

**Title: Asthma Management Strategy**

**Request for Information Response**

**General Requirements**

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The Green & Healthy Homes Initiative (GHHI), operating in 20 US Cities including Detroit, Flint and Lansing, Michigan, is an innovative and transformative prevention model that uses housing as a platform for health to reduce the high costs of health care associated home-based environmental health triggers that contribute to asthma episodes resulting in hospitalizations, emergency department visits, and increased medication usage. Since 2009, GHHI has completed 5,000 homes evidencing significant savings for Medicaid, state and local governments and families. Through its work, GHHI has evidenced a 64% reduction in asthma related hospitalizations and 47% reductions in emergency department visits for its clients. It has also worked with HUD to develop a national certification program modeled after its healthy, safe and energy efficient standards.

GHHI proposes the use of its evidence-based and proven in-home patient education, healthy housing assessment, and integrated asthma reduction intervention services to deliver interventions to 1,600 Medicaid patients (children and adults) in Genesee County (750), Ingham County (500), Muskegon County (100) and Saginaw County (250). GHHI's Michigan office, based in Lansing, will be home to an efficient intake and coordination system with key staff, and will work with local health departments and contractors at the four project sites to provide the in-home services. In addition, GHHI will work with its broad network of healthcare and housing (including energy efficiency) partners throughout the state as well as Third Sector Capital Partners to implement the GHHI model.

As part of Governor Snyder's 10-point "Reinventing Michigan" plan, he calls for a reinvention of health care in order to build a stronger and healthier Michigan. His stated vision is for "Michiganders to be healthy, productive individuals, living in communities that support health and wellness, with ready access to affordable, patient- centered and community-based system of care." In support of this effort, the Michigan Department of Community Health (MDCH) is addressing the state's critical health indicators, including a specific plan to reduce asthma burden by "concentrating on communities and populations enduring asthma disparities."

The first goal in MDCH's strategic plan, "Asthma in Michigan: A Blueprint for Action," is to reduce asthma emergency visit rates in at least two high burden communities by 25 percent. To date, in data gathered from a sample set of Baltimore families receiving healthy homes interventions to remediate asthma triggers, emergency department visits were reduced by more than 50 percent.

As per the 2012 Michigan Asthma Surveillance Report, the four communities in which GHHI will focus efforts accounted for 2,009 of the state's total (16,743) asthma-related hospitalizations in 2010 and accounted for \$45.6 million of the state's \$394 million in expenses for asthma-related hospitalizations per year. There is a strong link between unhealthy housing and inefficient housing and housing-based illness. According to the Healthy Homes Strategic Plan (HUD, 2009), a disproportionate burden of housing-related hazards impact low-income persons and minorities who are more likely to lack resources to prevent and/or mitigate residential problems that negatively impact health. Children are more susceptible to household hazards due to exposure to allergens, pests, etc. Risks are greater due to the rapid development of children, frequent hand to mouth contact and are compounded by them spending most of their time indoors where contaminants are found. GHHI is noted as a model program to address these

issues cost-effectively in a 2013 report from the Federal Healthy Homes Work Group entitled “Advancing Healthy Housing: A Strategy for Action.”

Through the investment of upstream healthy homes interventions, the State will immediately benefit from significant savings on Medicaid and Medicare costs created by asthma. Additionally, the State will benefit from energy savings and the reduction in outdoor pollution due to the installation of the weatherization/ energy efficiency measures which produce a monetizable ancillary social value to these environmental interventions.

### **Outcome Targets and Justification**

The model is designed to improve asthma control by extending the continuum of care beyond the clinic into the home environment, thereby bringing access to preventive services and coordinated care in the most appropriate setting.

The data drawn from Healthy Homes interventions GHHI conducted over the past several years demonstrates dramatic reductions of 50% in emergency department visits and 64% in hospitalizations for asthma in the three years following a Healthy Homes intervention.

GHHI will target super utilizer (high cost burden) households with asthma-diagnosed individuals. Prevalence and cost data comes from the Michigan Asthma Surveillance Report. Targeting a subset of the Medicaid/CHIP population is necessary because a disproportionate share of health care spending is used to provide care to a relatively small group of super-utilizers within Medicaid, with just 5% of Medicaid beneficiaries accounting for 54% of total Medicaid expenditures and 1% of Medicaid beneficiaries accounting for 25% of total Medicaid expenditures.<sup>26</sup> Research indicates the majority (nearly 60%) of Medicaid beneficiaries who were among the top 10% in one year remained among the top 10% in two subsequent years.<sup>27</sup> Thus, in the cost savings analysis we assume pediatric asthma patients may continue to generate

high utilization rates and costs for a period of at least three years, although cost savings may continue to accrue beyond three years because the elimination of home-based exposures structurally reduces the number of preventable emergency department visits and hospital admissions.

Independent actuarial analysis by Milliman Inc., a seasoned firm which serves as an advisor to the Center for Medicaid and Medicare Services, set a projection of 10.5% in Year 1, 12.36% in Year 2, and 16.26% in Year 3 in reduction in total medical service expenditures over the average of the entire asthma populations (not just hospitalized children or related emergency department visits) through GHHI interventions. GHHI is utilizing Milliman's independent projections for this proposal, projecting outcomes of reduction in emergency room visits, inpatient admissions, and professional specialty care services per year post intervention which will save \$5,782 per patient in the 3 years following the intervention. Conservatively, no savings are calculated beyond 3 years following each intervention although current experience shows longer term returns. These outcomes are measurable through the Medicaid claims information the state holds. The difference between set costs per beneficiary per year can easily be tracked and calculated for patients, pre- and post-GHHI intervention. The specific measures reviewed will be hospitalization costs, emergency department (ED) visit costs, outpatient visit costs, and pharmacy costs.

