U.S. Department of Housing and Urban Development

Lead Hazard Control and Healthy Homes

Lead and Healthy Homes Technical Studies (LHHTS) Grant Program
FR-6700-N-15
11/06/2023

Table of Contents

Program Office:
Lead Hazard Control and Healthy Homes

Funding Opportunity Title:
Lead and Healthy Homes Technical Studies (LHHTS) Grant Program

Funding Opportunity Number:
FR-6700-N-15

Assistance Listing Number (formerly CFDA Number):
14.906,14.902

Due Date for Applications:
11/06/2023

OVERVIEW

The U.S. Department of Housing and Urban Development (HUD) issues this Notice of Funding Opportunity (NOFO) to invite applications from eligible applicants for the program and purpose described within this NOFO. You, as a prospective applicant, should carefully read all instructions in all sections to avoid sending an incomplete or ineligible application. HUD funding is highly competitive. Failure to respond accurately to any submission requirement could result in an incomplete or noncompetitive proposal.

In accordance with Title 24 part 4, subpart B of the Code of Federal Regulations (CFR), during the selection process (which includes HUD's NOFO development and publication and concludes with the award of assistance), HUD is prohibited from disclosing covered selection information. Examples of impermissible disclosures include: 1) information regarding any applicant's relative standing; 2) the amount of assistance requested by any applicant; and 3) any information contained in the application. Prior to the application deadline, HUD may not disclose the identity of any applicant or the number of applicants that have applied for assistance.

For further information regarding this NOFO, direct questions regarding the specific requirements of this NOFO to the agency contact identified in section VII.

Paperwork Reduction Act Statement. In accordance with the Paperwork Reduction Act of 1995 (44 U.S.C. 3501- 3520) (PRA), the Office of Management and Budget (OMB) approved the information collection requirements in this NOFO. HUD may not conduct or sponsor, and a person is not required to respond to a collection of information unless the collection displays a valid OMB control number. This NOFO identifies its applicable OMB control number, unless its collection of information is excluded from these requirements under 5 CFR part 1320.

OMB Approval Number(s):
2539-0015

I. FUNDING OPPORTUNITY DESCRIPTION

A. Program Description

1. Purpose

Through this NOFO, HUD is funding studies to improve knowledge of housing-related health and safety hazards and to improve or develop new hazard assessment and control methods, with

a focus on lead and other key residential health and safety hazards. HUD is especially interested in applications that will advance our knowledge of priority healthy homes issues by addressing important gaps in science related to the accurate and efficient identification of hazards and the implementation of cost-effective hazard mitigation. This includes studies using implementation sciences in identifying specific conditions under which residential environmental hazard interventions, that have been shown to be effective in specific housing types and residential settings, can be assessed in other contexts. Key hazards are discussed in Appendix A, Key Residential Health, and Safety Hazards, of this NOFO. A list of references that serves as the basis for the information provided in this NOFO is provided as Appendix C, Relevant Publications, Guidelines and Other Resources. Priority research topics of particular interest to HUD are identified in section III.F.1.

Both the Lead and Healthy Homes Technical Studies (LHHTS) Programs are important for the achievement of research goals identified in HUD's *Healthy Homes Strategic Plan* (available at: https://www.hud.gov/sites/documents/DOC_13701.PDF),the federal healthy homes strategic plan, *Advancing Healthy Housing : A Strategy for Action* (available at: https://www.hud.gov/sites/documents/STRATPLAN_FINAL_11_13.PDF, and the *Federal Action Plan to Reduce Childhood Lead Exposures and Associated Health Impacts* (https://www.hud.gov/sites/dfiles/HH/documents/fedactionplan_lead_final.pdf).

a. General Goals

(1) Lead Technical Studies (LTS)

The overall goal of the LTS grant program is to gain knowledge to improve the efficacy and cost-effectiveness of methods for evaluation and control of residential lead-based paint hazards. Through this Program, HUD is working to fulfill the requirements of sections 1051 and 1052 of the Residential Lead-Based Paint Hazard Reduction Act of 1992 (Title X) (42 U.S.C. §§ 4854 and 4854a) which directs HUD to conduct research on topics which include the development of improved methods for evaluating and reducing lead-based paint hazards in housing, among others. Brief descriptions of active and previously funded LTS projects can be found on HUD's website at https://www.hud.gov/program_offices/healthy_homes. Where appropriate, you are encouraged to build your proposed study upon HUD-sponsored work that has been previously completed, in addition to other relevant research (i.e., reported in the published literature). The results of the applicable aspects of LTS will be used in part to update *HUD's Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* (Guidelines) and other HUD policy guidance. For supporting references, including where to find the Guidelines, see: The HUD Guidelines for the Evaluation and Control of Lead-based Paint in Housing | HUD.gov / U.S. Department of Housing and Urban Development (HUD) and Appendix C.

The overall objectives include but are not limited to the statutory requirements listed in Section 1052 of Title X:

1. Develop improved methods for evaluating lead-based paint hazards.
2. Develop improved methods for reducing lead-based paint hazards.
3. Develop improved methods for measuring lead in paint films, dust, and soil.
4. Establish performance standards for various detection methods, including spot test kits.
5. Establish performance standards for lead-based paint hazard reduction methods, including the use of encapsulants.
6. Establish appropriate cleanup standards.

7. Evaluate the efficacy of interim controls in various situations.
8. Evaluate the relative performance of various abatement techniques.
9. Evaluate the long-term cost-effectiveness of interim control and abatement strategies.
10. Assess the effectiveness of hazard evaluation and reduction activities.

Studies should be related to the above primary objectives. For example, a study using large databases may be related to the efficacy of interim controls, etc. Another example may be relating the use of novel methods for lead risk assessment or for dust lead measurements to the primary objective of developing improved methods for evaluating lead-based paint hazards or for measuring lead in dust.

(2) Healthy Homes Technical Studies (HHTS)

The overall goal of the HHTS Program is to advance the recognition and control of priority residential health and safety hazards and more closely examine the link between housing and health. The overall objectives of the Program include but are not limited to:

(a) Development and evaluation of cost-effective test methods and protocols for the identification and assessment of housing-related hazards.

(b) Development and assessment of cost-effective methods for reducing or eliminating housing-related hazards.

(c) Evaluation of the effectiveness of housing interventions and barriers and incentives affecting future use of the most cost-effective strategies.

(d) Supporting translational and implementation research studies which involve the adaptation and use of effective healthy homes intervention strategies in different housing types, residential settings, and populations.

(e) Investigation of the epidemiology of housing-related hazards and illness and injuries associated with these hazards, with an emphasis on low income, vulnerable populations (e.g., children, communities of color, persons with disabilities, senior citizens, etc.).

(f) Analysis of existing data or generation of new data to improve knowledge regarding the prevalence and severity of specific hazards in various types of housing and by demographic characteristics of residents, with a focus on low-income housing.

(g) Improved understanding of the relationship between residential exposure and illness or injury of children or other vulnerable populations. (Note: Applicants that propose this type of study should discuss how the knowledge that is gained from the study could be used in a program to reduce these hazards in target communities).

HUD anticipates that the results of program-supported studies will help to develop evidence-based approaches that are cost-effective and efficient and will result in the reduction of health threats for the maximum number of residents and, in particular, children and other vulnerable populations (e.g., communities of color, persons with disabilities, the elderly) in low-income households. Study results are also expected to improve our understanding of how specific aspects of the indoor environment can affect the health of residents.

Applicants should consider the ability of their proposed study to generate definitive results. Since the size of the awards under this NOFO may limit the ability of applicants to design and implement research on health outcomes using the strongest methodology (i.e., a randomized controlled trial), applicants should consider focusing on important indoor environmental quality (IEQ) measures instead of health outcomes in studies where this is appropriate, such as when existing research has demonstrated a significant association between the IEQ measures and health outcomes. A focus on environmental outcomes is expected to produce results that will

complement the health outcome, typically, the impact of improvements to IEQ on health outcomes can be inferred where the evidence base is sufficient. HUD is especially interested in funding practical, applied research, including studies using implementation science, which can directly inform policies and practices to reduce the prevalence and severity of residential health and safety hazards and improve the health and well-being of residents. You should be aware of where your proposed study fits within a translational research framework (i.e., Pettibone et al., 2018: https://doi.org/10.1289/EHP3657). Implementation research (IR) helps identify the context (real world environmental and social setting) that impacts the adoption of interventions within a community to address persistent residential environmental health hazards (Bauer, 2020; Smith, 2020). Identifying and understanding the specifications of the context within which the study is being conducted helps provide a better understanding of how and for whom the interventions work, under what conditions, and the expected outcomes (Smith, 2020). To use IR studies effectively the researcher needs to identify the interventions of interest, then determine whether the interventions have shown both effectiveness and efficacy, and if they have, finally use mixed methods designs (Lane-Fall, 2019). HUD is particularly interested in IR proposals that involve the identification and study of the context and conditions under which different interventions are effective, thus making these interventions more acceptable and easily implementable in low-income and affordable housing environments.

The HHTS Program is a component of HUD's Healthy Homes Program. A description of the Healthy Homes Program is available on the HUD website at https://www.hud.gov/program_offices/healthy_homes/hhi. In addition to deficiencies in basic housing conditions that may impact health (e.g., structural problems, lack of adequate heating and cooling, pest infestation, excess moisture), other subtler health hazards may exist in the residential environment (e.g., asthma triggers, volatile and semi-volatile organic compounds including pesticide residues, injury hazards, etc.). While some hazards will be found disproportionately in housing that is substandard, housing-related environmental hazards may also exist in housing that is otherwise of acceptable quality. Appendix A of this NOFO briefly describes the key housing-associated health and safety hazards HUD considers targets for intervention. The hazards and conditions identified in Appendix A are not considered exhaustive, applicants may submit applications that focus on topics that are not included in Appendix A. HUD has also developed resource papers on several topics of importance under the Healthy Homes Program, including mold, environmental aspects of asthma, carbon monoxide, pesticides, residential assessment and unintentional injuries. These resource papers can be downloaded from https://www.hud.gov/program_offices/healthy_homes.

b. Community Participation

HUD believes that it is important for researchers to incorporate meaningful community participation in the development and implementation of studies that are conducted in communities and/or involve significant interaction with community residents. Community participation can improve study effectiveness in various ways, including the development of more appropriate research objectives, improving recruitment and retention of study participants, improving participants' involvement in, and understanding of a study, improving ongoing communication between researchers and the affected community, and improving dissemination of study findings. Community Based Participatory Research (CBPR) offers researchers the opportunity to use translational science to improve sustainability/long-term success and efficacy of effective scientific interventions to address residential environmental health issues in diverse

communities. It also helps identify specific conditions and structures within the communities needed for these effective interventions to work best. HUD encourages applicants to consider using elements of a CBPR approach, where applicable, in study design and implementation. (See, e.g., The National Institute of Environmental Health Sciences report titled "Successful Models of Community-Based Participatory Research" at https://www.hud.gov/sites/documents/DOC_12485.PDF and the Wallerstein and Duran (2010) paper titled "Community-based participatory research contributions to intervention research: The intersection of science and practice to improve health equity"). CBPR is characterized by substantial community input in all phases of a study (i.e., design, implementation, data interpretation, conclusions, and communication of results).

2. HUD and Program-Specific Goals and Objectives

This NOFO supports HUD's Strategic Plan for Fiscal Years (FY) 2022-2026 to accomplish HUD's mission and vision. Each of the five goals in the Strategic Plan include what HUD hopes to accomplish, the strategies to accomplish those objectives, and the indicators of success. However, of the five goals only those applicable to this NOFO are identified below.

You are expected to align your application to the applicable strategic goals and objectives below. Use the information in this section to describe in your application the specific goals, objectives, and measures that your project is expected to help accomplish. If your project is selected for funding, you are also expected to establish a plan to track progress related to those goals, objectives, and measures. HUD will monitor compliance with the goals, objectives, and measures in your project.

Applicable Goals and Objectives from HUD's Strategic Plan

1. **Strategic Goal 1: Support Underserved Communities**
Fortify support for underserved communities and support equitable community development for all people.
2. **1A: Advance Housing Justice**
Fortify support for vulnerable populations, underserved communities, and Fair Housing enforcement.
3. **1B: Reduce Homelessness**
Strengthen Federal, State, Tribal, and community implementation of the Housing First approach to reducing the prevalence of homelessness, with the ultimate goal of ending homelessness.
4. **1C: Invest in the Success of Communities**
Promote equitable community development that generates wealth-building for underserved communities, particularly for communities of color.
5. **Strategic Goal 2: Ensure Access to and Increase the Production of Affordable Housing**
Ensure housing demand is matched by adequate production of new homes and equitable access to housing opportunities for all people.
6. **2A: Increase the Supply of Housing**
Enhance HUD's programs that increase the production and supply of housing across the country.
7. **2B: Improve Rental Assistance**
Improve rental assistance to address the need for affordable housing.
8. **Strategic Goal 3: Promote Homeownership**
Promote homeownership opportunities, equitable access to credit for purchase and improvements, and wealth-building in underserved communities.

9. **3A: Advance Sustainable Homeownership**
Advance the deployment of tools and capital that put sustainable homeownership within reach.

10. **3A ◆ Major Initiative: Expand Homeownership Opportunities**
Promote financing for innovative ownership models to increase the availability of affordable housing.

11. **3B: Create a More Accessible and Inclusive Housing Finance System**
Advance new policy, programs, and modernization initiatives that support a more equitable housing finance system. Promote the preservation and creation of affordable housing stock.

12. **Strategic Goal 4: Advance Sustainable Communities**
Advance sustainable communities by strengthening climate resilience and energy efficiency, promoting environmental justice, and recognizing housing's role as essential to health.

13. **4A: Guide Investment in Climate Resilience**
Invest in climate resilience, energy efficiency, and renewable energy across HUD programs.

14. **4B: Strengthen Environmental Justice**
Reduce exposure to health risks, environmental hazards, and substandard housing, especially for low-income households and communities of color.

15. **4C: Integrate Health and Housing**
Advance policies that recognize housing's role as essential to health.

Funding Opportunity Goals

- a. General Goals

  (1) Lead Technical Studies (LTS)

  The overall goal of the LTS grant program is to gain knowledge to improve the efficacy and cost-effectiveness of methods for evaluation and control of residential lead-based paint hazards. Through this Program, HUD is working to fulfill the requirements of sections 1051 and 1052 of the Residential Lead-Based Paint Hazard Reduction Act of 1992 (Title X) (42 U.S.C. §§ 4854 and 4854a) which directs HUD to conduct research on topics which include the development of improved methods for evaluating and reducing lead-based paint hazards in housing, among others. Brief descriptions of active and previously funded LTS projects can be found on HUD's website at https://www.hud.gov/program_offices/healthy_homes. Where appropriate, you are encouraged to build your proposed study upon HUD-sponsored work that has been previously completed, in addition to other relevant research (i.e., reported in the published literature). The results of the applicable aspects of LTS will be used in part to update HUD's Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing (Guidelines) and other HUD policy guidance. For supporting references, including where to find the Guidelines, see: The HUD Guidelines for the Evaluation and Control of Lead-based Paint in Housing | HUD.gov / U.S. Department of Housing and Urban Development (HUD) and Appendix C.

  The overall objectives include but are not limited to the statutory requirements listed in Section 1052 of Title X:

  1. Develop improved methods for evaluating lead-based paint hazards.

  2. Develop improved methods for reducing lead-based paint hazards.

3. Develop improved methods for measuring lead in paint films, dust, and soil.

4. Establish performance standards for various detection methods, including spot test kits.

5. Establish performance standards for lead-based paint hazard reduction methods, including the use of encapsulants.

6. Establish appropriate cleanup standards.

7. Evaluate the efficacy of interim controls in various situations.

8. Evaluate the relative performance of various abatement techniques.

9. Evaluate the long-term cost-effectiveness of interim control and abatement strategies.

10. Assess the effectiveness of hazard evaluation and reduction activities.

Studies should be related to the above primary objectives. For example, a study using large databases may be related to the efficacy of interim controls, etc. Another example may be relating the use of novel methods for lead risk assessment or for dust lead measurements to the primary objective of developing improved methods for evaluating lead-based paint hazards or for measuring lead in dust.

(2) Healthy Homes Technical Studies (HHTS)

The overall goal of the HHTS Program is to advance the recognition and control of priority residential health and safety hazards and more closely examine the link between housing and health. The overall objectives of the Program include but are not limited to:

(a) Development and evaluation of cost-effective test methods and protocols for the identification and assessment of housing-related hazards.

(b) Development and assessment of cost-effective methods for reducing or eliminating housing-related hazards.

(c) Evaluation of the effectiveness of housing interventions and barriers and incentives affecting future use of the most cost-effective strategies.

(d) Supporting translational and implementation research studies which involve the adaptation and use of effective healthy homes intervention strategies in different housing types, residential settings, and populations.

(e) Investigation of the epidemiology of housing-related hazards and illness and injuries associated with these hazards, with an emphasis on low income, vulnerable populations (e.g., children, communities of color, persons with disabilities, senior citizens, etc.).

(f) Analysis of existing data or generation of new data to improve knowledge regarding the prevalence and severity of specific hazards in various types of housing and by demographic characteristics of residents, with a focus on low-income housing.

(g) Improved understanding of the relationship between residential exposure and illness or injury of children or other vulnerable populations. (Note: Applicants that propose this type of study should discuss how the knowledge that is gained from the study could be used in a program to reduce these hazards in target communities).

3. Changes from Previous NOFO

The following is a summary of the major changes in this NOFO relative to the Fiscal Year (FY) 2022 LHHTS NOFO. This is not intended to be an exhaustive list, so applicants should be sure to read the entire NOFO.

a. Section I.A.4.a., Standard Definitions – These new definitions are added to this year's NOFO: Environmental Justice, Equity, Minority-Serving Institutions, Racial Equity, Resilience, and Underserved Communities. The following definition is removed: DUNS.

b. Affirmatively Furthering Fair Housing (AFFH) is removed as a threshold requirement; however, AFFH remains a program requirement under section IV.G. of the NOFO.

c. Section. III., Eligibility Information. Organizations that received an award under the FY 2021 or FY 2022 Lead and Healthy Homes Technical Studies Grant Program cycle are ineligible unless applying with a different Principal Investigator (PI).

d. Section III.E., Statutory and Regulatory Requirements Affecting Eligibility – This section in the NOFO is updated to include applicable eligibility requirements. The NOFO Template supplemental document is also updated and posted on HUD's Funding Opportunity webpage.

e. Section IV.B.1., Content and Form of Application Submission – This section in the NOFO is updated to require form HUD 424-B (Applicant Assurances and Certifications) and Federal Assistance Assurances.

f. Section. V.B., Review and Selection Process – This section is updated to include a new requirement to ensure applicants have Experience Promoting Racial Equity.

g. Narratives. These narratives are required and must address the issues described in the corresponding sections:

- Advancing Racial Equity (Section III.F);
- Affirmative Marketing (Section III.F);
- Affirmatively Furthering Fair Housing (Section IV.G); and
- Experience Promoting Racial Equity (Section V.B).

Applicants will submit these four (4) equity narratives in Appendix B (maximum of 2 pages)**.** Each narrative will be evaluated for sufficiency and will not change the applicant's score or rank as compared to other applicants. If a narrative is deemed insufficient, it will be a "Curable Deficiency" that will be communicated to the applicant for correction with a notice of deficiency.

h. Section VI.B., Administrative, National and Departmental Policy Requirements and Terms for HUD Applicants and Recipients of Financial Assistance Awards – This section in the NOFO is updated to include compliance with: Secretary Fudge's, April 12, 2022, memorandum; equity requirements; and waste, fraud, and abuse requirements. Additionally, this section clarifies requirements related to nondiscrimination and equal opportunity. The related NOFO supplemental document is updated and posted on HUD's Funding Opportunity webpage. Furthermore, this section is updated to require program details related to its termination policy.

i. Federal Relay Service – The Federal Relay Service contract expired in February 2022. HUD no longer uses the service. The NOFO is updated to include the use of Federal Communications

Commission (FCC) relay services for individuals who are deaf or hard of hearing as well as individuals who have speech or communication disabilities.

j. Under the General Goals for LTS, HUD added the following language: The overall objectives include but are not limited to the statutory requirements listed in Section 1052 of Title X:

- Develop improved methods for evaluating lead-based paint hazards.
- Develop improved methods for reducing lead-based paint hazards.
- Develop improved methods for measuring lead in paint films, dust, and soil.
- Establish performance standards for various detection methods, including spot test kits.
- Establish performance standards for lead-based paint hazard reduction methods, including the use of encapsulants.
- Establish appropriate cleanup standards.
- Evaluate the efficacy of interim controls in various situations.
- Evaluate the relative performance of various abatement techniques.
- Evaluate the long-term cost-effectiveness of interim control and abatement strategies.
- Assess the effectiveness of hazard evaluation and reduction activities.

k. HUD has modified the list of priority research topics for FY 2022 by including the following (see section III.F.1).

> (2) The World Health Organization (WHO) "Environment, Climate Change and Health" mentions that housing practices influence climate, which has an intimate relationship with health. The building sector (residential and commercial) accounted for 19% of global greenhouse gas emissions and one-third of global black carbon emissions in 2010, according to the Intergovernmental Panel on Climate Change (2014). The University of California at Davis Western Cooling Efficiency Center reported that, "Residential energy use is responsible for about 20% of total greenhouse gas (GHG) emissions in the US."
>
> As the Federal agency dedicated to creating strong, sustainable, inclusive communities, and quality affordable homes, HUD is on the front lines of the nation's efforts to increase resilience to climate impacts. In response to the policy set forth in Executive Order 14008, HUD Action Plan is organized around three overarching Climate Action Goals for programs and policies under HUD's purview: Goal 1: Increase Climate Resilience, Goal 2: Reduce Greenhouse Gas Emissions and Goal 3: Pursue Environmental Justice. To support HUD's New Climate Action Plan: https://www.hud.gov/climate, HUD is interested in research that identifies actions that protect the health and safety of the families from hazards resulting from natural disasters and help them to mitigate the risks of such health and safety hazards in housing occurring before anticipated disasters. Also, HUD is interested in research on the health effects of indoor air quality of switching, in HUD-supported housing, to low-carbon or zero-carbon sources of energy. (Note: Applicants that propose this type of study should discuss how the knowledge that is gained from the study could be used in a program to reduce these hazards in target communities). The OLHCHH offers a list of activities (https://www.hud.gov/climate/OLHCHH) that support and implement Climate Action more broadly.

(4) Indoor air quality is also damaged by poor choice of building materials, structural risks as well as poor ventilation practices. Poor ventilation practices may promote excessive exposure to moisture, mold, radon, asbestos, lead, volatile organic compounds (VOC), and indoor pollutants (see Appendix C for research literature on these subjects). HUD is interested in innovative methods (not discussed elsewhere in this list of priorities) to identify the sources and control the hazards in order to improve the indoor air quality in the residences of the people we serve.

l. HUD has eliminated the Pre-Application Step.

4. Definitions

a. Standard Definitions

Affirmatively Furthering Fair Housing (AFFH) means taking meaningful actions, in addition to combating discrimination to overcome patterns of segregation and foster inclusive communities free from barriers that restrict access to opportunity based on protected characteristics. Specifically, affirmatively furthering fair housing means taking meaningful actions that, taken together, address significant disparities in housing needs and in access to opportunities, replacing segregated living patterns with truly integrated and balanced living patterns, transforming racially and ethnically concentrated areas of poverty into areas of opportunity, and fostering and maintaining compliance with civil rights and fair housing laws. The duty to affirmatively further fair housing extends to all program participant's activities and programs relating to housing and urban development.

Assistance Listing number refers to the unique number assigned to each Federal assistance program publicly available in the Assistance Listing, which is managed and administered by the General Services Administration. The Assistance Listing number was formerly known as the Catalog of Federal Domestic Assistance (CFDA) number.

Authorized Organization Representative (AOR) is a person authorized to legally bind your organization and submit applications via Grants.gov. The AOR is authorized by the E-Business Point of Contact (E-Biz POC) in the System for Award Management (see E-Biz POC definition). An AOR may include an Expanded AOR and/or a Standard AOR.

Expanded Authorized Organization Representative is a user in Grants.gov who is authorized by the E-Biz POC to perform the functions of a Standard AOR, initiate and submit applications on behalf of your organization, and is allowed to modify organization-level settings and certifications in Grants.gov.

Standard Authorized Organization Representative is a user in Grants.gov who is authorized by the E-Biz POC to initiate and submit applications in Grants.gov. A Grants.gov user with the Standard AOR role can only submit applications when they are a Participant for that workspace.

Consolidated Plan is the document submitted to HUD that serves as the comprehensive housing affordability strategy, community development plan, and submission for funding under any of the Community Planning and Development formula grant programs (e.g., CDBG, ESG, HOME, and HOPWA). This Plan is prepared in accordance with the process described in 24 CFR part 91. This plan is completed by engaging in a participatory process to assess their affordable housing and community development needs and market conditions, and to make data-driven, place-based

investment decisions with funding from formula grant programs. (See 24 CFR part 91 for HUD's requirements regarding the Consolidated Plan and related Action Plan).

Contract means, for the purpose of Federal financial assistance, a legal instrument by which a recipient or subrecipient purchases property or services needed to carry out the project or program under a federal award. For additional information on contractor and subrecipient determinations, see 2 CFR 200.331.

Contractor means an entity that receives a contract as defined above and in 2 CFR 200.1.

Cooperative agreement has the same meaning defined at 2 CFR 200.1.

Deficiency, with respect to the making of an application for funding, is information missing or omitted within a submitted application. Examples of deficiencies include missing documents, missing or incomplete information on a form, or some other type of unsatisfied information requirement. Depending on specific criteria, a deficiency may be either Curable or Non-Curable.

> ***A Curable Deficiency*** is missing or incomplete application information that may be corrected by the applicant with timely action. To be curable, the deficiency must:
>
> - Not be a threshold requirement, except for documentation of applicant eligibility;
> - Not influence how an applicant is ranked or scored versus other applicants; and
> - Be remedied within the time frame specified in the notice of deficiency.
>
> ***A Non-Curable Deficiency*** is missing or incomplete application information that cannot be corrected by an applicant after the submission deadline. A non-curable deficiency is a deficiency that is a threshold requirement, or a deficiency that, if corrected, would change an applicant's score or rank versus other applicants. If an application includes a non-curable deficiency, the application may receive an ineligible determination, or the non-curable deficiency may otherwise adversely affect the application's score and final funding determination.

E-Business Point of Contact (E-Biz POC) is an organization applicant who is responsible for the administration and management of grant activities for his or her organization. The E-Biz POC is likely to be an organization's chief financial officer or authorizing official. The E-Biz POC authorizes representatives of their organization to apply on behalf of the organization (see Authorized Organization Representative definition). There can only be one E-Biz POC per unique entity identifier (see definition of Unique Entity Identifier below).

