



Measuring the Impact of Affordable Housing Interventions: Strategies for Study Design and Implementation

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April 2017



Healthy Home
Happy Kids





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High-quality affordable housing is known to have a positive impact on the health and well-being of low-income families. However, there is an ongoing need for a more definitive evidence base that quantifies the actual effect of high-quality affordable housing on resident health and health care costs. Such an evidence base would likely enhance the ability of the housing and community development fields to attract additional investment in high-quality affordable housing. Despite its necessity, this evidence base is difficult to create as there are unique challenges when conducting methodologically rigorous research in the context of providing affordable housing to low-income families.

Determined to contribute to this evidence base by filling one particular knowledge gap, Enterprise Community Partners and the National Center for Healthy Housing embarked on a longitudinal, multisite study in 2013 to evaluate the impact of green affordable housing on the respiratory health of children with asthma, their health care utilization and the well-being of their caregivers. Although the study will not conclude until 2022, the research team believed it important to share with the field some of the strategies that have been most effective in addressing the unique challenges posed by this type of research. These strategies and the insights that their implementation has provided will help to inform other research studies that are employing similarly robust research methods to evaluate interventions that support low-income people and the communities in which they live.

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The vision of the study's earliest proponents pushes us to imagine a time when the impact of housing on the health of its residents is no longer questioned. It sets in place a pathway for all affordable housing residents to benefit from healthy and well-designed housing.

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“We have an intuitive sense that if we put people in healthier housing, it’s good for them. But in the financing world, these green elements of affordable housing are perceived as the ‘nice to do’ versus the ‘need to do.’ In order to transform the perception of this work into a ‘need to do,’ we need rigorous evidence from a large-scale study that fills the scientific evidence gap. This study addresses the methodological limitations of existing, smaller studies to bolster the evidence around the health effects of green housing renovations.”

-National Advisory Committee Member

Introduction

An Ambitious Study to Fill the Evidence Gap

Along with the growing need for affordable housing across the U.S., there is a heightened awareness that poor quality housing can trigger chronic health conditions, especially for children and other vulnerable populations. In fact, 20 to 30 percent of asthma attacks are linked to home conditions that can be avoided by improving housing quality.¹ The Enterprise Green Communities Criteria (the Criteria), created in 2004 and most recently updated in 2015, provide the national standard for high-quality affordable housing.

The rehabilitation of existing affordable housing to meet the Criteria is an important strategy for preserving housing affordability while increasing housing quality, particularly because living in substandard housing can have far-reaching negative impacts on residents and on society as a whole. While some studies have demonstrated that these green housing standards benefit resident health, the current evidence is not sufficient to drive future changes in policy, financing and development practices. In light of this evidence gap, there is a need for a robust and methodologically rigorous study that evaluates and quantifies the health-related benefits of rehabilitating affordable housing to the Criteria's standards.

In 2013, Enterprise Community Partners (Enterprise) joined the National Center for Healthy Housing (NCHH) and other research and funding partners to fill this evidence gap by launching *Healthy Home, Happy Kids*. Over an eight-year period, this research study will measure the effect of green rehabilitation of affordable homes on children's asthma and other health outcomes, including their health care utilization and the health and well-being of their caregivers. The study is uniquely positioned to fill the gap in the evidence base because it stands apart from other research studies in a number of ways:

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Comprehensive: The study evaluates the impact of a comprehensive set of green features in the Enterprise Green Communities Criteria, whereas other studies have focused on only a subset of green features.

Scale: This national, multisite study has a target of enrolling a total of 1,226 participants, making it the largest study of its kind, with the power to return statistically significant results.

Methodological Rigor: The findings from this mixed-methods study will be based on clinical health measures, self-reported data, indoor environmental quality measurements and observations of housing conditions.

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This ambitious effort applies a robust, exacting research methodology within the complex environment of providing affordable housing to low-income families. The barriers facing affordable housing providers and the low-income families living in their properties inherently present challenges for the implementation of such a robust research study. Despite these challenges, this kind of research remains critical to fill important evidence gaps and quantify the impact of investing in high-quality affordable housing.

Documenting What Works: Strategies for Overcoming Study Challenges

The study is now in the data collection phase, which will continue through 2021 before the final study results are available in 2022. Throughout the research design and implementation process, both expected and unexpected barriers have arisen, requiring a variety of different tactics to resolve them. As we continue to collect data and wait for the study results, this is an opportune moment to reflect on both the challenges encountered in the study and the strategies that we have employed to overcome them. We expect these findings can benefit other similarly robust research efforts to expand the evidence base related to affordable housing and community development interventions.

To systematically capture these reflections, an independent consultant conducted phone interviews with many members of the project team, including project directors and managers, university researchers and project advisors.

This report documents key findings about the study that were noted in these interviews. They are organized into three main categories that mirror the progression of the study: Research Design, Identification of Eligible Housing, and Recruitment and Enrollment of Participants.