In reporting from the Michigan Asthma Surveillance Report, for the majority of patients going to the ED for asthma they will have at least one repeat visit over the course of a year. In 2007, the average Medicaid Managed Care cost per asthma ED visit was \$243 in Michigan, and the average cost per inpatient admission (hospitalization) was \$11,671. This model targets super-utilizer patients who have been hospitalized in the previous year for asthma. The counterfactual

would be the continued medical care costs per person over the subsequent years, without a GHHI intervention. This is estimated to be \$11,904.66/year per individual.

The state would recognize cost savings by simply not having to pay for the evidenced-based projected additional hospitalizations, emergency department visits and increased medication costs over the three year period. Eliminating the need for these services is the direct cost savings. Over the course of time, it may provide a basis for the State to lower negotiated capitation rates while providing any appropriate incentives to the health care provider for referral to the housing intervention and education program.

With GHHI, the overall health care costs per participant would be the GHHI interventions plus the percentage of medical costs (nurse/case management care) that is typical in patient care on an on-going basis. By the end of 5 years the total return on investment is \$1.20/\$1. For the \$6,018,487 investment in this program Michigan would conservatively be projected to save **\$7,227,000. On a strict dollars calculation basis that equates to a return on investment of 120%.** This ROI does not take into account additional savings resulting from better controlled asthma and its impact on conditions that have comorbidity with asthma such as adolescent depression, chronic bronchitis, and longer term COPD, and emphysema. Directly correlated to the GHHI intervention practices are improvements in school (children) and work (adults) attendance, productivity and related wealth retention. Please note, however, that all savings calculations included in this proposal are only based on just the impact of the interventions on emergency department visits, hospitalizations, outpatient visits, and medication/pharmacy costs.

As you will see in the chart below, for the purpose of this proposal, GHHI has selected the four counties of Genesee, Ingham, Muskegon and Saginaw as a diverse representative set of

counties reflecting high incidence of asthma among children and adults, housing condition and critical mass of infrastructure on which to base a statewide model.

County	Hospitalizations	Rate of Hospitalizations	Total Cost/yr	Children under 18 w/ Asthma	Adults 18+ w/ Asthma	Prevalence among Kids on Medicaid	Population
Berrien	178	11	\$ 6,749,000.00	2,862	6,212	6.3	156,067
Genesee	771	17.3	\$ 18,228,000.00	2,862	6,212	11	425,790
Ingham	537	21.2	\$ 11,743,000.00	4,503	19,622	7.2	281,723
Jackson	288	17.7	\$ 6,239,000.00	2,829	19,022	5.5	160,309
Kalamazoo	233	10.1	\$ 9,566,000.00	4,028	15,101	5.4	254,580
Kent	566	9.5	\$ 21,531,000.00	11,755	37,142	5	614,462
Macomb	1,243	14.7	\$ 29,769,000.00	13,954	52,589	4.3	847,383
Monroe	236	16	\$ 5,675,000.00	2,676	8,227	6	151,048
Muskegon	177	10.3	\$ 6,775,000.00	3,196	7,658	10.3	172,188
Oakland	1,734	14.2	\$ 46,640,000.00	21,268	67,810	5	1,221,000
Ottawa	133	5.4	\$ 8,465,000.00	4,843	12,768	4.7	269,801
Saginaw	524	24.9	\$ 8,877,000.00	3,697	12,290	24.9	198,353
St. Clair	231	13.2	\$ 6,264,000.00	2,970	15,369	5.3	160,644
Washtenaw	422	13.7	\$ 12,099,000.00	5,335	28,146	13.7	350,946
Wayne	6,307	31.3	\$ 88,017,000.00	38,928	158,715	5.5	1,792,000
<b>Pilot Counties</b>	<b>832</b>	<b>18.42</b>	<b>\$ 31,019,000.00</b>	<b>14,562</b>	<b>53,103</b>	<b>13.5</b>	<b>840,757</b>
<b>Replication Counties</b>	<b>13,580</b>	<b>15.37</b>	<b>\$ 286,637,000.00</b>	<b>125,706</b>	<b>466,883</b>	<b>8.01</b>	<b>7,056,294</b>
<b>State of Michigan</b>	<b>16,743</b>	<b>16.6</b>	<b>\$ 394,000,000.00</b>	<b>232,770</b>	<b>724,054</b>		<b>9,883,360</b>

## Theory of Change

Substandard housing conditions have a profound effect on respiratory health, particularly on pediatric asthma, and cause preventable utilization of emergency medical care services. In 2010, asthma accounted for 3.1 million emergency department visits, the 20th most common principle diagnosis for an emergency visit. It was the 23<sup>rd</sup> most common principle diagnosis for hospital stays and had a 30-day readmission rate of 11.9%. Among Medicaid beneficiaries with asthma, 25% of all asthma-related expenditures were for hospital based services. The high costs associated with asthma are not isolated to acute hospital care. From 1997 to 2008, the inflation adjusted costs of asthma medications for children quadrupled. With asthma being one of the health conditions where prevalence is still increasing, a dramatic change in the national approach is needed. Home-based public health prevention by a multidisciplinary team is the most cost-

effective approach to address the problem at its source. The project aims to not only help patients and their families manage their asthma, but addresses the underlying housing conditions and removes environmental health hazards responsible for preventable asthma episodes that send beneficiaries back to the hospital. The integrated delivery of environmental health services, health education and home improvement, is necessary to address asthma at the primary source of asthma trigger exposure, the home.

