years in age or older?
 - If YES, continue to question 2
 - If NO, go to “End of interview for exclusions”

2. Do you still live in a FEMA-issued trailer more than 6 hours per day?
 - If YES, continue to next section
 - If NO, go to “End of interview for exclusions”

IF YES is answered for questions 1-2:

If you agree to have us test your trailer, several things will take place:

1. We will set up a time to visit your trailer soon. The visit will not take more than an hour and a half. Cooking and smoking will not be allowed during the testing process.
2. We will ask you some questions about how you cook in your home and if people smoke in your home.
3. We will look around your home and fill out a short form about what type of heating you have, what type of stove you cook on, what type of air conditioner you have, and other similar questions.
4. We will test your trailer for formaldehyde and will also measure the temperature and humidity. We will deliver the test results of your trailer to you about a month after we test it.
5. For your time and inconvenience, you will also receive a \$50 gift card

Are you interested in participating in this study?

IF YES

GO TO “WHEN SOMEONE AGREES TO PARTICIPATE”

IF NO

Okay, thank you so much for your time.

[HANG UP AND RECORD IN PHONE LOG AS REFUSAL]

END OF INTERVIEW FOR EXCLUSIONS

Thank you very much for your interest and for your willingness to be in the study.

Unfortunately, it is important that people in our study be the adult resident and are 18 years or older. Also, because we are interested in the formaldehyde levels that people are currently exposed to, we are working with those who are still living in their FEMA-issued trailer. Thank you again for your time. *[RECORD AS EXCLUSION IN PHONE LOG]*

WHEN SOMEONE AGREES TO PARTICIPATE

Go to Appendix C: OBTAINING ASSENT *[RECORD AS AGREED IN PHONE LOG]*

**APPENDIX C:
OBTAINING ASSENT**

Thank you for helping us with this important project. Everything you tell us and all your test results will be kept private to the extent allowed by the law. To protect your privacy, we will not put your name on the project forms, but we will write down your trailer’s address or a unique identification number assigned by the CDC.

You can change your mind and decide that you do not want us to test your trailer. If you do change your mind, it will not affect any of your benefits from the Federal Government.

Adult resident’s Name

Date

Time

Person Obtaining Assent

Date

Time

“In my opinion, this person cannot give informed assent.”

Person conducting telephone interview

Date

Time

APPENDIX D: INFORMED CONSENT FOR PARTICIPATION

Evaluation of Formaldehyde in Occupied FEMA Owned Temporary Housing Units

For all potential participants, the informed consent document will be available for the participant to read or, if requested by the participant, will be read out loud. Participants will be required to provide a signature to document informed consent. The informed consent document will request permission for collection and testing of a laboratory sample.

(Flesch-Kincaid Reading Level for English text below = 5.2)

1. Introduction and purpose

We are working for the Centers for Disease Control and Prevention (CDC). CDC is working with the Federal Emergency Management Agency (FEMA) to find out whether there is formaldehyde (a potentially harmful chemical) in the trailers people are living in. We have picked some trailers at random, like flipping a coin. We are asking the people who live in those trailers to let us test their inside air for formaldehyde. We have picked your trailer as one that we would like to test. What we learn will help CDC and FEMA make decisions on housing placement priorities and if some people need to be moved into different trailers to protect their health. The testing process will include air testing which will take no more than one hour and a half. At the same time there will be a brief inspection of the trailer for up to 30 minutes, and some questions to be answered by you for up to 15 minutes. Section 301 of the Public Health Act permits us to collect such information. No cooking or smoking will be allowed during the testing process.

We are doing this testing in a scientifically valid way. That means that we choose the trailers to test instead of letting people ask to have their trailer tested. You and FEMA will learn the formaldehyde level in your trailer, and FEMA will learn the formaldehyde levels across many other trailers. This will help FEMA make decisions to protect people's health.

2. Freedom of choice

You can choose to be part of this project or not. We will explain what we want to do to you so you can decide. Please ask us questions if you do not understand something. If you choose to be part of this project, you will need to sign this form. Then we will give you a copy of this form.