Highlights of the report’s strategies and insights include:

Research Design

- Forming a cross-sectoral and collaborative project team with a national advisory committee resulted in a study design sufficiently robust to fill a key evidence gap.
- Centralized research coordination with strong feedback loops and project management tools standardized data collection efforts across multiple sites.
- Conducting pilot tests has been a valuable way to identify and address future challenges in data collection.

Identification of Eligible Housing

- Expanding the types of developments included in the study pipeline helps compensate for developments that do not meet the study’s strict ventilation criteria.
- Ongoing flexibility in the strategies used to secure housing helps overcome external barriers that would otherwise limit the study pipeline.
- Equipping research team staff to deal with variability in construction timelines is an important strategy for minimizing the effect of this uncertainty on study findings.

Recruitment and Enrollment of Participants

- Being sensitive to common barriers to low-income families’ participation in research studies and adjusting outreach plans accordingly is a fundamental strategy for success in enrollment.
- Establishing trust by pursuing community-based recruitment partnerships and strategies helps the local research teams maximize recruitment efforts.
- Collaboration with property managers has been critical for successful outreach.





Overview of the Study

The *Healthy Home, Happy Kids* research study is gathering evidence across three cities (New York City, Chicago and San Francisco) and is designed to test two primary hypotheses:

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First Hypothesis: Green housing renovations will reduce health care utilization of resident children with not-well-controlled asthma from baseline to one year after intervention.²

Second Hypothesis: Green housing renovations will improve the self-reported general physical and mental health of adult and child residents from baseline to one year after intervention.

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Study Organization

A national advisory committee with diverse expertise was formed to provide advice on the study design and implementation, with one member serving as a primary advisor throughout the implementation of the study. Enterprise provides overall project management and oversight for the study and NCHH is the coordinating research center for the study, with a local research partner in each of the three study cities that is responsible for the research efforts in that city. These local research partners are the Icahn School of Medicine at Mount Sinai, the University of California at San Francisco and the University of Illinois at Chicago. Each local research partner has a site coordinator who is responsible for reporting and coordinating the local research activities. In addition, the University of Colorado is conducting the study's economic analysis, while other consultants assist with various aspects of the study.

Throughout this report, the collective team of Enterprise, NCHH and the local research partners is referred to as the *project team*. The three university partners leading the research efforts in San Francisco, Chicago and New York City are referred to as *local research teams*.

Identifying Eligible Housing Developments

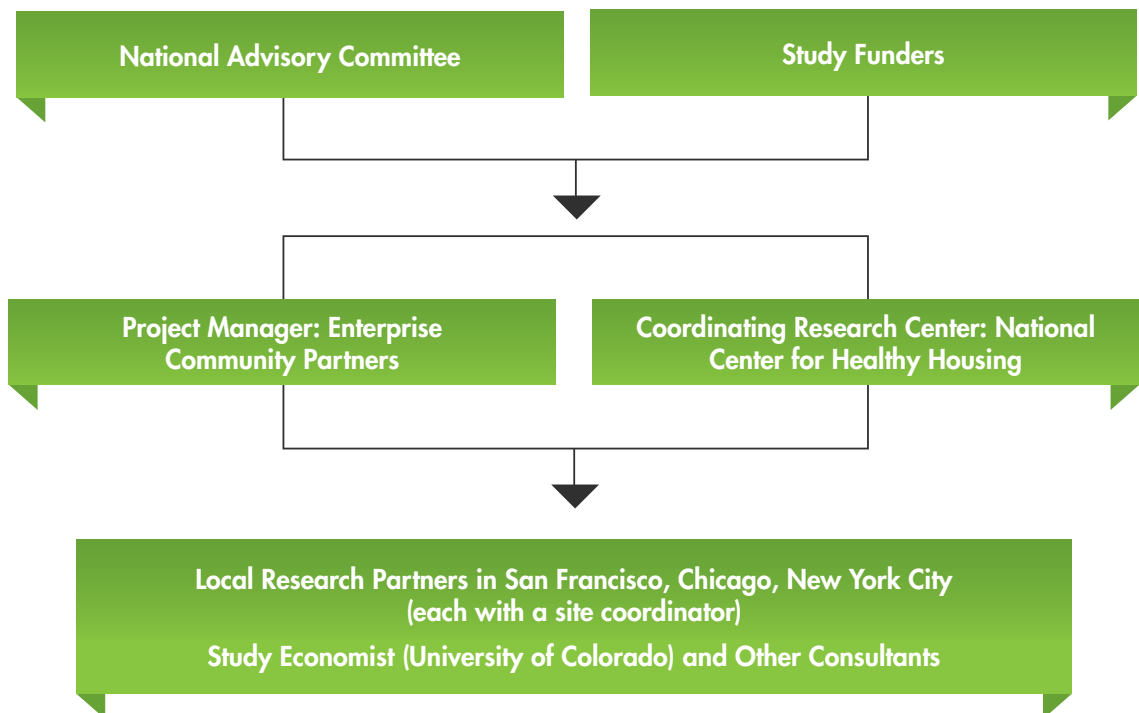
At each study site, Enterprise uses its deep knowledge of the local affordable housing market to identify housing developments planned for rehabilitation that are candidates for the study and then coordinates with the property owners to determine their willingness and ability to include the development in the study's housing pipeline. Ultimately, the study protocol calls for the identification of 12,000 housing units that will undergo rehabilitation. Because the study

Overview of the Study

measures the impact of a comprehensive set of green renovations, housing developments included in the study must meet all of the mandatory criteria in Enterprise's Green Communities Criteria for moderate rehabilitations, in addition to several of the criteria for substantial rehabilitations (including upgrading ventilation systems).