In GHHI's approach, licensed clinicians, community health workers (certified asthma educators), and other relevant agencies each play a unique yet coordinated role in creating healthy communities comprised of healthy individuals and healthy homes. Through the leadership of a unique position of this model, the Outcome Broker, GHHI addresses fractured systems, poor coordination, and cost inefficiencies that fail to address home-based environmental health hazards that exacerbate asthma and exist outside the current health system's continuum of care. By integrating environmental health services, GHHI provides low-cost, sustainable Healthy Homes' interventions and health education as recommended by National Asthma Education and Prevention Program (NAEPP) guidelines that target super-utilizers among Medicaid beneficiaries. There is growing evidence that some Medicaid high-cost super-utilizers, including pediatric asthma patients, are not receiving coordinated care, preventive care, or care in the most appropriate settings.<sup>1</sup> As a patient-centered, community-based approach, GHHI provides a continuum of comprehensive care, ensuring both provider and patient adhere to NAEPP guidelines. GHHI has developed an environmental health curriculum, an environmental assessment tool, and a comprehensive intervention strategy that is based on CDC, HUD, and EPA best practices.

## **Program Model**

The GHHI Michigan Outcome Broker (Program Manager) will be housed in GHHI's Michigan Office in Lansing. The Outcome Broker will coordinate services and interface with health care provider organizations and community health service organizations. Also housed at GHHI Michigan will be two intake coordinators, an investment relations manager, and a Medicaid claims analyst. The GHHI staff will coordinate the local work in the four participating counties and lay the groundwork for a statewide model.

The intake coordinators will receive referrals from Medicaid Managed Care Organizations in Genesee, Ingham, Muskegon and Saginaw Counties. The program estimates 2000 referrals across the four (4) counties with a minimum of 1600 homes receiving full intervention services. The intake coordinators will enter client information into the GHHI data platform, and work to schedule approved participants for an assessment and education visit conducted by a local agency in each county. GHHI has an ongoing program in Genesee County and is beginning a program in Ingham County, and has capacity through partners to conduct the assessments. In Saginaw County and Muskegon County, GHHI will pre-certify a pool of contractors to conduct the housing assessment and work, and will build capacity through the county health departments and non-profit agencies to conduct the work.

Assessment / Education - The intake coordinators will work to schedule eligible participants for home visits. A GHHI assessment and education visit will be contracted out to local partners. The home visiting team consists of a certified asthma educator (Educator), and an environmental health assessment technician (Assessor). The Educator interviews the primary caregiver and the patient to assess the present level of control using the Asthma Control Test/Childhood Asthma Control Test (ACT/CACT). The interview provides a baseline overview of current asthma



maintenance activities, appropriate controller and rescue medication usage, common home environmental asthma triggers, effective cleaning practices, and behaviors that are supportive of asthma management (such as eliminating environmental tobacco smoke). The education and training are tailored to address the family's needs in order to improve asthma maintenance, including:

- use of controller medication
- asthma control plans
- patient-motivated health empowerment.

The visit includes development of an Asthma Control Plan to be reviewed and signed by the patient's primary care physician or specialist. The plan serves as a patient-centered self-management tool to improve clinical interactions by empowering the family with knowledge, attitudes and skills to use during future follow-up visits. The patient/caregiver will also agree to the Healthy Homes Compact of action steps to reduce hazards and sustain the intervention. The Educator will discuss all issues and pertinent information with the patient's provider and nurse care manager/case management team throughout the intervention and post-intervention process.

Employing a certified, professional asthma educator in this role and connecting patients and their families to community based services in a non-clinical setting is a unique aspect of our model. In the home setting, Educators can provide training in the same environment that patients and caregivers will be in as they work on asthma management practices.

At the same time, the Assessor performs an assessment of the home using the GHHI Comprehensive Environmental Health and Housing Assessment (CEHHA) tool. CEHHA is specifically designed to identify, in a single inspection, the following:

- sources of indoor allergens

- excess moisture
- toxins
- improper ventilation
- structural defects
- Other unsafe conditions

The Assessor develops a Scope of Work based on the results of the environmental assessment detailing the specific intervention services needed for the patient's home. The Assessor will conduct randomized sampling of indoor allergens in 10% of units to identify allergens that are not readily ascertainable by visual inspection or occupant interviews. Sampling will be conducted prior to the intervention and three months post-intervention. The Program's testing strategy employs a multi-assay analysis that tests for multiple allergens: dust mites, cockroaches, mice and rats, and mold.

Home Improvement Interventions: At the initial visit, the Educator and the Environmental Technician will provide patients and their families with tools to reduce indoor allergens and other home hazards, such as:

- HEPA Vacuum
- Indoor Allergen Cleaning Kit
- Hypo-allergenic mattress pad and pillow covers
- Carbon monoxide and smoke detectors.

The intervention team is also positioned to provide referrals to other external services or agencies as needed. Connecting patients with social services is a unique strength of involving community-based organizations like GHHI in the care delivery system – a service that an MCO cannot provide on its own.