Eligibility requirements are mandatory requirements for an application to be eligible for funding.

Environmental Justice means investing in environmental improvements, remedying past environmental inequities, and otherwise developing, implementing, and enforcing laws and policies in a manner that advances environmental equity and provides meaningful involvement for people and communities that have been environmentally underserved or overburdened, such as Black and Brown communities, indigenous groups, and individuals with disabilities. This definition does not alter the requirements under HUD's regulations at 24 CFR 58.5(j) and 24 CFR 50.4(l) implementing Executive Order 12898. E.O. 12898 requires a consideration of how federally assisted projects may have disproportionately high and adverse human health or environmental effects on minority and/or low-income populations. For additional information on

environmental review compliance, refer to: https://www.hud.gov/program_offices/comm_planning/environment_energy/regulations.

Equity has the meaning given to that term in Section 2(a) of Executive Order 13985 and means the consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as Black, Latino, and Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality.

Federal Award, has the meaning, depending on the context, in either paragraphs (1) or (2) of this definition:

(1)

(a) The Federal financial assistance that a recipient receives directly from a Federal awarding agency or a subrecipient receives indirectly from a pass-through entity, as described in 2 CFR 200.101; or

(b) The cost-reimbursement contract under the Federal Acquisition Regulations that a non- Federal entity receives directly from a federal awarding agency or indirectly from a pass- through entity, as described in 2 CFR 200.101.

(2) The instrument setting forth the terms and conditions. The instrument is the grant agreement, cooperative agreement, other agreement for assistance covered in paragraph (2) of the definitions of Federal financial assistance in 2 CFR 200.1, and this NOFO, or the cost-reimbursement contract awarded under the Federal Acquisition Regulations.

(3) Federal award does not include other contracts that a Federal agency uses to buy goods or services from a contractor or a contract to operate Federal Government owned, contractor operated facilities (GOCOs).

(4) See also definitions of Federal financial assistance, grant agreement, and cooperative agreement in 2 CFR 200.1.

Federal Financial Assistance has the same meaning defined at 2 CFR 200.1.
Grants.gov is the website serving as the Federal government's central portal for searching and applying for Federal financial assistance throughout the Federal government. Registration on Grants.gov is required for submission of applications to prospective agencies unless otherwise specified in this NOFO.

Historically Black Colleges and Universities (HBCUs) are any historically Black college or university that was established prior to 1964, whose principal mission was, and is, the education of Black Americans, and that is accredited by a nationally recognized accrediting agency or association determined by the Secretary of Education to be a reliable authority as to the quality of training offered or is, according to such an agency or association, making reasonable progress toward accreditation. A list of accredited HBCUs can be found at the U.S. Department of Education's website.

Minority-Serving Institutions (MSIs) are

(1) a part B institution (as defined in 20 U.S.C. 1601);

(2) a Hispanic-serving institution (as defined in 20 U.S.C. 1101a(5));

(3) a Tribal College or University (as defined in 20 U.S.C. 1059c);

(4) an Alaska Native-serving institution or a Native Hawaiian-serving institution (as defined in 20 U.S.C. 1059d(b));

(5) a Predominantly Black Institution (as defined in 20 U.S.C. 1059e);

(6) an Asian American and Native American Pacific Islander-serving institution (as defined in 20 U.S.C. 1059g); or

(7) a Native American-serving nontribal institution (as defined in 20 U.S.C. 1059f).

Non-Federal Entity (NFE) means a state, local government, Indian tribe, Institution of Higher Education (IHE), or non-profit organization that carries out a federal award as a recipient or subrecipient.

Primary Point of Contact (PPOC) is the person who may be contacted with questions about the application submitted by the AOR. The PPOC is listed in item 8F on the SF-424.

Racial Equity is the elimination of racial disparities, and is achieved when race can no longer predict opportunities, distribution of resources, or outcomes – particularly for Black and Brown persons, which includes Black, Latino, indigenous, Native American, Asian, Pacific Islander, and other persons of color.

Recipient means an entity, usually but not limited to non-Federal entities, that receives a federal award directly from HUD. The term recipient does not include subrecipients or individuals that are beneficiaries of the award.

Resilience is a community's ability to minimize damage and recover quickly from extreme events and changing conditions.

Small business is defined as a privately-owned corporation, partnership, or sole proprietorship that has fewer employees and less annual revenue than regular-sized business. The definition of "small"—in terms of being able to apply for government support and qualify for preferential tax policy—varies by country and industry. The U.S. Small Business Administration defines a small business according to a set of standards based on specific industries. See 13 CFR Part 121.

Subaward means an award provided by a pass-through entity to a subrecipient for the subrecipient to carry out part of a federal award received by the pass-through entity. It does not include payments to a contractor or payments to an individual that is a beneficiary of a Federal program. A subaward may be provided through any form of legal agreement, including an agreement that the pass-through entity considers a contract.

Subrecipient means an entity, usually but not limited to non-Federal entities, that receives a subaward from a pass-through entity to carry out part of a federal award but does not include an individual that is a beneficiary of such award. A subrecipient may also be a recipient of other federal awards directly from a federal awarding agency.

System for Award Management (SAM) is the Federal Repository into which an entity must provide information required for the conduct of business as a recipient. Registration with SAM is

required for submission of applications via Grants.gov. You can access the website at https://www.sam.gov/SAM/. There is no cost to use SAM.

Threshold Requirements are eligibility requirements that must be met for an application to be reviewed, rated, and ranked. Threshold requirements are not curable, except for documentation of applicant eligibility, which are listed in Section III.D., Threshold Eligibility Requirements. Similarly, there are eligibility requirements under Section III.E., Statutory and Regulatory Requirements Affecting Eligibility.

Underserved Communities has the meaning given to that term in Section 2(b) of Executive Order 13985 and refers to populations sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life, as exemplified by the list in the definition of "equity" above.

Unique Entity Identifier (UEI) means the identifier assigned by SAM to uniquely identify business entities. As of April 4, 2022, the Federal government has transitioned from the use of the DUNS Number to the use of UEI, as the primary means of entity identification for Federal awards government-wide.

b. Program Definitions.

None

B. Authority

The Lead Technical Studies program is authorized under sections 1051 and 1052 of the Residential Lead-Based Paint Hazard Reduction Act of 1992 (Title X of the Housing and Community Development Act of 1992, 42 U.S.C. §§ 4854 and 4854a). The Healthy Homes Technical Studies program is authorized under sections 501 and 502 of the Housing and Urban Development Act of 1970 (12 U.S.C. §§ 1701z-1 and 1701z-2). Funding is provided by the Consolidated Appropriations Act, 2023 (Public Law 117-328), approved December 29, 2022.

II. AWARD INFORMATION

A. Available Funds

Funding of approximately **$7,000,000** is available through this NOFO. Subject to appropriations, HUD reserves the right to award fiscal year 2024 funds based on this NOFO competition.

Additional funds may become available for award under this NOFO consistent with Section VI.A.2.e., Adjustments to Funding. Use of these funds is subject to statutory constraints. All awards are subject to the funding restrictions contained in this NOFO.

Of the $7,000,000 available through this NOFO, up to $2,000,000 is available for the LTS grant program and $5,000,000 is available for the HHTS grant program, from the funding sources noted in section I.B. Authority.

B. Number of Awards

HUD expects to make approximately 13 awards from the funds available under this NOFO.

For each of the grant programs funded under this announcement, HUD expects to make the following awards: approximately 4 to 8 awards for the LTS Grant Program and approximately 4 to 5 awards for the HHTS Grant Program. However, the estimated number of awards will depend on the number of eligible applicants for each grant program, their requested amounts, and other factors. For information on the methodology used to make award determinations under this NOFO, please see Section V.B Review and Selection Process below.

C. Minimum/Maximum Award Information

1. Awards will range from $300,000 to a maximum of $800,000 for the LTS Grant Program and $300,000 to a maximum of $1,000,000 for the HHTS Grant Program.
2. **Note for New Applicants**. If supported by the majority of the Application Review Panel, HUD will make an award of up to $800,000 under the LTS Grant Program or up to $1,000,000 under the HHTS Grant Program for the highest scoring application from a qualified new applicant, as defined here, on the condition that the application receives a score of at least 82 points. **A new applicant is an organization that has not been previously funded by the Office of Lead Hazard Control and Healthy Homes (OLHCHH) under the Technical Studies Grant Program to which they are applying as the primary grantee.** A new applicant may have previously been a sub-grantee under an award to another organization. If there is not a qualified new applicant for funding, any remaining funds will be made available to the general pool of qualified LHHTS Grant Program applicants based on the final overall ranking.

Estimated Total Funding:
$7,000,000

Minimum Award Amount:
$300,000
Per Project Period

Maximum Award Amount:
$1,000,000
Per Project Period

D. Period of Performance

The start date will be determined during the period of negotiations with successful applicants. The period of performance cannot exceed 36 months from the time of award. The proposed performance period should include adequate time for such project components as the Institutional Review Board process (if required), the hiring of new staff, the recruitment of study participants, and the development of methods (e.g., analytical methods), all of which have been found to delay projects in the past.
Period of performance extensions for delays due to exceptional conditions beyond the grantee's control will be considered for approval by HUD in accordance with 2 CFR § 200.308(e)(2), as applicable, and the OLHCHH Program Guide (https://www.hud.gov/sites/documents/PGI_2013-03.PDF). If requested, determined to be appropriate, and subsequently approved by OLHCHH, grantees will be eligible to receive a single extension of up to 12 months in length.

Estimated Project Start Date:

12/07/2023

Estimated Project End Date:
12/07/2026

Length of Project Periods:
36-month project period and budget period

Length of Periods Explanation of Other:
N/A

E. Type of Funding Instrument

Funding Instrument Type:
CA (Cooperative Agreement)
Awards will be made as cooperative agreements. Anticipated substantial involvement by HUD staff for cooperative agreements may include, but will not be limited to:

1. Review and suggestion of amendments to the study design, including study objectives; field sampling plan; data collection methods; sample handling and preparation; and sample and data analysis.
2. Review and provision of technical recommendations in response to quarterly progress reports (e.g., amendments to study design based on preliminary results).
3. Review and provision of technical recommendations on the journal article(s) and final study report.

Awardees are expected to make reasonable efforts to incorporate HUD suggestions and recommendations when provided.

III. ELIGIBILITY INFORMATION

A. Eligible Applicants

00 (State governments)

01 (County governments)

02 (City or township governments)

04 (Special district governments)

05 (Independent school districts)

06 (Public and State controlled institutions of higher education)

07 (Native American tribal governments (Federally recognized))

08 (Public housing authorities/Indian housing authorities)

11 (Native American tribal organizations (other than Federally recognized tribal governments))

12 (Nonprofits having a 501(c)(3) status with the IRS, other than institutions of higher education)

13 (Nonprofits without 501(c)(3) status with the IRS, other than institutions of higher education)

20 (Private institutions of higher education)

22 (For profit organizations other than small businesses)

23 (Small businesses)

Additional Information on Eligibility
Applications to supplement existing projects are eligible to compete with applications for new awards.

However, Federal agencies and organizations with the same Principal Investigator (PI) that received an award under the FY 2021 or FY 2022 Lead and Healthy Homes Technical Studies Grant Program cycle are ineligible.

Faith-based organizations

(1) Faith-based organizations may apply for this award on the same basis as any other organization, as set forth at 24 CFR 5.109, and subject to the protections and requirements of 42 U.S.C. 2000bb et seq., HUD will not, in the selection of recipients, discriminate against an organization based on the organization's religious character, affiliation, or exercise.

(2) A faith-based organization that participates in this program will retain its independence and may continue to carry out its mission consistent with religious freedom and conscience protections in Federal law, including the Free Speech and Free Exercise Clauses of the Constitution, 42 U.S.C. 2000bb et seq., 42 U.S.C. 238n, 42 U.S.C. 18113, 42 U.S.C. 2000e-1(a) and 2000e-2(e), 42 U.S.C. 12113(d), and the Weldon Amendment, among others. Religious accommodations may also be sought under many of these religious freedom and conscience protection laws, particularly under the Religious Freedom Restoration Act.

(3) A faith-based organization may not use direct financial assistance from HUD to support or engage in any explicitly religious activities except where consistent with the Establishment Clause and any other applicable requirements. Such an organization also may not, in providing services funded by HUD, discriminate against a beneficiary or prospective program beneficiary on the basis of religion, religious belief, a refusal to hold a religious belief, or a refusal to attend or participate in a religious practice.

B. Ineligible Applicants

1. Individuals
2. Federal agencies
3. Organizations with the same Principal Investigator (PI) that received an award under the FY 2021 or FY 2022 Lead and Healthy Homes Technical Studies Grant Program cycle.
4. Foreign entities and sole proprietorship organizations are not eligible to compete for or receive awards made under this announcement.

C. Cost Sharing or Matching

This Program does not require cost sharing or matching, but provides points based on leverage as described below.

Under the application rating factor 3, applicants that provide evidence of significant resource leveraging will receive points (see Leveraging Resources under Section V.A.1.b.(3)(e)).

D. Threshold Eligibility Requirements

Applicants who fail to meet any of the following threshold eligibility requirements are deemed ineligible. Applications from ineligible applicants are not rated or ranked and will not receive HUD funding.

1. Resolution of Civil Rights Matters

Outstanding civil rights matters must be resolved before the application submission deadline. Applicants with unresolved civil rights matters at the application deadline are deemed ineligible. Applications from ineligible applicants are not rated or ranked and will not receive HUD funding.

a. An applicant is ineligible for funding if the applicant has any of the charges, cause determinations, lawsuits, or letters of findings referenced in subparagraphs (1) – (5) that are not resolved to HUD's satisfaction before or on the application deadline date for this NOFO.

(1) Charges from HUD concerning a systemic violation of the Fair Housing Act or receipt of a cause determination from a substantially equivalent state or local fair housing agency concerning a systemic violation of a substantially equivalent state or local fair housing law proscribing discrimination because of race, color, religion, sex (including sexual orientation and gender identity), national origin, disability or familial status;

(2) Status as a defendant in a Fair Housing Act lawsuit filed by the United States alleging a pattern or practice of discrimination or denial of rights to a group of persons raising an issue of general public importance under 42 U.S.C. 3614(a);

(3) Status as a defendant in any other lawsuit filed or joined by the Department of Justice, or in which the Department of Justice has intervened, or filed an amicus brief or statement of interest, alleging a pattern or practice or systemic violation of Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Section 109 of the Housing and Community Development Act of 1974, the Americans with Disabilities Act, Violence Against Women Act, or a claim under the False Claims Act related to fair housing, non-discrimination, or civil rights generally including an alleged failure to affirmatively further fair housing;

(4) Receipt of a letter of findings identifying systemic non-compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Section 109 of the Housing and Community Development Act of 1974; Violence Against Women Act; or the Americans with Disabilities Act; or

(5) Receipt of a cause determination from a substantially equivalent state or local fair housing agency concerning a systemic violation of provisions of a state or local law prohibiting discrimination in housing based on sexual orientation, gender identity, or lawful source of income.

b. HUD will determine if actions to resolve the charge, cause determination, lawsuit, or letter of findings taken before the application deadline date will resolve the matter. Examples of actions that may be sufficient to resolve the matter include, but are not limited to:

(1) Current compliance with a voluntary compliance agreement signed by all the parties;
(2) Current compliance with a HUD-approved conciliation agreement signed by all the parties;
(3) Current compliance with a conciliation agreement signed by all the parties and approved by the state governmental or local administrative agency with jurisdiction over the matter;
(4) Current compliance with a consent order or consent decree;
(5) Current compliance with a final judicial ruling or administrative ruling or decision; or
(6) Dismissal of charges.

2. Timely Submission of Applications

Applications submitted after the deadline stated within this NOFO that do not meet the requirements of the grace period policy are marked late. Late applications are ineligible and are not considered for funding. See Section IV. D. Application Submission Dates and Times.

E. Statutory and Regulatory Requirements Affecting Eligibility

Eligibility Requirements for Applicants of HUD's Financial Assistance Programs
The following requirements affect applicant eligibility. Detailed information on each requirement is found in the "Eligibility Requirements for Applicants of HUD's Financial Assistance Programs" document on HUD's Funding Opportunities page.

- Universal Identifier and System for Award Management (SAM.gov) Requirements
- Outstanding Delinquent Federal Debts
- Debarments or Suspensions, or both
- Mandatory Disclosure Requirement
- Pre-selection Review of Performance
- Sufficiency of Financial Management System
- False Statements
- Prohibition Against Lobbying Activities

In addition, each applicant under this NOFO must have the necessary processes and systems in place to comply with the Award Term in Appendix A of 24 CFR part 170 if the applicant receives an award, unless an exception applies as provided in 2 CFR170.110.

F. Program-Specific Requirements

1. Priority Research Topics/Study Conducted in Properties Remediated with OLHCHH Grant

Even though HUD will consider funding applications for technical studies on topics that are consistent with the overall goals and objectives of the LHHTS Grant Program as described above, HUD is particularly interested in the following research topic areas listed below. Applications that clearly include disaster recovery, climate resilience, or strengthen environmental justice and/or form a partnership with at least one of OLHCHH grantees (see grantee contact list at https://www.hud.gov/program_offices/healthy_homes/lbp/lhc and

https://www.hud.gov/program_offices/healthy_homes/hhi/hhts) and conduct a significant part of the proposed study in properties that are or were remediated with an OLHCHH grant, will **receive 3 points under rating factor 2** of the application (see section V.A.1.b(2)). However, you are not limited to addressing only topic areas listed below in your application. If topics other than those identified under the priority topics are proposed, it is important that the applicant describes in sufficient detail how the proposed study is consistent with the overall LHHTS Grant Program goals and objectives.

Applications for additional work related to ongoing HUD-funded technical studies (i.e., for work outside the scope of the original agreement) are eligible to compete with applications for awards in new subjects. These applications will be evaluated in the same manner as applications in new subjects. Brief descriptions of current and recently completed technical studies grant projects and grantee contact information can be found on the HUD website at https://www.hud.gov/program_offices/healthy_homes/hhi/hhts

a. LTS Grant Program

(1) Evaluation of the effectiveness and longevity of specific residential lead hazard control interventions. The effectiveness of lead hazard control interventions (i.e., interim controls or a combination of interim controls and abatement) over various time periods following implementation is a topic that has been primarily covered through HUD's Evaluation of the HUD Lead Hazard Control Grant Program (referred to as the National Evaluation) (https://doi.org/10.1016/j.envres.2004.12.011, https://doi.org/10.1016/j.envres.2005.02.002, https://doi.org/10.1016/j.envres.2006.04.007, https://doi.org/10.1016/j.envres.2010.11.003), that assessed the impact of lead hazard control interventions conducted by 14 grantees that were among the first recipients of HUD lead hazard control grants. Follow-up research on a subset of the original study participants demonstrated that dust-lead levels generally remained low (particularly on floors) six years following interventions (Wilson et al., 2006). Although this research has demonstrated that interim controls can be effective in reducing dust-lead levels over an extended period, there is still value in conducting research on the efficacy and durability of specific interventions or combinations of interventions and their impact on occupant's health. For example, HUD has supported research that focused on the benefits of window replacement in reducing window and floor dust-lead approximately 12 years post-intervention (Dixon et al., 2012). It is notable that these durability results were achieved even though the grant programs do not require ongoing lead-based paint maintenance after the interventions, in contrast to the requirement for such maintenance under most housing assistance programs covered by HUD's Lead Safe Housing Rule and described in Chapter 6 of the HUD Guidelines (www.hud.gov/program_offices/healthy_homes/lbp/hudguidelines). Furthermore, because there is no recognized safe level of lead exposure for children, the ability of interim controls to maintain low dust-lead levels in treated homes has assumed even greater importance. The lack of a specific blood-lead threshold for adverse health effects in children is reflected by the action of the U.S. Centers for Disease Control and Prevention in adopting a "reference value" approach for lead in children's blood based on the blood lead level distribution in U.S. children (currently set at 3.5 µg/dL (https://www.cdc.gov/nceh/lead/news/cdc-updates-blood-lead-reference-value.htm). Research supports the need to achieve and maintain low dust-lead levels in order to keep children's lead exposure as low as is feasible, so evaluations of the effectiveness of specific interim controls, combinations of interim controls, and/or ongoing lead-based paint maintenance

activities following well characterized interim controls are of particular interest to HUD with respect to their ability to sufficiently maintain low dust-lead levels over both the short and long term (e.g., 3 or more years). HUD is also interested in the ability of specific lead hazard control treatments to consistently achieve low clearance levels (i.e., at or below the clearance levels of 10 µg/ft^2 for floors and 100 µg/ft^2 for windowsills) that became effective on March 8, 2021, through an EPA regulatory action.

(2) The value of lead risk assessments when triggered by children with blood lead levels (BLLs) at or near CDC's blood lead reference value of 3.5 µg/dL is not well understood. Some local, state, and federal laws require that an environmental investigation (i.e., a lead risk assessment) be conducted in a residence if a child has a BLL at or above the reference value. However, the frequency at which lead based paint (LBP) hazards are identified in the homes of children with these BLLs has not been well documented. A study conducted by Cluett et al. (2019) found relatively small differences in the frequency of LBP hazard detection in the homes of children with BLLs of 5-9 µg/dL compared to the homes of children with BLLs ≥ 10 µg/dL. The researchers reported that a slightly higher percentage of homes among the children in the lower BLL group (23%) had no identified LBP hazards compared to the higher BLL group (15%). HUD is interested in supporting similar research for children with BLLs near or above the current CDC blood-lead reference value of 3.5 µg/dL (e.g., BLLs ≥ 3 µg/dL and < 5 µg/dL). HUD anticipates that this research could likely be conducted in a cost-effective manner using existing data sets.

(3) Analysis of Available Data and Databases. HUD is interested in supporting research using existing data to address key scientific issues related to the identification and control of lead-based paint hazards. Research efforts often generate large data sets that are analyzed to address primary research objectives; however, there is often important information to be gained by conducting additional analyses of the collected data. Such analyses can generally be conducted at low-cost relative to the cost of the initial research. Applicants submitting proposals in this area should explain how the analyses would address one or more important issues and will result in improvements in lead hazard assessment and control methods. HUD is also interested in the creative use of existing databases (e.g., Census data, blood-lead screening data, etc.) to improve the efficacy of lead hazard control programs (e.g., by improved targeting of the highest risk homes and neighborhoods), assess the effectiveness of enforcement and lead hazard control activities and regulations, and other uses of these data that further the goal of improving methods for the identification and control of residential lead-based paint hazards. If using data older than 10 years, the applicant needs to justify why they are using data that old.

(4) Use of novel methods for lead risk assessment. Since 1995 and the first HUD *Guidelines*, the practice of lead-based paint risk assessment has remained rather static. Except for the improvements in XRF instrumentation and technology, little has changed in the performance of a lead-based paint risk assessment. There remains a need to do a visual assessment of paint conditions and to obtain dust lead loadings (using dust wipes followed by laboratory analysis) and soil samples. HUD is interested in the use of novel approaches that could shorten the time needed to perform risk assessments and new approaches that can prioritize homes that could likely contain lead-based paint hazards.

(5) Use of novel methods for dust lead measurements for hazard assessment or clearance. Since 1995 and the first HUD *Guidelines*, the practice of lead dust measurement has consisted of the use of dust wipes followed by laboratory analysis and has been the standard for the determination of the lead dust loading on floors, windowsills and window troughs. The dust wipe materials have significantly improved, as has the laboratory instrumentation to provide more sensitive analyses to report the lower levels required by the most recent EPA and HUD revised standards. HUD is interested in new approaches to determine lead loadings in dust samples that may eliminate the need for the use of dust wipes and the need for follow-up with laboratory analysis. Such "shortcuts" could shorten the times and expense of risk assessments and the time necessary to obtain clearance after remediation activities, including shortening the time needed for relocation of residents until clearance is obtained.

b. HHTS Grant Program

(1) Implementation research on interventions incorporating the eight principles of healthy homes. HUD is interested in assessing novel or promising methods for implementing integrated housing health and safety assessments and subsequent interventions (i.e., the healthy homes model) in high-risk homes. This priority topic addresses the need for the wider adoption of the healthy homes model (or major aspects of it), especially with respect to its application in neighborhoods or housing with a high prevalence of substandard housing and/or vulnerable populations. For example, on the principle of making homes contaminant-free, studying actions that reduce indoor air quality contaminants, e.g., carbon monoxide, nitrogen dioxide, and formaldehyde, is of interest. Previous HUD-funded research has documented significant reductions in housing-related health and safety hazards and conditions. These studies have demonstrated significant reductions in the total number of hazards, including injury hazards and asthma triggers, when units were assessed three to six months following intervention (see Appendix C: Reddy et al., 2017; Dixon et al., 2009; Klitzman et al., 2005).

(2) The World Health Organization (WHO) "Environment, Climate Change and Health" mentions that housing practices influence climate, which has an intimate relationship with health. The building sector (residential and commercial) accounted for 19% of global greenhouse gas emissions and one-third of global black carbon emissions in 2010, according to the Intergovernmental Panel on Climate Change (2014). The University of California at Davis Western Cooling Efficiency Center reported that, "Residential energy use is responsible for about 20% of total greenhouse gas (GHG) emissions in the US."

As the Federal agency dedicated to creating strong, sustainable, inclusive communities, and quality affordable homes, HUD is on the front lines of the nation's efforts to increase resilience to climate impacts. In response to the policy set forth in Executive Order 14008, HUD Action Plan is organized around three overarching Climate Action Goals for programs and policies under HUD's purview: Goal 1: Increase Climate Resilience, Goal 2: Reduce Greenhouse Gas Emissions and Goal 3: Pursue Environmental Justice. To support HUD's New Climate Action Plan: https://www.hud.gov/climate, HUD is interested in research that identifies actions that protect the health and safety of the families from hazards resulting from natural disasters and help them to mitigate the risks of such health and safety hazards in housing occurring before such anticipated disasters.

Also, HUD is interested in research on the health effects on indoor air quality of switching**,** in HUD-supported housing, to low-carbon or zero-carbon sources of energy. (Note: Applicants that

propose this type of study should discuss how the knowledge that is gained from the study could be used in a program to reduce these hazards in target communities). The OLHCHH offers a list of activities (https://www.hud.gov/climate/OLHCHH) that support and implement Climate Action more broadly.

(3) Developing easily replicable, cost-effective methods for identifying, preventing, and controlling mold and excess moisture in various types of residential buildings, with a focus on affordable housing. Specific needs include better tools for the identification of hidden mold and moisture problems and the assessment of improved surveillance and maintenance protocols for existing residential buildings (e.g., training of maintenance workers and supervisors on use of structured surveillance and response protocols).

(4) Indoor air quality is also damaged by poor choice of building materials, structural risks as well as poor ventilation practices. Poor ventilation practices may promote excessive exposure to moisture, mold, radon, asbestos, lead, volatile organic compounds (VOC), and indoor pollutants (see Appendix C for research literature on these subjects). HUD is interested in innovative methods (not discussed elsewhere in this list of priorities) to identify the sources and control the hazards in order to improve the indoor air quality in the residences of the people we serve.