In order to be eligible for the study, housing rehabilitations must also meet certain time requirements. Properties included in the study's intervention group must undergo rehabilitation by mid-2020. Properties in the study's control group must be planned for rehabilitation sometime in the future after the study's data collection is complete. As a result of these requirements, not all housing planned for rehabilitation qualifies for the study's housing pipeline.

The study does not provide any funding or subsidy for the construction costs to rehabilitate housing, so property owners must go through conventional methods to secure their construction financing, including both public and private funding sources. The study is truly being implemented in a "natural" environment, in which the developers alone are responsible for securing all necessary financing and approvals to undertake the renovations.





Enrolling Residents as Study Participants

Once candidate housing developments are confirmed for inclusion in the study, the local research teams develop site-specific recruitment plans to identify and enroll eligible participants. The study protocol calls for the enrollment of a total of 1,226 children with not-well-controlled asthma across all three cities. The recruitment strategies for identifying and enrolling eligible residents include a diverse set of outreach activities, such as passing out flyers in building lobbies, mailing flyers directly to residents, sending emails to residents, calling residents on the phone, attending resident meetings and events, hosting or attending health fairs and attending other community or social service events where residents are present.

For the study's intervention group, the local research teams enroll participating families and collect baseline data approximately one to three months before the participants' apartment homes are rehabilitated. The local research teams conduct a second round of data collection immediately after construction is complete and again one year later. For properties in the study's control group, baseline data collection is conducted when the property is identified for the study and then again one year later—all before any construction begins. Data collection is primarily done in the residents' homes and includes a health interview, clinical health measures, home environmental sampling and ventilation system testing.



Strategies & Insights

This study has the ambitious and purposeful goal of determining the impact of green renovations on the health and health care utilization of low-income children with not-well-controlled asthma and the well-being of their caregivers. It takes a study with this kind of statistical power to effectively quantify the health-related benefits of rehabilitating affordable housing to the Criteria's standards. Filling this crucial evidence gap can drive future changes in policy, financing and industry standards.

In its efforts to address this evidence gap, the project team implemented a number of strategies and solutions to address challenges facing both affordable housing developers and low-income residents. The project team anticipated a number of these challenges and was able to proactively create solutions and processes to minimize or overcome them. However, unexpected challenges arose during the study's design and implementation, and resolving these challenges revealed the project team's persistence, patience and solutions-oriented approach to moving this research forward.

The following sections of this report present the project team's collective insights and are organized into three categories that mirror the progression of the *Healthy Home, Happy Kids* study:



Research Design



Identification of Eligible Housing



Recruitment and Enrollment of Participants

The long-term value of this study is in empirically proving the benefits on health of green rehabilitation. At first, green was considered "out there," an oddity, and then proven in terms of financial and environmental benefits. And as a result it became standard practice. Health aspects of green building may follow the same trajectory.

Project Team Member



Research Design

As with any research project, the design of this study is fundamental for ensuring that it can provide the definitive evidence necessary to attract increased investment in the green renovation of affordable housing. The research team engaged a multidisciplinary national advisory committee and chose as its primary advisor an individual who pioneered healthy housing research to ensure that the study protocols are methodologically robust and that the study has sufficient statistical power to close the evidence gap. As a large multisite study, the research design process also focused on how to assure standardization of data collection and analysis across the three study cities.

The strategies and insights for research design include:

1. Forming a cross-sectoral and collaborative project team with a national advisory committee resulted in a study design sufficiently robust to fill a key evidence gap.
2. Centralized research coordination with strong feedback loops and project management tools standardized data collection efforts across multiple sites.
3. Conducting pilot tests has been a valuable way to identify and address future challenges in data collection.

Strategy 1: Forming a cross-sectoral and collaborative project team with a national advisory committee resulted in a study design sufficiently robust to fill a key evidence gap.

Implementing a rigorous research study in the context of rehabilitating affordable housing for low-income families has no shortage of complexities, requiring a strong multidisciplinary team. The project team and national advisory committee include subject-matter experts in multiple fields related to the study, including affordable housing development, asthma study design, environmental sampling and building performance testing, respiratory health assessments, health economics, conduct of multisite studies, statistical analysis of quasi-experimental studies, research of home-based hazards, and measurement of health and physiological outcomes.

