PROMOTING HEALTHY HOUSING FOR CHILDREN WITH ASTHMA THROUGH A VIRTUAL HOME VISIT PROGRAM

A PILOT PROJECT SUMMARY REPORT

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

This novel pilot brought together pediatric patients with asthma and a multidisciplinary service provider team on a virtual app-based platform to assess the patients' homes for environmental asthma triggers. The team was able to provide coordinated medical care, housing expertise, and case management through a Virtual Home Visit (VHV).

- **Feasibility**: The VHV proved to be a feasible method for assessing and addressing asthma home triggers. Patients and their families expressed interest in and high satisfaction with the program. The families and the team did not encounter significant technological barriers. The pilot period coincided with an unprecedented pivot to virtual services not only in healthcare but in all facets of daily life. This pivot created a steep learning curve for patients and families in technological literacy.
- **Intersection of health and housing services**: Coordination between the health and housing members of the team streamlined individual patient care and assisted in identifying population health priorities. The application of evidence-based asthma guidelines to the design of the VHV allowed the team to focus on proven remediation strategies. This collaboration between health and housing service providers established a forum for ongoing education, program design, and advocacy efforts. Specific steps for the implementation of this pilot are fully described in the Description of Pilot section.
- **Pandemic effect**: It is necessary to acknowledge the unique conditions and challenges presented by the COVID-19 pandemic when interpreting the outcomes and lessons learned during this pilot. Across all medical settings and regions, healthcare utilization by children with asthma decreased significantly, presumably due to the effect of social distancing measures. This made it difficult to interpret improved health outcomes in the pilot population. In addition, local restrictions did not permit more extensive interior remediation interventions. To further appreciate the effect of specific interventions, practitioners will need to continue evaluating program outcomes.
- **Housing Outcomes**: The pilot team identified multiple asthma triggers and remediation needs in the majority of the homes assessed through a VHV. Consistent with guidelines, most of these homes received more than one remediation measure.
- **Health Outcomes**: The children in this pilot experienced improved asthma health outcomes. Frequency of emergency department visits, hospitalizations, and oral steroid courses dramatically decreased in the six months following the VHV compared to the six months prior. Further investigation will be needed to determine outcomes independent of the effects of the COVID-19 pandemic.
- **Financing Needs**: Housing is an essential component of health. Representatives from the housing, medical, government, and health insurance sectors need to work together to develop sustainable financing models which incorporate payment for healthy housing services.

BACKGROUND

The Virtual Home Visit: A Novel Approach

The Healthy Housing Virtual Home Visit (VHV) Program offers a unique opportunity to provide health and housing expertise directly to families where they live and improve coordination between pediatric health care and housing service organizations. Providing education regarding home asthma triggers and mitigation strategies is a key component of these visits as well as ensuring access and adherence to medical treatment. By providing remediation to homes in D.C. as a result of a Virtual Home Visit, there is potential to address and improve substandard housing conditions for families in greatest need more efficiently. This program aims to use health and housing resources more effectively, reduce intervention time, and increase the stock of healthy, affordable housing in under-resourced neighborhoods. Such an effort could create new home equity for owners, especially in gentrifying neighborhoods like those in the District of Columbia where increased property values can be substantial[1]. Additionally, this effort aims to improve the quality of rental housing for tenants when landlords are made aware of poor housing conditions and instructed on how to make repairs.

The Virtual Home Visit Program project team consists of the Children's National IMPACT D.C. Asthma Clinic and Child Health Advocacy Institute, Yachad, a nonprofit housing remediation organization, the Asthma Home Visiting Program based at Yachad, Local Initiatives Support Corporation (LISC) D.C., and the Institute for Public Health Innovation (IPHI) in D.C.