3. Benefits/Risks

If you agree to be in this evaluation, you can learn more about your home environment. If the formaldehyde level in your trailer is high, you may be given priority for housing relocation.

4. Confidentiality

Everything you tell us and all your test results will be kept private to the extent allowed by the law. To protect your privacy, we will not put your name on the project forms, but

we will write down your trailer's address or a unique identification number assigned by the CDC. We will tell FEMA about the levels of formaldehyde in each trailer. Personally identifying data will be destroyed by the CDC, but left at the Louisiana and Mississippi Departments of Public Health at the completion of the study.

5. Cost/Payment

It will not cost you anything to have your trailer tested as part of this project. You will be compensated for your time and inconvenience with a \$50 gift card at the completion of the study.

6. Right to refuse or withdraw

Before we start, we want to make sure you understand that it is up to you whether or not to join this project. You have the right to ask us to stop the testing at any time for any reason.

7. Persons to contact

If you have any questions please feel free to ask us now.

If you have questions later, please contact:

Matt Murphy at 770-488-3417 or
Gary Noonan at 770-488-3449

If you feel that you have been harmed by this evaluation or if you have any concerns about your rights, please contact the CDC Deputy Associate Director for Science in Atlanta, Georgia, USA at 800-584-8814.

8. Your consent

I agree to allow the air in my trailer to be tested. The information in this informed consent form has been explained to me. I have been given a chance to ask questions. I feel that all of my questions have been answered. I know that it is my choice to allow the air testing or not. I know that if I agree to the testing I can have it stopped at any time.

I give permission for an air sample to be collected and tested for formaldehyde, and for the temperature and humidity to be measured in my home.	<input type="checkbox"/> YES	<input type="checkbox"/> NO
---	------------------------------	-----------------------------

I have read or had this form read to me. By signing below, I consent to the air testing and to providing answers to the survey questions.

Name and signature of participant

Date (mm/dd/yyyy)

Name and signature of witness

Date (mm/dd/yyyy)

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**APPENDIX E:
EXPOSURE ASSESSMENT QUESTIONNAIRE AND WALK THROUGH SURVEY**

INTERVIEWER SCRIPT:

The purpose of this part of the interview is to collect some information about you and your FEMA trailer environment. If there is a question that you do not want to answer, please let me know and we can skip it. All of your responses will be kept private and will not affect any of the home or health care services that you currently receive.

This interview will begin with a few questions about your age and where you work. We will then look at the inside and outside of your trailer. We will walk around and through your trailer with you to make some observations.

Form Approved

OMB No. 0920-0008

Expiration Date 3/31/2010

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EXPOSURE ASSESSMENT QUESTIONNAIRE AND WALK THROUGH SURVEY

Date _____ (mm/dd/yyyy)
 Interviewer initials _____

Trailer VIN _____ Trailer barcode _____
 Trailer type: Travel trailer Mobile home Park Other
 Street address: _____
 County: _____ State (circle one): LA / MS
 Zip code: _____

Is this home located on private land or in a federal/commercially owned park?
 Private land Park
 If a park, please indicate the park name: _____

Trailer occupied since _____ (mm/dd/yyyy)

Who pays for your utilities? Self FEMA Other

Total number of residents in trailer _____

Number of residents in trailer, by age group _____ adults (≥18 years)
 _____ children (≥13-<18 yrs)
 _____ children (3-<13 yrs)
 _____ children (<3 yrs)

May we contact you if we have any additional questions? Yes No
If YES, what is the best phone number to use and time of day to call?