The collaboration of the project team, the national advisory committee and the project funders was critical to a successful study design. The engagement of these key stakeholders from the outset of the study ensured that the recommendations provided by the national advisory committee were integrated into the study protocols with sufficient funding for implementation. This was particularly important when the advisory committee recommended updates to the study protocols to take into account the latest and most conclusive methods for data collection and analysis. With a funder



engaged throughout the study design process, the project team was able to obtain the necessary funding for implementing these protocol updates.

Specific examples of recommendations made by the national advisory committee to enhance the study design include:

- ➔ Expanding the data collection measures to include blood analysis to measure biomarkers for allergies and measuring exhaled nitric oxide to measure a child's airway inflammation.
- ➔ Narrowing the study to include only children with not-well-controlled asthma because children with mild or well-controlled asthma are less likely to demonstrate improvement in asthma severity after renovations. As a result, a screening step was added to the enrollment process to assure that at-risk children are enrolled that meet specific criteria for not-well-controlled asthma.
- ➔ Expanding the health interview questionnaire to include questions about household information (e.g., household cleaning habits and smoking habits), allergy triggers, nasal symptom score and information about the child's doctor to confirm asthma diagnosis. This also included adding the Asthma Control Test to categorize the child's asthma control.

We have a very good, multidisciplinary Advisory Committee that includes expertise in medicine, epidemiology, statistics, data management, outreach, environmental sampling, ventilation, to name a few. They were very effective in designing the protocols.

Project Team Member

Strategy 2: Centralized research coordination with strong feedback loops and project management tools standardized data collection efforts across multiple sites.

The project team anticipated that challenges would arise when implementing this rigorous multisite, multi-year research study with many different stakeholders and numerous moving pieces. As a result, the project team designed project management tools and created strong feedback loops to ensure that the team could identify and resolve problems quickly and effectively. In its role as the coordinating research center, NCHH ensures that the study methods remain consistent across all three sites even when site-specific challenges arise.

The entire project team's collective commitment to collaboration has been crucial for implementing the study as designed. Virtual cross-site meetings held regularly have helped to create a connected, supportive team and provide a critical feedback loop as the study progresses. During these bimonthly virtual meetings, the project team exchanges updates and together addresses any issues that have emerged.

Specific examples of how the strong collaboration, feedback loops and project management tools have benefitted the study include:

- ➔ Documenting multisite study protocols for Institutional Review Boards (IRB) required approval from three different IRBs. Throughout this process, it was invaluable to have NCHH provide centralized research coordination to incorporate the team's diverse expertise and perspectives into a single study protocol for approval across multiple IRBs.
- ➔ Early in the study's data collection efforts, the project team identified the need for a set of procedures that enables local research team staff to appropriately respond to health risks they observe during data collection. This need arose when a member of one of the local research teams observed conditions in a study participant's home that could present a health risk to the family over time. The project team collaborated to define specific hazards that warrant immediate action, including broken or missing carbon monoxide detectors or fire extinguishers. The team then created a plan for how the local research teams would notify residents or landlords of the observed hazards. This unexpected task required input from the entire research team, as it involved sensitivities around protecting participant privacy, ensuring that dangerous hazards are dealt with in a timely manner and maintaining landlord-tenant relationships. The plan that was developed allows the local research teams to protect participant confidentiality per the study protocols, yet ensure that immediate health risks are brought to the attention of the appropriate party while avoiding adding any relational tensions between tenants and landlords.



- ➔ In the initial phase of data collection, the local research teams found that some families interested in the study were not eligible to participate, based on the study's definition of not-well-controlled asthma. This concern was raised to NCHH as the coordinating research center, and it worked with the primary study advisor and the other local research sites to review the study definition of eligibility. As a result, the project team modified the definition slightly to expand the number of children that are eligible, while preserving the rigor and overall integrity of the study. The eligibility criteria now allow for an unscheduled visit to a medical practitioner for asthma or an emergency room visit for asthma as part of the definition for not-well-controlled asthma.
- ➔ Developed with the study's primary advisor, the study's project management tracker offers a centralized place to track progress toward quarterly and annual goals. One of the primary features that has made this tracking tool successful is the ability to input detailed information on goals for each site, with the additional ability to automatically roll up that information into concise summaries of study progress at the national and site level. The tracker also enables the team to test the impact of modifying the study's goals on the overall project timing in order to inform research strategy moving forward. This tracker is regularly shared with the primary study advisor, facilitating an additional component of the study's feedback loop.

Strategy 3: Conducting pilot tests has been a valuable way to identify and address future challenges in data collection.

The project team conducted pilot tests for data collection at the end of the research design phase to standardize data collection techniques across the study's multiple sites, ensure high data quality and identify any potential challenges that could arise in the future. During these pilot tests, the researchers conducted a walkthrough of the home, practiced the informed consent process, collected data from environmental monitoring equipment, administered two on-site breathing tests and conducted an interview of parents and children.

The researchers typically spend one to three hours in the home, during which time family members may be coming and going, parents may be interrupted by children, and siblings may distract one another. The local research teams discussed any challenges identified during these pilots with one another, enabling consistency in how the teams managed potential on-site distractions. The teams were also able to identify possible difficulties in data collection or inconsistencies with data collection instruments through the pilot testing process.