(5) Physical Injury Prevention Measures: HUD is interested in research on the combined efficacy of evidence-based injury intervention packages for preventing injury in high-risk populations, particularly children, persons with disabilities, and seniors in low-income households. HUD is further interested in demonstrating the feasibility and cost-effectiveness of incorporating evidence-based physical injury prevention measures into residential programs (such as packages of interventions that can be used in the OLHCHH's Older Adult Home Modification grant program), including housing for seniors and green renovation and rehabilitation programs, as well as ongoing maintenance.

(6) Mitigation of Residential Asthma Triggers: In 2014, three Institutes within the National Institutes of Health held a workshop on the state of the science on the indoor environment and asthma (Gold et al., 2017). Research needs identified by participants included well-designed (and, if feasible, blinded and controlled) trials to test the conditions under which free-standing air filtration systems, structural interventions, and other emerging building-level interventions reduce indoor pollutants, allergens, and other contaminants. The authors noted that this is a precondition to assessing whether exposure reduction improves respiratory health. An additional area of research need of relevance for this NOFO is the testing of low-cost interventions easily transferable from home to home or interventions that can be applied to any home without the need for structural changes, with these targeting highly mobile populations or populations with little control over the structure of their homes.
In a more recent systematic review of the research on indoor allergen control, Leas et al. (2018) concluded that the strength of evidence for the effectiveness of both single and multicomponent interventions was not strong. Common weaknesses of the reviewed studies included infrequent use of validated measures of asthma control, inconsistent assessment of asthma severity, and infrequent reporting of standardized measures of asthma exacerbations, healthcare use, and quality of life. The authors concluded that additional evaluation was needed for the following single interventions: HEPA vacuum cleaning; carpet removal; pet cleaning/removal, and mold removal. Although the authors concluded that multicomponent interventions that include HEPA vacuums or pest control reduce asthma exacerbations and improve quality of life, they indicate a

need to evaluate these interventions more efficiently such as by testing standardized bundles of interventions. **If you are proposing research on home asthma interventions, you must describe how your study design addresses the weaknesses identified in the systematic review and why it would be expected to produce definitive findings or information that would be important in the design of a larger, more definitive study. HUD will not fund additional studies within this focus area unless there are one or more compelling and novel aspects of the study design and the common weaknesses identified in the systematic review are clearly addressed.**

(7) Studies in Native American tribal communities: Studies that address important healthy homes issues in Federally recognized, Native American communities. Applicants in this area are encouraged to explore potential opportunities to partner with communities that have received a grant through HUD's "Healthy Homes Production Grant Program for Tribal Housing" (CFDA number: 14.913). A recent HHTS Program cooperative agreement supported important research in tribal housing in rural Alaska (see Appendix C: Singleton et al. 2017 and 2018). HUD's Office of Policy Development and Research published a report on the "Housing Needs of American Indians and Alaska Natives in Tribal Areas" in 2017 (https://www.huduser.gov/portal/publications/HNAIHousingNeeds.html).

2. HUD will not fund applications that involve laboratory testing on living organisms except for laboratory testing on animals that are residential pests (e.g., cockroaches, bed bugs, mice, etc.) that is a component of a more comprehensive study to improve IPM methods. Applicants should be aware that under the technical studies grant programs, HUD is interested in funding applied research that is closely related to improving our ability to identify and sustainably implement interventions to control key residential hazards. Applications that have a more basic research focus may not be well suited for funding through these programs.

3. General Information

You may address one, or more than one, of the above technical studies topic areas within your proposal, or submit separate applications for different topic areas. You must, however, submit your application under the **LTS program or the HHTS program;** your application cannot be reviewed under both programs. In proposing to conduct a study on a particular topic, applicants should consider:

a. The "fit" of the proposed hazard assessment and/or control methods within the overall goal of addressing "priority" health and safety hazards in a cost-effective manner;

b. The expected efficacy and cost-effectiveness of the proposed methods for hazard control and risk reduction. Questions to consider include the degree to which interventions would be accepted by occupants and by housing owners and managers, ease and cost of implementation, the length of time the intervention would stay effective, and the cost-effectiveness of the intervention in preventing illness or injury or in improving the health of residents with existing illness;

c. The ability of the study to generate definitive results. If your proposed study design does not incorporate the strongest methodology (i.e., a randomized controlled trial) to assess the effect of an intervention on health outcomes, you should consider focusing on important indoor environmental quality (IEQ) measures instead of health outcomes where this is appropriate. A focus on environmental outcomes is generally expected to produce more definitive results as

opposed to a health outcome focus, and the impact of improvements to IEQ on health outcomes can be inferred where the evidence base is sufficient;
d. Where and how these methods would be applied and tested, and/or perform demonstration activities;
e. The degree to which the study will help develop practical, widely applicable, and accepted methods and protocols or improve our understanding of a key residential health hazard; and
f. The likelihood that the study findings could be used to reduce social disparities of health that are attributable or strongly associated with exposure to residential health and safety hazards.
Applicants should consider the efficiencies that might be gained by working cooperatively with one or more recipients of HUD's Office of Lead Hazard Control and Healthy Homes grantees, which are widely distributed throughout the United States. Information on current grantees is available at https://www.hud.gov/program_offices/healthy_homes/lbp/lhc.
NOTE: A limited amount of hazard control activities, which involve construction limited to what is necessary to conduct the proposed research, may be conducted as part of Healthy Homes or Lead Technical Study (see Section IV.F.7).

4. Program Requirements
a. **Program Performance**. Grantees shall take all reasonable steps to accomplish all activities within the approved period of performance. HUD reserves the right to terminate the cooperative agreement prior to the expiration of the period of performance if the grantee fails to make reasonable progress in implementing the approved program of activities or fails to comply with the terms of the cooperative agreement.
b. **Regulatory Compliance**. Grantees must comply with all relevant federal (40 CFR 260 - 268 (RCRA) and 300 - 374 (CERCLA)), state, tribal, and local regulations regarding exposure to and proper disposal of hazardous materials.
c. **Blood Lead Testing**. Any blood lead testing, blood lead level test results, medical referral, or follow-up for children under 6 years of age must be conducted according to the recommendations of the CDC, Preventing Lead Poisoning in Young Children (see Appendix C of this NOFO).
d. **Restricted Use of Funds**. HUD LHHTS grant funds must not be used to replace existing resources dedicated to any ongoing project.
e. **Laboratory Analysis for Lead**. Laboratory analysis covered by the EPA's National Lead Laboratory Accreditation Program (NLLAP) must be conducted by a laboratory recognized under the program, unless approved by HUD based on its prior consideration of the justification by the grantee.
f. **Laboratory Analysis for Mold**. Samples to be analyzed for mold (fungi) must be submitted to a laboratory accredited through the Environmental Microbiological Laboratory Accreditation Program (EMLAP), administered by the American Industrial Hygiene Association (AIHA), unless approved by HUD based on its prior consideration of the justification by the grantee.
g. **Human Research**. Human research subjects will be protected from research risks in conformance with Federal Policy for the Protection of Human Subjects, required by HUD at 24 CFR 60 (See Section V.A.1.b.(3).(b).(iii) below regarding the Institutional Review Board process, which is required for some technical studies).
h. **OSHA Compliance**. The requirements of the Occupational Safety and Health Administration (OSHA) (e.g., 29 CFR parts 1910 and/or 1926, as applicable) or the state or local occupational safety and health regulations, whichever are most stringent, must be met.

i. **Disclosure**. All test results and other information in pre-1978 housing related to lead-based paint or lead-based paint hazards must be provided to the owner of the unit, together with a statement describing the owner's legal duty to disclose the knowledge of lead-based paint and its hazards to prospective tenants (before initial leasing or lease renewal with changes) and buyers (before sale) (24 CFR Part 35, subpart A). Disclosure of other identified housing-related health or safety hazards to the owner of the unit, for purposes of encouraging remediation is encouraged but not required by HUD unless such disclosure is an element of an Institutional Review Board (IRB) approval of the research.

j. **Privacy**. Submission of any information to databases (whether website, computer, paper, or other format) of addresses of housing units identified, treated, or cleared under these studies may be subject to the protections of the Privacy Act of 1974, and shall not include any personal information that could identify any household member. You should also check to ensure you meet state and local privacy regulations as well as other federal privacy laws and regulations.

k. **Community Involvement**. Applicants who incorporate meaningful community involvement into any study that requires a significant level of interaction with a community during implementation (e.g., projects being conducted within occupied dwellings, or which involve surveys of community residents) will receive a higher score in rating factor 3, Soundness of Approach. The term community refers to a variety of populations comprised of persons who have commonalities that can be identified (e.g., based on geographic location, ethnicity, health condition, age, disability, limited English proficiency (LEP), etc.). Applicants should identify the community that is most relevant to their particular project. Meaningful community involvement also requires that recipients ensure that individuals with disabilities can access and fully participate in activities and throughout all phases of a study. This includes providing information to the community that is accessible and effective for individuals with disabilities and providing auxiliary aids and services as well as reasonable accommodations to ensure effective communication for and equal participation by individuals with disabilities (see 24 CFR § 8.6 and § 8.33). Recipients must also ensure meaningful access for persons with limited English proficiency (LEP). This includes providing language assistance services and documents in other languages to ensure that LEP persons can participate in activities and throughout all phases of a study (see Title VI of the Civil Rights Act of 1964 and Executive Order 13166).

In accordance with Section 504 of the Rehabilitation Act of 1973 (29 U.S.C.§ 794) and HUD's implementing regulations at 24 CFR Part 8, and Title II of the Americans with Disabilities Act (42 U.S.C. §§ 12131-12134) and the implementing regulation at 28 CFR Part 35, the programs services, and activities funded through this NOFO must be accessible to and usable by persons with disabilities. All meetings must be held in facilities that are physically accessible to persons with disabilities. Recipients and subrecipients must also provide effective communication for individuals with disabilities (see 24 CFR § 8.6). Auxiliary aids or services and reasonable accommodations must be provided to ensure equal participation by individuals with disabilities.

Recipients and subrecipients must take reasonable steps to ensure meaningful language access for persons with limited English proficiency (LEP) pursuant to Title VI of the Civil Rights Act of 1964 and Executive Order 13166. For assistance in ensuring meaningful access for individuals with limited English proficiency, recipients and subrecipients should consult HUD's Final Guidance to Federal Financial Assistance Recipients Regarding Title VI Prohibition Against National Origin Discrimination Affecting Limited English Proficient Persons (HUD's LEP Guidance) published in the Federal Register on January 22, 2007 (72 Fed. Reg. 2732).

There are many different approaches to involving the community in the conception, design, and implementation of a study and the subsequent dissemination of findings. Examples include but are not limited to: establishing a structured approach to obtain community input and feedback (e.g., through a community advisory board); including one or more community-based organizations as study partners; employing community residents to recruit study participants and collect data; and enlisting the community in the dissemination of findings and translation of results into improved policies and/or practices. A discussion of community involvement in research involving housing-related health hazards can be found in Chapter 5 of the Institute of Medicine publication titled "Ethical Considerations for Research on Housing-Related Health Hazards Involving Children" (see Appendix C for more information on this report).

l. **Standardized Dust Sampling Protocol and Quality Control Requirements**. Grantees collecting samples of settled dust from participant homes for environmental allergen analysis (e.g., cockroach, dust mite) will be required to use a standard dust sampling protocol, unless the grantee provides compelling justification to use an alternate protocol (e.g., the study involves the development of an alternative sampling method). The HUD protocol is on the OLHCHH website at: https://www.hud.gov/sites/documents/DOC_12539.PDF

m. **Requirements for Peer Review of Scientific Data**. All HUD-sponsored research is subject to the Office of Management and Budget (OMB) Final Information Quality Bulletin for Peer Review (70 FR 2664-2677, January 14, 2005) prior to its public dissemination. In accordance with paragraph II.2 of the Bulletin, HUD will not require further peer review conducted on information that has already been subjected to adequate peer review.

n. **Principal Investigator (PI)**. The PI for the proposed study must directly represent and be directly employed by the applicant organization for the proposed role in the grant application. If the proposal includes co-PIs, the lead co-PI must represent and be directly employed by the applicant organization.

Advancing Racial Equity

In accordance with Executive Order 13985, *Executive Order On Advancing Racial Equity and Support for Underserved Communities Through the Federal Government*, and federal fair housing and civil rights laws, you must submit a narrative demonstrating the following:

- You analyzed the racial composition of the persons or households who are expected to benefit from your proposed grant activities;
- You identified any potential barriers to persons or communities of color equitably benefiting from your proposed grant activities;
- You detailed the steps you will take to prevent, reduce or eliminate these barriers; and
- You have measures in place to track your progress and evaluate the effectiveness of your efforts to advance racial equity in your grant activities.

Note that any actions taken in furtherance of this section must be consistent with federal nondiscrimination requirements.

This narrative is required and must address each of the four bullets in the paragraph above. Applicants will submit this narrative according to the instructions in Section IV.B. Applicants should provide their response in Appendix B (maximum of 2 pages). This narrative will be evaluated for sufficiency. If the narrative is deemed insufficient, it will be a "Curable Deficiency" that will be communicated to the applicant for correction with a notice of deficiency.

Affirmative Marketing

You must submit a narrative demonstrating that the housing, services, or other benefits provided under this grant will be affirmatively marketed broadly throughout the local area and nearby areas to any demographic groups that would be unlikely or least likely to apply absent such efforts. Such demographic groups may include, for example, Black and Brown persons or communities, individuals with limited English proficiency, individuals with disabilities, or families with children. Such activities may include outreach through community contacts or service providers or at community centers serving the target population; and marketing on websites, social media channels, television, radio, and print media serving local members of the targeted group. Documentation for this factor consists of a narrative describing the activities that will fulfill the factor requirements.

This narrative is required and must address the issues outlined in the paragraph above, according to the instructions in Section IV.B. Applicants will submit this narrative in the Appendix B. This narrative will be evaluated for sufficiency. If the narrative is deemed insufficient, it will be a "Curable Deficiency" that will be communicated to the applicant for correction with a notice of deficiency. This is a mandatory requirement.

G. Criteria for Beneficiaries.

N/A

IV. APPLICATION AND SUBMISSION INFORMATION

A. Obtain an Application Package

Instructions for Applicants

All application materials, including the Application Instructions and Application Package, are available through Grants.gov. You must access and review all available application materials. You must submit your application electronically via Grants.gov under the Funding Opportunity Number cited within this NOFO. Your application must list the applicable Funding Opportunity Number.

You can request a waiver from the requirement for electronic submission, if you demonstrate good cause. An example of good cause may include: a lack of available Internet access in the geographic area in which your business offices are located. However, lack of SAM registration or valid UEI is not a good cause. If you cannot submit your application electronically, you must ask in writing for a waiver of the electronic grant submission requirements. HUD will not grant a waiver if you fail to submit to HUD in writing or via email a request for a waiver at least 15 calendar days before the application deadline. If HUD grants a waiver, a paper application must be received before the deadline for this NOFO. To request a waiver, you must contact:

Name:

Brenda Reyes, MD MPH
Email:
Brenda.m.reyes@hud.gov
HUD Organization:
OLHCHH
Street:
451 7th Street, S.W. Rm 8236
City:
Washington
State:
DC DISTRICT OF COLUMBIA
Zip:
20410
Grants.gov provides customer support information on its website at https://www.grants.gov/web/grants/support.html. If you have difficulty accessing the application and instructions or have technical problems, you can receive customer support from Grants.gov by calling (800) 518-GRANTS (this is a toll-free number) or by sending an email to support@grants.gov. HUD welcomes and is prepared to receive calls from individuals who are deaf or hard of hearing, as well as individuals with speech or communication disabilities. To learn more about how to make an accessible telephone call, please visit https://www.fcc.gov/consumers/guides/telecommunications-relay-service-trs. The Grants.gov Help Desk can be reached twenty-four hours per day, seven days per week, except federal holidays. HUD recommends calling the Help Desk rather than emailing, because determining the basis for the problem may require a conversation with the Grants.gov Support Customer Service Representative.

B. Content and Form of Application Submission

You must verify that boxes 11, 12, and 13 on the SF-424 match the NOFO for which you are applying. If they do not match, you have downloaded the wrong Application Instruction and Application Package.
Submission of an application that is otherwise sufficient, under the wrong Assistance Listing and Funding Opportunity Number is a Non-Curable Deficiency, unless otherwise stated under the Threshold requirements section.

1. Content

Forms/Assurances/Certifications	Submission Requirement	Notes/Description
Application for Federal Assistance (SF-424)	This form is required.	Review section IV.B.2. of this NOFO for detailed submission requirements

Forms/Assurances/Certifications	Submission Requirement	Notes/Description
Applicant and Recipient Assurances and Certifications (HUD 424-B)	This form is required.	Review section IV.B.2. of this NOFO for detailed submission requirements
Applicant/Recipient Disclosure/Update Report (HUD 2880)	This form is required.	Review section IV.B.2. of this NOFO for detailed submission requirements
Disclosure of Lobbying Activities (SF-LLL)	Review section IV.G. of this NOFO for detailed submission requirements.	Federally recognized Indian tribes and tribally designated housing entities (TDHEs) established by federally recognized Indian tribes as a result of the exercise of the tribe's sovereign power are excluded from coverage of the Byrd Amendment, but state-recognized Indian tribes and TDHEs established only under state law shall comply with this requirement.
Grant Application Detailed Budget Worksheet (HUD424-CBW)	HUD will provide instructions to grantees on how the form is to be submitted.	HUD will provide instructions to grantees on how the form is to be submitted.

Additionally, your complete application must include the following narratives and non-form attachments.

a. Application:
Applications must contain the items listed in this section. These items include the standard forms that are applicable to this funding announcement (collectively referred to as the "standard forms"). Copies of these forms are available online at How to Apply for Grants | GRANTS.GOV (https://www.grants.gov/web/grants/applicants/apply-for-grants.html). The required items are:

- **Application Abstract** (two-page maximum, see section IV.B.2.b., below for the page layout requirements). An abstract with the project title, the names and affiliations of all investigators; identification of partner organizations; a summary of the objectives, study design, and expected results, and the total funds requested, must be included in the proposal. Information contained in the abstract will not be considered in the evaluation

and scoring of your application and will not be counted towards the 25-page maximum. Any information you wish to be considered in scoring of the application must be provided under the appropriate rating factor response.

- **Response to Rating Factors.** A project description/narrative statement addressing the rating factors for award, which are identified in section V.A.1.b. The narrative statement must be identified in accordance with each factor for award (Rating Factors 1 through 4). The full application must be formatted as per section IV.B.2.b. The project description or narrative must be included in the responses to the rating factors. Any description/narrative more than this limit will not be read. The points you receive for each rating factor will be based on the portion of your narrative statement that you submit in response to that particular factor, supplemented by any appendices that are referenced in your narrative response to the rating factor. Supporting materials that are not referenced or discussed in your responses to the individual rating factors will not be considered. Additional materials (e.g., appendices) can be submitted with your application. The footer on the pages of these materials should identify the rating factor that they are supporting.
- **Equity Narratives.** The applicant is required to complete and submit the following four (4) narratives (maximum of 2 pages) in the **Appendix B**:
    - a written narrative on Advancing Racial Equity that addresses the four bullets in **Section III.F**;
    - a written narrative on Affirmative Marketing that addresses the issues outlined in **Section III.F**;
    - a written narrative on Affirmatively Furthering Fair Housing that addresses the issues outlined in **Section IV.G**; and
    - a narrative for Experience Promoting Racial Equity outlined in Section **V.B**.

  Each narrative will be evaluated for sufficiency and will not change the applicant's score or rank as compared to other applicants. If a narrative is deemed insufficient, it will be a "Curable Deficiency" that will be communicated to the applicant for correction with a notice of deficiency.

- **Supporting Materials.** Include, as appendices, the following materials that are needed to support your responses to the rating factors. These will not be counted towards the Rating Factors narrative 25-page limit:
    - The resumes of the PI and other key personnel. Each resume shall not exceed three pages and is limited to information that is relevant in assessing the qualifications and experience of key personnel to conduct and/or manage the proposed technical study.
    - Organizational chart.
    - Letters of commitment.
    - List of references cited in your responses to the rating factors.

- **Additional Information.** The additional optional materials must not exceed 20 pages. Any pages more than this limit will not be read. The additional information should not be a continuation of the rating factor narrative but provide further clarification if needed, of statements made in the rating factor narrative. Additional information that is a continuation of rating factor narrative will not be considered.

- **Budget.** Include a total budget using form HUD424CBW (https://www.hudexchange.info/resource/304/hud-form-424cbw/) included in the Instructions download at Grants.gov, with supporting cost justification of up to four pages, which will cover all budget categories of the federal grant request. This information will not be counted towards the Rating Factors narrative 25-page limit. Use the budget format discussed in Rating Factor (3), Section V.A.1.b.(3).(d).(i) below. In completing the budget forms and justification, you should address the following elements:
    - Direct Labor costs, including all full- and part-time staff required for the planning and implementation phases of the project. These costs should be based on full time equivalent (FTE) or hours per year (hours/year) (i.e., one FTE equals 2,080 hours/year);
    - Allowance for two trips to HUD OLHCHH required conference, location to be determined, during the period of performance of your grant, planning each trip for 1-2 people, as needed. In planning your trips, you should assume one or two overnight stays depending on your location;
    - Allowance for the cost of publications, such as article processing charges and page charges. For more information please see link: What is the difference between APCs and page charges? A guide to potential costs associated with publishing your manuscript — (sagepub.com)
    - A separate budget form and justification for each sub-recipient receiving more than 10 percent of the total federal budget request; and
    - Supporting documentation for salaries and prices of materials and equipment, upon request.

2. Format and Form

Narratives and other attachments to your application must follow the following format guidelines. Do not submit password protected or encrypted files.

25 Pages maximum length of narratives

Other

a. Application:
Up to twenty-five (25) 8-1/2 x 11-inch page limit.
Number the pages of the narrative.
Minimum 12-point Times New Roman font. Minimum margin width of 1-inch on all sides.
Minimum of single line spacing.

C. System for Award Management (SAM) and Unique Entity Identifier (UEI)

1. SAM Registration Requirement

You must register with https://www.sam.gov/before submitting their application. You must maintain current information in SAM on immediate and highest-level owner and subsidiaries, as well as on all predecessors that have been awarded a federal contract or grant within the last three years, if applicable. Information in SAM must be current for all times during which you have an active Federal award or an application or plan under consideration by HUD.

2. UEI Requirement
As of April 4, 2022, entities doing business with the federal government must use the UEI created in SAM.gov. Also, you must provide a valid UEI, registered and active at www.sam.gov/ in the application. For more information, see: https://www.gsa.gov/about-us/organization/federal-acquisition-service/office-of-systems-management/integrated-award-environment-iae/iae-systems- information-kit/unique-entity-identifier-update.

3. Requirement to Register with Grants.gov
Anyone planning to submit applications on behalf of an organization must register at Grants.gov and be approved by the E-Biz POC in SAM to submit applications for the organization. Registration for SAM and Grants.gov is a multi-step process and can take four (4) weeks or longer to complete if data issues arise. Applicants without a valid registration cannot apply through Grants.gov. Complete registration instructions and guidance are provided on Grants.gov.

D. Application Submission Dates and Times

1. Application Due Date Explanation
The application deadline is 11:59:59 PM Eastern time on

11/06/2023
Submit your application to Grants.gov unless a waiver has been issued allowing you to submit a paper application. Instructions for submitting your paper application will be contained in the waiver of electronic submission.

"Received by Grants.gov" means the applicant received a confirmation of receipt and an application tracking number from Grants.gov. Grants.gov then assigns an application tracking number and date-and timestamp each application upon successful receipt by the Grants.gov system. A submission attempt not resulting in confirmation of receipt and an application tracking number is not considered received by Grants.gov.

Applications received by Grants.gov must be validated by Grants.gov to be received by HUD.

"Validated by Grants.gov" means the application has been accepted and was not rejected with errors. You can track the status of your application by logging into Grants.gov, selecting "Applicants" from the top navigation, and selecting "Track my application" from the dropdown list. If the application status is "rejected with errors," you must correct the error(s) and resubmit the application before the 24-hour grace period ends. Applications in "rejected with errors" status after the 24-hour grace period expires will not be received by HUD. Visit Grants.gov for a complete description of processing steps after applying.

HUD strongly recommends you submit your applications at least **48 hours before the deadline** and during regular business hours to allow enough time to correct errors or overcome other problems.

2. Grants.gov Customer Support

Grants.gov provides customer support information on its website at https://www.grants.gov/web/grants/support.html. If you have difficulty accessing the application and instructions or have technical problems, contact Grants.gov customer support center by calling (800) 518-GRANTS (this is a toll-free number) or by sending an email to

support@grants.gov.The customer support center is open 24 hours a day, seven days per week, except Federal holidays. Individuals who are deaf or hard of hearing, or who have speech and other communication disabilities may use a relay service to reach Grants.gov Customer Support. To learn more about how to make an accessible telephone call, visit the webpage for Federal Communications Commission.

3. Grants.gov Application Submission

You can verify the contents of your submitted application to confirm Grants.gov received everything you intended to submit. To verify the contents of your submitted application:

- Log in to Grants.gov.
- Click the Check Application Status link, which appears under the Grant Applications heading in the Applicant Center page. This will take you to the Check Application Status page.
- Enter search criteria and a date range to narrow your search results.
- Click the Search button. To review your search results in Microsoft Excel, click the Export Data button.
- Review the Status column. To view more detailed submission information, click the Details link in the Actions column.
- To download the submitted application, click the Download link in the Actions column.

Take note of the Grants.gov tracking number, as it is needed by the Grants.gov customer support center should you seek their assistance.

HUD may extend the application deadline for any program if Grants.gov is offline or not available to applicants for at least 24 hours immediately prior to the deadline date, or the system is down for 24 hours or longer and impacts the ability of applicants to cure a submission deficiency within the grace period.

HUD may also extend the application deadline upon request if there is a presidentially declared disaster in the applicant's area.

If these events occur, HUD will post a notice on its website establishing the new, extended deadline for the affected applicants. HUD will also publish the extension on Grants.gov.

In determining whether to grant a request for an extension based on a presidentially declared disaster, HUD will consider the totality of the circumstances including the date of an applicant's extension request (how closely it followed the basis for the extension), whether other applicants in the geographic area are similarly affected by the disaster, and how quickly power or services are restored to enable the applicant to submit its application.

NOTE: Busy servers, slow processing, large file sizes, improper registration

or password issues are not valid circumstances to extend the deadline dates or the grace period.

4. Amending or Resubmitting an Application

Before the submission deadline, you may amend a validated application through Grants.gov by resubmitting a revised application containing the new or changed material. The resubmitted application must be received and validated by Grants.gov by the applicable deadline.