Based on the environmental assessment, the home may require additional improvement services. Of the hundreds of homes GHHI has assessed and provides services for through HUD-funded asthma grants, mold and moisture hazards are seen in approximately half of the homes; combustion by-products are seen in a quarter of homes; and pests are seen in approximately a third of homes. Such additional asthma trigger remediation services will be bid out and provided by pre-approved GHHI contractors in the four Michigan counties, including crews who are already working with GHHI in Genesee County. The Outcome Broker will pre-qualify contractors, and will review the Scope of Work following the assessment and assign homes needing work to the approved contractors. Additional home improvements may include:

- Integrated pest management,
- Mold remediation,
- Installation of an Austin Air Healthmate air filtering unit for the bedroom of the identified asthmatic, or
- Energy Star air conditioners depending on moisture and cooling needs as measured by the hygrometer, visual inspection, and occupant's sensitivity to extreme heat conditions.
- Venting for dryers, ranges and bathrooms to improve indoor air quality, reduce moisture, and reduce the risk of carbon monoxide poisoning.
- Carpets dry steam cleaned or removed and replaced with smooth, sealable floors.
- Additional furnace filters with reminder cards mailed when it is time to change them to improve indoor air quality.

The specific services provided by contractors will be based on the results of the environmental assessment. The additional remediation carried out by the Hazard Reduction

Contractors will average about 1.5 work days. The Outcome Broker will oversee all contractors and contract for clearance inspection and quality assurance and control services.

Time for services: The initial visit of the Educator and Assessment Technician will take 2-3 hours per patient, and additional services provided by the contractor are estimated to take an additional 1-2 days. The time frame of assessment and scope of work development to bidding out the work to a contractor and completion of intervention is estimated to be less than 4 weeks. In the first quarter following the intervention, there will be two follow up visits by the Educator and Technician contractor to provide additional education, services related to maintaining the home intervention, and the collection of post-intervention data. In the first year, the program plans to provide services for 400 patients, and in years 2, and 3, GHHI will provide interventions for 600 patients per year, for a total of 1600 patients. Years 4 and 5 will be ongoing follow up, data collection and evaluation to track the savings in health care utilization stemming from the interventions.

Identification, Selection, and Enrollment: The identified Michigan counties (Genesee, Ingham, Muskegon, and Saginaw) were selected based on the number of asthma related hospitalizations, the costs/year from asthma, the prevalence of asthma among children and adults utilizing Medicaid, and capacity for GHHI interventions. From the pool of 2,009 asthma hospitalizations in these four counties annually, GHHI expects to receive 500 referrals in year 1(24%) and 750 referrals in years 2 and 3 (37%) from the following anticipated Health Care partners: HealthPlus Partners, Inc., Meridan Health Plan of Michigan, Inc., McLaren Health Plan, Molina Healthcare of Michigan, PHP- Family Care, Priority Health Government Programs, Inc., and United Healthcare Community Plan. These referral rates are based on experience and data from the 20 existing Green & Healthy Homes Initiative sites throughout the US. To enroll Medicaid

recipients, the program will work with Medicaid MCOs who will make referrals of asthma diagnosed children. Each referral partner will be trained on the GHHI selection process to increase successful recruitment, client engagement and enrollment. The intake coordinators will check the referrals to determine if they meet the inclusion criteria (Medicaid child or adult with an asthma diagnosis who has been hospitalized for asthma in the preceding year). The intake coordinators will work with the patient to obtain the necessary consent forms before the visit by the local contracted Educator and Technician is scheduled. If the referred patient currently has a care management team in place beyond a primary care physician or specialist, their care management structure will be engaged prior to the patient being enrolled for GHHI services. At each step of the assessment, education, and home intervention process, GHHI will keep the patient's care services team notified of the ongoing work.

Data, Analysis, and Evaluation: GHHI staff (off site) will ensure data and information from the home education, assessment, and interventions are entered into the GHHI data platform, including cost information for the GHHI services. For each program participant, GHHI will work with the Medicaid Managed Care Organizations and the Michigan Department of Community Health Data Warehouse that stores state Medicaid claims information to track and analyze the cost information before and after the GHHI intervention. The staff Medicaid claims analyst will lead this effort for all 2000 referrals and 1600 intervention participants, and will work with participants' managed care teams to ensure all pertinent information is available to patients' care teams. By comparing and analyzing the cost for GHHI services and the reduced costs for health care services, the Medicaid claims analyst and off site GHHI data team will calculate overall program savings. The Investor Relations Manager will provide ongoing reports and information to funders.

## **Program Schedule**

The GHHI Outcome Broker will provide overall project management through each phase of PFS:

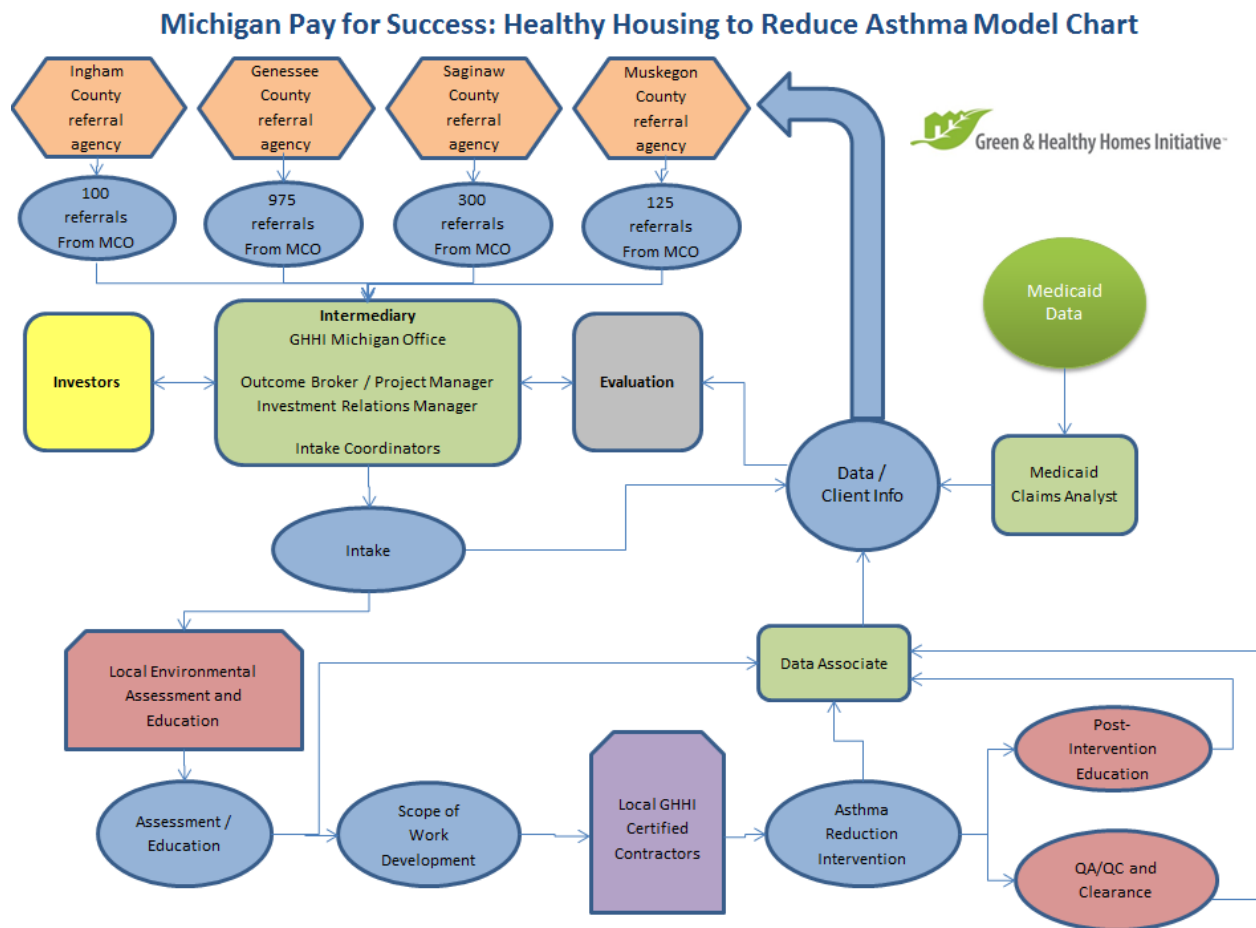
**Start-Up Phase (0-3 Months)** – All remaining staff will be hired and initial Start-Up activities will be completed within 90 days including: conduct partner meetings and execute MOUs with all program partners, IRB approval completed (if needed), contractor pre-qualification and bid-related protocols and procedures completed for the local assessors, educators, and home intervention work. The investor relations manager will work with the GHHI Outcome Broker to raise funds.

**Intermediate Phase (3-6 Months)** – The Investor Relations Manager will continue to raise private capital to support the GHHI interventions with the Pay For Success partner organizations. The program will start recruitment of patients for the Year 1 intervention (250).

**Intervention Phase (7 months to 3 years)** – Under direction of the Outcome Broker, the local Educator and Assessment contractors will provide resident education, environmental assessments and initial home interventions. The pre-qualified and certified GHHI contractors will conduct additional housing interventions if warranted by the environmental assessment for those patients' homes as well over that same time frame. All 800 GHHI interventions will be conducted during the Intervention Phase. The project expects to complete 250 homes by the end of Year 1, 925 homes by the end of Year 2, and 1600 homes by the end of Year 3. Participants will flow through the program in an average of 90 days from referral to completion of the follow up health and indoor allergen sampling at 3 months. The outcome measurements will be done by pulling from the Medicaid cost data as it comes available, looking 12 months prior to the GHHI

intervention and yearly data through 3 years following each intervention. The Medicaid cost data will be obtained from the state and analyzed by the GHHI Data and Evaluation manager.

**Final Phase (4 years- 5 years)** - During this final two years, the project will complete all 3-month post intervention client health surveys and property indoor allergen sampling for units done at the end of Year 3, and complete data analysis to measure the direct cost impact from producing improved health outcomes for Medicaid clients. GHHI will take the cost difference in the selected outcome measures from the interventions and determine the overall gross cost savings from the 1600 interventions. After review by the state and the Pay For Success investors, based on the Pay For Success agreement, a proportion of the net savings will be paid by the state to the investors. GHHI will prepare and complete a Final Report for the project during this phase.



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## Technical Requirements

### **Strength of Evidence Base Supporting the Service's Positive Impact and Proposed Target Outcomes**

By providing access to the knowledge, skills and resources of a multi-disciplinary team, the intervention model can reduce State Medicaid payments per beneficiary by supporting home-based preventive services that address upstream social determinants of health, turning the hazards of poor quality housing into safe green & healthy housing. As a patient-centered community-based approach, GHHI-AIM provides a continuum of comprehensive care, ensuring both provider and patient adhere to National Asthma Education and Prevention Program (NAEPP) guidelines. Programs that follow the recommendations in the NAEPP guidelines for comprehensive asthma care have been shown to be efficacious, resulting in reduced asthma-associated morbidity, in inner-city, poor pediatric populations and other vulnerable groups at risk for experiencing asthma outcome disparities.<sup>i</sup> NAEPP guidelines recommend four essential components of asthma management critical for effective long-term control of asthma: assessment and monitoring; control of factors contributing to symptom exacerbation; pharmacotherapy; and education for partnership in care.<sup>ii</sup> However, these four best practices recommended in the guidelines are not achievable solely through a clinic-centered approach to the management of asthma care, nor are they widely implemented for the most vulnerable populations. Clinic-based asthma management programs often neglect to incorporate environmental control practices to limit home-based exposures that are known to trigger symptom exacerbation and lead to increased use of preventable emergency services. GHHI-AIM includes the correct diagnosis and treatment of the patient as well as their home environment to sustain the family management of asthma over the long-term. Generally American housing markets produce low cost housing units