Some examples of updates to data collection procedures identified through the pilot testing process include:

- ➔ After a careful examination of the pros and cons of collecting blood samples from children in the home, including a review of New York laws regarding blood transport, the project team decided that it is not feasible to collect blood samples in the participants' homes for the New York sites. The study protocols were updated to reflect that in New York, blood would be drawn at local Quest Diagnostic labs. During the first home visit, families are given a requisition form from their local center to test for blood biomarkers (IgE levels) that indicate allergies to pests and pets. This change allowed the team to overcome a site-specific challenge, while not changing the uniformity of measurement across the three sites.
- ➔ The calibration of some of the instruments used for environmental assessment was affected during transportation to a participant's home. Procedures for carefully calibrating the instruments were amended, and at some sites the local research teams began using car services instead of public transportation to minimize the effect of transportation on instrument calibration.
- ➔ The project team decided that data collected during health interviews would be entered into laptops in real time during home visits, instead of completing validated health questionnaires by hand and transferring them into an electronic format later. This approach reduces possible human error and allows the data to be submitted immediately to the study's centralized research center. This change required that the project team



establish privacy and security protocols with the host research organization for each local research team. The collaboration between NCHH and each university to establish security protocols required additional time during research design and piloting data collection.

- ➔ The local research teams anticipated the challenge of unpredictable wireless connectivity when collecting data in participant homes. As a result, the project team purchased hotspot cards to provide reliable Wi-Fi access during the in-home health interviews so that the researchers can access the study's research tools and database. This was particularly important given the decision to collect health interview data on laptops, as discussed above.
- ➔ When piloting the environmental testing protocols, the research team realized that the study participants randomly selected for this portion of the study were not going to be adequately compensated for the time and inconvenience that the environmental testing required. The process of setting up the proper equipment and taking the environmental samples required more time than originally anticipated. The protocol also required that the testing instruments remain in a participant's home for a four-day period, and they need to be located in a particular place in the home to effectively gather data, which may interfere in the family's daily activities during that period. As a result, the research team increased the compensation for these participants to \$100 per environmental testing visit, in addition to their compensation for participating in other aspects of the study.



Identification of Eligible Housing

Setting out to fill evidence gaps through a comprehensive multisite health and housing study necessitates a strict adherence to housing eligibility standards, which can prove difficult. The project team must identify housing developments that meet the study's timeframe, have children present on site and have a developer or property owner who is able and willing to include the property in the study's pipeline. It is also critical that the homes in the study's intervention group comply with the Criteria to maximize resident health improvements. As a result, the project team must conduct a thorough vetting of developments to confirm that they are eligible for the study.

The strict criteria for properties to be included in the study's housing pipeline, coupled with financing and construction delays that continually challenge affordable housing development, have created both delays and uncertainty in the study. While many factors influencing the study's pipeline are outside the control of the research team, several strategies have proven useful for helping to minimize some of the effects of this uncertainty on the progress of the research.

The strategies and insights for identification of eligible housing include:

1. Expanding the types of developments included in the study pipeline helps compensate for developments that do not meet the study's strict ventilation criteria.
2. Ongoing flexibility in the strategies used to secure the housing pipeline helps overcome external barriers that would otherwise limit the study pipeline.
3. Equipping research team staff to deal with variability in construction timelines is an important strategy for minimizing the effect of this uncertainty on study findings.

Strategy 1: Expanding the types of developments included in the study pipeline helps make up for developments that do not meet the study's strict ventilation criteria.

One of the most challenging aspects of the Criteria for developers to meet, and also one of the most influential for health outcomes, is the industry's ventilation standard, ASHRAE 62.2-2010. Proper ventilation can prevent the development of mold, mitigate against the buildup of hazardous air pollutants within the home and promote comfortable temperatures. This ventilation standard can be perceived to be costly when rehabbing older properties. Unfortunately, development financing and other construction barriers have reduced the number of rehabilitation projects with ventilation upgrades, ultimately narrowing the anticipated pipeline of housing developments for the study. In addition, the Enterprise staff charged with identifying housing developments for the study have found that some developers have expressed an interest in the study but required more time to finalize their construction scope of work, creating delays in confirming whether a property could be included in the study's pipeline.



To shorten these delays and encourage developers to include improved ventilation in their construction plans, the project team works collaboratively with development teams to assess whether a project complies with the study criteria. The project team also retained a consultant to assist developers in identifying cost-effective ways to meet the ventilation standard, if possible. These consultant services are free of charge for developers, and create a way to boost the study's housing pipeline while also increasing the number of units that will maximize resident health outcomes through improvements to ventilation. While many developers are unable to change their scope of work to comply with ASHRAE 62.2-2010 for cost and feasibility reasons, some have sought to modify their scope of work to meet the study's criteria.

Enterprise staff work collaboratively with the rest of the project team, providing frequent status updates on developers' capacity to include ventilation and on market conditions that might impede financing. Together, the team discusses options to expand the study's housing pipeline without impacting its rigor or expected findings. As a result, the project team has been able to expand the type of housing developments included in the study to compensate for developments that do not meet ASHRAE 62.2-2010 and cannot be included in the study.