Pediatric Asthma Remains a Large and Intractable Public Health Challenge

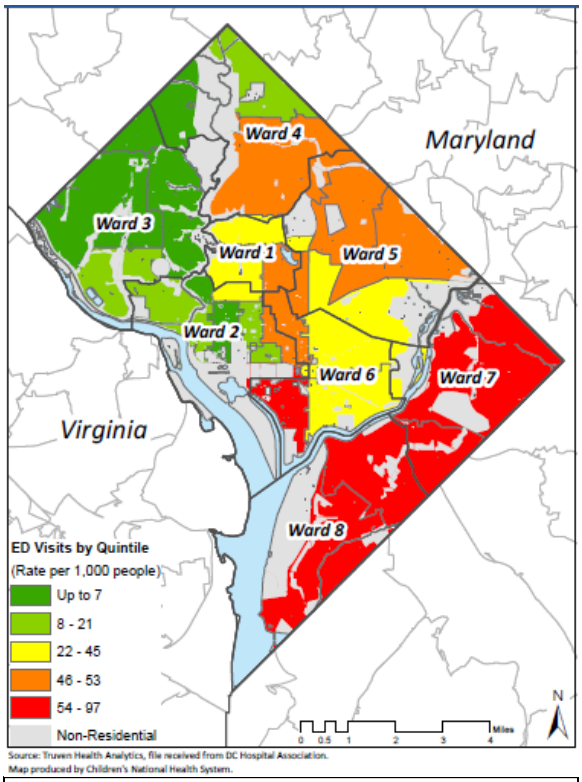


Figure 1: Asthma-related ED Visits by Zip Code, Washington, D.C.[19]

In the United States, asthma is the most common chronic pediatric disease, affecting at least 6.3 million children under 18 years old in 2014 and accounts for more than 600,000 emergency department (ED) visits annually[2,3]. Despite evidence-based care guidelines from the National Institutes of Health[4], overall national attack rates, ED visits, and hospitalizations have decreased only modestly[5]. In addition, striking disparities in asthma care and outcomes persist among youth with asthma. Children and adolescents who experience socioeconomic challenges, who reside in urban areas, and children of color continue to receive less guideline-based care and incur a disproportionate share of asthma-related morbidity[5, 6]. ED visit rates, hospitalization rates, and death rates, for example, remain significantly higher among African American/Black and Hispanic youth than among non-Hispanic white youth[5, 7]

Washington, D.C. provides a powerful case study of these disparities. In 2012, for example, the current asthma prevalence rate in D.C. was more than five times greater among non-Hispanic Black youth than among non-Hispanic White youth[8]. Disparities in outcomes are even more dramatic. Surveillance reveals that ED visits and hospitalizations are heavily concentrated among Black children residing in under-resourced neighborhoods in Northeast and Southeast D.C. For example, the highest ED visit rates in 2014 occurred in three ZIP codes that comprise Southeast D.C. (Figure 1). The highest ZIP code rate (97.5 visits/1000 in Southeast D.C.) was 23.2 times greater than the lowest (4.2

visits/1,000 in Northwest D.C.). The former ZIP code has 90.0% Black residents with 32.9% experiencing family-based poverty; the latter has 9.2% Black residents with 1.9% experiencing family-based poverty[8].

Reducing overall asthma morbidity and its racial/ethnic disparities are priorities for health and social service agencies, including at the federal level[9]. Environmental asthma triggers are a key determinant in asthma outcomes, as exposure to indoor irritants and allergens significantly affects asthma morbidity and control, as detailed by the National Asthma Education and Prevention Program's (NAEPP) "Guidelines Implementation Panel Report."[10] Asthma interventions must therefore address indoor environmental asthma triggers and exposures in new and meaningful ways for youth of color in under-resourced communities to experience improved asthma outcomes. Self-reporting of home asthma triggers reveals high rates of potential adverse exposures in these communities[11], but objective assessment linked to real-time education through home visits is preferred. While there are reports of many successful home visit programs within urban populations, significant barriers to the successful completion of home visits exist including scheduling difficulties, family living circumstances, family privacy concerns, and caregivers' personal issues[12]. Such barriers create time-consuming logistical difficulties for home visitors[13].

The Role of Housing Conditions in Adverse Health Outcomes

Housing is a significant social determinant of health. Lower income housing often suffers from deferred maintenance which can result in significant environmental hazards associated with diseases like asthma. These conditions include pest infestations, plumbing and roof leaks causing water infiltration and mold, poor ventilation causing high humidity, and environmental tobacco smoke.