Phone: () _____ Time: _____ AM / PM
 Alternate: () _____ Time: _____ AM / PM

Public reporting burden of this collection of information is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to CDC/ATSDR Reports Clearance Officer, 1600 Clifton Road NE, MS D-74, Atlanta, Georgia 30333; ATTN: PRA (0920-0008)



INTERVIEWER QUESTIONNAIRE

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Pests		
1.	Have pesticides been sprayed inside your home the past month ?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know
Indoor environment		
2.	Does your trailer have air conditioning?	<input type="checkbox"/> Yes <input type="checkbox"/> No (go to question # 4)
3.	During the past 2 weeks , how many hours—on average—did you keep your air conditioning running every day?	<input type="checkbox"/> Less than 1 hour <input type="checkbox"/> 1–4 hours <input type="checkbox"/> 5–8 hours <input type="checkbox"/> More than 8 hours <input type="checkbox"/> Don't know
4.	During the past 2 weeks , how many hours—on average—did you keep your heater running every day?	<input type="checkbox"/> Less than 1 hour <input type="checkbox"/> 1–4 hours <input type="checkbox"/> 5–8 hours <input type="checkbox"/> More than 8 hours <input type="checkbox"/> Don't know <input type="checkbox"/> No working heater in trailer
5.	Do you regularly use space heaters?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know
6.	Were the windows, scuttles, and/or door open in the past 3 hours?	<input type="checkbox"/> Yes <input type="checkbox"/> No (go to question # 8) <input type="checkbox"/> Don't know
7.	Approximately how long did you keep your windows and/or door open before this visit ?	<input type="checkbox"/> Less than 1 hour <input type="checkbox"/> 1–4 hours <input type="checkbox"/> 5–8 hours <input type="checkbox"/> More than 8 hours <input type="checkbox"/> Don't know
8.	Did anyone smoke in here in the past 3 hours?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know
9.	During the past two weeks , how many people have smoked in here?	# People: _____
10.	How many packs of cigarettes are smoked in this house each day?	<input type="checkbox"/> None <input type="checkbox"/> < ½ pack <input type="checkbox"/> ½ - 1 pack <input type="checkbox"/> >1 – 2 packs <input type="checkbox"/> > 2 packs <input type="checkbox"/> Don't know

11.	Does anyone cook in here?	<input type="checkbox"/> Yes <input type="checkbox"/> No (go to question #13) <input type="checkbox"/> Don't know
12.	Did anyone cook in here the past 3 hours?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know
Daily activities		
13.	What is the average amount of time that you spend inside your trailer each day?	<input type="checkbox"/> Less than one hour <input type="checkbox"/> 1-4 hours <input type="checkbox"/> 5-8 hours <input type="checkbox"/> More than 8 hours <input type="checkbox"/> Don't know
14.	Do you or your household members sleep in this trailer?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know
15.	Were any of the following used here in the past week?	<input type="checkbox"/> Candles <input type="checkbox"/> Air fresheners <input type="checkbox"/> Glue, paint, furniture finish <input type="checkbox"/> Mothballs <input type="checkbox"/> Closet fresh (mildewcide) <input type="checkbox"/> Nail polish
16.	Do you have any pets that you keep in here and how many?	<input type="checkbox"/> Dog #: _____ <input type="checkbox"/> Cat #: _____ <input type="checkbox"/> Bird #: _____ <input type="checkbox"/> Other: _____ #: _____
17.	Have you noticed the roof leaking in the past 3 months?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know
18.	Have you noticed pipes leaking in the past 3 months?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know
19.	Have you noticed mold in your home during the past 3 months?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know

INTERVIEWER WALK-THRU OBSERVATION CHECKLIST

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here

Questions pertaining to the trailer		(Check all that apply)
1.	Do you see any problems with the roof (for example sagging or holes)?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unable to see entire roof
2.	Are there signs that water spills onto siding?	<input type="checkbox"/> Yes <input type="checkbox"/> No
3.	Are there any signs of mold in the living area of the trailer?	<input type="checkbox"/> Yes <input type="checkbox"/> No If YES , estimate size of mold growth? <input type="checkbox"/> < 1 sq. foot <input type="checkbox"/> 1-4 sq. feet <input type="checkbox"/> > 4 sq. feet
4.	Is there carpeting in the trailer?	<input type="checkbox"/> Yes <input type="checkbox"/> No
5.	What type of air conditioning does the trailer have?	<input type="checkbox"/> Central AC/forced air <input type="checkbox"/> AC/chiller on roof of Trailer <input type="checkbox"/> No working AC system <input type="checkbox"/> Other: _____
6.	What type of heating does the trailer have?	<input type="checkbox"/> Central heating/forced air <input type="checkbox"/> Space heaters <input type="checkbox"/> No working heating system <input type="checkbox"/> Other: _____
7.	What type fuels are used for cooking?	<input type="checkbox"/> Electricity <input type="checkbox"/> Propane Gas <input type="checkbox"/> Natural Gas <input type="checkbox"/> Charcoal or wood <input type="checkbox"/> Other: _____
8.	Is there a functioning smoke detector?	<input type="checkbox"/> Yes <input type="checkbox"/> No