There's a lot of desire within the region to understand the non-economic benefits of doing green housing—the health and health outcomes benefits. This city has a high incidence of asthma and childhood health issues. They're interested in this study's examination of health care cost utilization and how green building may affect that.

Project Team Member



Some examples of how the project team has expanded the type of housing developments included in the study include:

- ➔ Scattered site developments are now included as part of the study pipeline, although the project team initially expected that the pipeline would consist of buildings with at least 100 units. Scattered site developments make recruitment and data collection efforts more difficult, as the residents are not clustered in one location, but the local research teams have been able to modify their recruitment approach for these developments to overcome this challenge.
- ➔ Select new construction developments were added to the study pipeline. The only new construction developments included in the study are those where the residents are moving from a nearby existing building to the new building. This has allowed the project team to add to the housing pipeline while not changing the protocol for baseline data collection or recruitment of participants.
- ➔ The project team has also begun to include public housing developments that are undergoing rehabilitation through the federal Rental Assistance Demonstration (RAD) program to further expand the study's housing pipeline. These developments are undergoing rehabilitation as they transition from public to private ownership.

Strategy 2: Ongoing flexibility in the strategies used to secure the housing pipeline helps overcome external barriers that would otherwise limit the study pipeline.

All of the housing in this study is being financed and rehabilitated by the property owners or developers—the study is not subsidizing construction costs or expediting approvals for these developments. Thus, the barriers and delays that these rehabilitation projects face reflect current conditions in the affordable housing industry, which could not have been fully predicted when the study was designed in 2013.

Delayed funding and challenges in securing new multifamily construction loans, as well as rising construction and labor costs, have resulted in some properties dropping out of the study, with replacement properties being slow to come on line. The increased demand for affordable housing in the three cities where the study takes place created an urgency for developers to complete a project as quickly as possible so they could move on to the next. In some cases, this meant that the developer would forego making ventilation improvements as a means of streamlining project completion. There has also been a shift in the Low Income Housing Tax Credit (LIHTC) priorities, with more focus on investments in new construction than rehabilitation of existing housing.³ Combined, these factors have made the process of identifying and maintaining a robust pipeline of eligible properties a greater challenge than expected.

As a result, the project team has frequently adjusted the strategy for recruiting housing developments, as well as the study timeline and goals, to reflect the time required for developers to move through the financing and approvals process, while not reducing the overall rigor of the study or the integrity of the expected findings.

Some examples of these modifications include:

- ➔ The original goals for the study required that recruitment of participants and baseline data collection would start in control group properties a full year after starting in the intervention group properties. This would allow for consistency in the seasons in which data collection takes place and enable data collection for control group properties to occur around the same time as the post-construction data collection for the intervention group properties. However, several control group properties became ready for recruitment of participants and data collection well before the original schedule. Because many of the intervention group properties were experiencing financing and construction

Developers' margins for buildings are very slim. They don't want to lose their shirt on the funding. If it's a question of starting their project now or waiting six months to get funding for ventilation, they'll start now.

Project Team Member

delays, the project team decided to allow recruitment and data collection to proceed for a select set of these control group properties. This enabled the project team to take advantage of the housing pipeline available and begin data collection efforts, while not significantly affecting the overall study goals or findings.

- ➔ In Illinois, a multiyear budget impasse resulted in the state not having appropriation authority to release federal HOME funds and other federal funds. Without access to these funds, developers incurred property closing delays and large reductions in rehabilitation financing. This caused lengthy delays in the study's progress in Chicago, as few affordable housing developers could proceed with their plans without the array of financing they had planned to receive. The project team called on longstanding relationships with partners and developers and also took action to develop new relationships. The Enterprise team discussed the development pipeline with public and private financing agencies, organizations active in housing rehabilitation and current development partners. Staff also presented at regional conferences, continuing outreach to cultivate the development pipeline for the study over the next several years. These efforts to expand the development pipeline would have been impossible without the team's industry knowledge and relationships.
- ➔ Some property owners have expressed liability concerns, worrying that collecting resident health and environmental sampling data prior to rehabilitation could foster tensions with residents or lead to lawsuits. These concerns reflect the contentious environment in some cities regarding housing quality and resident lawsuits. The magnitude of this concern led the project team to spend considerable time evaluating the liability risk to ensure that bringing developers into the study would not impact their ability to provide affordable housing to residents over both the short and long term. As a result, the project team has held thorough discussions with interested developers to address these concerns. While some owners were still unwilling to participate, many have been able to include their property in the study as a result of the information presented. Addressing these concerns has added to the time that it takes to secure housing developments for the study, but has allayed developer concerns and added to the housing pipeline.

Once we have educated the owners about our testing, they are OK with having us reach out to residents. It can be tough when owners' lawyers get involved because they think they can edit or modify the protocols, which isn't possible.