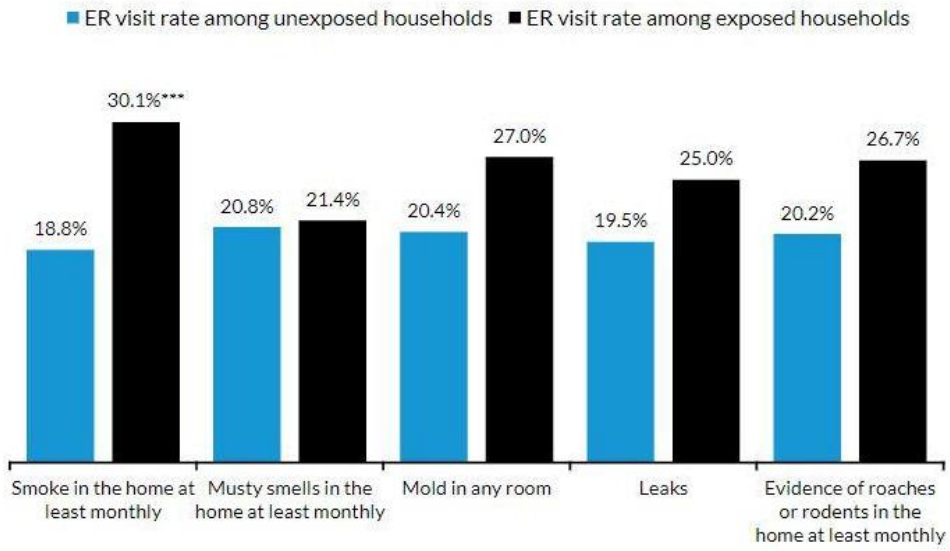


Figure 2: Share of Households with a Child with Asthma Reporting an ER or Urgent Care Visit in the Past 12 Months, by Exposure to Asthma Triggers ***Estimate is significantly different ($p < .01$) from estimate for households not exposed to an asthma trigger.[16]

The District of Columbia is a high-risk jurisdiction for housing-related health problems for two primary reasons: an older housing stock, and a high poverty rate. Some 60% of District housing was built before 1950, and more than 80% was built before 1978. In D.C. there are sections of the city that exhibit higher rates of poverty and not surprisingly, have higher rates of environmental disease such as asthma and lead poisoning[14]. There are also many apartment buildings plagued with deferred or no routine maintenance impacting the most vulnerable District residents. Such poorly maintained housing presents elevated risks for exposure to cockroaches, rodents, dust, and mold that contribute to persistent asthma. A study done after the complete renovation of a formerly substandard multi-family housing complex in D.C. showed significant improvements in childhood asthma for the building's residents[14]. The apartment complex known as Wheeler Terrace in Southeast D.C. received a total renovation using Enterprise Green Communities Building criteria with funding from the United States Department of Housing and Urban Development. The residents were primarily low-income, female, heads of households. Data on residents' health, and housing conditions was collected at baseline and one-year post remediation intervention. Indicators of mice/rats, insecticide use, cockroaches, mildew/odor/musty smells, and water/dampness

(measures associated with asthma) improved significantly. Adult health was significantly improved. Other health measures trended positively but did not achieve significance including child and adult injury, and child and adult asthma.

In 2018, the pilot team conducted a project which offered housing remediation services to D.C. families referred from health and legal agencies. That project's goal was to better understand if and how home remediation reduced asthma triggers and subsequent need for medical treatment. Ten homes were remediated as part of this effort, and seventeen individuals with asthma resided in these homes. The project demonstrated an improvement in the number of days without asthma and wheezing symptoms in 65% and 53% of residents, respectively, as well as a reduction in the use of quick-relief medications in 59% of residents. None of the residents with asthma had increased symptoms or healthcare utilization during the post-remediation period. Despite the limits of small sample size and self-reporting of health symptoms, this experience supported the feasibility of a collaborative approach, development of evaluation tools, and built referral mechanisms between healthcare and housing service organizations.

Leveraging Technology and Telehealth to Improve Health and Housing Outcomes

There exists a promising opportunity to leverage widespread access to technology to improve access to healthcare and quality housing. In recent years, Children's National Hospital has expanded telemedicine services offered to patients in their home (direct to consumer or DTC) using an app-based platform. The largest growth in DTC has occurred in primary care to address chronic conditions including asthma. The ability to have various parties participate in the same visit regardless of their physical location has greatly facilitated care coordination.

National data indicates that smartphone ownership has good penetration into the US population. The Deloitte 2018 Survey of US Health Care Customers found that adult Medicaid beneficiaries own smartphones (86%) and tablets (69%) at the same rates as the general adult US population (86% and 72%, respectively), but at slightly lower rates than those with employer insurance (94% and 79%)[17]. The general penetration of smartphone ownership in the US population indicates that smartphone technology may be a viable platform to facilitate housing interventions. According to the D.C. Health Matters website, 80.3% of households in D.C. have an internet subscription[17]. However, there are disparities in internet access between wards, with households in Wards 7 and 8 having lower rates (60-70%) of household internet subscriptions[17].