If HUD receives an original and a revised application for a single proposal, HUD will evaluate only the last submission received by Grants.gov before the deadline.

5. Grace Period for Grants.gov Submissions

If your application is received by Grants.gov before the deadline, but is rejected with errors, you have a grace period of 24 hours after the application deadline to submit a corrected, received, and validated application through Grants.gov. The date and time stamp on the Grants.gov system determines the application receipt time. Any application submitted during the grace period but not received and validated by Grants.gov will not be considered for funding. There is no grace period for paper applications.

6. Late Applications

An application received after the NOFO deadline date that does not meet the Grace Period requirements will be marked late and will not be reviewed by HUD for funding

consideration. Improper or expired registration and password issues are not sufficient causes to allow HUD to accept applications after the deadline date.

7. Corrections to Deficient Applications

HUD will not consider information from applicants after the application deadline except for curable deficiencies.

HUD will uniformly notify applicants of each curable deficiency. See curable deficiency definition in section I.A of this NOFO. Examples of curable (correctable) deficiencies include inconsistencies in the funding request and failure to submit required certifications. These examples are non-exhaustive.

When HUD identifies a curable deficiency, HUD will notify the authorized organization representative identified on the SF-424 Application for Federal Assistance via email. This email is the official notification of a curable deficiency.

You must email corrections of Curable Deficiencies to applicationsupport@hud.gov within the time limits specified in the notification. The time allowed to correct deficiencies will be no less than 48 hours and no more than 14 calendar days from the date of the email notification. The start of the cure period will be the date stamp on the email sent from HUD. If the deficiency cure deadline date falls on a Saturday, Sunday, Federal holiday, or on a day when HUD's Headquarters are closed, then the applicant's correction must be received on the next business day HUD Headquarters offices in Washington, DC are open.

The subject line of the email sent to applicationsupport@hud.gov must state: Technical Cure and include the Grants.gov application tracking number or the GrantSolutions application number (e.g., Subject: Technical Cure - GRANT123456 or Technical Cure - XXXXXXXXXXX). If this information is not included, HUD cannot match the response with the application under review and the application may be rejected due to the deficiency.

Corrections to a paper application must be sent in accordance with and to the address indicated in the notification of deficiency. HUD will treat a paper application submitted in accordance with a waiver of electronic application containing the wrong UEI as having a curable deficiency.

Failure to correct the deficiency and meet the requirement to have a UEI and active registration in SAM will render the application ineligible for funding.

8. Authoritative Versions of HUD NOFOs

The version of this NOFO posted on Grants.gov includes the official documents HUD uses to solicit applications.

9. Exemptions

Parties that believe the requirements of the NOFO would impose a substantial burden on the exercise of their religion should seek an exemption under the Religious Freedom Restoration Act (RFRA).

E. Intergovernmental Review

This program is not subject to Executive Order 12372, Intergovernmental Review of Federal Programs.

F. Funding Restrictions

1. Purchase of Real Property. The purchase of real property is not an allowable cost under these programs.
2. Purchase or Lease of Equipment. The purchase or lease of equipment having a per-unit cost more than $5,000 is not an allowable cost unless prior written approval is obtained from HUD.
3. Medical Treatment. Medical treatment costs are not allowable under this program.
4. Profit. For profit entities are not allowed to earn a profit under this grant program.
5. You must comply with the Coastal Barrier Resources Act (16 U.S.C. § 3501 et seq.).
6. You may not conduct lead or healthy home hazard control activities or related work that constitutes construction, reconstruction, repair, or improvement (as referenced in Section 3(a)(4) of the Flood Disaster Protection Act of 1973 (42 U.S.C. §§ 4001-4128)) of a building or mobile home which is in an area identified by the Federal Emergency Management Agency (FEMA) as having special flood hazards unless:
a. The community in which the area is situated is participating in the National Flood Insurance Program in accordance with the applicable regulations (44 CFR parts 59-79), or less than a year has passed since FEMA notification regarding these hazards; and
b. Where the community is participating in the National Flood Insurance Program, flood insurance on the property is obtained in accordance with section 102(a) of the Flood Disaster Protection Act (42 U.S.C. § 4012a(a)). You are responsible for assuring that flood insurance is obtained and maintained for the appropriate amount and term.
7. Construction Activities. Construction activities supported with funds awarded under this NOFO are limited to what is necessary to conduct the proposed research and subject to the limitations cited below;
a. The amount of HHTS grant funds used for construction activities, e.g., to supplement a new housing construction or substantial rehabilitation project to improve indoor environmental quality may not exceed 20% of the total HUD funds awarded and must be limited to construction that is necessary to conduct the proposed research. Furthermore, the majority of any funds dedicated to construction activities supported by a HHTS grant shall be spent for interventions not intended for lead hazard control.
b. The amount of LTS grant funds used for construction activities, e.g., to conduct repair or

substantial rehabilitation that is necessary to conduct the proposed study, may not exceed 20% of the total HUD funds awarded.
8. Costs related to insect or animal testing are not allowable under this program except, when necessary, in the context of a broader study focusing on improving integrated pest management methods.

Indirect Cost Rate
Normal indirect cost rules under 2 CFR part 200, subpart E apply. If you intend to charge indirect costs to your award, your application must clearly state the rate and distribution base you intend to use. If you have a Federally negotiated indirect cost rate, your application must also include a letter or other documentation from the cognizant agency showing the approved rate. Successful applicants whose rate changes after the application deadline must submit the new rate and documentation to assure the award agreement incorporates the applicable rate.

Applicants other than state and local governments. If you have a Federally negotiated indirect cost rate, your application must clearly state the approved rate and distribution base and must include a letter or other documentation from the cognizant agency showing the approved rate. If your organization does not have a current negotiated rate (including provisional rate) and elects to use the de minimis rate, your application must clearly state you intend to use the de minimis rate of 10% of Modified Total Direct Costs (MTDC), as defined at 2 CFR 200.1. Costs must be consistently charged as either indirect or direct costs but may not be double charged or inconsistently charged as both, as described in 2 CFR 200.403. Once elected, the de minimis rate must be applied consistently for all Federal awards until the organization chooses to negotiate a rate, which the organization may apply to do at any time. Documentation of the decision to use the de minimis rate must be retained on file for audit.

State and local governments. If your department or agency unit has a Federally negotiated indirect cost rate, your application must include that rate, the applicable distribution base, and a letter or other documentation from the cognizant agency showing the negotiated rate. If your department or agency unit receives more than $35 million in direct Federal funding per year, you may not claim indirect costs until you receive a negotiated rate from your cognizant agency for indirect costs as provided in Appendix VII to 2 CFR part 200.

If your department or agency unit receives no more than $35 million in direct Federal funding per year and your department or agency unit has developed and maintains an indirect cost rate proposal and supporting documentation for audit in accordance with 2 CFR Part 200, Appendix VII, you may use the rate and distribution base specified in that indirect cost rate proposal.

Alternatively, if your department or agency unit receives no more than $35 million in direct Federal funding per year and does not have a current negotiated rate (including provisional) rate, you may elect to use the de minimis rate of 10% of MTDC. As described in 2 CFR 200.403, costs must be consistently charged as either indirect or direct costs but may not be double charged or inconsistently charged as both. Once elected, the de minimis rate must be applied consistently for all Federal awards until your department or agency chooses to negotiate for a rate, which you may apply to do at any time. Documentation of the decision to use the de minimis rate must be retained on file for audit.

G. Other Submission Requirements

1. Standard Application, Assurances, Certifications and Disclosures

Standard Form 424 (SF-424) Application for Federal Assistance

The SF-424 is the government-wide form required to apply for Federal assistance programs, discretionary Federal grants, and other forms of financial assistance programs. You must complete and submit the form with the other required forms and information as directed in this NOFO.

By signing the forms in the SF-424 either through electronic submission or in paper copy submission (for those granted a waiver), you and the signing authorized organization representative affirm that you both have reviewed the certifications and assurances associated with the application for Federal assistance and (1) are aware the submission of the SF-424 is an assertion that the relevant certifications and assurances are established and (2) acknowledge that the truthfulness of the certifications and assurances are material representations upon which HUD will rely when making an award to the applicant. If it is later determined the signing authorized organization representative to the application made a false certification or assurance, caused the submission of a false certification or assurance, or did not have the authority to make a legally binding commitment for the applicant, the applicant and the individual who signed the application may be subject to administrative, civil, or criminal action. Additionally, HUD may terminate the award to the applicant organization or pursue other available remedies. Each applicant is responsible for including the correct certifications and assurances with its application submission, including those applicable to all applicants, those applicable only to Federally recognized Indian tribes, or Alaskan native villages and those applicable to applicants other than Federally recognized Indian tribes, or Alaskan native villages.

Assurances (HUD 424-B)

By submitting your application, you provide assurances that, if selected to receive an award, you will comply with U.S. statutory and other requirements, including, but not limited to civil rights requirements. All recipients and subrecipients of the award are required to submit assurances of compliance with federal civil rights requirements. *See*, *e.g.*, Title VI of the Civil Rights Act of 1964, Title IX of the Education Amendments Act of 1972, Section 504 of the Rehabilitation Act of 1973, Violence Against Women Act, and the Age Discrimination Act of 1975; *see also* 24 C.F.R. §§ 1.5; 3.115; 8.50; and 146.25. HUD accepts these assurances in the form of the HUD 424-B, which also require compliance with HUD Reform Act requirements and all general federal nondiscrimination requirements in the administration of the federal assistance award.

Applicant Disclosure Report Form 2880 (HUD 2880)

The form HUD 2880 is required if you are applying for assistance within the jurisdiction of HUD to any project subject to Section 102(d) of the HUD Reform Act. Assistance is provided directly by HUD to any person or entity, but not to subrecipients. It includes assistance for the acquisition, rehabilitation, operation, conversion, modernization, renovation, or demolition of any property containing five or more dwelling units that is to be used primarily for residential purposes. It includes assistance to independent group residences, board and care facilities, group homes and transitional housing but does not include primarily nonresidential facilities such as intermediate care facilities, nursing homes and hospitals. It also includes any change requested

by a recipient in the amount of assistance previously provided, except changes resulting from annual adjustments in Section 8 rents under Section 8(c)(2)(A) of the United States Housing Act of 1937 (42 U.S.C. 1437f). See HUD Reform Act regulation for additional information.

Code of Conduct

Both you, as the award recipient, and all subrecipients must have a code of conduct (or written standards of conduct). The code of conduct must comply with the requirements included in the "Conducting Business in Accordance with Ethical Standards" section of the Administrative, National and Department Policy Requirements and Terms for HUD Financial Assistance Awards, as well as any program-specific requirements. These requirements include ethical standards related to conflicts of interest for procurements in 2 CFR 200.318(c) and 2 CFR 200.317, as well as HUD-specific conflict of interest standards. HUD maintains a list of organizations that have previously submitted written standards of conduct on its Code of Conduct for HUD Grant Programs webpage. But it is your responsibility to ensure that the standards are compliant with the noted requirements and that HUD has the latest version of the written standards. Updated written standards should be submitted with the application. Any updates to your written standards, after the application period, should be submitted as directed by the HUD program contact for this NOFO.

Affirmatively Furthering Fair Housing

With some exceptions for Federally recognized Indian tribes and their instrumentalities, the application must discuss how the applicant will carry out the proposed activities in a manner that affirmatively furthers fair housing in compliance with the Fair Housing Act and its implementing regulations, and how applicants will meet the requirements of the definition of AFFH at 24 CFR 5.151. Applicants may propose activities that are consistent with their jurisdiction's Analysis of Impediments (AI), an Assessment of Fair Housing (AFH), or other means of fair housing planning that meaningfully supports their AFFH certification.

If the applicant will carry out proposed activities in a jurisdiction with an AFH, the proposed activities should be consistent with the AFH's fair housing goals and with fair housing strategies specified in the jurisdiction's Consolidated Plan or Public Housing Agency Plan.

You must submit a narrative in Appendix B, according to the instructions in Section IV.B., which describes how your proposed NOFO activities are aligned with Affirmatively Furthering Fair Housing (AFFH) requirements. This narrative will be evaluated for sufficiency. If the narrative is deemed insufficient, it will be a "Curable Deficiency" that will be communicated to you for correction with a notice of deficiency.

2. Other Program-Specific Requirements

None.

V. APPLICATION REVIEW INFORMATION

A. Review Criteria

Each of the four factors is weighted as indicated by the number of points that are assigned to it. The maximum score that can be attained is 102 points (100 points from the four rating factors and an extra 2 preference points if the applicant is a Minority Serving Institution (MSI), or partnering with an MSI that is substantially involved in conducting the technical studies). For the

MSI partner to be substantially involved, they must either manage a phase of the proposed study and/or at least have one person as key personnel on the study team). Applicants should be certain that each of these factors is adequately addressed in the project description and accompanying materials. To the extent feasible, include all the needed information within your response to each rating factor. If your response to a particular rating factor cites information provided in your response to another rating factor, clearly indicate where the information is located so that the reviewer can easily locate it.

1. Rating Factors

(1) Capacity of the Applicant and Relevant Organizational Experience: Maximum Points = 20

This factor addresses the extent to which you have the ability, capacity, and organizational resources necessary to successfully implement your proposed activities in a timely manner. The rating of your application will include any sub-grantees, consultants, sub-recipients, and members of consortia that are firmly committed to the project (generally, "subordinate organizations"). In rating this factor, HUD will consider the extent to which your application demonstrates:

(a) The capability and qualifications of key and supporting personnel (13 points).
HUD will assess the qualifications of key personnel (especially the PI and co-Principal Investigator(s) (co-PIs)) to carry out the proposed study as evidenced by academic and professional background, publications, and recent (within the past 5 years) research experience. The proposed PI must directly represent and be compensated directly by the applicant for their role in the proposed study. Publications and/or research experience are considered relevant if they require the acquisition and use of knowledge and skills that can be applied in the planning and execution of the technical study that is proposed under this NOFO. **In providing information on the key personnel, please include information on their organization position title, phone/fax numbers, email addresses, percentage of time proposed for this grant, percentage of time being spent on other HUD grants, and percentage of time to be spent on other activities. (Note: you have the option to provide the information on key personnel's organization, position title, phone/fax numbers, email addresses, percentage of time proposed for this grant, and percentage of time to be spent on other activities as an attachment).** HUD will also evaluate the qualifications of supporting personnel such as statisticians and research assistants. Indicate roles and activities of partner organizations as they will be evaluated with respect to their qualifications and capabilities to successfully implement their proposed project roles and activities. HUD strongly encourages collaboration with Minority Serving Institutions (MSIs) such as the Historic Black Colleges and Universities (HBCUs), the Hispanic Associations of Colleges and Universities (HACUs), etc., as partners (MSI must be substantially involved in conducting the technical studies). For the MSI partner to be substantially involved, they must either manage a phase of the proposed study and/or at least have one person as key personnel on the study team. Please do not include the Social Security Numbers (SSN) of any staff members.

(b) Past performance of the study team in managing similar projects (7 points).
HUD will evaluate your demonstrated ability to successfully manage various aspects (e.g., personnel management, data management and analysis, quality control, reporting) of a complex technical study, as well as your overall success in completing studies on time and within budget.

If applicable, provide the number and title of any past OLHCHH grants and describe the objectives and outcomes of those grants and your organization's performance in their implementation (e.g., whether they were completed on time without the request for an extension of the original period of performance). Also, describe the past performance of the organization (applicant and/or partners) on other research related to residential environmental health and safety, or other relevant experiences. Provide details about the nature of the project, the funding organization, and your performance (e.g., timely completion, achievement of desired outcomes). If your organization has an active OLHCHH grant or cooperative agreement, provide a description of the progress and outcomes achieved under that award. If you completed one or more HUD-funded Technical Studies grants, your performance will be evaluated in terms of achievements made under the previous grant(s). If you were a PI or a co-PI of a previous HUD technical studies grant from OLHCHH in a fiscal year in which the NOFO required that grantees provide HUD with a draft manuscript for publication as a final work product (i.e., NOFOs starting in Fiscal Year 2006) and you have not submitted a final report or demonstrated a credible attempt to publish the results in a scientific or professional journal, 5 points will be deducted under this sub-factor.

(2) Need for the research: Maximum Points = 30

This factor addresses the need for the proposed technical study based on the extent to which it is expected to advance scientific knowledge on a key healthy homes or lead hazard control issue by addressing an important information gap. In responding to this factor, you should document in detail how your project will make a significant contribution towards achieving some or all of HUD's stated goals and objectives for one or more of the topic areas described under section III.F.1. For example, you should demonstrate how your proposed study addresses a need with respect to the development of improved methods for the assessment and control of residential hazards or addresses a need associated with an important housing-related environmental health hazard. Keep in mind that HUD is particularly interested in protecting the health of children, communities of color who are disproportionately exposed to health and safety hazards in housing, persons with disabilities, and other sensitive populations such as seniors. This is especially important if you are proposing to study a topic that is not highlighted as a priority area by HUD in Section III.F.1. Specific issues to be addressed for this factor include:

(a) Research Need to be addressed:

(i) A concise review of the research need that is addressed by your proposed study and why it is consistent with the goals and objectives of the NOFO; identify which NOFO goals and objectives are addressed by the proposed study. Explain why the knowledge gap that your proposed study will address is considered key (e.g., based on identified gaps in the literature or well documented knowledge from professional practice) for advancing our understanding of important healthy homes or lead-based paint hazard issues. The importance of the issue that the proposed study addresses can be demonstrated by factors such as: the severity and frequency of occurrence of the illness/injury that is causally related to the study focus; the prevalence of the condition; the economic impact of the issue, and the impact of the illness/injury on vulnerable populations. If your proposed study involves implementation science, clearly describe the effective interventions, and provide data that shows that the interventions have not been widely adopted to address the residential environmental hazards they are intended for (12 points).

(ii) If you are proposing research on a topic identified in Section III.F.1 of this NOFO or you

have partnered with an OLHCHH program grantee and a significant part of your study (over 50 percent) will be conducted on properties that are or were remediated with an OLHCHH grant, you will be awarded additional points under this rating factor. (3 points).

(b) Discuss the relevant scientific literature, which should be thoroughly cited in your application. Your proposed study will be judged in part on the soundness of the underlying body of research upon which it is based (e.g., the degree to which it is based upon well-understood or poorly understood associations from previous studies) and the clarity and soundness of your summary and interpretation of this research base. If your application also incorporates the results of unpublished research, you should clearly summarize the results of that research in your response to this rating factor (7 points).
(c) A discussion of how your proposed study would significantly advance the current state of scientific knowledge by summarizing its relationship to past research that is published in the peer-reviewed literature and/or which builds upon pilot research that has not been published (a summary of the latter data should be provided in the application, if applicable). HUD will award the most points under this sub-factor for proposals that are expected to have the greatest impact in advancing the evidence base on key healthy homes or lead hazard topics, with the goal of applying the research findings to the creation of a larger supply of healthy housing in the U.S. (4 points).
(d) A discussion on how you anticipate your study findings will be used to improve current methods for assessing or mitigating the hazards under study, particularly for affordable housing. Describe how the findings from your study could ultimately be used by programs conducting housing interventions, such as HUD's Lead Hazard Control Program that also conduct non-lead focused interventions with "healthy homes supplement" funding. If applicable, indicate why the method/protocol that would be improved through your study would lead to improved practice and could be widely adopted (e.g., low cost, easily replicated, lack of other options). (4 points).

(3) Soundness of Approach: Maximum Points = 38
This factor addresses the quality of your proposed technical study plan. Specific components include the following:
(a) Soundness of the study design (20 points).
(i) Clearly and thoroughly describe your proposed study and its design and identify the major objectives. If you are proposing an implementation science study, clearly identify the effective interventions and the context within which you intend to conduct your studies. Describe and discuss why your choice of research design, variables to be measured, and the expected outcomes will address the knowledge gap identified in Rating Factor 2a. If you are proposing a community-based research of home interventions to reduce the risk or severity of an illness or injury, provide evidence for the need for the interventions in the target community (e.g., the prevalence of the targeted hazard and/or the related health outcome). If possible, your study should be designed to address one or more testable hypotheses that you should state clearly and specifically. If you are requesting an award of $800,000 or more under the HHTS Grant Program, you must clearly describe how funding at this level allows you to design your study in a manner that will provide more definitive findings than would a lower funding level (e.g., use of a randomized controlled trial or other design that incorporates a control group). Failure to describe the study design in sufficient detail will result in the loss of points (10 points).
(ii) The study should be presented as a logical sequence of steps or phases with individual tasks

described for each phase and all-important milestones identified, as well as any important "decision points" (2 points).
(iii) Describe the statistical basis for your study design and demonstrate that you would have adequate statistical power (showing the power calculations) to test your stated hypotheses and achieve your study objectives (2 points).
(iv) Discuss your plans for data management and analysis describing key data and the statistical methods that will be employed to analyze these data. (3 points).
(v) If you are proposing to conduct a study that includes a significant level of community interaction (e.g., studies involving participant recruitment, survey research, environmental assessment, or intervention in homes), describe your plan for meaningful involvement of the affected community in your proposed study, including how you will ensure the programs, services, and activities funded through this NOFO will be accessible to and usable by persons with disabilities and meaningful access for persons with Limited English Proficiency (LEP). This includes describing how all meetings are held in facilities that are physically accessible to persons with disabilities and how you will provide effective communication including auxiliary aids and services and providing reasonable accommodations to ensure equal opportunity for persons with disabilities consistent with obligations under Section 504 of the Rehabilitation Act of 1973 (29 USC 794), HUD's implementing regulations at 24 CFR Part 8, and Title II of the Americans with Disabilities Act (42 USC 12131-12134) and implementing regulations at 28 CFR Part 35.

You should also describe how your community interaction will take reasonable steps to ensure meaningful language access for persons with limited English proficiency (LEP) pursuant to Title VI of the Civil Rights Act of 1964 and Executive Order 13166. For assistance in ensuring meaningful access for individuals with limited English proficiency, you should consult HUD's Final Guidance to Federal Financial Assistance Recipients Regarding Title VI Prohibition Against National Origin Discrimination Affecting Limited English Proficient Persons (HUD's LEP Guidance) published in the Federal Register on January 22, 2007 (72 Fed. Reg. 2732).

You should define the community of interest with respect to your proposed study and discuss why and how your proposed approach to community involvement will make a meaningful contribution to your study and to the community. For studies in which community participants must visit a facility operated by the applicant pursuant to activities conducted under this NOFO, applicants are advised that such activities must be held in facilities that are physically accessible to persons with disabilities as required by Section 504 of the Rehabilitation Act and its implementing regulations at 24 CFR Part 8 and Title II of the Americans with Disabilities Act (42 USC 12131-12134) and its implementing regulations at 28 CFR Part 35.

Where physical accessibility is not achievable, recipients and subrecipients must give priority to alternative methods of involvement and product delivery that are accessible to and usable by individuals with disabilities and offer programs, services, and activities to individuals with disabilities in the most integrated setting appropriate (3 points or NA).

(b) Quality assurance mechanisms (6 points).
You must describe the quality assurance mechanisms that will be integrated into your project design to ensure the validity and quality of the results. Applicants that receive awards will be required to submit a quality assurance plan to HUD. You should plan for this and include quality assurance activities in your study work plan.

(i) Discuss the major quality assurance mechanisms that are relevant for your proposed study. Examples of quality assurance mechanisms include but are not limited to: procedures for selection of samples/sample sites, sample handling, use of quality control samples, validating the accuracy of instrumentation, standardization of interventions, measures to ensure accuracy during data capture and management, staff training and oversight, and final validation of your dataset. If applicable, documents (e.g., government reports, peer-reviewed academic literature) that provide the basis for your quality assurance mechanisms should be cited. Identify who will have primary responsibility for drafting and ensuring compliance with the Quality Assurance Plan (QAP) and describe how the QAP will be used during the implementation of your study. (A sample QAP template is available at http://www.hud.gov/sites/documents/DOC_36504.DOC.) Your application will be rated on the thoroughness, clarity, and validity of your proposed quality assurance activities, and their appropriateness for ensuring the validity and quality of the data (3 points).
(ii) For the collection of data using survey or other observational tools, describe the procedures that you will follow to ensure accurate data capture and transfer (e.g., transfer of data from the field to a database). Also, describe any research done (or planned) to validate the instrument (2 points or NA).
(iii) Institutional Review Boards. In conformance with the Common Rule (Federal Policy for the Protection of Human Subjects, codified by HUD at 24 CFR 60.101, which incorporates the DHHS regulation at 45 CFR part 46, subpart A), if your research involves human subjects, your organization must provide proof (e.g., a letter signed by an appropriate official) that the research has been reviewed and approved by an Institutional Review Board (IRB) before you can initiate activities that require IRB approval. Before initiating such activities, you must also provide the number for your organization's assurance (i.e., an "institutional assurance") that has been approved by the DHHS's Office for Human Research Protections (OHRP). You must also provide proof that the IRB that approves your study is registered with the OHRP. You do not have to provide proof of IRB approval with your application. If you do not have IRB approval yet, you should address how you will obtain such approval. Describe how you will obtain informed consent (e.g., from the subjects, their parents, or their guardians, as applicable) and discuss the steps you will take to help ensure participants' understanding of the elements of informed consent, such as the purpose, benefits, and risks of the research. Describe how this information will be provided and how the consent will be collected. For example, describe your use of "plain language" forms, flyers, and verbal scripts, and how you plan to work with families with LEP or primary languages other than English, and with families including persons with disabilities. For additional information on what constitutes human subject research or how to obtain an institutional assurance see the OHRP website at https://www.hhs.gov/ohrp/index.html (1 point or NA).

(c) Section 3 Requirements (1 point or NA).
If your proposed project will conduct limited housing construction or rehabilitation, explain in a separate narrative how you will provide appropriate opportunities to Section 3 residents and Section 3 businesses of the target area, in compliance with Section 3 of the Housing and Urban Development Act of 1968 (12 U.S.C. § 1701u) and HUD's implementing rules at 24 CFR Part 75. If, on the other hand, your proposed project will not conduct housing construction or rehabilitation, your application need only include an explicit statement (in your narrative response to this sub-factor) to that effect.

(d) Budget Proposal (8 points).
(i) Your budget proposal should thoroughly estimate all applicable direct and indirect costs and be presented in a clear and coherent format. HUD is not required to approve or fund all proposed activities. You must thoroughly document and justify all budget categories and costs (Form HUD424CBW) and all major tasks, for yourself, sub-recipients, major subcontractors, joint venture participants, or others contributing resources to the project (2 points).
(ii) A separate budget must be provided for partners who are proposed to receive 10 percent or more of the federal budget requested. (1 point or NA).
(iii) Your narrative justification associated with these budgeted costs should be submitted as part of the Total Budget (Federal Share and Leveraging) but is not included in the 25-page limit for this submission. The narrative should clearly provide an explanation of the basis for the major budget items and reflect the HUD 424 CBW line-by-line. Separate narrative justifications should be submitted for partners that are submitting separate HUD 424 CBW budget forms (3 points).
(iv) Your budget will be assessed on the degree to which it appears to be an efficient use of resources considering the proposed scope of your study. A particular focus will be on the mix of individuals that will be compensated by the grant and the estimated number of hours for each (2 points).