through a process called filtering, where existent housing units drop in cost as their relative quality falls, rather than through construction of new, lower cost units.<sup>iii</sup> As a result, lower income families occupy many of the nearly 30 million American homes with structural damages, elevated levels of lead, radon or environmental contaminants that place them at risk for injuries and acute or chronic illnesses.<sup>iv</sup> Poor quality housing increases the accumulation of negative externalities in low-income neighborhoods placing many vulnerable populations (children, elderly, poor health) at greater risk.<sup>v</sup> Thus, constrained by a limited supply of affordable quality housing and the limited resources that families bring to market, low-income households are systematically exposed to poor quality housing, which is a known social determinant of health and economic inequalities.<sup>vi</sup> As a social determinant of health, housing deficiencies present proximal conditions that have been strongly associated with allergen sensitization and asthma exacerbation.<sup>vii</sup> Deteriorated housing conditions, which often present multiple deficiencies, when coupled with low social cohesion in the neighborhood have been found to result in significantly elevated odds of asthma prevalence.<sup>viii</sup> The integrated delivery of home-based multi-trigger, multicomponent preventive environmental health services is an essential component of comprehensive asthma care, especially for low-income children living in unhealthy housing. GHHI views the lack of such home-based interventions as a deficiency in the delivery of healthcare to medically underserved populations and as a significant driver of health disparities in the target population. In fact, interventions conducted in the home environment present a unique opportunity to prevent asthma exacerbations which are commonly triggered by exposure to allergens and irritants within the home (See Table 1).<sup>ix</sup> The Community Guidelines therefore recommend community-based interventions that include assessment of the home environment,

changing the indoor home environment to reduce asthma triggers, and health education about the home environment.<sup>x</sup>

National research shows respiratory disorders were the most frequent reason for admission to the hospital through the ED, accounting for 27.8% of all such admissions for US children and adolescents.<sup>xi</sup> Meanwhile there is growing evidence that some Medicaid high-cost super-utilizers, especially among pediatric and adult asthma patients, are not receiving coordinated care, preventive care, or care in the most appropriate settings.<sup>xii</sup> The model assumes total cost of medical care savings will be driven primarily by reductions in expenditures on inpatient hospitalizations and emergency department visits. In 2012, State of Michigan Medicaid program incurred asthma-related costs over \$394 million annually for patients with primary asthma-diagnosis. These high and consistently growing costs confirm the magnitude of asthma morbidity from a payer's perspective, yet relatively few children has access to two necessary components of recommended NAEPP best practices: health education and control of environmental triggers.

GHHI-AIM is community-based model which addresses the priority area of asthma management by reducing health care costs for asthma patients who are super-utilizers of the health care system. The best practices of this asthma control program are designed to meet NAEPP guidelines and monitor performance based on outcome measures, specifically established for NIH-initiated clinical research on adult and children populations, concerning asthma healthcare utilization and costs (Akinbami et al 2011). The project goals are aligned with the Michigan prevention goals and objectives as outlined in the "Asthma in Michigan: A Blueprint for Action Strategic Plan 2011-2014". The project goals are also aligned with the U.S. Department of Health and Human Services Healthy People 2020 by working with the patient and

provider to accomplish the objectives for Respiratory Diseases 1-7 and Environmental Health 13- reduce indoor allergen levels. The project is designed to utilize \$6,018,487 in Michigan Pay for Success funds, with an ROI of 120%, to eliminate asthma triggers through Green & Healthy Home interventions and extend the delivery of environmental health education into 1,600 residences where high-cost, asthma-diagnosed children and adults reside. By implementing this model with \$6,018,487 GHHI expects to capture direct medical savings \$7,227,700 over five years with a return on investment of \$1.20 for every \$1 invested. These cost savings are primarily driven by cost avoidance attributable to the reduction in medical utilization costs from hospitalizations, emergency room visits, and specialty care. These cost savings projections have received an actuarial review certification by Milliman.

A literature review provides sufficient evidence to demonstrate an integrated health education and environmental remediation intervention can generate savings in direct medical cost averted per child ranging from \$2,181 per year (Jowers et al, 2000), \$2,509 per year for subset with 1 or more hospitalization over two years (Sullivan et al, 2002), and \$4115-5166 per year (Karnick et al, 2007).<sup>11</sup> The actuarial-certified cost savings analysis, based on reductions similar to past program performance and Jowers et al (2000), projected total cost of care savings of 10.5% in year 1, 12.36% in year 2, and 16.26%. At the end of three years, which is the proposed operational period of the project, the cost savings analysis projects a positive return on investment as savings to investment ratio of 1.20. Including savings beyond the operational period to allow for three-year accrual yields a savings to investment ratio of 1.20. Since we operate under the precautionary principle when mitigating all environmental health hazards identified in the home this model has the added benefit of improving other health outcomes, such as lead poisoning, CVD morbidity and mortality, COPD symptoms or senior trip and fall

injuries, which may further reduce total cost of care for all residents living in the home.