Project Team Member

Strategy 3: Equipping research team staff to deal with variability in construction timelines is an important strategy for minimizing the effect of this uncertainty on study findings.

A variable housing pipeline directly impacts the workflow of each local research team. At times the local research teams may be recruiting participants and conducting data collection at multiple housing developments, and at other times they may be waiting for developments in the housing pipeline to near construction start so that they can begin recruiting participants.

Consequently the local research teams must modify their data collection plans for each development as construction plans change. These changes can include a change in construction scope so that only some units within a development meet the study's criteria, a change in which buildings in a large development will undergo construction first or a change in the start date for construction.

Some examples of the strategies that have helped the local research teams retain data quality while working within the uncertainties of affordable housing development timelines include:

- ➔ Hiring research assistants (RAs) who can handle the demands and unpredictability of the study, while mastering the required elements of data collection. The project teams conduct ongoing training and repeat data collection procedures to ensure that any lags in active data collection do not have a negative impact on the study. This keeps both the RAs and the rest of the local research teams familiar and skilled with the study's data collection procedures.
- ➔ The pace of affordable housing rehabilitation does not always provide the continuity and clear timeline that researchers need to allocate faculty and other research staff to a study. Strong and frequent communication between the Enterprise staff who have relationships with the development teams and between the local research teams and the developments' property management and construction teams has been beneficial in reducing the degree of uncertainty experienced in the study. Despite these efforts, however, some uncertainty persists as housing developments continue to experience financing delays or changes in construction timing that are unpredictable and outside the development team's control.

The level of complexity of this study does lead to challenges. The research assistants need to be able to walk around a house and point out abnormalities, do monitoring correctly and do the survey with residents. We've had the benefit of smart RAs but it is hard to find RAs who can do all three tasks and are facile with a computer.

Local Research Team Member



Recruitment and Enrollment of Participants

Integral to the success of a study like this is engaging with the residents and their communities, beginning early in the project. Because the study puts a fair amount of burden on participants, families need to feel comfortable with the protocols and trust the researchers before they decide to enroll. Going into the study, the local research teams understood that recruiting participants requires devoting time to establish relationships, understanding the dynamics in the community that may influence perceptions of the study and staying engaged with each enrolled family. The research team developed recruitment strategies to identify eligible participants and address barriers that commonly limit enrollment of low-income populations in health studies. Members of the research team at each site also attend resident and community meetings to learn about the community, discuss the study with interested residents and answer questions.

Despite these strategies for establishing trust and understanding the local context, in many cases identifying participants who meet the study's strict eligibility criteria has been one of the greatest barriers for meeting participant enrollment goals, requiring additional creativity and flexibility from the project team.

The strategies and insights for recruitment and enrollment include:

1. Being sensitive to common barriers to low-income families' participation in research studies and adjusting outreach plans accordingly is a fundamental strategy for success in enrollment.
2. Establishing trust by pursuing community-based recruitment partnerships and strategies helps the local research teams maximize recruitment efforts.
3. Collaborating with property managers has been critical for successful outreach to residents.

Strategy 1: Being sensitive to common barriers to low-income families' participation in research studies and adjusting outreach plans accordingly is a fundamental strategy for success in enrollment.

The local research teams understand that developing trust within a community is important to the study's success. They carefully consider recruitment and participation strategies to address common participation barriers, such as transportation, child care and inflexible work schedules—all of which can make it difficult to maintain connection with participating households. These barriers to participation can be exacerbated by the added stress of construction-related changes in residents' housing.



The research team has employed a variety of strategies to ensure that they are sensitive to these different constraints and tailor outreach strategies to reduce the effect of these possible participation barriers. These strategies include:

- ➔ The local research teams conduct recruitment and home visits outside of typical working hours, including evenings and weekends. They go on site on weekdays and weekends at different times to maximize their opportunity to connect with as many residents as possible and to be sensitive to the varying work schedules of residents.
- ➔ The teams invest time to build a trusting relationship and to stay in touch with enrolled families during the months between home visits. Members of the research team reach out to participants between rounds of data collection to maintain a connection with the residents. The local research teams are also developing relationships with resident leaders, who can help maintain the connection between participants and the study as time progresses.
- ➔ Some developments have presented the additional challenge of existing tensions and complexities related to resident relocation and the resident-landlord relationship. In some cases, the rehabilitation of the housing units is being conducted at a time when there is a transition in property ownership, temporary relocation of residents or other significant local changes. These complexities can make both the development teams and the residents wary of engaging in the study. The project team has listened to these local concerns and modified the outreach strategy accordingly. In some cases, the local research teams have relied on community and resident leaders to introduce them to residents, while in other cases, the teams have been able to connect with residents directly by spending time on site.

Strategy 2: Establishing trust by pursuing community-based recruitment partnerships and strategies helps the local research teams maximize recruitment efforts.

Many of the enrollment challenges common to other health studies involving low-income individuals are also relevant to this study, including distrust of people coming in from outside the community. For this study, the stress caused by construction-related changes in residents' housing can exacerbate this distrust, particularly when there are other issues concerning residents.