Notes: _____

APPENDIX F: ENVIRONMENTAL SAMPLING PROTOCOL

Formaldehyde Samples

Analysis Method:

Formaldehyde samples will be collected using the NIOSH Manual of Analytical Methods (NMAM) Method 2016 with Supelco S10 LpDNPH cartridges. The limit of detection (LOD) shall be 0.07 microgram per sample and the limit of quantification (LOQ) shall be 0.23 microgram. Lower LOD and LOQ are acceptable. A minimum quantifiable concentration of 0.0063 parts per million is required with a 30 liter sample volume collected over one hour. The definition from the NMAM should be used for LOD and LOQ. (<http://www.cdc.gov/niosh/nmam/pdfs/glossary.pdf>).

Sample Collection:

Samples will be collected at a flow rate of 500 ± 50 milliliters per minute for one hour. Each sample will be collected in the center of the THU primary living room on a four foot tall stand that mimics the breathing zone height of an adult when sitting. Residents will be asked to configure doors and windows as they would have them while they slept. Sampling will be under observation by one of the sampling team members at all times. Every tenth sample collected by a team will be a duplicate sample. Sampling will occur during a specific window of time per day for all THUs which is between 10:00 AM – 8:00 PM. No cooking or smoking in the THU will be allowed during the one-hour sample collection period.

Quality Assurance and Control:

Six to ten, or additional as required by the lab, media blanks will be taken from each lot of sample tubes. The media blanks should be taken from the start of a lot (2 to 3), from the middle of a lot (2 to 4) and from the end of a lot (2 to 3). All media blanks should be logged on the chain of custody sheet and sent for analysis on the day that they were collected with the field blanks and samples.

Two to ten, or additional as required by the lab, field blanks will be collected on each day in which samples are collected. This can be divided by travel groups, (groups consisting of teams that are operating in close proximity or who are traveling together). All field blanks should be logged on the chain of custody sheet and sent for analysis on the day that they were collected with the media blanks and samples.

Sample Handling:

Sample tubes will be stored in a freezer or in a cooler on ice at all times (upon receipt, while not being used for sampling, and during shipment to the laboratory).

At the end of each sampling day samples will be shipped to the analytical laboratory either overnight or if collected after the last overnight drop off time the next morning in coolers with chain of custody documents enclosed or attached. Samples collected on Saturday and Sunday will be stored on ice or in a freezer and shipped by overnight means with the appropriate chain of custody documents to the analytical laboratory on the following Monday morning.

Temperature and Relative Humidity

Temperature and relative humidity will be logged using a HOBO® brand temperature and relative humidity logging instrument manufactured by Onset Computer Corporation (or equivalent) and will be set to collect data at five minute intervals. Data will be collected during the site visits for a minimum of 5 minutes before and 5 minutes after the collection of the formaldehyde sample at each THU. Data logs will be divided into individual logs for each sample. A suggested method for this is to flag the start and stop times by an event marker at the start and finish of data collection. Data will be downloaded to a laptop at end of each day. Files will be labeled with site #, date, and visit number in a standard form. Data event flags will be confirmed on the sample collection data sheet. Files will be e-mailed each day to the database manager.

Data Sheets

Data sheets will be filled out prior to and during site visit. Information about THU received prior to site visit will be confirmed at time of site visit. Data sheets will be faxed or sent overnight each day to the database manager.