The Impact of the COVID-19 Pandemic on Housing and Technology Access

The COVID-19 pandemic has upended many financial and service sectors. In healthcare, the unprecedented pivot to virtual care during the pandemic will likely prove to be transformational. Telehealth allowed patients to stay connected to their medical providers and this period witnessed a dramatic increase in the adoption of telehealth services and expanded its utility[18]. At Children's National, telehealth visits accounted for 60-70% of primary care visits during April to June 2020 and still comprised about 25% of those visits at the end of the year. The IMPACT DC Asthma clinic developed a telehealth visit model and conducted almost all its visits virtually from March to December 2020.

The COVID-19 pandemic also shined a light on housing inequities as stay-at-home orders and social distancing guidelines kept residents indoors in many jurisdictions. D.C. residents who live in substandard housing spent more hours of the day exposed to conditions associated with asthma. Additionally, rental property managers were reluctant to send in maintenance personnel to repair leaks or exterminate pests.

The COVID-19 pandemic has led to increased investment citywide in DC to bridge the digital divide. For example, the D.C. Public Charter School Board facilitated a $250,000 purchase of 1,600 T-Mobile hotspots for students who lacked Wi-Fi in late March[19]. Also, Mayor Muriel Bowser announced a $1 million fund to help close the digital divide for students in traditional public schools and public charter schools across the District.[19]

DESCRIPTION OF PILOT

Primary Objective
To evaluate the feasibility and efficacy of using a Virtual Home Visit (VHV) to address asthma home triggers.

Secondary objective
To describe the resources, partnerships, and financing needed to develop a sustainable Virtual Home Visit program, and to use evidence-based asthma guidelines to influence the development of a model Virtual Home Visit program.

Pilot Design
The pilot aimed to study a cohort of children aged 2-17 years that were seen in the IMPACT D.C. Asthma Clinic. Those in the cohort had persistent asthma and self-identified substandard housing conditions related to mold, pests, carpeting, tobacco smoke, ventilation, and pets. The age range was selected because children under two are typically not diagnosed with asthma. Children with chronic medical conditions (other than asthma) were not included in the pilot.

Children and their families used a telehealth platform, Zoom, through their smartphones or computers to complete a virtual medical and housing assessment led by a pediatric healthcare provider and housing specialist. The clinical and housing assessments were guided by an electronic medical record (EMR) template and an Indoor Environmental Trigger Checklist developed by the project team.

In addition, clinical staff used the CNH EMR systems to review all visits to CNH during the study period to include the 12-month period before and 6-month period after the VHV. All potentially eligible participants were screened for participation in the pilot. Reasons for ineligibility were tracked to allow for a clear description of the pilot population. In addition, parents choosing to decline participation were asked to provide simple demographic data and reason for declining.

The IMPACT D.C. Asthma Clinic traditionally has 3 clinical sites for in-person visits as well as virtual visit capability through CNH enterprise telehealth services. Prior to this pilot, patients with substandard housing conditions were referred to community partners for in-person home assessment.

<u>Pre-visit Protocol</u>:
Once a patient was identified at the IMPACT D.C. Asthma Clinic with persistent asthma and self-identified substandard housing conditions, a staff member scheduled the patient for a VHV follow up appointment. The parent/guardian of the patient received appointment confirmation with a video visit link. Prior to the VHV, staff called the patient/family to review the VHV process and complete video and audio testing as needed. Appointment reminders were sent to patient/family 48-hours prior to and the morning of the VHV appointment.

<u>Pilot Intervention: Video Home Visit (VHV) - within 2 weeks of IMPACT D.C. visit:</u>
Pilot team members present on each Virtual Home Visit included: a medical provider, a Virtual Home Visit coordinator, and two housing specialists from Yachad, a nonprofit housing remediation organization. The length of each VHV was approximately 30 minutes, and followed the structure outlined below:

1. Medical Assessment – 5 minutes

a. Led by Clinician (using VHV EMR template)
b. Review of medications and plan made at recent IMPACT D.C. visit
c. Evaluation of recent asthma symptoms
d. Discuss further medical recommendations and follow-up
e. Charted by treating physician in the electronic medical record (EMR)