Improvement of indoor air quality by removing particulate matter and other airborne pollutants from home environments also has a significant benefit to persons with pre-existing cardiovascular disease. In fact, epidemiological research has demonstrated a strong causal relation between exposure to PM<sub>2.5</sub> and negative outcomes (mortality and hospitalization) related to cardiovascular disease.<sup>xiii</sup> In this way, GHHI's proposed service and payment delivery model is not only scalable in terms of being able to be implemented in other locations; it can also be replicated to address other health concerns affected by unhealthy and unsafe conditions of the home environment.

<b>Housing Condition</b>	<b>Green Activity</b>	<b>Healthy Home Activity</b>	<b>Trigger</b>	<b>Environmental factor</b>	<b>Level of Evidence<sup>(1)</sup></b>
1a Dampness	Sealing of structural air leakages	Plumbing Repair Remove carpets Mold/ Mildew remediation	Supports mold growth and provides environment favorable to dust mites, cockroach and rodents <sup>(2)</sup>	Cockroach House Dust Mite	Sufficient evidence of a causal relationship
1b Humidity	Ventilation of dryers, bathrooms and kitchen Air sealing	Dehumidifier Moisture control education		Fungi or molds	Sufficient evidence of an association
1c Water Infiltration	Sealing of structural air leakages	Water Intrusion Repair Window		Rodents	Inadequate or insufficient

	Reroute Sub Pump Drain Waterproofing	Replacement Gutters & downspouts Repair/replacem ent			evidence to determine whether or not an association exists
2 Excess cold	Furnace and hot water heater replacement Sealing of structural air leakages Attic/Basement/Cr awl space Insulation Weather-stripping	Window replacement	Extreme temperature s contribute to increased respiratory illnesses, rates of hospitalizati on and developmen tal delays <sup>(3)</sup>	Rhinovirus	Sufficient evidence of an association
				Respiratory syncytial virus <sup>(4)</sup>	Limited or suggestive evidence of an association
				Breathing cold air <sup>(5)</sup>	Not rated
3 Excessive Heat	Window AC Unit Sealing of structural air leakages Weather-stripping	Window replacement			Not rated
5 Biocides	Sealing of	Mold/ Mildew	Reduced	Pesticides	Inadequate

	structural air leakages Weather-stripping	remediation Integrated Pest Management & Education Green Cleaning Kit	pest infestation results in less pesticide use		or insufficient evidence to determine whether or not an association exists
6 CO and fuel combustion products	Replace/ repair furnace Replace/ repair hot water heater Replace/ repair gas stove			Oxides of nitrogen	Sufficient evidence of an association
9 Uncombusted fuel gas	Check for natural gas leaks from combustion appliances	Education Repair of gas leaks Provide maintenance service to appliances. Replaced appliances	Natural gas smell or detection of small gas leaks using gas detectors.	Old or poor maintained combustion appliances	Not rated

10 Volatile Organic Compounds	Whole house ventilation Education	Education	Respiratory irritants from building materials, detergents, cleaning products and fragrances.	Fragrances Formaldehyde	Limited or suggestive evidence of an association
11 Crowding and Spacing	Whole house ventilation Education Improved Ventilation to reduce increased moisture	Education Removal of clutter Assess for condition of sanitation and washing facilities Assess for safety issues associated with the deterioration	Respiratory irritants from building materials, detergents, cleaning products and fragrances. Increase in	Volatile Organic Compounds Excessive noise.	Inadequate or insufficient evidence to determine whether or not an association exists Not rated

		of the structure	moisture in the home due to increased human activities. Deteriorated areas giving rise to safety and health hazards.	Inadequate space for the amount of individuals. Inadequate number of washing and sanitation facilities. Excessive moisture. Increase in accidents and health issues.	
15 Domestic Hygiene, pests and refuse	Assess for integrity and efficiency of hot water unit. Assessment for moisture/water	Integrated Pest Management Education	Presence of pest infestations. Poor floors or	Increase in respiratory conditions including asthma.	Inadequate or insufficient evidence to



	leaks		areas difficult to sanitize. Presence of food debris or waste.		determine whether or not an associatio n exists
17 Personal hygiene, sanitation and drainage	Assessment for signs of sewage backups	Education Assessment of conditions of sanitary and washing areas	Signs of sewage backups. Sewage smells	Fungi or molds	Sufficient evidence of a causal relationshi p