(e) Leveraging Resources (3 points)
Your proposal will be assessed on the extent to which it demonstrates that the effectiveness of HUD's Technical Studies grant funds is being increased by securing other resources or by structuring the study in a cost-effective manner, such as integrating the work into an existing study that will be concurrent with your proposed study. Contributed resources must be shown to be specifically dedicated to and integrated into supporting study activities. Staff and in-kind contributions should be assigned a market-rate monetary value. You should be aware that federal sources are generally not allowed to be used for monetary leverage unless otherwise permitted by that specific federal program's authorizing statute. Your proposal will be scored based on the magnitude of your proposed leveraging, with leveraging valued at 6% or more of your proposed budget awarded the maximum number of points.
To receive points for leveraging from a partner or a source outside your organization, it must be documented with a letter of firm commitment that identifies the monetary value of the contribution. The commitment letter must also be signed by an official of the organization legally able to make commitments on behalf of the organization.

(4). Achieving Results and Project Management: Maximum Points =12
This factor emphasizes HUD's commitment to ensuring that applicants keep promises made in their applications. The performance of successful applicants will be assessed quarterly to ensure that performance goals are met. This factor requires applicants to clearly identify benchmarks and milestones that demonstrate progress in study completion as well as final study outcomes. Applicants must also provide a management plan that indicates how they will ensure timely and successful completion of the study.

The application should include the following:
(a) Demonstration that it is clearly feasible to complete the study within the proposed period of performance and successfully achieve your objectives. You should provide a schedule for the clear and expeditious completion of all major tasks, with associated benchmarks and major study milestones and deliverables. Benchmarks and important milestones (e.g., completing the

recruitment of study participants) should be identified on a quarterly basis in a study timeline. Any interim products should be identified. HUD has observed that studies can miss targeted performance timelines because of delays in the IRB approval process, unexpected difficulties with recruiting study participants, or delays in developing new laboratory methods or instruments. Successful applicants will be required to enter project benchmarks and milestones into a spreadsheet, which will be used by HUD to track study progress. (3 points).

(b) A management plan that discusses the schedule for the completion of all major tasks, with associated benchmarks and major study milestones and deliverables. Identify the organization/person that will have primary responsibility for completion of each of the major study tasks and indicate plans for ensuring effective communication among members of the study team as well as the community, if applicable, about goals, methods, progress, and timeliness. You must also submit an organizational chart that shows the key players in the project, their roles, and their reporting relationships. The chart may be submitted as an attachment and will not count towards the 25-page maximum. (6 points).

(c) In your response you should identify potential obstacles and delays in maintaining your proposed schedule and achieving your study objectives (e.g., recruitment and/or retention) and discuss steps and adjustments you would take to respond to these potential obstacles and delays to ensure timely completion of the study (2 points).

(d) Include plans and schedules for preparation and submission of a minimum of one manuscript for publication in a peer-reviewed academic journal following HUD acceptance. Depending on the study's focus, HUD may also accept submission of a manuscript for publication of study findings in one or more high quality professional journals (i.e., if this is considered more appropriate for the focus area than publication in a scientific/academic journal). Where possible, include the name of the journal in which you plan to publish. The final deliverable can be submitted to HUD during the agreed upon period of performance or during the 90-day closeout period following award expiration (1 point).

Maximum Points: 100

Section 3

In accordance with HUD's Section 3 regulations at 24 CFR 75.7, your application will receive up to 1 points based the quality of Section 3 plans submitted. The program office will consider the following in evaluating the quality of the Section 3 plan: _____.

If your proposed project will conduct limited housing construction or rehabilitation, explain in a separate narrative how you will provide appropriate opportunities to Section 3 residents and Section 3 businesses of the target area, in compliance with Section 3 of the Housing and Urban Development Act of 1968 (12 U.S.C. § 1701u) and HUD's implementing rules at 24 CFR Part 75. If, on the other hand, your proposed project will not conduct housing construction or rehabilitation, your application need only include an explicit statement (in your narrative response to this sub-factor) to that effect.

2. Other Factors

Preference Points

This NOFO supports the following policy initiatives. If your application demonstrates the appropriate information for the policy initiative, your application will receive up to two (2) points for each initiative, and will receive no more than a total of four (4) points. These points are added to your application's overall score.

Minority-Serving Institutions (2 points)

You may choose to voluntarily commit to address policy initiatives in your application. Addressing these policy initiatives is not a requirement to apply for or receive an award. If you choose to address a voluntary policy initiative in your application, however, you will be required to adhere to the information submitted with your application should you receive an award. The proposed information will be included as a binding requirement of any federal award you receive as a term and condition of that award.

This program does not offer points for Climate Change

This program does not offer points for Environmental Justice.

This program does not offer preference points related to HBCUs.

Minority-Serving Institutions

Pursuant to Executive Orders 13985, 14041, 14045, and 14031, you may receive up to two (2) preference points if you are an applicant designated as a minority-serving institution (MSI) or if your application proposes one or more partnerships with minority-serving educational institutions that have been historically underserved.

An applicant designated by the U.S. Department of Education as an MSI will receive up to two (2) preference points when the application includes documentation of the applicant’s status as an HBCU, Hispanic-serving institution, Tribal-controlled postsecondary institution, Alaska Native-serving or Native-Hawaiian-serving institution, Predominantly Black Institution, Asian and Native American Pacific Islander-serving institution or Native American-serving nontribal institution.

An applicant partnering with an HBCU, Hispanic-Serving Institution, Tribal-controlled postsecondary institution, Alaskan Native-serving or Native-Hawaiian-serving institution, Predominantly Black Institution, Asian and Pacific Islander-serving institution, or Native American-serving nontribal institution will receive up to two (2) Preference Points when the application includes a Letter of Commitment certifying that a partnership is in place and signed by an authorizing official of the MSI and documentation of the college or university's status as an HBCU, Hispanic-serving institution, Tribal-controlled postsecondary institution, Alaska Native-serving or Native-Hawaiian-serving institution, Predominantly Black Institution, Asian and Native American Pacific Islander-serving institution, or Native American-serving nontribal institution.

The Minority Serving Institution must be substantially involved (the MSI partner must either manage a phase of the proposed study and/or at least have one person as key personnel on the study team) in carrying out the technical study for the applicant to receive the preference points for partnering with an MSI.

This program does not offer Promise Zone preference points.

B. Review and Selection Process

1. Past Performance

In evaluating applications for funding, HUD will consider an applicant's past performance in managing funds. Items HUD will consider include, but are not limited to:

OMB-designated repositories of governmentwide data, as noted in 2 CFR 200.206(a)

The ability to account for funds in compliance with applicable reporting and recordkeeping requirements

Timely use of funds received from HUD

Timely submission and quality of reports submitted to HUD

Meeting program requirements

Meeting performance targets as established in the grant agreement

The applicant's organizational capacity, including staffing structures and capabilities

Timely completion of activities and receipt and expenditure of promised matching or leveraged funds

Promoting self-sufficiency and economic independence

Producing positive outcomes and results

HUD may reduce scores based on the past performance review, as specified under V.A. Review Criteria. Whenever possible, HUD will obtain and review past performance information. If this review results in an adverse finding related to integrity of performance, HUD reserves the right to take any of the remedies provided in the Pre-Selection Review of Performance section of the *Eligibility Requirements for Applicants of HUD Financial Assistance Programs*.

2. Assessing Applicant Risk

In evaluating risks posed by applicants, HUD may use a risk-based approach and may consider any items such as the following:

(1) Financial stability;

(2) Quality of management systems and ability to meet the management standards prescribed in this part;

(3) History of performance. The applicant's record in managing Federal awards, if it is a prior recipient of Federal awards, including timeliness of compliance with applicable reporting requirements, failing to make significant progress in a timely manner, failing to meet planned activities in a timely manner, conformance to the terms and conditions of previous Federal awards, and if applicable, the extent to which any previously awarded amounts will be expended prior to future awards;

(4) Reports and findings from audits performed under Subpart F—Audit Requirements of this part or the reports and findings of any other available audits; and

(5) The applicant's ability to effectively implement statutory, regulatory, or other requirements imposed on non-Federal entities.

a. Applications. An award will be made to the highest scoring “new applicant” that is eligible for an award if the decision is supported by the majority of the Application Review Panel and the applicant's score is 82 points or higher. Awards will then be made in rank order in the LTS and HHTS programs separately, within the limits of funding availability of each program, from among applications that scored at least 75 points; however, for the lowest ranked of the highest ranked applications that differ in score by one point or less, the Application Review Panel will make the final funding recommendation based on which application(s) it judges address(es) the most critical research needs.

b. Partial Funding. In the selection process, HUD reserves the right to offer partial funding to any or all applicants. If you are offered a reduced grant amount, you will have a maximum of 14 calendar days to accept such a reduced award. If you fail to respond within the 14-day limit, you shall be considered to have declined the award.

3. Experience Promoting Racial Equity

In evaluating applications for funding, HUD will consider the extent to which the application demonstrates that the applicant has the experience and the resources to effectively address the needs of underserved communities, particularly Black and Brown communities. This may include experience successfully working directly with such groups, experience designing or operating programs that equitably benefit such groups, or experience successfully advancing racial equity in other ways. This may also include experience soliciting, obtaining, and applying input from such groups when designing, planning, or implementing programs and activities.

This narrative is required and must address the issues outlined in the paragraph above. Applicants will submit the Experience Promoting Racial Equity narrative, according to the instructions in Section IV.B. Specifically, applicants should describe their experience and/or resources to effectively address the needs of underserved communities, particularly Black and Brown communities. The narrative will be submitted in Appendix B. This narrative will be evaluated for sufficiency and will not change the applicant’s score, or rank as compared to other applicants. If the narrative is deemed insufficient, it will be a “Curable Deficiency” that will be communicated to the applicant for correction with a notice of deficiency.

VI. AWARD ADMINISTRATION INFORMATION

A. Award Notices

Following the evaluation process, HUD will notify successful applicants of their selection for funding. HUD will also notify other applicants, whose applications were received by the deadline but were not chosen for award. Notifications will be sent by email to the person listed as the AOR in item 21 of the SF-424.

1. Final Grant

After HUD has made selections, HUD will finalize specific terms of the award and budget in consultation with the selected applicant. If HUD and the selected applicant do not finalize the terms and conditions of the award in a timely manner, or the selected applicant fails to provide requested information, an award will not be made to that applicant. In this case, HUD may select

another eligible applicant. HUD may also impose specific conditions on an award as provided under 2 CFR 200.208.

2. Adjustments to Funding

To ensure the fair distribution of funds and enable the purposes or requirements of a specific program to be met, HUD reserves the right to fund less than the amount requested in an application.

a. HUD may fund no portion of an application that:

(1) Is ineligible for funding under applicable statutory or regulatory requirements;

(2) Fails, in whole or in part, to meet the requirements of this notice;

(3) Duplicates activities funded by other federal awards; or

(4) Duplicates activities funded in a prior year.

b. HUD may adjust the funding for an application to ensure funding diversity, geographic diversity, and alignment with HUD administrative priorities.

c. If an applicant turns down an award offer, or if HUD and an applicant do not finalize the terms and conditions of the award in a timely manner, HUD may withdraw the award offer and make an offer of funding to another eligible application.

d. If funds remain after all selections have been made, remaining funds may be made available within the current fiscal year for other competitions within the program area, or be held for future competitions (if allowable in accordance with the applicable appropriation or authorizing statute), or be used as otherwise provided by authorizing statute or appropriation.

e. If, after announcement of awards made under the current NOFO, additional funds become available either through the current appropriations, a supplemental appropriation, other appropriations or recapture of funds, HUD may, in accordance with the appropriation, use the additional funds to provide additional funding to an applicant awarded less than the requested amount of funds to make the full award, and/or to fund additional applicants that were eligible to receive an award but for which there were no funds available.

3. Funding Errors

If HUD commits an error that when corrected would cause selection of an applicant during the funding round of a Program NOFO, HUD may select that applicant for funding, subject to the availability of funds. If funding is not available to award in the current fiscal year, HUD may make an award to this applicant during the next fiscal year, if funding is available.

4. Applicants who have been selected for the award will be notified by email from the OLHCHH Grant Officer. The email will state the amount the applicant is eligible to receive, and the name of the Government Technical Representative (GTR). This email is not an authorization to begin work or incur costs under the award. An executed cooperative agreement is the authorizing document.
5. HUD may require that the selected applicants participate in negotiations to determine the specific terms of the cooperative agreement and budget. If you accept the terms and conditions of the cooperative agreement, you must return your signed cooperative agreement by the date

specified during the negotiation. In cases where HUD cannot successfully conclude negotiations with a selected applicant or a selected applicant fails to provide HUD with the requested information, an award will not be made to that applicant. In this instance, HUD may offer an award, and proceed with negotiations with the next highest-ranking applicant. You should note that, if you are selected for multiple OLHCHH awards, you must ensure that you have sufficient resources to provide the promised leveraging for the multiple awards. During negotiations, if you are selected for multiple awards, you will be required to provide alternative leveraged resources, if necessary, before any of the cooperative agreements can be awarded. This is required in order to avoid committing duplicate leveraged resources to more than one OLHCHH cooperative agreement.

6. If you are awarded a cooperative agreement, you will receive instructions on how to have the grant account entered into HUD's Line of Credit Control System (eLOCCS) payment system. Other forms and program requirements will also be provided.
7. In accordance with 2 CFR § 200, Subpart F - Audits Requirements, grantees expending $750,000 in Federal funds within a program or fiscal year must have a single or program-specific audit conducted for that year in accordance with the provisions of that subpart.

B. Administrative, National and Departmental Policy Requirements and Terms for HUD Applicants and Recipients of Financial Assistance Awards

Unless otherwise specified, the following Administrative, National and Department Policy Requirements and Terms for HUD Financial Assistance Awards apply. Failure to comply with these requirements may impact your ability to receive or retain a financial assistance award from HUD. Read the requirements carefully as the requirements are different among HUD's programs.

1. Compliance with The Fair Housing Act (42 U.S.C. 3601-3619) and implementing regulations at 24 CFR part 100 et seq
2. Compliance with Title VI of the Civil Rights Act of 1964, 42 U.S.C. 2000d-2000d-4 (Nondiscrimination in Federally Assisted Programs) and implementing regulations at 24 CFR part 1
3. Compliance with the Age Discrimination Act of 1975 (42 U.S.C. 6101-6107) and implementing regulations at 24 CFR part 146
4. Compliance with Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 794) and implementing regulations at 24 CFR part 8
5. Compliance with the Americans with Disabilities Act, 42 U.S.C. 12101 et seq
6. Compliance with Affirmatively Furthering Fair Housing (AFFH) requirements, including those listed on HUD's Affirmatively Furthering Fair Housing webpage
7. Compliance with Economic Opportunities for Low-and Very Low-income Persons (Section 3) requirements, including those listed at 24 CFR part 75
8. Compliance with Improving Access to Services for Persons with Limited English Proficiency (LEP) requirements, including those listed within Federal Register Notice, FR-4878-N-02 (also see HUD's webpage)
9. Compliance with Accessible Technology requirements, including those listed on in HUD's Policy on Section 508 of the Rehabilitation Act and Accessible Technology

10. Compliance with Equal Access Requirements (see 24 CFR 5.105(a)(2) and 5.106)
11. Compliance with Ensuring the Participation of Small Disadvantaged Business, and Women-Owned Business requirements at 2 CFR 200.321
12. Compliance with Energy Efficient, Sustainable, Accessible, and Free from Discrimination by Design
13. Compliance with Real Estate Acquisition and Relocation requirements (see 49 CFR part 24 and applicable program regulations)
14. Compliance with Participation in HUD-Sponsored Program Evaluation (see Federal Register Notice, FR-6278-N-01)
15. Compliance with OMB Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (see 2 CFR part 200)
16. Compliance with Drug-Free Workplace requirements (see 2 CFR part 2429, which is HUD's implementation of 41 U.S.C. 701, et seq.)
17. Compliance with the requirements related to safeguarding resident/client files
18. Compliance with the Federal Funding Accountability and Transparency Act of 2006 (2 CFR part 170) (FFATA), as amended
19. Compliance with Eminent Domain
20. Compliance with Accessibility for Persons with Disabilities requirements on HUD's Disability Overview webpage
21. Compliance with Violence Against Women Act at 24 CFR part 5, subpart L and applicable program regulations
22. Compliance with Conducting Business in Accordance with Ethical Standards/Code of Conduct, including 2 CFR 200.317, 2 CFR 200.318(c) and other applicable conflicts of interest requirements
23. Compliance with the Build America, Buy America (BABA) Act procurement requirements and implementing guidance available on HUD's dedicated webpage
24. Compliance with System for Award Management and Universal Identifier Requirements at 2 CFR part 25
25. Compliance with section 106(g) of the Trafficking Victims Protection Act of 2000 (TVPA), as amended (22 USC 7104(g)) and implementing regulations at 2 CFR part 175 (Award Term for Trafficking in Persons)
26. Compliance with Award Term and Condition for Recipient Integrity and Performance Matters (see Appendix XII to 2 CFR part 200)
27. Compliance with Suspension and Debarment (see 2 CFR part 2424 and 2 CFR part 180)
28. Compliance with environmental justice requirements under Executive Orders 12898 and 14008, and OMB Memorandum M-21-28, which implements the Justice40 Initiative, section 223 of Executive Order 14008.
29. Compliance with Eliminating Barriers That May Unnecessarily Prevent Individuals with Criminal Histories from Participation in HUD Programs (see HUD Secretary Fudge's April 12, 2022 memorandum)
30. Compliance with equity requirements, which include compliance with racial equity and underserved communities and LGBTQ+ requirements under Executive Orders 13985 and 13988
31. Compliance with waste, fraud, and abuse requirements, including whistleblower protections (see HUD's webpage)

31. Compliance with 41 U.S.C. § 4712, Enhancement of contractor protection from reprisal for disclosure of certain information. Compliance with 41 U.S.C. § 4712, which includes informing your employees in writing of their rights and remedies, in the predominant native language of the workforce. Under 41 U.S.C. § 4712, employees of a contractor, subcontractor, grantee, subgrantee, and personal services contractor may not be discharged, demoted, or otherwise discriminated against as a reprisal for disclosing information that the employee reasonably believes is evidence of gross mismanagement of a Federal contract or grant, a gross waste of Federal funds, an abuse of authority relating to a Federal contract or grant, a substantial and specific danger to public health or safety, or a violation of law, rule, or regulation related to a Federal contract (including the competition for or negotiation of a contract) or grant. (See Federal Contractor or Grantee Protections | Office of Inspector General, Department of Housing and Urban Development (hudoig.gov)

Environmental Review

Compliance with environmental requirements, including regulations at 24 CFR part 50 or 58:

Compliance with 24 CFR part 50 or 58 procedures is explained below:
a. Eligible Construction and Rehabilitation Activities. A FY 2023 LHHTS award does not constitute approval of specific sites where activities that are subject to environmental review may be carried out. The provisions of section 305(c) of the Multifamily Housing Property Disposition Reform Act of 1994, implemented by HUD regulations at 24 CFR part 58, "Environmental Review Procedures for Entities Assuming HUD Environmental Responsibilities," are applicable to properties assisted with LHHTS grant funds. Therefore, recipients conducting eligible construction and rehabilitation activities must comply with 24 CFR part 58. Recipients that are States, units of general local government or Native American tribes must carry out environmental review responsibilities as a responsible entity under part 58. Recipients that are academic, not-for-profit, for-profit institutions or specialized units of local government must contact and partner with a non-recipient responsible entity, usually the unit of general local government or Native American tribe, to assume the environmental review responsibilities for construction or rehabilitation activities funded (in whole or in part) under this NOFO. Reasonable expenses incurred for compliance with these environmental requirements are eligible expenses under this NOFO. Under 24 CFR 58.11, where the recipient is not a State, unit of general local government or Native American tribe, if a responsible entity objects to performing the environmental review, or the recipient objects to the responsible entity performing the environmental review, HUD may designate another responsible entity to perform the review or may perform the environmental review itself under the provisions of 24 CFR part 50. When HUD performs the review itself, following grant award execution, HUD will be responsible for ensuring that any necessary environmental reviews are completed.

b. For all cooperative agreements under this NOFO, recipients and other participants in the project are prohibited from undertaking, or committing or expending HUD or non-HUD funds (including leveraged funds) on, a project or activities under this NOFO (other than activities listed in 24 CFR 58.34, 58.35(b) or 58.22(f)) until the responsible entity completes an environmental review and the applicant submits and HUD approves a Request for the Release of Funds and the responsible entity's environmental certification (both on Form HUD-7015.15) or, in instances where the recipient is not a State, unit of general local government or Native American tribe and HUD performs the environmental review under part 50, HUD has completed

the review and notified the grantee of its approval. The results of the environmental reviews may require that proposed activities be modified, or proposed sites rejected. For Part 58 procedures, see https://www.hudexchange.info/programs/environmental-review/. **For assistance, contact Karen Griego, the Office of Lead Hazard Control and Healthy Homes Program Environmental Clearance Officer at (505) 346-6462 (this is not a toll-free number) or the HUD Environmental Clearance Officer in the HUD Field Office serving your area.** HUD welcomes and is prepared to receive calls from individuals who are deaf or hard of hearing, as well as individuals with speech or communication disabilities. To learn more about how to make an accessible telephone call, please visit https://www.fcc.gov/consumers/guides/telecommunications-relay-service-trs. Recipients of a grant under this program will be given additional guidance in these environmental responsibilities.

c. All other activities not related to construction or rehabilitation activities are exempt or categorically excluded under 24 CFR 50.19 (b)(1), (3), (5) and (9), and 24 CFR 58.34(a)(1), (3), (5), and (9) from the requirements of the National Environmental Policy Act of 1969 (42 U.S.C. § 4321) and are not subject to environmental review under the related environmental laws and authorities at 24 CFR 50.4 and 24 CFR 58.5.

Prohibition on Surveillance

Compliance with 2 CFR 200.216, Prohibition on Certain Telecommunication and Video Surveillance Services or Equipment is required.

Remedies for Noncompliance

HUD may terminate a Federal award, in whole or in part, for any of the reasons specified in 2 CFR 200.340, Termination.

1. The Grant Officer (GO) may, on reasonable notice to the Grantee and/or subgrantee, temporarily suspend the award and withhold further payments pending corrective action by the Grantee and/or subgrantee. The award may be terminated in whole or in part before the end of the performance period when the Grantee and/or subgrantee has failed to comply with the terms, conditions, standards, or provisions of this award, or if an award no longer effectuates the program goals or agency priorities. The award may be terminated for convenience when both parties agree that the continuation of the award would not produce beneficial results. Action will be taken in accordance with 2 CFR §200.339 – §200.343.

2. Effects of Suspension and Termination - Costs of Grantee or subgrantee resulting from obligations incurred by the Grantee or subgrantee during a suspension or after the termination of an award are not allowable unless HUD expressly authorizes them in the notice of suspension or termination. Other Grantee or subgrantee costs during suspension or after termination which are necessary and not reasonably avoidable are allowable if:

a. The costs result from financial obligations which were properly incurred by the Grantee or subgrantee before the effective date of suspension or termination, are not in anticipation of it; and

b. The costs would be allowable if the award was not suspended or expired normally at the end of the period of performance in which the termination takes effect.

3. Relationship to Debarment and Suspension - The enforcement remedies identified in this section, including suspension and termination, do not preclude the Grantee or subgrantee from being subject to “Debarment and Suspension” under Executive Orders 12549 and 12689, 2 CFR Part 180 as outlined in 2 CFR §200.339

Lead-Based Paint Requirements

When providing housing assistance funding for purchase, lease, support services, operation, or work that may disturb painted surfaces, of pre-1978 housing, you must comply with the lead-based paint evaluation and hazard reduction requirements of HUD’s lead- based paint rules (Lead Disclosure; and Lead Safe Housing (24 CFR part 35)); and EPA’s lead- based paint rules (e.g., Repair, Renovation and Painting; Pre-Renovation Education; and Lead Training and Certification (40 CFR part 745)).

When providing education or counseling on buying or renting housing that may include pre-1978 housing under your grant you must inform clients of their rights under the Lead Disclosure Rule (24 CFR part 35, subpart A), and, if the focus of the education or counseling is on rental or purchase of HUD-assisted pre-1978 housing, the Lead Safe Housing Rule (subparts B, R, and, as applicable, F - M).

C. Reporting

HUD requires recipients to submit performance and financial reports under OMB guidance and program instructions.

1. Recipient Integrity and Performance Matters

You should be aware that if the total Federal share of your federal award includes more than $500,000 over the period of performance, the award will be subject to post award reporting requirements reflected in Appendix XII to 2 CFR part 200, Award Terms and Conditions for Recipient Integrity and Performance Matters.

2. Race, Ethnicity and Other Data Reporting

HUD requires recipients that provide HUD-funded program benefits to individuals or families to report data on the race, color, religion, sex, national origin, age, disability, and family characteristics of persons and households who are applicants for, participants in, or beneficiaries or potential beneficiaries of HUD programs in order to carry out the Department’s responsibilities under the Fair Housing Act, Executive Order 11063, Title VI of the Civil Rights Act of 1964, and Section 562 of the Housing and Community Development Act of 1987. These authorities prohibit discrimination in housing and in programs receiving financial assistance from the Department and direct the Secretary to administer the Department's programs and activities in a manner affirmatively to further these policies and to collect certain data to assess the extent of compliance with these policies. Each recipient shall keep such records and submit to the Department timely, complete, and accurate compliance reports at such times, and in such form and containing such information, as the Department may determine to be necessary to enable it to ascertain whether the recipient has complied or is complying with 24 CFR parts 1

and 121. In general, recipients should have available for the Department data showing the demographics of beneficiaries of federally-assisted programs.

Depending on the type of research the applicant may need to complete the Race and Ethnic Data Reporting Form HUD-27061, U.S. Department of Housing OMB Approval No. 2535-0113.

3. Compliance with the Federal Funding Accountability and Transparency Act of 2006 (Pub. L. 109-282) as amended (FFATA)

FFATA requires information on federal awards be made available to the public via a single, searchable website, which is www.USASpending.gov. Accordingly, each award HUD makes under this NOFO will be subject to the requirements provided by the Award Term in Appendix A to 2 CFR part 170, "REPORTING SUBAWARD AND EXECUTIVE COMPENSATION INFORMATION," unless the Federal funding for the award (including funding that may be added through amendments) is not expected to equal or exceed $30,000. Requirements under this Award Term include filing subaward information in the Federal Funding Accountability and Transparency Act (FFATA) Sub-award Reporting System (FSRS.gov) by the end of the month following the month in which the recipient awards any sub-grant equal to or greater than $30,000.