2. Housing Assessment – 20 minutes
    a. Led by Housing Specialist (using Indoor Environmental Trigger Checklist)
    b. Virtual home tour (photographs taken for documentation)
    c. Screening for asthma home triggers
    d. Charted by Housing Specialist in database (REDCap for this pilot)
3. Close Out – 5 minutes
    a. Led by Housing Specialist and VHV Coordinator
    b. Charted by Housing Specialist and Clinician or VHV Coordinator in the pilot database and EMR

If patient cancelled or did not attend the VHV:

1. VHV Coordinator made two attempts to call parent/guardian to reschedule the appointment and repeat Pre-Visit protocol (listed above).
2. If a patient or parent/guardian declined the VHV at that point, the original plan was to offer an in-person home visit as an alternative. With the onset of the COVID 19 pandemic, in-person visits were no longer offered as they were not an option. Reason(s) for declining the VHV were documented.

<u>Post VHV:</u>

1. VHV Coordinator sent a follow up email to parent/guardian including brief medical assessment and identified housing remediation needs.
2. Housing Specialists developed housing plans including a scope of work and shared with parent/guardian and healthcare staff. Plan was uploaded into the patient's medical chart.
    a. This housing plan was documented in the patient's EMR to ensure inclusion in clinical notes as part of patient's history and evaluation.
3. Housing Specialists communicated with parent/guardian the individualized housing remediation plan including any needed follow up in-person visit, communication with landlord, and/or coordination of home repairs
4. The housing remediation team planned to do additional follow-up in-person inspections when housing conditions warranted further examination. They also provided families with environmental asthma trigger reduction supplies such as dust mite covers, HEPA vacuums, air purifiers, furnace filters and dehumidifiers.
5. Tradespeople completed repair work in compliance with COVID-safe protocols.
6. Some families were referred to the District of Columbia Department of Energy and the Environment for possible additional remediation services such as weatherization, energy efficiencies, and lead abatement.
7. VHV Coordinator communicated with parent/guardian after the VHV to complete three surveys outlined below:
    a. *Post-48 Hours*: Questions focused on parent/guardian satisfaction around recruitment and participation in the Virtual Home Visit.
    b. *Post-1 Months*: Questions focused on parent/guardian satisfaction around receiving follow-up VHV communication and home remediation.
    c. *Post-6 Months*: Questions focused on patient's asthma risk and impairment after completion of VHV and home remediation.

RESULTS AND DISCUSSION

Patient Participation and Show Rates

The pilot demonstrated patients and families were willing to schedule and complete a video home visit to assess their homes for home asthma triggers. The team identified and approached 97 families for a VHV. Out of this cohort, 77% of approached families agreed to schedule a VHV and 76% of scheduled families completed a VHV (Figure 3). The high completion rate likely reflects a motivated patient population who had already completed an initial IMPACT DC visit - the vast majority of which were also conducted virtually. For reference, figure 4 includes show rates for other clinics and programs serving similar populations.

Figure 3: Remediation Funnel Metric (Source: VHV Study)

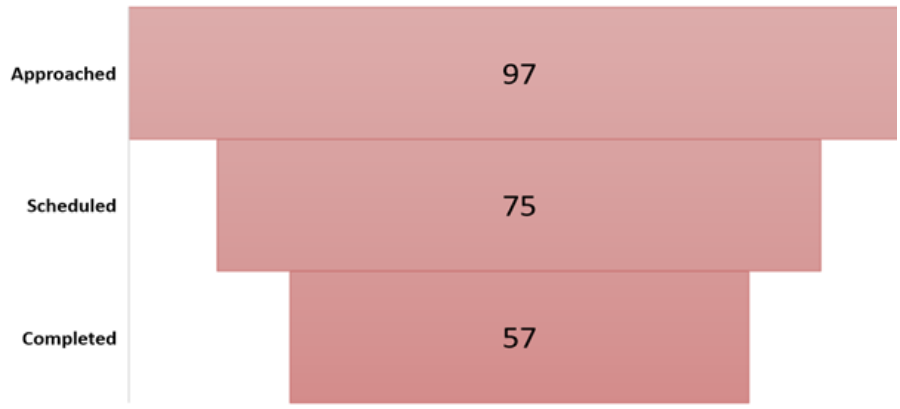


Figure 4: Show Rate Comparison (Source: VHV Study)

Program or Clinic	Show Rate
Virtual Home Visit Pilot	76%
Children's National Goldberg Center for Community Health (2020, In-Person)	77%
Children's National Goldberg Center for Community Health (2020, Telemedicine)	77%
IMPACT DC Asthma Clinic (2019, In-Person)	43%
IMPACT DC Asthma Clinic (2020, Telemedicine)	49%

Technological challenges were encountered early in the pilot study and several families benefited from direct instruction on the use of telehealth platforms. With the onset of the pandemic in March 2020, most families demonstrated increased familiarity and experience in the use of video conferencing platforms. This reflects the ubiquitous use of these platforms during the pandemic for education, workplace, and social purposes after the start of the COVID-19 pandemic.