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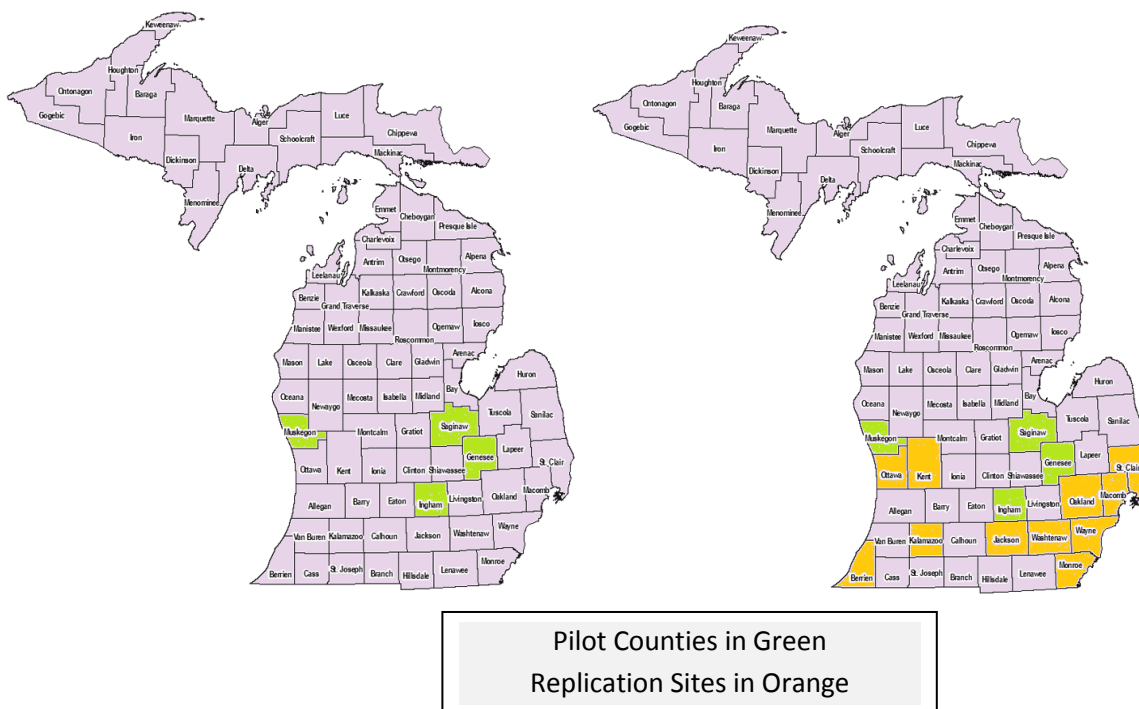
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### **Ability to Scale Intervention as Proposed for Project as Well as Beyond the Project**

GHHI proposes to deliver the Asthma Intervention Strategy to at least 1,600 homes, affecting at least 1,600 asthma sufferers. We anticipate a savings of \$7,227,700 to the State of Michigan as a result of the delivery of these upstream health interventions. Based on the prevalence of asthma sufferers across the State of Michigan and the abundance of poor quality housing stock, we believe there is sufficient need for these services to be scaled and replicated across the state. We believe there are two effective strategies for scaling/replicating this program for greater impact: geographic and non-geographic.

Geographic Scaling: Geographic scaling would aim to replicate this program in additional communities throughout the State of Michigan. We would recommend looking at communities with the greatest prevalence of Asthma and State spending associated with Asthma. Additionally, we would look at communities that express a demand and those who have existing infrastructure to adopt this program as early adopters for expansion.

The State of Michigan has a robust network of 83 counties, which serve as administrative divisions of the state. The county network will serve as the replication vehicle to expanding the GHHI AIM program throughout Michigan. Beginning with Genesee, Ingham, Muskegon and Saginaw as the four first pilot counties, the program will work to expand to eleven additional communities that have compelling need for these services, making a total of 16 counties benefiting from this Pay for Success model. These eleven replication counties are: Berrien, Jackson, Kalamazoo, Kent, Macomb, Monroe, Oakland, Ottawa, St. Clair, Washtenaw and Wayne County. From these 16 pilot and replication sites, GHHI will work to expand further into counties of need and work on a strategy of non-geographic scaling to reach people in a more efficient manner.



Non-Geographic Scaling: Non-geographic scaling would require the State making available resources, regardless of geography, to provide the Asthma Management Strategy interventions for individuals suffering from Asthma. This may be done through establishing a statewide fund making resources available for those referred by a primary care physician or other medical expert. Alternatively, the State could establish a system where primary care physicians could prescribe Asthma Management Strategy housing interventions for individuals suffering from Asthma where the intervention services would be reimbursed by state Medicaid.

GHHI has worked nationally to raise the visibility of issues related to housing as a platform for opportunity that will aid in the adoption of models, such as the one proposed here, that support cost-saving, higher impact intervention models. The opportunity for scaling this program is fortified by soon to be release HUD Safe and Healthy Homes Investment Partnership (SHHIP) community certification program. SHHIP is being modeled off of collaborative models, specifically GHHI, and will incentivize communities through awarding bonus points for working collaboratively to adopt upstream and preventative approaches to home intervention programs. The US Conference of Mayors has twice passed (2010 and 2012) resolutions supporting GHHI as a model for all member cities, including 39 Michigan Cities, which includes a value for implementing up-stream health interventions. In 2012, GHHI partnered with Clinton Global Initiative-America to commit to scaling GHHI, and its principles, more broadly across the nation. Finally, GHHI has been exploring the opportunities to leverage the Patient Protection and Affordable Care Act (ACA) and believe that the legislation will drive demand for program adoption, like this one. ACA will promote preventative and upstream health interventions that

will result in better treatment and long term savings to public systems. Additionally, through the Community Benefits mandate in Section 9007 of ACA, non-profit hospitals must implement an investment strategy that

Potential impediments or limitations to scaling the services are the potentially limited capacity of trained contractors to provide consistent and quality services that meet the Asthma Management Strategy Healthy Homes Intervention standard of intervention. Additionally, it will take time and a campaign to create awareness of the program among potential benefactors, service delivery providers and primary care physicians. A final consideration would be the potential limit to private investors available or interested in participating in this program.

Potential investors include Living Cities, Enterprise Community Partners, Calvert Foundation, Kresge Foundation, Annie E. Casey Foundation, Pritzker Foundation, WK Kellogg Foundation, Charles Stewart Mott, Osprey Foundation, JPB Foundation, Robert Wood Johnson, Rockefeller Foundation, Goldman Sachs and the Joyce Foundation.

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