Understanding that research efforts embedded in community relationships are often more successful, the project team pursued a number of partnerships with local organizations, such as health clinics, churches and cultural groups, whose staff know the residents and can assist with recruitment efforts. These relationships enhance productivity and the quality of communication among the research team, community leaders, developers, property management and residents and allow researchers to learn about local circumstances that may impact the study's progress. This outreach has been valuable for navigating these complexities, as their perspectives have helped to shape on-site recruitment efforts.

Some of the partnerships that the study team has developed include:

- ➔ In San Francisco, the local research team coordinated with a social service provider working at one of the study's developments to identify resident events that may present an opportunity for recruitment. Through this collaboration, they were able to visit the weekly food pantry during the hours that residents come to pick up food. This created the opportunity for the local research team to recruit possible candidates for the study at an event that they otherwise would not have known about or been able to attend.
- ➔ The research team is developing a formal partnership with a community development corporation (CDC) serving the residents of one large development in the study. Through this partnership, the CDC will assist the local research team in identifying residents to serve as resident ambassadors, helping to identify and recruit eligible families for the study. The local research team will provide the necessary training to the resident ambassadors to ensure that the study protocols are carefully followed, while the CDC will help provide oversight and management of the ambassador activities. This approach will leverage the principles of community-based participatory research strategies by having existing community relationships drive the recruitment process. The research team expects to use this model at other large sites included in the study's housing pipeline.

- ➔ At one development, a property owner was concerned that the study's timing coincides with the owner's public housing portfolio conversion from city to private management under the Rental Assistance Demonstration (RAD) program. Residents were anxious about the transition and the new management, and city leaders worried that more newcomers (i.e., the researchers) showing up on site would add to residents' concerns. Through a series of meetings with city agency staff, property owners and managers, resident service partners and resident representatives, these concerns were addressed and city leaders, housing developers and local advocates agreed to support the study. These partnerships were vital for ensuring that outreach and enrollment could move forward at this site.

We are working with families who are extremely isolated and there's a tremendous amount of distrust of folks from outside of these insular communities.

Project Team Member

Strategy 3: Collaboration with property managers has been critical for successful outreach.

Frequent communication between the local research team and property managers is an important element of successful outreach. Staying in touch and building positive relationships with property managers enables the site coordinators to learn when community meetings or on-site resident gatherings occur and increases the likelihood that the local research teams will be invited to attend these events. This collaboration also facilitates other aspects of on-site outreach, such as gaining access to community shared spaces to post flyers and obtaining a resident address list for mailing study information and enrollment cards.

Some examples of successful collaborations with property managers include:

- ➔ In discussions with the property manager at one site about options for the site coordinator to meet residents, the property manager suggested the site coordinator visit the food bank to engage with families there. This creative solution was successful in enabling the local research teams to interact with more residents and led to more outreach through placement of study flyers in food bags.
- ➔ One property owner has been integral in designing a resident ambassador program on site, which will utilize resident leaders to identify families that may be candidates for the study. The property owner's assistance in determining the best method to engage resident ambassadors has provided valuable insights that will increase the chances of a successful recruitment effort.



Conclusion

This study's robust methodology and size are hallmarks of the bold vision of its funders and the multidisciplinary national advisory committee and project team that designed the study protocols. Their vision aims for landmark change that will cement our understanding of the connection between home and health and fill a critical gap in the evidence base by demonstrating the benefits of investment in housing interventions on the health of children and the well-being of their caretakers. Investments in improving the quality of affordable housing now will pay dividends far into the future.

The vision of the study's earliest proponents pushes us to imagine a time when the impact of healthy housing on the health of its residents is no longer questioned. It sets in place a pathway for housing advocates to present clear evidence to policymakers and housing finance agencies that paying for upstream costs in building construction and rehabilitation will positively impact health and reduce downstream health care costs.

Putting a study of this magnitude into practice presents ongoing challenges that consume time and resources. Trusting its potential and the benefit it will bring to many lives, the project team has worked collaboratively to address both the expected and unexpected challenges, with an ongoing commitment to the study's success.

One of the greatest contributions of this study, even as the research team awaits the final results, is that its ambitious goals can motivate the industry to seek concrete actions to further connect the health and housing fields to improve health outcomes for low-income people. It is only with a committed and cross-sectoral team of researchers, advisors and funders who are willing to push the envelope that this kind of change is possible.

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Appendix

¹ 2015 Enterprise Green Communities Criteria Vision Statement

² For the purposes of this study, not-well-controlled childhood asthma is strictly defined as an Asthma Control Test (ACT) score of less than 20, or an asthma episode that resulted in an unscheduled visit to a medical practitioner, an emergency room, hospital or urgent care center within the past year. All children enrolled in this study must have doctor-diagnosed asthma.

³ Mattson-Teig, J. 2016, June 1. Banks Take a Step Back on Construction Loans. Retrieved November 10, 2016, from <http://nreionline.com/lending/banks-take-step-back-construction-loans>.



Healthy Home
Happy Kids