4. Program-Specific Reporting Requirements

a. **Performance Reporting**. All HUD-funded programs, including this program, require recipients to submit, not less than annually, a report documenting achievement of outcomes under the purpose of the program and the work plan in the award agreement.
(1) Final budget and work plans are due 60 days after the start date.
(2) Progress reporting is required on a quarterly basis. Project benchmarks and milestones will be tracked using a benchmark spreadsheet that incorporates the benchmarks and milestones identified in the response to the application rating factor (4) (see section V.A.1.b.(4)).
(3) Tangible Personal Property Report: Grant recipients who purchase equipment in excess of $5,000 a piece must complete OMB's annual Tangible Personal Property Report, if and after that report receives OMB approval under the Paperwork Reduction Act of 1995 (see 75 Federal Register 14441-14442; March 25, 2011). This report has four components: the Annual Report, the Final (Award Closeout) Report, and the Disposition Report/Request, and, if needed, the Supplemental Sheet (see https://www.whitehouse.gov/omb/grants_forms). Generally, the average estimated time to complete each of these components is 0.5 hours; it is likely to be less for this grant program.
(4) Section 3: Grant recipients covered by Section 3 (see Section V.A.1.b.3.(c).(ii) of this NOFO) must comply with reporting and record-keeping requirements for Section 3 of the Housing and Urban Development Act of 1968, 12 U.S.C. § 1701u (Economic Opportunities for Low- and Very Low-Income Persons in Connection with Assisted Projects). Those requirements can be found at 24 CFR part 75.
(5) Compliance with Section 872 of the Duncan Hunter National Defense Authorization Act for Fiscal Year 2009 (Pub. L. 110-417), ("Section 872"). Section 872 requires the establishment of a government-wide data system – the Federal Awardee Performance and Integrity Information System (FAPIIS) - to contain information related to the integrity and performance of entities awarded federal financial assistance and making use of the information by federal officials in making awards. OMB is in the process of issuing regulations regarding federal agency implementation of section 872 requirements. A technical correction to this NOFO may be issued

when such regulations are promulgated. HUD anticipates that the terms and conditions to its FY 2022 awards will contain requirements related to meeting FFATA and Section 872 requirements.
(6) Annual submission of Form HUD27061, if applicable (i.e., when using human subjects), for reporting on racial and ethnic data on human subjects.
(7) Final Report: The cooperative agreement will specify the requirements for final reporting (e.g., final technical report and final project benchmarks and milestones achieved against the proposed benchmarks and milestones which were approved and incorporated into your cooperative agreement).
(8) Draft Scientific Manuscript(s) and brown-bag presentation: Grantees will be required to complete a minimum of one draft manuscript for publication in a peer-reviewed journal as well as deliver a "brown-bag" presentation to OLHCHH staff on the results of their study.
Questions regarding specific program requirements should be directed to the point of contact listed in Section VII below.

D. Debriefing

For a period of at least 120 calendar days, beginning 30 calendar days after the public announcement of awards under this NOFO, HUD will provide a debriefing related to their application to requesting applicants. A request for debriefing must be made in writing or by email by the AOR whose signature appears on the SF-424 or by his or her successor in office and be submitted to the POC in Section VII Agency Contact(s) of this NOFO. Information provided during a debriefing may include the final score the applicant received for each rating factor, final evaluator comments for each rating factor, and the final assessment indicating the basis upon which funding was approved or denied.

An organization that submitted an application will receive a verbal debriefing after a request is made by the authorized official or his/her successor in office.

VII. AGENCY CONTACT(S)

HUD staff will be available to provide clarification on the content of this NOFO.
Questions regarding specific program requirements for this NOFO should be directed to the POC listed below.

Name:
Brenda M. Reyes MD, MPH

Phone:
202 402 6745

Email:
Brenda.m.reyes@hud.gov

Individuals who are deaf or hard of hearing, or who have speech and other communication disabilities may use a relay service to reach the agency contact. To learn more about how to make an accessible telephone call, visit the webpage for the Federal Communications Commission. Note that HUD staff cannot assist applicants in preparing their applications.

VIII. OTHER INFORMATION

1. Compliance of this NOFO with the National Environmental Policy Act (NEPA)

A Finding of No Significant Impact (FONSI) with respect to the environment has been made for this NOFO in accordance with HUD regulations at 24 CFR part 50, which implement section 102(2)(C) of the National Environmental Policy Act of 1969 (42 U.S.C. 4332(2)(C)). The FONSI is available for inspection at HUD's Funding Opportunities web page.

2. Web Resources.

- **Affirmatively Furthering Fair Housing**
- **Assistance Listing (formerly CFDA)**
- **Climate Action Plan**
- **Climate and Economic Justice Screening Tool (CEJST)**
- **Code of Conduct Requirements and E-Library**
- **Environmental Review**
- **Equal Participation of Faith-Based Organizations**
- **Fair Housing Rights and Obligations**
- **Federal Awardee Performance and Integrity Information System**
- **Federal Funding Accountability and Transparency Act (FFATA) Subaward Reporting System**
- **Grants.gov**
- **Healthy Homes Strategic Plan**
- **Healthy Housing Reference Manual**
- **Historically Black Colleges and Universities (HBCUs)**
- **HUD's Strategic Plan**
- **HUD Grants**
- **HUD Reform Act**
- **HUD Reform Act: HUD Implementing Regulations**
- **Limited English Proficiency (LEP)**
- **NOFO Webcasts**
- **Procurement of Recovered Materials**
- **Promise Zones**
- **Section 3 Business Registry**
- **State Point of Contact List**
- **System for Award Management (SAM)**
- **Real Estate Acquisition and Relocation**
- **Unique Entity Identifier**
- USA Spending

3. Program Relevant Web Resources

None.

4. Additional Information

For programmatic questions on the LHHTS Grant Program, you may contact Brenda M. Reyes, MD, MPH, Office of Lead Hazard Control & Healthy Homes, at 202-402-6745 or via email at Brenda.m.reyes@hud.gov.

For grants administrative questions, you may contact Ms. Jonnette H. Simmons, Office of Lead Hazard Control & Healthy Homes, at telephone 678-732-2625 or via email at Jonnette.H.Simmons@hud.gov.
HUD welcomes and is prepared to receive calls from individuals who are deaf or hard of hearing, as well as individuals with speech or communication disabilities. To learn more about how to make an accessible telephone call, please visit https://www.fcc.gov/consumers/guides/telecommunications-relay-service-trs.
Other Office of Lead Hazard Control & Healthy Homes Information: For additional general, technical, and grant program information pertaining to the Office of Lead Hazard Control and Healthy Homes, visit www.hud.gov/healthyhomes.

Appendices: Appendices A, B and C to this NOFO are available for downloading with the application at https://www.Grants.gov.

Applicants may use the checklist below as a guide when preparing the APPLICATION package.
a. Applicant Abstract (limited to 2 pages)

b. Application Rating Factor Responses (Total narrative response limited to 25 pages.)
(1) Capacity of the Applicant and Relevant Organizational Experience (20 points)
(2) Need for the Research (30 points)
(3) Soundness of Approach (38 points)
(4) Achieving Results and Project Management (12 points)

c. Required materials in response to rating factors (do not count towards the application 25-page limit)
(1) Resumes of Key Personnel (limited to 3 pages per resume; do not include Social Security Numbers on resumes)
(2) Organizational Chart
(3) Letters of Commitment (if applicable) – Letters of commitment should include language defining the activities to be performed, the contributions to be made, and the monetary value of each. NOTE: HUD recommends against including letters of support that do not commit services, materials, or funds; they will not be considered in the evaluation of your application.

d. Optional material in support of the Rating Factors (20-page limit).

e. All required forms in the SF-424 Family of Forms SF-LLL, HUD-424CBW and HUD-2880.

f. Applicant and Recipient Assurances and Certifications (HUD 424-B)

g. Narratives. All required narratives, including a written narrative on Advancing Racial Equity that addresses the four bullets in Section III.F; a written narrative on Affirmative Marketing that addresses the issues outlined in Section III.F., and a written narrative on Affirmatively Furthering Fair Housing that addresses the issues outlined in Section IV.G. Each narrative must be submitted on Appendix B (maximum of 2 pages total), and must address the issues described in the corresponding sections:

- **Advancing Racial Equity narrative (Section III.F)**
- **Affirmative Marketing narrative (Section III.F)**
- **Affirmatively Furthering Fair Housing (Section IV.G); and**
- **Experience Promoting Racial Equity (Section V.B)**

Each narrative will be evaluated for sufficiency and will not change the applicant's score or rank as compared to other applicants. If a narrative is deemed insufficient, it will be a "Curable Deficiency" that will be communicated to the applicant for correction with a notice of deficiency.

APPENDIX

APPENDIX A: Key Residential Health and Safety Hazards

The following briefly describes the residential health and injury hazards HUD considers key targets for intervention:

Allergens and Asthma: In 2007, the CDC estimated that over 25 million Americans have asthma with an associated annual cost of more than $56 billion. Asthma is now recognized as the leading cause of school and work absences, emergency room visits, and hospitalizations. For sensitized children, exposure to allergens from dust mites, cats, mold, and cockroaches have been confirmed to cause exacerbation of asthma, with suggestive evidence that dust mite and cockroach allergen can also exacerbate asthma in children that are not sensitized to them. There is sufficient evidence that exposure to tobacco smoke and damp conditions can exacerbate asthma in children. A causal relationship has also been identified for exposure to some of these agents (e.g., cockroaches, cats) and exacerbation of asthma in adults (Kanchongkittiphon et al., 2015). A study of children with atopic (allergic) asthma from seven major U.S. cities reported that over half of the children were allergic to cockroach and dust mite allergens (approximately 70% and 63%, respectively), with approximately 50% of the children allergic to mold (Morgan et al. 2004). Significant fractions of children also tested positive for allergy to cat, rodent and dog allergens. This is consistent with other studies that have found that cockroach allergens tend to be the dominant allergen among asthmatic children living in the inner-city, whereas dust mite allergens appear to dominate among asthmatic children living in most suburban environments. While children are the population most at risk for developing asthma, there is a growing need to address the onset of new cases in older adults, and to examine how their risk factors might differ from those of children (Selgrade et al. 2006).
HUD-funded researchers reported a significant association between higher values of the Environmental Relative Moldiness Index (ERMI), a measure of mold exposure derived using DNA-based measurements of specific fungi in house dust samples, during the first year of life and the diagnosis of asthma at age seven (Reponen et al., 2011). In a follow-up paper, the researchers identified three specific mold species that were significantly associated with asthma development among the study cohort (Reponen et al., 2012).
Interventions known to have beneficial effects include the installation of impervious mattress and pillow covers, which can reduce dust mite allergen exposure by 90 percent. Other dust mite control measures include dehumidification, laundering bedding in hot water, specialized cleaning (dry steam or use of a HEPA vacuum), and removal of carpets and other materials that accumulate dust and are difficult to clean (e.g., dust sinks). Providing residents with education

and instruction on cleaning with repeat visits by outreach workers have been shown to result in significant reduction in levels of dust mite and cockroach allergens in floor dust and significant reductions in asthma symptoms among children living in the intervention group when compared to the control group (Takaro et al. 2004; Morgan et al. 2004). Numerous studies employing community health workers to conduct home interventions have demonstrated improvements in children's asthma control (Breysse et al. 2013; Campbell et al. 2015; Kapheim et al. 2015; Turcotte et al. 2014). CDC health scientists in coordination with the Task Force on Community Preventive Services reviewed 20 studies in which multi-trigger, multicomponent, interventions were conducted in the homes of children, and they reported reductions in symptoms, missed school days, and asthma acute care visits (Crocker et al., 2011). A separate analysis reported a positive return on investment for the interventions in these studies (Nurmagambetov et al., 2011). Interventions emphasizing the mitigation of mold and moisture problems in the homes of asthmatic children have also been shown to be effective. In one HUD-supported study, asthmatic children living in homes in which nontrivial mold growth was identified, were randomized into two groups, with one group receiving interventions to address the residential mold/moisture problems. The remediation group showed statistically significant reductions in symptom days, symptom score, and the need for acute care (Kercsmar et al. 2006). The mean cost of home interventions was $3,458 per home, including the cost of addressing lead-based paint hazards. Moving families with an asthmatic child into new housing designed to reduce exposure to asthma triggers has also been shown to be effective. HUD-supported research conducted by Takaro et al. (2011) demonstrated improvements in asthma symptoms and other indicators for subjects who lived in asthma-friendly Breathe-Easy Homes in addition to receiving traditional in-home asthma education and outreach. Breathe-Easy Homes addressed multiple asthma triggers by incorporating comprehensive enhancements into the physical structure, including moisture-reduction features, low dust-generating and chemical-emitting finishes, and advanced fresh-air ventilation systems. The authors reported significant improvements in primary (e.g., symptom-free days, FEV1) and secondary (days rescue medicine used, nights with symptoms) outcomes among BEH occupants. Another HUD-funded study conducted in Boston public housing that was newly constructed or rehabbed using green construction methods (and incorporated green management approaches) also demonstrated improvements in children's asthma and in adult sick-building type symptoms (Colton et al. 2015).

Asbestos: Asbestos is a mineral fiber that has been used commonly in a variety of building construction materials and household products for insulation and as a fire-retardant. The Environmental Protection Agency (EPA) and the Consumer Product Safety Commission (CPSC) have banned most asbestos products. Manufacturers have also voluntarily limited the use of asbestos. Today, asbestos is most commonly found in older homes in pipe and furnace insulation materials, asbestos shingles, millboard, textured paints and other coating materials, and floor tiles. Elevated concentrations of airborne asbestos can occur when asbestos-containing materials (ACMs) are disturbed by cutting, sanding or other remodeling activities. Improper attempts to remove these materials can release asbestos fibers into the air in homes, increasing asbestos levels and endangering the people living in those homes. The most dangerous asbestos fibers are too small to be visible. After they are inhaled, they can remain and accumulate in the lungs. Asbestos can cause lung cancer, mesothelioma (a cancer of the chest and abdominal linings), and asbestosis (irreversible lung scarring that can be fatal). Most people with asbestos-related diseases were exposed to elevated concentrations on the job; some developed disease from

exposure to clothing and equipment brought home from job sites. As with radon, dose-response extrapolations suggest that lower-level exposures, as may occur when asbestos-containing building materials deteriorate or are disturbed, may also cause cancer. Intact asbestos-containing materials are not a hazard; they should be monitored for damage or deterioration and isolated if possible. Repair of damaged or deteriorating ACMs usually involves either sealing (encapsulation) or covering it (enclosure). Repair is usually cheaper than removal, but it may make later removal of asbestos more difficult and costly. Repairs should only be done by a trained professional certified to handle asbestos safely and can cost from a few hundred to a few thousand dollars; removal can be more expensive.

Combustion Products of Heating Systems: Burning of oil, natural gas, kerosene, and wood for heating or cooking purposes can release a variety of combustion products of health concern. Depending upon the fuel, these may include carbon monoxide (a chemical asphyxiant), oxides of nitrogen (respiratory irritants), polycyclic aromatic hydrocarbons (e.g., the carcinogen benzo[a]pyrene) and inhalable particulate matter (PM). Exposure to carbon monoxide, an odorless gas, can be fatal. Nitrogen dioxide can irritate or damage the respiratory tract, and sulfur dioxide can irritate the eyes, nose and respiratory tract. Improper venting and poor maintenance of heating systems and cooking appliances can dramatically increase exposure to combustion products. As green construction and rehabilitation become more popular, and homes become increasingly airtight to improve energy efficiency, there are concerns about potential trade-offs in indoor air quality and resident health (Selgrade et al. 2006, Wilson et al. 2014). Experts recommend having combustion heating systems inspected by a trained professional every year to identify blocked openings to flues and chimneys, cracked or disconnected flue pipes, dirty filters, rust or cracks in the heat exchanger, soot or creosote build-up, and exhaust or gas odors. Also installing a carbon monoxide detector is recommended; however, such a detector will not detect other combustion by-products.

E-Cigarettes: A recent review of the public health consequences of electronic cigarettes by the National Academies of Sciences, Engineering, and Medicine (NASEM, 2018) noted in summary that while “[e]-cigarette aerosol contains fewer numbers and lower levels of most toxicants than smoke from combustible tobacco cigarettes does,” “[t]here is conclusive evidence that e-cigarette use increases airborne concentrations of particulate matter and nicotine in indoor environments compared with background levels,” and “that in addition to nicotine, most e-cigarette products contain and emit numerous potentially toxic substances.” The review noted that, “the absolute risks of the products cannot be unambiguously determined at this time. Long-term health effects, of particular concern for youth who become dependent on them, are not yet clear,” and recommended research on “the impact of e-cigarette use in indoor air quality and biomarkers of second-hand e-cigarette exposure in scenarios and exposure surveys that are relevant for the populations exposed, including ... children, [and] pregnant women.”

Environmental Tobacco Smoke (ETS): ETS (also known as secondhand smoke) results from the combustion of tobacco products and exhalation of inhaled tobacco smoke by active smokers. Tobacco smoke contains as many as 7000 individual compounds, including formaldehyde, carbon monoxide, nicotine, nitrosamines and polyaromatic hydrocarbons, with nearly 70 compounds identified as carcinogens (US DHHS, 2010; IARC, 2004). Exposure to ETS has been associated with numerous adverse health effects, including multiple types of cancer, coronary

heart disease, asthma, respiratory tract infections and others. Additionally, exposure to ETS has been estimated to cause approximately 50,000 excess deaths annually in the U.S., including sudden infant death syndrome (Cal EPA, 2005). Children are particularly vulnerable to the effects of ETS. The U.S. Surgeon Generals' office reported that approximately 22 million children may be exposed to ETS in the U.S. (US DHHS, 2006). Exposure to ETS can be a problem even in rooms or units where smoking does not occur. Van Deusen et al. (2009) reported that levels of particulate matter (an indicator of tobacco smoke) were elevated in rooms within a home that were distant from the primary room where smoking occurred. In addition, ETS also migrates between units in multi-unit buildings. Kraev et al. (2009), measured nicotine in air and air exchange rates in individual units of a lower-income multi-unit building in the Boston area and found measurable levels of nicotine in units where no smoking occurred; King et al. (2010) reported similar results in nonsmoking units and hallways as part of a study in Buffalo. Wilson et al. (2011) analyzed measurements of cotinine exposure in children (an indicator of ETS exposure) and found that those living in multifamily housing had higher levels than children in detached housing, indicating the contribution from ETS migrating between units of multifamily housing.

Green Construction and Energy Upgrades: Green building and design standards are being incorporated into housing construction and rehab specifications with increasing frequency. The use of green standards has been primarily driven by the efficiency gains and the resulting reductions in cost of energy and water usage. The potential impact of green standards on indoor environmental quality and health has mainly been based on the expectation that green features and management practices would reduce exposure to allergens and toxic substances within the home (e.g., improved indoor air quality, use of integrated pest management). Some recent studies have shown a positive correlation between green construction/weatherization and improved health of residents. A HUD-funded study demonstrated benefits to indoor air quality and resident health in green vs. conventional low-income housing. The researchers reported 57%, 65%, and 93% lower concentrations of PM 2.5, NO2, and nicotine, respectively, in green vs control homes, as well as fewer reports of mold, pests, inadequate ventilation, and stuffiness (Colton et al. 2014). They further reported that asthmatic children living in green homes experienced fewer asthma symptoms, asthma attacks and asthma-related school absences when compared to those in conventional housing (Colton et al., 2015). In another HUD-funded study, Breysse et al. 2013 reported decreases in the overall number of children with poorly controlled asthma when combining weatherization and healthy homes interventions.

Infiltration of Ambient Pollutants: Personal exposure to airborne contaminants is a function of indoor and outdoor exposures. For people living in areas that are near roadways or a point source generating hazardous pollutants, for example, the infiltration of ambient pollutants has the potential to dominate personal exposures. Logue et al. (2010, 2011) identified a number of pollutants that present significant health risks in indoor environments; however, many of those pollutants are found also in the ambient environment suggesting infiltration of ambient air pollution may be of concern when identifying exposure risks to occupants of a home. Meng et al. (2005) reported in the Relationships of Indoor, Outdoor, and Personal Air (RIOPA) study across three U.S. cities that approximately 60% of indoor PM 2.5 originated from the outdoors. Allen et al. (2012) identified the frequency of air conditioner use and the opening of windows as predictors of ambient pollution infiltration during the summer months, while temperature and the

use of forced air heat were predictors during winter months. Studies on practical control technologies and to reduce the infiltration of outdoor air pollutants into homes are needed.

Insect and Rodent Pests: The observed association between exposure to cockroach allergen and asthma severity has already been noted above. In addition, cockroaches may act as vehicles to contaminate environmental surfaces with certain pathogenic organisms. Rodents can transmit a number of communicable diseases to humans, either through bites, arthropod vectors, or exposure to aerosolized excreta. Humans can become sensitized to proteins in rodent urine, dander and saliva. Such sensitization may contribute to asthma severity among sensitized individuals. Insect and rodent infestations are frequently associated with substandard housing that makes them difficult to eliminate. Even though studies have shown that bedbugs do not transmit any human diseases, CDC, EPA and USDA have declared bedbugs as pest of significant public health importance. Research indicates that the presence of bedbugs and their bites can result in adverse physical and mental health effects (e.g., infections, anxiety, and insomnia) as well as economic consequences. These include allergic reactions to their bites, secondary infections and expensive control measures and therefore have to be treated. However, the treatment of rodent and insect infestations often includes the use of toxic pesticides that may present hazards to occupants (see below). A HUD-funded study demonstrated that the use of an integrated pest management (IPM) approach resulted in significant reduction in cockroaches in heavily infested public housing (Wang et al., 2009). The use of IPM for pest control is recommended by federal agencies, including the U.S. EPA, HUD, and the CDC because it minimizes the use of toxic pesticides and instead emphasizes environmental controls such as elimination of harborages and removing access to food and water. This recommendation was recently confirmed by an expert panel that systematically reviewed the literature on this topic (Sandel et al., 2010). According to the expert panel, sufficient evidence was available to support the implementation of an IPM approach as a way of reducing pesticide residues in the home.

Lead Hazards: Exposure to lead, especially from deteriorating lead-based paint, remains one of the most important and best-studied of the household environmental hazards to children. Although blood lead levels (BLLs) have fallen nationally, a large reservoir of lead remains in housing. Recent results from CDC's Fourth National Health and Nutrition Examination Survey (NHANES 2002) demonstrate that the national geometric mean blood lead concentration of children aged 1-5 years has decreased from 2.3 µg/dL in 1991 to 1.6 µg/dL in the period 1999-2002 (CDC 2005). During the 1999-2002 survey period, children aged 1-5 years had the highest prevalence of elevated BLLs (1.6%), so that approximately 310,000 children aged 1-5 years remained at risk for exposure to harmful lead levels. Overall, by race/ethnicity, non-Hispanic blacks and Mexican Americans had higher percentages of elevated BLLs (1.4% and 1.5%, respectively) than non-Hispanic whites (0.5%). Among subpopulations, non-Hispanic blacks aged 1-5 years and aged >60 years had the highest prevalence of elevated BLLs (3.1% and 3.4%, respectively). As BLLs have dropped over the years, recent analyses have examined the relationship between relatively low blood lead concentrations (<10g/dL) and cognitive functioning in representative samples of U.S. children and adolescents and have found evidence that suggests that deficits in cognitive and academic skills associated with lead exposure have no threshold (Lanphear et al., 2000; Canfield et al., 2003). These findings clearly support the importance of primary prevention with respect to childhood lead exposure. Despite dramatic reductions in blood lead levels over the past 15 years, lead poisoning continues to be a

significant health risk for young children.
According to the recent HUD funded American Healthy Homes Survey II lead findings report (AHHS II), an estimate of 34.6 million homes (about 29.4% of US housing stock) contain LBP, of which about 30.9 million (89%) were built before 1978. Using the definition of lead dust hazards applicable to AHHS, about 22.3 million (18.9% of all homes) have one or more significant LBP hazards. The survey further estimates that 1.6 million homes with one or more LBP hazards poses the highest risk of lead poisoning because they housed low-income families (household income less than $35,000 per year) and have children who are less than six years of age. Among HUD grantees, lead hazard control (LHC) costs tend to range from $500 to $15,000 per unit, with a median cost of $5,960. Corrective measures include paint stabilization, enclosure and removal of certain building components coated with lead paint, cleanup and 'clearance testing,' which ensures the unit is safe for young children. In addition, acute injuries to children have been well documented, most notably in instances involving sanding or stripping of lead-based paint or visible deterioration of lead-based painted residential building components combined with children who exhibit pica tendencies.
Evaluation of lead hazard control interventions conducted by recipients of HUD's lead hazard control grants found that interventions were effective in significantly reducing pre-intervention dust-lead levels on floors and window surfaces up to six years following intervention (Wilson et al. 2006). More intensive treatments were found to significantly reduce dust lead loadings on windowsills and troughs compared to lower-level treatments, however, no significant differences in dust-lead loadings on floors were reported. Sandel et al. (2010) confirmed these general findings, citing that lead hazard control interventions were effective in reducing exposures to lead exposures. The authors concluded that the evidence was sufficient to promote lead hazard control interventions as a means of reducing lead exposure and associated health effects, particularly in children. In a HUD-funded follow-up study of residential window replacement and lead hazard control after homes were enrolled in an evaluation of the HUD Lead Hazard Control Grant Program, Dixon, et al. 2012, reported that 12 years after intervention, homes with all replacement windows had significantly lower interior floor dust-lead and sill-lead levels compared to homes with partial window replacement. Wilson, et al. 2015 reported on the importance of including porches in the evaluation and control of lead-based paint hazards. The study demonstrated significant reductions in porch dust-lead levels following floor replacement or paint stabilization.
Drinking water can also be an important source of lead exposure. Lead can leach from brass fixtures into water as well as from lead solder used in interior plumbing. Also, some older homes in the U.S. have lead supply lines connecting the home to the larger public water supply line. Lead leaching from supply lines can be mitigated through treatment of the water using chemical agents at water treatment plants. Lead exposure from inadequate water treatment was documented among children living in Flint, Michigan in 2015 (Hanna-Attisha et al., 2016).