SAMPLING STANDARD OPERATING PROCEDURE

Preparation prior to site visit:

Formaldehyde

Operational Checks:

- 1) Pump and calibrator batteries checked for charge and functionality.
- 2) Pump flow rates calibrated to 500 ± 50 milliliters per minute.
- 3) Sample tubes lot # and expiration date checked.
(Expired tubes will be discarded)
- 4) If necessary, collect media blanks and label.
- 5) Stock coolers with “Blue Ice”
- 6) Sample tubes placed in cooler in number to be equal to trip blanks and samples to be collected + 2.

Temperature and Relative Humidity

Turn on HOBO® instrument and check for proper operation.

Operational checks:

- 1) Confirmation of time synchronization
 - a) Time must agree ± 1 minute with Formaldehyde Chronometer.
 - b) Time should be adjusted if necessary.
- 2) Confirm readings of HOBO® meet manufacturer’s specifications.
 - a) Temperature readings must be $\pm 0.63^\circ$ C of average temperature reading of all HOBO® instruments in group.
 - b) Humidity readings must be $\pm 2.5\%$ of average humidity reading of all HOBO® instruments in group.
 - c) Any HOBO® falling outside the manufacturer’s specifications will be flagged as out of calibration and removed from service until a calibration is performed.
- 3) Confirm that HOBO® is set to log Temperature and Humidity measurements at five minute intervals.
 - a) Adjust to 5 minute data logging interval if necessary.
 - b) Confirm event marker is operating correctly. (If not remove from service)

Data Sheet

1. Confirm information is correct for scheduled site visits.
2. Confirm sheets for all scheduled site visits are present.

Site Visit:

Formaldehyde

1. Calibrate pumps to a flow rate of 500 ± 50 milliliters per minute.
2. Record pump identification and pre-sample flow rate data on data sheet.
3. Label Sample tube.
4. Sample tube and trip blank data recorded on data sheet.
5. Sample tube set on tripod at central unobstructed location in the THU at breathing level.
6. Pump started and time recorded on data sheet.
7. Sample collected for 60 ± 2 minutes.
8. Pump stopped sample immediately capped and stop time recorded on data sheet.
9. Sample returned to cooler.
10. Pump post sample flow rate checked and recorded on data sheet.
11. Sample identification on tube confirmed with data on sample sheet.
12. Trip blanks will be recorded, processed, labeled and returned to cooler.

Temperature and Relative Humidity

1. Confirm that data logger is operating.
 - a. LED blinks.
2. Activate event marker at least 5 minutes prior to start of formaldehyde sample.
 - a. Press button for one second.
3. Record start time for HOB0® sample on data sheet.
4. Continue sampling until at least 5 minutes after completion of Formaldehyde sample, activate event marker to indicate end time of data collection.
 - a. Press button for one second
5. Record stop time on data sheet.

Data Sheet

1. Confirm with the occupants that information previously provided is correct
2. Completely fill out data sheet.
3. Have second team member confirm that data sheet is complete.

Post Site Visit:

Formaldehyde

Monday - Friday samples

1. Confirm that the proper numbers of field and media blanks are enclosed.
2. Chain of custody documents completed for each sample.
3. Cooler "Blue Ice" refreshed.
4. Cooler sealed and shipping label affixed for overnight shipment to lab.

Saturday and Sunday samples

1. Confirm that the proper numbers of field and media blanks are enclosed.
2. Chain of custody documents completed for each sample.
3. Samples stored in freezer.

Monday morning

1. Cooler "Blue Ice" refreshed.
2. Cooler sealed and shipping label affixed for overnight shipment to lab.

Temperature and Relative Humidity

1. Data downloaded to a laptop hard drive.
 - a. Data files will be named with Site #, date and visit number in the form – LA 001.10-12-2007.01. (Or similar)
2. Data file event marks will be checked against data sheet start and stop times.
3. Data e-mailed to data base manager.

Data sheet

Fax or overnight data sheet to data base manager.