Mold and Moisture: An analysis of several pulmonary disease studies estimates that 25 percent of airways disease, and 60 percent of interstitial lung disease may be associated with moisture in the home or work environment. Moisture is a precursor to the growth of mold and other biological agents, which is also associated with respiratory symptoms. An investigation of a cluster of Pulmonary Hemosiderosis (PH) cases in infants showed PH was associated with a history of recent water damage to homes and with levels of the mold Stachybotrys Atra (SA) in air and cultured surface samples, although this association could not be considered a causal

relationship Associations between exposure to SA and 'sick building' symptoms in adults have also been observed. Other related toxigenic fungi have been found in association with SA-associated illness and could play a role. For sensitive individuals, exposure to a wide variety of common molds may also aggravate asthma. A review by an expert committee convened by the Institute of Medicine found sufficient evidence for an association between exposure to mold and other agents in damp indoor environments and asthma symptoms in sensitized persons, upper respiratory tract symptoms, cough, and wheeze (IOM 2004). The committee also found limited or suggestive evidence for an association between damp indoor environments and the development of asthma. A HUD-funded study reported three mold species common to water damaged buildings, Aspergillus ochraceus, Aspergillus unguis, and Penicillium variabile, when measured in house dust during the first year of life, were significantly associated with the development of asthma in children at age 7 (Reponen et al. 2012; Reponen et al. 2013). Addressing mold problems in housing requires coordination among the medical, public health, microbiological, housing, and building science communities. Krieger et al. (2010) report that an expert panel review of relevant literature on this topic found that a combined approach of eliminating active leaks and moisture intrusion into the home while also removing moldy items already in place was an effective intervention strategy for reducing exposure to mold and associated respiratory health effects. The panel concluded that there was sufficient evidence to support implementation of a coordinated intervention strategy for mold and moisture problems. The cost of mold/moisture-related intervention work (e.g., IPM, clean and tune furnace, remove debris, vent clothes dryer, cover dirt floor with impermeable vapor barrier) is a few hundred dollars, unless major modification of the ventilation system or structural repairs is needed. For example, in Cleveland, mold interventions, including repairs to ventilation systems and basement flooring, in the most heavily contaminated homes range from $500 to $5,000, with some costs also being dedicated to LHC simultaneously through its lead and asthma program.

Pesticide Residues: According to the EPA, 75 percent of U.S. households used at least one pesticide product indoors during the past year. Products used most often are insecticides and disinfectants. Another study suggests that 80 percent of most people's exposure to pesticides occurs indoors and that measurable levels of up to a dozen pesticides have been found in the air inside homes. The amount of pesticides found in homes appears to be greater than can be explained by recent pesticide use in those households; other possible sources include contaminated soil or dust that migrates in from outside, stored pesticide containers, and household surfaces that collect and then release the pesticides. Pesticides used in and around the home include products to control insects (insecticides), termites (termiticides), rodents (rodenticides), molds and fungi (fungicides), and microbes (disinfectants). In 2005, the American Association of Poison Control Centers reported that some 1.6 million children were involved in common household pesticide poisonings or exposures (AAPCC 2005). In households with children less than five years of age, almost half stored at least one pesticide product within the reach of children. Exposure to high levels of cyclodiene pesticides, commonly associated with misapplication, has produced various symptoms, including headaches, dizziness, muscle twitching, weakness, tingling sensations, and nausea. In addition, the EPA is concerned that cyclodienes might cause long-term damage to the liver and the central nervous system, as well as an increased risk of cancer. A recent expert panel review (Sandel et al., 2010) found that implementation of an integrated pest management approach was an effective intervention for reducing pesticide residues in the home and should be implemented in lieu of pesticide

application for reducing pests. Furthermore, there is evidence to suggest that the usage of insecticides for combating bed bugs is becoming increasingly ineffective due to the development of resistance to pyrethroids, the active ingredient (Adelman et al, 2011).

Radon: The National Academy of Sciences estimates that approximately 15,000 cases of lung cancer per year are related to radon exposure. Epidemiologic studies of miners exposed to high levels of radon in inhaled air have defined the dose response relation for radon-induced lung cancer at high exposure levels. Extrapolation of these data has been used to estimate the excess risk of lung cancer attributable to exposure to radon gas at the lower levels found in homes. These estimates indicate that radon gas is an important cause of lung cancer deaths in the U.S. Excessive exposures are typically related to home ventilation, structural integrity and location. Radon measurement and remediation methods are well developed, and the EPA recommends that every home be measured for radon. Sandel et al. (2010) conducted a review of the literature and concluded that active soil depressurization beneath the foundation of the structure was an effective method for reducing radon exposures in the home. EPA estimates that materials and labor costs for radon reduction in an existing home are $800-$2,500. Including radon resistant techniques in new home construction costs $350-$500 and can save up to $65 annually in energy costs, according to the EPA. The American Association of Radon Scientist (AARST) has published several standard protocols for the testing and mitigation of radon hazards in single and multifamily housing (e.g., ANSI/AARST ASD-RMS-2006, CCAH-2012, MAMF-2012, RMS-MF 2014, MAH 2014).

Semi-Volatile Organic Compounds (SVOCs): Several SVOCs are emerging as potential health risks in the home due to their ubiquitous nature in consumer and building products that are produced in high volume and used worldwide. SVOCs exist partially in the gas-phase and emit their respective chemical gradually over time, particularly in the presence of increased temperatures. Two compounds of increasing concern are phthalates and polybrominated diphenyl ethers (PBDE). During recent years, phthalate and PBDE compounds have received increased scrutiny due to their potential cumulative health risks and increased use in consumer products. PBDE are found in flame retardants, plasticizers, and flexible foams, and may also be found in children's products. Pthalates are used as plasticizers and are most notable for their use in children's products, such as teething rings, food contact items and other flexible polyvinyl chloride (PVC)-based products. The health effect most widely associated with phthalates exposures are reproductive effects, while PBDE has shown toxicity potential in liver, thyroid and neurodevelopment systems. Exposure to phthalates may occur via many different routes; inhalation, ingestion, water and soil. It may occur in various environments from the home to the workplace. Children are reported to have the highest exposures to pthalates among all age groups (CDC, 2005), along with lower socioeconomic status households (Zota et al., 2008). Both phthalates and PBDE have been found in house dust; exposure to dust has been reported as the primary route of exposure for PBDE (Wilford et al., 2005; Zota et al., 2008). The presence of both phthalates and PBDE in house dust presents potential risks particularly to young children. Several house characteristics, including older age of house, water leakage and use of PVC in flooring materials, have been identified as significant indicators for potential phthalates exposures (Bornehag et al., 2005). The increased concern over phthalates and PBDE has led to increased regulatory scrutiny. In 2008, the U.S. Consumer Product Safety Commission issued a prohibition on the use of several phthalate compounds above threshold levels in children's toys

and items used for childcare. Furthermore, PBDE have been banned at the state level, including in California and Washington.

Third Hand Smoke (THS): Adverse health effects from exposure to active smoking and passive smoking (ETS or Second-Hand Smoke (SHS)) are well documented. Tobacco smoke contains as many as 7,000 individual compounds, including formaldehyde, carbon monoxide, nicotine, nitrosamines and polyaromatic hydrocarbons, with nearly 70 compounds identified as carcinogens (US DHHS, 2010; IARC, 2004). THS refers to residual pollutants originating from tobacco smoke that persist in dust and adsorb onto surfaces, ultimately re-emitting pollutants into the gaseous phase over time after the smoke has dissipated (Hoh et al., 2012). Pollutants that are re-emitted also have the potential to interact with the local atmosphere resulting in physical and chemical transformation of original contaminants into secondary pollutants, some of which may be more hazardous than the original pollutant (Matt et al., 2011). HUD-funded research also found that the presence of smokers in a home was a significant predictor of both children's blood-lead levels and surface dust-lead loading (Dixon et al., 2009; Gaitens et al., 2009). Exposure to THS occurs most often by inhalation, but may also occur through ingestion of contaminated dust, or through dermal contact with surfaces that have residual contamination. While this is an emerging area of research with relatively sparse information to date, there is initial evidence to suggest that THS may be a concern, particularly for children who have a higher frequency of hand-to-mouth activity that might increase their exposure by ingestion and dermal routes, in addition to inhalation. Matt et al. (2010) reported that THS residue persisted in homes even after they had been cleaned and prepared for the next tenant.

Unintentional Injuries/Fire: In 1997, nearly 7 million persons in the U.S. were disabled for at least one full day by unintentional injuries received at home; for children younger than 15 years of age, unintentional injury is now the leading cause of death and disability. A HUD-supported study of deaths among US children and adolescents from 1985 to 1997 found that an average of 2,822 unintentional deaths occurred annually from residential injuries (Nagaraja et al., 2005). The highest death rates were attributable to fires, submersion or suffocation, and poisoning. Black children were two times more likely to die from residential injuries than white children. The elderly are also at an elevated risk for residential injuries. Home visitation protocols have been shown to be effective in reducing exposure to injury hazards. The 'add-on' cost of injury prevention measures, when combined with other housing interventions, are estimated at about $100 per unit. This includes the cost of some injury prevention devices (e.g., smoke alarms, electrical socket covers, etc.). DiGuiseppi et al. (2010) reported on an expert panel review of seventeen interventions intended to reduce injuries due to residential deficiencies. Installed and properly working smoke detectors were determined to be an effective intervention that should be implemented for reducing fire-related injuries. This panel deemed four-sided pool enclosures efficacious and pre-set safe hot waters heaters sufficient for reducing residential-based injuries.

APPENDIX B: Advancing Racial Equity, Affirmative Marketing, Affirmatively Furthering Fair Housing (AFFH) and Experience Promoting Racial Equity Narratives.

The Applicant is required to submit in a maximum of 2 pages, the following narratives addressing the issues described in the corresponding sections:

- **Advancing Racial Equity narrative (Section III.F)**
- **Affirmative Marketing narrative (Section III.F)**
- **Affirmatively Furthering Fair Housing (Section IV.G); and**
- **Experience Promoting Racial Equity (Section V.B)**

Applicants will submit each of the equity narratives in this Appendix. Each narrative will be evaluated for sufficiency and will not change the applicant's score or rank as compared to other applicants. If a narrative is deemed insufficient, it will be a "Curable Deficiency" that will be communicated to the applicant for correction with a notice of deficiency.

APPENDIX C: Relevant Publications, Guidelines and Other Resources

The sources below are provided for informational purposes only. By inclusion in this Appendix, HUD is not necessarily endorsing any of the research, findings, or policies. To secure any of the documents listed, call the telephone number provided. HUD welcomes and is prepared to receive calls from individuals who are deaf or hard of hearing, as well as individuals with speech or communication disabilities. To learn more about how to make an accessible telephone call, please visit https://www.fcc.gov/consumers/guides/telecommunications-relay-service-trs. A number of these references are provided on HUD's CD, Residential Lead Desktop Reference, 3rd Edition. Several of these references can be downloaded from the Internet without charge from the HUD Office of Lead Hazard Control and Healthy Homes Internet site, https://www.hud.gov/program_offices/healthy_homes.

1. REGULATIONS:

Worker Protection: Occupational Safety and Health Administration (OSHA) publications listed below can be purchased by calling either OSHA Regulations at 202-693-1888(OSHA Regulations) (this is not a toll-free number) or the Government Printing Office (GPO) at 202-512-1800(this is not a toll-free number). OSHA standards and other publications can be downloaded or purchased (as applicable) from OSHA's publication web page, www.osha.gov/pls/publications/pubindex.list. https://www.osha.gov/publications A broad range of information on construction and other worker protection requirements and guidelines is available from OSHA's home page, www.osha.gov/ and from www.osha.gov/SLTC/lead/.

Waste Disposal: A copy of the EPA regulations at 40 CFR parts 260-268 can be purchased by calling 800-424-9346, or, from the Washington, DC, metropolitan area, 703-412-9810(this is not a toll-free number). The regulations can also be downloaded without charge from the EPA website at www.epa.gov/lead/pubs/fslbp.htm.

Lead

a. U.S. Environmental Protection Agency. Requirements for Lead-Based Paint Activities in Target Housing and Child-Occupied Facilities; Final Rule: 40 CFR part 745 (EPA) (Lead Hazard

Standards, Work Practice Standards, EPA and State Certification and Accreditation Programs for those engaged in lead-based paint activities) can be purchased by calling the Toxic Substances Control Act (TSCA) Assistance Service at 202-554-1404 (this is not a toll-free number). The rule and guidance can be downloaded from the Internet without charge at www.epa.gov/lead/pubs/leadcert.htm.

b. HUD. Requirements for Notification, Evaluation and Reduction of Lead-Based Paint Hazards in Federally Owned Residential Property and Housing Receiving Federal Assistance; Final Rule: 24 CFR part 35, subparts B through R, published September 15, 1999 (64 FR 50201) (HUD) can be purchased by calling the NLIC's toll-free number (800-424-LEAD) or downloaded without charge from the HUD website at https://www.hud.gov/program_offices/healthy_homes/enforcement/lshr.

c. HUD. Requirements for Disclosure of Information Concerning Lead-Based Paint in Housing, 24 CFR Part 35, Subpart A (HUD, Lead-Based Paint Disclosure Rule) by calling the NLIC's toll-free number (800-424-LEAD). The rule, guidance, pamphlet and disclosure formats can be downloaded from the HUD website at https://www.hud.gov/program_offices/healthy_homes/enforcement/lshr.

d. HUD. Requirements for Notification, Evaluation and Reduction of Lead-Based Paint Hazards in Federally Owned Residential Property and Housing Receiving Federal Assistance, Response to Elevated Blood Lead Levels. Final rule. 82 FR 4151-4172; January 13, 2017. https://www.federalregister.gov/d/2017-00261.

e. U.S. Environmental Protection Agency. Lead; Identification of Dangerous Levels of Lead; Final Rule at 66 FR 1205-1240 (January 5, 2001). This rule and guidance can be obtained without charge by calling the NLICs toll-free number (800-424-LEAD) or by calling the TSCA Assistance Service at: 202-554-1404(this is not a toll-free number). The rule and guidance can be downloaded from the EPA website at www.epa.gov/lead/pubs/leadhaz.htm.

f. U.S. Environmental Protection Agency. Lead; Renovation, Repair, and Painting Program; Final Rule at 73 FR 21692- 21769 (April 22, 2008). As of April 22, 2011, the rule was fully implemented. This rule and guidance can be obtained without charge by calling the NLIC's toll-free number (800-424-LEAD) or by calling the TSCA Assistance Service at: 202- 554-1404 (this is not a toll-free number). The rule and guidance can be downloaded from the EPA website at www.epa.gov/lead/pubs/renovation.htm.

2. GUIDELINES AND OTHER RESOURCES:

Lead

Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing; HUD. The Guidelines can be downloaded from the HUD website without charge at www.hud.gov/program_offices/healthy_homes/lbp/hudguidelines.

Preventing Lead Poisoning in Young Children; Centers for Disease Control, August 2005. These guidelines can be obtained without charge by calling the CDC toll free number at 888-232-6789. The guidelines can also be downloaded from

www.cdc.gov/nceh/lead/publications/PrevLeadPoisoning.pdf.

Screening Young Children for Lead Poisoning: Guidance for State and Local Public Health Officials, November 1997; Centers for Disease Control and Prevention (CDC). These guidelines can be obtained without charge by calling the CDC toll free number at 888-232-6789 or they can be downloaded from www.cdc.gov/nceh/lead/publications/screening.htm.

EPA's TRW Bioavailability Committee has developed the following guidance and documents on the use of soil treatments for Pb contamination;
https://semspub.epa.gov/work/HQ/100000048.pdf
http://www.tandfonline.com/doi/pdf/10.1080/10937404.2013.825216

OLEM 9200.2-164. EPA issued this memo to transmit the Technical Review Workgroup (TRW) for Metals and Asbestos technical documents entitled "Standard Operating Procedure for an In Vitro Bioaccessibility Assay for Lead and Arsenic in soil" and "Validation Assessment of In Vitro Arsenic Bioaccessibility Assay for Predicting Relative Bioavailability of Arsenic in Soils and Soil-like materials at superfund sites." https://clu-in.org/download/contaminantfocus/arsenic/arsenic-SOP-OLEM-9200.2-164.pdf

Green Buildings
U.S. Department of Energy. Building Energy Codes Programs. Available at: www.energycodes.gov/development/green/codes.
Enterprise Community Partners. Green Communities. Available at: www.enterprisecommunity.org/solutions-and-innovation/green-communities
National Association of Home Builders. National Green Building Programs Information. Available at: www.nahb.org/en/nahb-priorities/green-building-remodeling-and-development/NAHB-toolkit-for-sustainability/national-green-building-program-information.aspx.
U.S. Environmental Protection Agency. Indoor air PLUS Program. Available at: www.epa.gov/indoorairplus/.

U.S. Green Building Council. LEED for Homes. Available at: https://new.usgbc.org/.

IPM
IPM: A Guide for Affordable Housing: http://www.stoppests.org/what-is-ipm/.

Bed Bugs
Collaborative Strategy on Bed Bugs. 2015. Prepared by The Federal Bed Bug Workgroup. https://www.epa.gov/sites/production/files/2015-02/documents/fed-strategy-bedbug-2015.pdf

Climate Change

HUD's New Climate Action Plan | HUD.gov / U.S. Department of Housing and Urban Development (HUD) available at: https://www.hud.gov/climate

- Research that identifies actions that protect the health and safety of the families from hazards resulting from natural disasters and help them to mitigate the risks of such health and safety hazards in housing occurring before such anticipated disasters.
- Reducing Carbon Emissions

3. REPORTS:

Lead

Putting the Pieces Together: Controlling Lead Hazards in the Nation's Housing, (Summary and Full Report); HUD, July 1995. A copy of this summary and report can be purchased by calling 800-245-2691 toll free

Preventing Lead Poisoning in Young Children, A Statement by the Centers for Disease Control and Prevention, Atlanta, GA, August. 2005. This can be downloaded from the Internet without charge at ww.cdc.gov/nceh/lead/publications/prevleadpoisoning.pdf.

American Healthy Homes Survey II Lead Findings final Report. U.S. Department of Housing and Urban Development, Office of Lead Hazard Control and Healthy Homes. October 29, 2021 at
www.hud.gov/sites/dfiles/HH/documents/AHHS_II_Lead_Findings_Report_Final_29oct21.pdf

Healthy Homes

Healthy Housing Reference Manual; HUD/CDC, 2006. A copy of this manual can be downloaded from the CDC website without charge at www.cdc.gov/nceh/publications/books/housing/housing_ref_manual_2012.pdf.

The Healthy Homes Initiative: A Preliminary Plan (Summary and Full Report); HUD, July 1995. A copy of this summary and report can be downloaded from the HUD website without charge at https://www.hud.gov/program_offices/healthy_homes.

Institute of Medicine. Damp Indoor Spaces and Health. The National Academies Press. Washington, D.C. 2004.

Institute of Medicine. Indoor Allergens. Assessing and Controlling Adverse Health Effects. The National Academies Press. Washington, D.C. 1993.

National Academies of Sciences, Engineering, and Medicine. 2018. Public health consequences of e-cigarettes. Washington, DC: The National Academies Press.
https://www.nap.edu/catalog/24952/public-health-consequences-of-e-cigarettes.

National Research Council and the Institute of Medicine. Ethical Considerations for Research on Housing-Related Health Hazards Involving Children. The National Academies Press. Washington, D.C. 2005.

Natural Resources Defense Council. Our Children at Risk. Washington, D.C. 1997. This can be ordered from the Internet from www.nrdc.org.

Pleis JR., Lucas JW, Ward BW. Summary Health Statistics for U.S Adults: National Health Interview Survey, 2008. National Center for Health Statistics. Vital Health Stat 10(242). 2009.

Bloom B, Cohen RA, Freeman G. Summary health statistics for U.S. children: National Health Interview Survey, 2008. National Center for Health Statistics. Vital Health Stat 10(244). 2009.

President's Task Force on Environmental Health Risks and Safety Risks to Children. Asthma and The Environment: An Action Plan to Protect Children. Washington, DC 1999.

U.S. Department of Health and Human Services. How Tobacco Smoke Causes Disease: The Biology and Behavioral Basis for Smoking-Attributable Disease: A Report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease

Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2010.

U.S. Department of Health and Human Services. U.S. Department of Health and Human Services. The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2006.

U.S. Environmental Protection Agency. 2009. Phthalates Action Plan. Accessed August 4, 2011. https://www.epa.gov/sites/production/files/2015-09/documents/phthalates_actionplan_revised_2012-03-14.pdf. California Environmental Protection Agency. 2005. Proposed Identification of Environmental Tobacco Smoke as a Toxic Air Contaminant. Part B: Health Effects. Sacramento, CA: California Environmental Protection Agency, Office of Environmental Health Hazard Assessment.

CDC. 2018. Center for Disease Control and Prevention. Fourth National Report on Human Exposure to Environmental Chemicals. https://www.cdc.gov/exposurereport/pdf/FourthReport_UpdatedTables_Volume1_Mar2018.pdf.
International Agency for Research on Cancer. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans: Tobacco Smoke and Involuntary Smoking. Vol. 83. Lyon (France): International Agency for Research on Cancer, 2004.

4. PAPERS

Adelman ZN, Kilcullen KA, Koganemaru R, Anderson MAE, Anderson TD, Miller DM. 2011. Deep sequencing of pyrethroid-resistant bed bugs reveals multiple mechanisms of resistance within a single population. PLoS ONE 6(10): e26228. doi:10.1371/journal.pone.0026228

Adhikari A, Jung J, Reponen T, Lewis JS, DeGrasse EC, Grimsley LF, Chew GL, Grinshpun SA. 2009. Aerosolization of fungi, (1->3)-β-D glucan, and endotoxin from flood-affected materials collected in New Orleans homes. Environmental Research 109(3): 215-224.
Adhikari A, Kettleson E, Vesper S, Kumar S, Popham D, Schaffer C, Indulgula R, Chatterjee K, Allam K, Grinshpun S, Reponen T. 2014. Dustborne and airborne gram-positive and gram-negative bacteria in high versus low ERMI homes. Science of the Total Environment 482-483: 92-99. http://doi.org/10.1016/j.scitotenv. 2014.02.110
Adhikari A, Lewis JS, Reponen T, DeGrasse EC, Grimsley LF, Chew GL, Iossifova Y, Grinshpun SA. 2010. Exposure Matrices of endotoxin, B-D-glucan, fungi and dust mite allergens in flood-affected homes of New Orleans. Science of the Total Environment 408: 5489-5498, http://doi:10.1016/j.scitotenv. 2010.07.087

Allen RW, Adar SD, Avol E, Cohen M, Curl CL, Larson T, Liu LJ, Sheppard L, Kaufman JD. 2012. Modeling the residential infiltration of outdoor PM2.5 in the multi-ethnic study of atherosclerosis and air pollution (MESA Air). Environ Health Perspect. 120:(6) 824-30.

ANSI/AARST RMS-13 Radon Mitigation Standards for Multifamily Buildings

ANSI/AARST MAH2014 Protocol for Conducting Measurements of Radon and Radon Decay Products in Homes.

Arbes SJ, Sever M, Mehta J, Gore JC, Schal C, Vaughn B, Mitchell H, Zeldin DC. 2004. Abatement of cockroach allergens (Bla g 1 and Bla g 2) in low-income, urban housing: Month 12 continuation results. J Allergy Clin Immunol, 113(1):109-114.

Bauer MS, Kirchner J. 2020. Implementation science: What is it and why should I care? Psychiatry Research 283 112376

Berges M, Metcalf M. 2013. Lessons Learned on Energy-Efficient Affordable Housing. Journal of Light Construction (JLC) February. 55-63.

Binns HJ, Gray KA, Chen T, Finster ME, Peneff N, Schaefer P, Ovsey V, Fernandes J, Brown M, Dunlap B. 2004. Evaluation of landscape coverings to reduce soil lead hazards in urban residential yards: The safer yards project. Environ Res. 96(2): 127-38.

Bornehag CG, Lundgren B, Weschler CJ, Sigsgaard T, Hagerhed-Engman L, Sundell J. 2005. Phthalates in indoor dust and their association with building characteristics. Environ Health Perspect 113(10):1399-404.

Bradham KD, Daimond GL, Nelson CM, Noerpel M, Scheckel KG, Elek B, Chaney RL, Ma Q, Thomas DJ. 2018. Long-term in situ reduction in soil lead bioavailability measured in a mouse model. Environ. Sci. Technol. 52: 13908 -13.

Breysse J, Jacobs DE, Weber W, Dixon S, Kawecki C, Aceti S, Lopez J. 2011. Health outcomes and green renovation of affordable housing. Public Health Reports, 126, Supplement 1, 64-75

Breysse J, Dixon S, Gregory J, Philby M, Jacobs DE, Krieger J. 2013. Effect of weatherization combined with community health worker in-home education on asthma control. Am J Public Health. 04:e57–e64. doi:10.2105/AJPH.2013.301402)

Breysse J, Dixon S, Jacobs DE, Lopez J, Weber W. Arch M. 2015. Self-reported health outcomes associated with green-renovated public housing among primarily elderly residents. J Public Health Management Practice, 00(00), 1–13

Campbell JD, Brooks M, Hosokawa P, Robinson J, Song L, Krieger J. 2015. Community health worker home visits for Medicaid-enrolled children with asthma: Effects on asthma outcomes and costs. Am J Public Health. August 13: e1–e7. doi:10.2105/AJPH.2015.302685

Canfield RL, Henderson CR, Cory-Slechta DA, Cox C, Jusko TA, Lanphear BP. 2003. Intellectual impairment in children with blood lead concentrations below 10 g per deciliter. N Engl J Med. 348: 1517-26.

Centers for Disease Control and Prevention, Blood Lead Levels United States, 1999-2002, Morbidity and Mortality Weekly Reports. 2005. https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5420a5.htm.

Chan WR and Singer BC. 2014. Measurement-based evaluation of installed filtration system performance in single-family homes. Lawrence Berkeley National Laboratory, Environmental Energy Technologies Division. April; LBNL-6607E.

Cho SJ, Ramachandran G, Grengs J, Ryan AD, Eberly LE, Adgate JL. 2008. Longitudinal evaluation of allergen and culturable fungal concentrations in inner-city households. Journal of Occupational and Environmental Hygiene. 5, 2, 107-18.

Cluett R, Fleisch A, Decker K, Frohmberg E, Smith AE. 2019. Findings of a statewide environmental lead inspection program targeting homes of children with blood lead levels as low as 5 μg/dL. Journal of Public Health Management and Practice, 25(1 Supp), S76–S83 DOI: 10.1097/PHH.0000000000000869.

Cohn RD, Arbes Jr. SK, Jaramillo R, Reid L, Zeldin D. National prevalence and exposure risk for cockroach allergen in U.S. households. Envir. Health Perspect. 114(4): 522-526.

Cohn RD, Arbes Jr. SK, Yin M, Jaramillo R, Zeldin D. National Prevalence of Exposure Risk for mouse allergen in U.S. Households. Journal of Allergy and Clinical Immunology, 113(8):1167-1171.