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**APPENDIX G:
SAMPLE DATA SHEET FOR FORMALDEHYDE, TEMPERATURE, AND RELATIVE
HUMIDITY DATA COLLECTION**

Date _____ (mm/dd/yyyy)

Sampling Team _____

TRAILER INFORMATION

THU Manufacturer	_____
THU Model	_____
VIN Number	_____
Unique Trailer ID	_____
Date of Manufacture	_____ (mm/dd/yyyy)
THU Address	_____
THU Type	<input type="checkbox"/> Travel trailer <input type="checkbox"/> Mobile home <input type="checkbox"/> Park <input type="checkbox"/> Other
Unit Faces:	N S E W (circle one)

Neighborhood North: Residential/Office/Retail/Manufacturer/Other _____
 South: Residential/Office/Retail/Manufacturer/Other _____
 East: Residential/Office/Retail/Manufacturer/Other _____
 West: Residential/Office/Retail/Manufacturer/Other _____

Comments:

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**APPENDIX G, con't:
SAMPLE DATA SHEET**

Date _____ (mm/dd/yyyy)

Sampling Team _____

TEMPERATURE and RELATIVE HUMIDITY

Sample Location	_____
Sampling Height (inches)	_____
HOBO No.	_____
HOBO S/N	_____
Start Time	_____ AM/PM
Stop Time	_____ AM/PM
HOBO Data File Name	_____

FORMALDEHYDE SAMPLE

Sample Number	_____	Tube Lot	_____
Pump Number S/N	_____	Tube S/N	_____
Pre-Sample Calibration Flow (LPM)	_____	Start Time	_____ AM/PM
Post-Sample Calibration Flow (LPM)	_____	Stop Time	_____ AM/PM
Average Flow (LPM)	_____	Sample Time (min)	_____
Sample Volume (L)	_____		
Field Blank S/N	_____	Chain of Custody #	_____
Shipped via	_____	Shipping #	_____

THU ENVIRONMENT DURING SAMPLING

Number of windows open:	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Door open?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know		
Air conditioning on?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know		
Heat on?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know		
Exhaust hatch open?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know		

Comments: _____

Corrections: _____

**APPENDIX H-1:
LETTER TO PARTICIPANT**

Dear _____:

Thank you for allowing the Centers for Disease Control and Prevention (CDC) to test your trailer for formaldehyde. This letter gives you the results and explains the meaning of these results.

Please remember that formaldehyde was tested in your trailer on just one occasion. The measured level applies to that occasion only. Previously, such as when the trailer was new, or during hot weather, the level might have been higher. In hot weather, such as this coming summer, the level in your trailer may go higher.

In general, the higher your level of formaldehyde exposure is, the greater the risk of health problems. At low levels, the risk is very low, and at higher levels, the risk rises. The formaldehyde level measured in your trailer is only one factor in determining who is sick or who might become sick. Understanding who might become sick depends on many additional factors, such as the age of people living in your trailer, what other health conditions they may have, how long and at what levels people have been exposed.

This single test does not adequately reflect your exposure to formaldehyde, and it cannot reliably predict the effect of formaldehyde exposure on your health. This test is most useful in helping FEMA prioritize who needs to be relocated sooner. It can tell whether you might need to move to new housing urgently, or whether there is more time to evaluate alternative housing.

The level measured in your trailer was **XXX**. You can look at the scale below to help understand this level.

Scale for Level, Measured in Parts per Billion (ppb)		
1000	High	If your reading falls into the higher range you need to place a high priority on lowering your exposure to formaldehyde. This is especially important if residents of your trailer are elderly, young children, or have health conditions, such as asthma.
100	Intermediate	If your reading falls into the intermediate range , your risk of irritation from formaldehyde exposure is lower, but it is still important to take steps to reduce your formaldehyde exposure. This is especially important if residents of your trailer are elderly, young children, or have health conditions such as asthma.
10	Low	If your reading falls into the lower range , these levels are found on the streets of many cities and in many buildings. The risk of health problems at these levels is low.
1		

NOTE: Levels are expressed at parts per billion (ppb). To convert to parts per million (ppm), divide by 1000.