Colton MD, Laurent JGC, MacNaughton P, Vallarino J, Kane J, Bennett-Fripp M, Spengler J, Adamkiewicz G. 2014. Indoor air quality in green vs conventional multifamily low-income housing. Environ. Sci. Technol. 48, 7833−41

Colton MD, Laurent JGC, MacNaughton P, Kane J, Bennett-Fripp M, Spengler J, Adamkiewicz G. 2015. Health benefits of green public housing: Associations with asthma morbidity and building-related symptoms. Am J Public Health. October 15: e1–e8. doi:10.2105/AJPH.2015.302793

Crawford C, Reponen T, Lee T, Iossifova Y, Levin L, Adhikari A, Grinshpun S. 2009. Temporal and spatial variation of indoor and outdoor airborne fungal spores, pollen, and (1→3)-β-d-glucan. Aerobiologia 25:147-158. doi 10.1007/s10453-009-9120-z

Dewalt FG, Cox DC, O'Haver R, Salatino D, Holmes D, Ashley PJ, Pinzer EA, Friedman W, Marker D, Viet SM, Fraser A. 2015. Prevalence of Lead Hazards and Soil Arsenic in U.S. Housing. J. Environ Health, 78(5) 22-9.

Digenis-Bury EC, Brooks DR, Chen L, Ostrem M, Horsburgh CR. 2008. Use of a population-based survey to describe the health of Boston public housing residents. Amer. J. Pub. Health, 98(1): 85-91.

DiGuiseppi C, Jacobs DE, Phelan KJ, Mickalide AD, Ormandy D. 2010. Housing interventions

and control of injury-related structural deficiencies: a review of the evidence. J Public Health Manag Pract. 16(5 Suppl):S34-43.

Dixon, SL., et al., 2012. Window replacement and residential lead paint hazard control 12 years later. Environ. Res. doi.10.1016/j.envres.2012.01.005

Dixon SL, Fowler C, Harris J, Moffat S, Martinez Y, Walton H, Ruiz B, Jacobs DE. 2009. An examination of interventions to reduce respiratory health and injury hazards in homes of low-income families. Environmental Research 109 123-30

Dixon SL, Gaitens JM, Jacobs DE, et al. 2009. Exposure of U.S. children to residential dust lead, 1999-2004: The contribution of lead-contaminated dust to children's blood lead levels. 117(4): Environ Health Perspect. 461-7.

Gaitens JM, Dixon SL, Jacobs DE. 2009. Exposure of U.S. children to residential dust lead, 1999-2004: Housing and demographic factors. 117(4): Environ Health Perspect. 468-74.

Galke W, Clark S, Wilson J, Jacobs D, Succop P, Dixon S, Bornschein B, McLaine P, Chen M. 2001. Evaluation of the HUD lead hazard control grant program: Early overall findings. Environ. Research. 86, 149-56.

Glasgow RE, Vinson C, Chambers D, Khoury MJ, Kaplan RM, Hunter C. 2012. National Institutes of Health Approaches to Dissemination and Implementation Science: Current and Future Directions. Am J Public Health. 102:1274–81. doi:10.2105/AJPH.2012.300755

Gold DR, Adamkiewicz G, Arshad SH, Celedon JC, Chapman MD, Chew GL, Cook DN, Custovic A, Gehring U, Gern JE, Johnson CC, Kennedy S, Koutrakis P, Leaderer B, Mitchell H, Litonjua AA, Mueller GA, et al. 2017. NIAID, NIEHS, NHLBI, MCAN Workshop Report: The Indoor Environment and Childhood Asthma: Implications for Home Environmental Intervention in Asthma Prevention and Management. J Allergy Clin Immunol. 2017; 140(4): 933–949. doi:10.1016/j.jaci.2017.04.024.

Guo Y, Kannan K. 2011 Comparative assessment of human exposure to phthalate esters from house dust in China and the United States. Environ Sci Technol. Mar 24.

Hanna-Attisha M, LaChance J, Sadler RC, Schnepp AC. 2016. Elevated blood lead levels in children associated with the Flint drinking water crisis: a spatial analysis of risk and public health response. Am J Public Health. Feb; 106 (2):283-90. https://ajph.aphapublications.org/doi/full/10.2105/AJPH.2015.303003. Epub 2015 Dec 21.

Hoh E, Hunt RN, Quintana PJ, Zakarian JM, Chatfield DA, Wittry BC, Rodriguez E, Matt GE. 2012. Environmental tobacco smoke as a source of polycyclic aromatic hydrocarbons in settled household dust. Environ Sci Technol. 46(7):4174-83.

Imm P, Knobeloch L, Buelow C, Anderson HA. 2009. Household exposures to polybrominated diphenyl ethers (PBDEs) in a Wisconsin Cohort. Environ Health Perspect. 117(12):1890-5.

Jacobs DE, Clickner RP, Zhou JY, Viet SM, Marker DA, Rogers JW, Zeldin DC, Broene P, Friedman W. 2002. Prevalence of lead-based paint in U.S. housing. Environmental Health Perspect. 110(10): A599-606.

Jacobs DE, Wilson J, Dixon SL, Smith J, Evens A. 2009. The relationship of housing and population health: A 30-year retrospective analysis. Environmental Health Perspect.117(4), 597-604

Johansson E, Reponen T, Meller J, Vesper S, Yadav J. 2014. Association of Streptomyces community composition determined by PCR-denaturing gradient gel electrophoresis with indoor mold status. Environ Monit Assess 186: 8773-83.

Johansson E, Reponen T, Vesper S, Levin L, Lockey J, Ryan P, Bernstein D, Villareal M, Hershey g, Schaffer C, LeMasters G. 2013. Microbial content of household dust associated with exhaled NO in asthmatic children. Environment International 59:141-7. http://doi.org/10 .1016/j.envint.2013.05.011

Julien R, Adamkiewicz G, Levy JL, Bennett D, Nishioka M, Spengler JD. 2008. Pesticide loadings of select organophosphate and pyrethroid pesticides in urban public housing. Journal of Exposure Science and Environmental Epidemiology. 18, 167–174.

Kanchongkittiphon W, Mendell MJ, Gaffin JM, Wang G, Phipatanakul W. 2015.Indoor environmental exposures and exacerbation of asthma: an update to the 2000 review by the Institute of Medicine. Environ Health Perspect 123:6–20.

Kapheim MG, Ramsay J, Schwindt T, Hunt BR, Margellos-Anast H. Utilizing the community health worker model to communicate strategies for asthma self-management and self-advocacy among public housing residents. J Comm Healthcare, 8 (2): 95-105.

Kass D, McKelvey W, Carlton E, Hernandez M, Chew G, Nagle S, Garfinkel R, Clarke B, Tiven J, Espino C. 2009. Effectiveness of an integrated pest management intervention in controlling cockroaches, mice, and allergens in New York City public housing. Environ Health Perspect 117(8):1219.

Kercsmar CM, Dearborn DG, Schluchter M, Xue L, Kirchner HL, Sobolewski J, Greenberg SJ, Vesper SJ, Allan T. 2006. Reduction in asthma morbidity in children as a result of home remediation aimed at moisture sources. Environ Health Perspect. Oct;114(10):1574-80.

Kettleson S, Kumar S, Reponen T, Vesper S, Meheust D, Grinshpun SA, Adhikari A. 2013. Stenotrophomonas, Mycobacterium, and Streptomyces in home dust and air: associations with moldiness and other home/family characteristics. Indoor Air 23:387-96.

King BA, Travers MJ, Cummings KM, Mahoney MC, Hyland AJ. 2010. Secondhand smoke transfer in multiunit housing. Nicotine Tob Res. 12(11):1133-41.

Klitzman S, Caravanos J, Belanoff C, Rothenberg L. 2005. A multihazard, multistrategy approach to home remediation: Results of a pilot study. Environmental Research 99: 294–306. doi:10.1016/j.envres.2005.03.003.

Kraev TA, Adamkiewicz G, Hammond SK, Spengler JD. 2009. Indoor concentrations of nicotine in low-income, multi-unit housing: associations with smoking behaviors and housing characteristics. Tob Control. 18(6):438-44.

Krieger J, Higgins DL. 2002. Housing and health: time again for public health action. Am J Public Health. May;92(5):758-68. doi: 10.2105/ajph.92.5.758. PMID: 11988443

Krieger J, Jacobs DE, Ashley PJ, Baeder A, Chew GL, Dearborn D, Hynes HP, Miller JD, Morley R, Rabito F, Zeldin DC. 2010. Housing interventions and control of asthma-related indoor biologic agents: a review of the evidence. J Public Health Manag Pract. 16(5 Suppl): S11-20. Review

Krieger JW, Takaro TK, Song L, Weaver M. 2005. The Seattle-King county healthy homes project: A randomized, controlled trial of a community health worker intervention to decrease exposure to indoor asthma triggers. Amer. J. Pub. Health, 95(4): 652-9.
Lai MW, Klein-Schwartz W, Rodgers GC, Abrams JY, Haber DA, Bronstein AC, Wruk KM. 2006. 2005 Annual report of the American Association of Poison Control Centers national poisoning and exposure database. Clinical Toxicology, 44: 803-932.

Lanphear BP, Dietrich K, Auinger P, Cox C. 2000. Cognitive deficits associated with blood lead concentration. Public Health Reports. 115(6): 530-1.

Lane-Fall MB, Curran GM, Beidas RS. 2019. Scoping implementation science for the beginner: locating yourself on the “subway line” of translational research. BMC Medical Research Methodology 19:133 https://doi.org/10.1186/s12874-019-0783-z

Largo TW, Borgialli M, Wisinski CL, Wahl RL, Priem WF. 2011. Healthy Homes University: A home-based environmental intervention and education program for families with pediatric asthma in Michigan. Public Health Reports, 12614-26.

Leas BF, D’Anci KE, Apter AJ, Bryant-Stephens T, Lynch MP, Kaczmarek JL, Umscheid CA. 2018. Effectiveness of indoor allergen reduction in asthma management: A systematic review. J Allergy Clin Immunol;141:1854-69.

Lee T, Grinshpun SA, Martuzevicius D, Adhikari A, Crawford CM, Reponen T. 2006. Culturability and concentration of indoor and outdoor airborne fungi in six single-family homes. Atmospheric Environment 40:2902-10.

Lobb R, Colditz GA. 2013. Implementation science and Its application to population health. Annu. Rev. Public Health. 34:235–51

Logue JM, McKone TE, Sherman MH, Singer BC. 2011. Hazard assessment of chemical air

contaminants measured in residences. Indoor Air. 21(2):92-109

Logue JM, Price PN, Sherman MH, Singer BC. 2012. A method to estimate the chronic health impact of air pollutants in U.S. residences. Environ Health Perspect. 120(2):216-22

MacDonald C, Sternberg A, Hunter PR. 2007. A systematic review and meta-analysis of interventions aimed at reducing exposure to house dust on the development and severity of asthma. Environ Health Perspect 115:1691-95.

Mankikar D, Campbell C, Greenberg R. 2016. Evaluation of a Home-Based Environmental and Educational Intervention to Improve Health in Vulnerable Households: Southeastern Pennsylvania Lead and Healthy Homes Program. Int J Environ Res Public Health. Sep 9;13(9):900. doi: 10.3390/ijerph13090900. PMID: 27618087

Matt GE, Quintana PJ, Zakarian JM, Fortmann AL, Chatfield DA, Hoh E, Uribe AM, Hovell MF. 2010. When smokers move out and non-smokers move in: residential thirdhand smoke pollution and exposure. Tob Control. 20(1): e1.

Matt GE, Quintana PJ, Destaillats H, Gundel LA, Sleiman M, Singer BC, Jacob P, Benowitz N, Winickoff JP, Rehan V, Talbot P, Schick S, Samet J, Wang Y, Hang B, Martins-Green M, Pankow JF, Hovell MF. 2011. Thirdhand tobacco smoke: emerging evidence and arguments for a multidisciplinary research agenda. Environ Health Perspect. 119(9):1218-26.

Matte TD, Jacobs DE. 2000. Housing and health-current issues and implications for research and programs. Journal of Urban Health: New York Academy of Medicine: 77, 1: 7-25.

Meng QY, Turpin BJ, Korn L, Weisel CP, Morandi M, Colome S, Zhang JJ, Stock T, Spektor D, Winer A, Zhang L, Lee JH, Giovanetti R, Cui W, Kwon J, Alimokhtari S, Shendell D, Jones J, Farrar C, Maberti S. 2005. Influence of ambient (outdoor) sources on residential indoor and personal PM2.5 concentrations: analyses of RIOPA data. J Expo Anal Environ Epidemiol. 15(1):17-28.

Mielke HW, Powell ET, Gonzales CR, Mielke Jr. PW Ottesen RT, Langedal M, 2006. New Orleans soil lead (Pb) cleanup using Mississippi River alluvium: need, feasibility, and cost. Environ Sci. Technol., 40(8): 2784- 9.

Mielke HW, Powell ET, Gonzales CR, Mielke PW. 2007. Potential lead on play surfaces: Evaluation of the PLOPS sampler as a new tool for primary lead prevention. Environ. Res. 103(2): 154-9.

Morgan WJ, Crain EF, Gruchalla RS, O'Connor GT, Kattan M, Evans 3rd R, Stout J, Malindzak G, Smartt E, Plaut M, Walter M, Vaughn B, Mitchell H; Inner-City Asthma Study Group. 2004. Results of home-based environmental intervention among urban children with asthma. N Engl J Med. 351: 1068-80.

Nagaraja J, Menkedick J, Phelan KJ, Ashley P, Zhang X, Lanphear BP. 2005. Deaths from

residential injuries in US children and adolescents, 1985-1997. Pediatrics. 116(2): 454-61.

Northridge J, Ramirez OF, Stingone JA and Claudio L. 2011. The role of housing type and housing quality in urban children with asthma. J Urban Health. Mar;87(2):211-24.

Pate AD, Hamilton RG, Ashley PJ, Zeldin DC, Halsey JF. 2005. Proficiency testing of allergen measurements in residential dust. The Journal of Allergy and Clinical Immunology, 116, 4: 844-50.

Patton AP, Calderon L, Xiong Y, Wang Z, Senick J, Sorensen-Allacci M, Plotnik D, Wener R, Andrews CJ, Krogmann U, Mainelis G. 2016. Airborne Particulate Matter in Two Multi-Family Green Buildings: Concentrations and Effect of Ventilation and Occupant Behavior. Int. J. Environ. Res. Public Health 13(1):144.

Paulin LM, Diette GB, Scott M, McCormack MC, Matsui EC, Curtin-Brosnan J, Williams DL, Kidd-Taylor A, Shea M, Breysse PN, Hansel NN.2013. Home interventions are effective at decreasing indoor nitrogen dioxide concentrations. Indoor Air. Dec 14. doi: 10.1111/ina.12085. [Epub ahead of print] PMID: 24329966

Peck RL, Grinshpun SA, Yermakov M, Rao MB, Kim J, Reponen T. 2015. Efficiency of portable HEPA air purifiers against traffic related combustion particles. Building and Environment 98 (2016): 21-9. http://doi.org/10.1016/j.buildenv.2015.12.018.

Peters JL, Levy JI, Muilenberg ML, Coull BA, Spengler JD. 2007. Efficacy of integrated pest management in reducing cockroach allergen concentrations in urban public housing. The Journal of Asthma: Official Journal of the Association for the Care of Asthma. 44(6), 455-60.

Rabito F, Carlson J, Holt E, Iqbal S, James M. 2011. Cockroach exposure independent of sensitization status and association with hospitalizations for asthma in inner-city children. Annals of Allergy, Asthma and Immunology, Vol. 106, Feb:103-9.

Rabito FA, Carlson JC, He H, Werthmann D, Schal C. 2017. A single intervention for cockroach control reduces cockroach exposure and asthma morbidity in children. J Allergy Clin Immunol 140(2):565-570.

Ramsay J, Schwindt T, Nguyen T, Margellos-Anast H. 2018. Translating a proven pediatric healthy homes intervention to adults. Health Promot Pract. Mar;19(2):222-32. doi: 10.1177/1524839916675118. Epub 2016 Oct 27.

Reddy AL, Gomez M, Dixon SL. 2017. The New York State healthy neighborhoods program: Findings from an evaluation of a large-scale, multisite, state-funded healthy homes program. March/April. 23(2): 210-18

Reponen T, Levin L, Zheng S, Vesper S, Ryan P, Grinshpun SA, Lemasters G. 2013. Family and home characteristics correlate with mold in homes. Environ Res. 124:67-70. PMID:23683889.

Reponen T, Lockey J, Bernstein J, et al. 2012. Infant origins of childhood asthma associated with specific molds. J Allergy Clin Immunol. 130:639-44. PMID: 22789397

Reponen T, Singh U, Schaffer C, Vesper S, Johansson E, Adhikari A, Grinshpun SA, Indulgula R, Ryan P, Levin L, LeMasters G. 2010. Visually observed mold and moldy odor versus quantitatively measured microbial exposure in homes. Science of the Total Environment 408:5565-74

Reponen T, Trakumas S, Willeke K, Grinshpun S, Choe K, Friedman W. 2002. Dynamic Monitoring of the Dust Pickup Efficiency of Vacuum Cleaners. AIHA Journal 63 689-97.

Reponen T, Vesper S, Levin L, et al. 2011. High environmental relative moldiness index during infancy as a predictor of asthma at 7 years of age. Ann Allergy Asthma Immunol. 107(2): 120.

Saegert SC, Klitzman S, Freudenberg N, Cooperman-Mroczek J, Nassar S. 2003. Healthy housing: a structured review of published evaluations of US interventions to improve health by modifying housing in the United States, 1990-2001. Am J Public Health. Sep;93(9):1471-7. doi: 10.2105/ajph.93.9.1471. PMID: 12948965

Sandel M, Baeder A, Bradman A, Hughes J, Mitchell C, Shaughnessy R, Takaro TK, Jacobs DE. 2010. Housing interventions and control of health-related chemical agents: a review of the evidence. J Public Health Manag Pract. Sep-Oct;16(5 Suppl): S24-33. Review.

Scammell MK, Duro L, Litonjua E, Berry L, Reid M. 2011. Meeting people where they are: engaging public housing residents for integrated pest management. Progress in Community Health Partnerships: Research, Education, and Action, 5:2 177-82.

Selgrade MK, Lemanske Jr. RF, Gilmour MI, Neas LM, Ward MD, Henneberger PK, Weissman DN, Hoppin JA, Dietert RR, Sly PD, Geller AM, Enright PL, Backus GS, Bromberg PA, Germolec DR, Yeatts KB. 2006. Induction of asthma and the environment: what we know and need to know. Environ Health Perspect.114(4):615-9.

Singh N, Wang C, Cooper R, Liu C. 2012. Interactions among carbon dioxide, heat and chemical lures in attracting the bed bug, Cimex lectularius L. (Hemiptera: Cimicidae). Psyche. Article ID 273613 http://dx.doi.org/10.1155/2012/273613.

Singh N, Wang C, Cooper R. 2013. Effect of trap design, chemical lure, carbon dioxide release rate, and source of carbon dioxide on efficacy of bed bug monitors. J. Econ. Entomol. 106(4): 1802Ð1811 (2013);

Singh N, Wang C, Cooper R. 2015. Effectiveness of a sugar-yeast monitor and a chemical lure for detecting bed bugs. J Econ Entomol. Jun;108(3):1298-303. Epub 2015 Mar 22

Singh U, Levin L, Grunshpun S, Schaffer C, Adhikari A, and Reponen T. 2011. Influence of home characteristics on airborne and dustborne endotoxin and /3-D-glucan. J. Envir. Monit. 13: 3246-53,

Singh U, Reponen T, Kyungmin JC, Grinshpun SA, Adhikari A, Levin L, Indugula R, Green BJ. 2011. Airborne Endotoxin and /3-D-glucan in PM1 in Agricultural and Home Environments. Aerosol and Air Quality Research, 11:376-86

Singleton R, Salkoski AJ, Bulkow L, Fish C, Dobson J, Albertson L, Skarada J, Kovesi T, McDonald C, Hennessy TW, Ritter T. 2017. Housing characteristics and indoor air quality in households of Alaska Native children with chronic lung conditions. Indoor Air 27(2): 478-86. First published online June 18, 2016. http://doi.org/10.1111/ina.12315.

Singleton R, Salkoski AJ, Bulkow L, Fish C, Dobson J, Albertson L, Skarada J, Ritter T, Kovesi T, Hennessy TW. 2018. Impact of home remediation and household education on indoor air quality, respiratory visits and symptoms in Alaska Native children. International Journal of Circumpolar Health, 77:1. http://doi.org/10.1080/22423982.2017.1422669.

Smith JD, Li DH, Rafferty MR. 2020. The Implementation Research Logic Model: a method for planning, executing, reporting, and synthesizing implementation projects. Implementation Science 15:84 https://doi.org/10.1186/s13012-020-01041-8

Sternthal MJ, Jun HJ, Earls F, Wright RJ. 2010. Community violence and urban childhood asthma: A multilevel analysis. European Respiratory Journal. 36(6): 1400-9.

Sung-Chul S, Reponen T, Levin L, Borchelt T, Grinshpun S. 2008. 'Aerosolization of Particulate (1→3)-ß-D-Glucan from Moldy Materials'. Applied & Environmental Microbiology, 74, 3:585-93, Academic Search Premier, EBSCOhost, viewed 15 November 2011.

Takaro TK, Krieger JW, Song L. 2004. Effect of environmental interventions to reduce exposure to asthma triggers in homes of low-income children in Seattle. Journal of Exposure Analysis and Environmental Epidemiology, 14, S133-43.

Takaro TK, Krieger J, Song L, Sharify D, Beaudet J. 2011. The breath-easy home: the impact of asthma-friendly home construction on clinical outcomes and trigger exposure. Amer J Public Health. 101: 55-62.

Trakumas S, Willeke K, Reponen T, Grunshpun S, Friedman W. 2001. Comparison of Filter Bag, Cyclonic, and Wet Dust Collection Methods in Vacuum Cleaners. AIHA 62:5, 573-83,

Trakumas S, Willeke K, Reponen T, Grunshpun S, Mainelis G, Friedman W. 2001. Particle Emission Characteristics of Filter-Equipped Vacuum Cleaners. AIHA 62:4: 482-93,

Turcotte DA, Alker H, Chaves E, Gore R, Woskie S. 2014. Healthy Homes: In-home environmental asthma intervention in a diverse urban community. Am J Public Health. 104: 665–71.

University of California at Davis Western Cooling Efficiency Center. Analysis of Greenhouse Gas Emissions from Residential Heating Technologies in USA.

https://wcec.ucdavis.edu/analysis-of-greenhouse-gas-emissions-from-residential-heating-technologies-in-usa-2/

Van Deusen A, Hyland A, Travers MJ, Wang C, Higbee C, King BA, Alford T, Cummings KM. 2009. Secondhand smoke and particulate matter exposure in the home. Nicotine Tob Res. 11(6):635-41.

Vesper SJ, McKinstry C, Ashley P, Cox D, Dewalt G. 2009. Correlation between ERMI values and other moisture and mold assessments of homes in the American Healthy Home Survey. Journal of Urban Health: Bulletin of the New York Academy of Medicine. Oxford University Press, Cary, NC, 86(6):850-860, (2009).

Wallerstein N, Duran B. 2010. Community-based participatory research contributions to intervention research: The intersection of science and practice to improve health equity. Am J Public Health. 100: S40–6. doi:10.2105/AJPH.2009.184036

Wang C, Bennett GW. 2006. Comparative study of integrated pest management and baiting for German cockroach management in public housing. J Econ Entomol 99(3):879-885.

Wang C, Bennett GW. 2009. Cost and effectiveness of community-wide integrated pest management for German cockroach, cockroach allergen, and insecticide use reduction in low-income housing. Journal of Econ Entomol. 102(4): 1614-23

Wang C, Cooper R. 2011. Detection tools and technologies. Pest Control Technology 39(8): 72, 74, 76, 78-79, 112.

Wang C, El-Nour MMA, Bennett GW. 2008. Survey of Pest Infestation, Asthma, and Allergy in Low-income Housing. J Community Health 33:31-9. doi:10.1007/s10900-007-9064-6

Wang C, Singh N, Zha C, Cooper R. 2016. Bed bugs: prevalence in low-income communities, resident's reactions, and implementation of a low-cost inspection protocol. Journal of Medical Entomology.

Wang C, Tsai W, Cooper R, White J. 2011. Effectiveness of bed bug monitors for detecting and trapping bed bugs in apartments. Journal of Econ Entomol 104: 274-8.

Wang C, Cooper R. 2012. The future of bed bug monitoring. Pestworld (January/February): 1-6.

Wells EM, Berges M, Metcalf M, Kinsella A, Foreman K, Dearborn D, Greenberg S. 2015. Indoor air quality and occupant comfort in homes with deep versus conventional energy efficiency renovations. Building and Environment 93:331-8.

Wilford BH, Shoeib M, Harner T, Zhu J, Jones KC. 2005. Polybrominated diphenyl ethers in indoor dust in Ottawa, Canada: implications for sources and exposure. Environ Sci Technol. 39. 70277035.

Willeke K, Trakumas S, Grinshpun S, Reponen T, Trunov M, Friedman W. 2001. Test methods for evaluating the filtration and particulate emission characteristics of vacuum cleaners. AIHAJ 62:3, 313-21,

Wilson J, Pivetz T, Ashley P, Jacobs D, Strauss W, Menkedick J, Dixon S, Tsai HC, Brown V, Friedman W, Galke W, Clark S. 2006. Evaluation of HUD-funded lead hazard control treatments at 6 years post-intervention. Environ Res. 102(2): 237-48.

Wilson SE, Kahn RS, Khoury J, Lanphear BP. 2007. The role of air nicotine in explaining racial differences in cotinine among tobacco-exposed children. Chest. 131(3):856-62.

Wilson KM, Klein JD, Blumkin AK, Gottlieb M, Winickoff JP. 2011. Tobacco-smoke exposure in children who live in multiunit housing. Pediatrics. 127(1):85-92.

Wilson JW, Dixon SL, Jacobs DE, Breysse JV, Akoto J, Tohn E, Isaacson M, Evens A, Hernandez Y. 2014. Watts-to-Wellbeing: Does residential energy conservation improve health? Energy Efficiency, 6(2), 151-60.

Wilson J, Dixon SL, Jacobs DE, Akoto J, Korfmacher KS, Breysse K. 2015. An investigation into porch dust lead levels. Environmental Research 137: 129–35

Wright R. 2006. Health Effects of Socially Toxic Neighborhoods: The violence and urban asthma paradigm. Clinics in Chest Medicine. 27: 413-21.

Yu CH, Yiin L, Fan Z, Rhoads GG. 2009. Evaluation of HEPA vacuum cleaning and dry steam cleaning in reducing levels of polycyclic aromatic hydrocarbons and house dust mite allergens in carpets. J Environ Monit. January; 11(1): 205-11.

Zota A, Adamkiewicz G, Levy JI, Spengler JD. 2005. Ventilation in public housing: implications for indoor nitrogen dioxide concentrations. Indoor Air, 15, 6, 393-401.

Zota AR, Rudel RA, Morello-Frosch RA, Brody JG. Elevated house dust and serum concentrations of PBDEs in California: unintended consequences of furniture flammability standards? Environ Sci Technol. 42(21):8158-648-64