Several important factors will help you evaluate what your level means for you and your family:

- **Age** of people in the trailer. Formaldehyde exposure is a special concern for children and the elderly. Children might be especially likely to become sensitive to formaldehyde, which would raise their chances of developing symptoms. Elderly people may be less able to tolerate high formaldehyde exposures. If children or elderly people are in your trailer, lower formaldehyde exposure is a priority.
- **Health conditions** of people in the trailer. Formaldehyde is irritating to the airways. People with asthma, bronchitis, or other breathing conditions are especially sensitive to exposures such as formaldehyde. The unborn child may be especially sensitive, so pregnant women should be considered especially sensitive. People with other chronic diseases may also be less able to tolerate formaldehyde exposure. If anyone in your trailer has any of these conditions, lower formaldehyde exposure is a priority.
- **How the trailer is used.** Some people are in their trailers essentially all the time. Other people are in their trailers only for short stays (say, if they are sleeping in their homes and only use their trailers for cooking). The more time you spend in your trailer, lower formaldehyde exposure is a priority.

How can you best protect your health?

While living in a trailer, there are several steps you can take to reduce your formaldehyde levels and to protect your health:

- **Ventilate the trailer.** You can lower formaldehyde levels by ventilating your trailer. Running the air conditioning (without recirculating indoor air) will lower the formaldehyde levels, and keeping the windows open will lower them even more.
- **Avoid other indoor air pollutants.** Nobody should smoke inside a trailer. Paint, varnish, solvents, cooking fuels—even nail polish remover and air fresheners—can increase the levels of indoor air pollutants.
- **Control moisture.** If your trailer has any leaks, and if moisture is a problem, this problem should be corrected. Moist conditions can allow mold to grow, and this may also be a health risk.
- **Treat any respiratory diseases.** If anybody in your trailer has asthma or similar conditions, it is important to follow medical advice and treat these conditions.

FEMA can provide advice and assistance for taking these protective steps.

What should you do now? (only 1 of the 3 following paragraphs will be used, depending on formaldehyde measurement)

For trailers with higher levels (in the 100-1000 ppb range):

Travel trailers are considered temporary housing. FEMA is committed to moving residents to permanent housing. Because the formaldehyde level in your trailer was in this range, relocating you will be a priority. This will be especially true if there are sensitive or vulnerable people, such as people with asthma or other conditions mentioned above, in your trailer. In the meantime, it is especially important for you to take steps to reduce formaldehyde exposure, as suggested above. A public health professional will assist you in understanding this information and in planning your next steps.

For trailers with intermediate levels (in the 10-100 ppb range):

Travel trailers are considered temporary housing. FEMA is committed to moving residents to permanent housing. While the formaldehyde level in your trailer was not in the highest range, there is still benefit to reducing it. While you await permanent housing, it is important to take steps to reduce formaldehyde exposure, as suggested above. If there are sensitive or vulnerable people, such as people with asthma or other conditions mentioned above, in your trailer, relocating you will be a higher priority. A public health professional will assist you in understanding this information and in planning your next steps.

For trailers with lower levels (in the 1-10 ppb range):

Travel trailers are considered temporary housing. FEMA is committed to moving residents to permanent housing. Fortunately, the formaldehyde level in your trailer was low, so there is a little more time to find suitable permanent housing for you. In the meantime, remember that levels may rise in the warmer weather, so your trailer will be retested when the weather warms up. It is still advisable to take steps to reduce formaldehyde exposure, as suggested above, especially if there are sensitive or vulnerable people, such as people with asthma or other conditions mentioned above, in your trailer. A public health professional will assist you in understanding this information and in planning your next steps.

CDC will share the testing results with FEMA. The results will help FEMA with making plans to move people into permanent housing.

A member of CDC's staff will help you in understanding this information so that you can make choices about your needs. **Please call 1-800-CDC-INFO if you would like to speak to a public health professional.**

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