Patient Demographics and Residence Variables

The pilot's patient population (57 patients in total) largely mirrored that seen by the IMPACT DC program as a whole. The majority of patients seen for a VHV and their families were identified as African American or Black. There was roughly an equal proportion of males and females with an average age of 8.2 years (Figure 4). The majority of patients utilize public health insurance and over 80% lived in the zip codes that comprise Wards 7 and 8 in Washington, D.C. (Figure 5). As previously discussed, residents of Wards 7 and 8 have the highest rates of healthcare utilization for asthma, higher rates of poverty, and lower rates of access to the internet compared to other areas on D.C.

The VHV pilot population did not include Spanish-speaking patients or families even though this was not an exclusion criteria and Spanish-speaking patients comprise about 10% of the IMPACT DC Asthma Clinic patient population. A number of Spanish-speaking families report substandard housing during their clinical visits with IMPACT DC. Further investigation should be pursued to understand factors that led to under-enrollment of Spanish-speaking families and to devise strategies for improved outreach and recruitment.

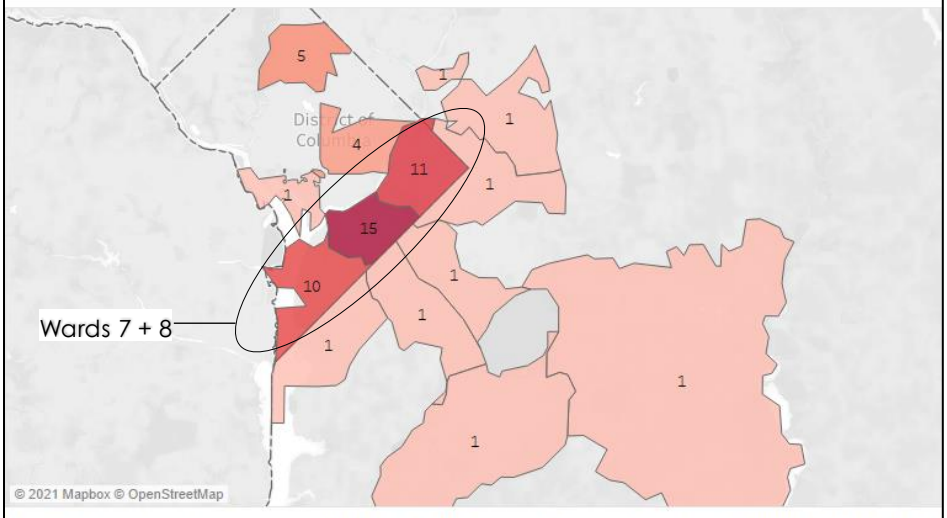
Figure 6: Residence Variables (Source: VHV Study)

Category	Frequency (%)
Residence Type	
Above Ground Apartment	26 (45.6%)
Townhouse	11 (19.3%)
Single-Family Home	10 (17.5%)
Basement Apartment	7 (12.3%)
Other	3 (5.3%)
Property Ownership Status	
Renter	49 (86.0%)
Owner	6 (10.5%)
Other	4 (7.0%)

Figure 5: Patient Demographics (Source: VHV Study)

Category	Frequency (%)
Sex	
Female	30 (52.6%)
Male	27 (47.4%)
Age	
0-6	21 (36.8%)
6-12	25 (43.9%)
12-19	11 (19.3%)
Ethnicity	
African American or Black	40 (70.2%)
Mixed	3 (5.3%)
Other/Unknown	2 (3.5%)
Not Specified	12 (21.1%)
Payer	
Public	32 (56.1%)
Multiple Payers	12 (21.1%)
Other	1 (1.8%)
Not Specified	12 (21.1%)

Figure 7: Geographic Distribution of Virtual Home Visit Patients (Source: VHV Study)



Note: Three patients were seen outside the immediate DMV area in zip codes **20906, 20879, 24747.**

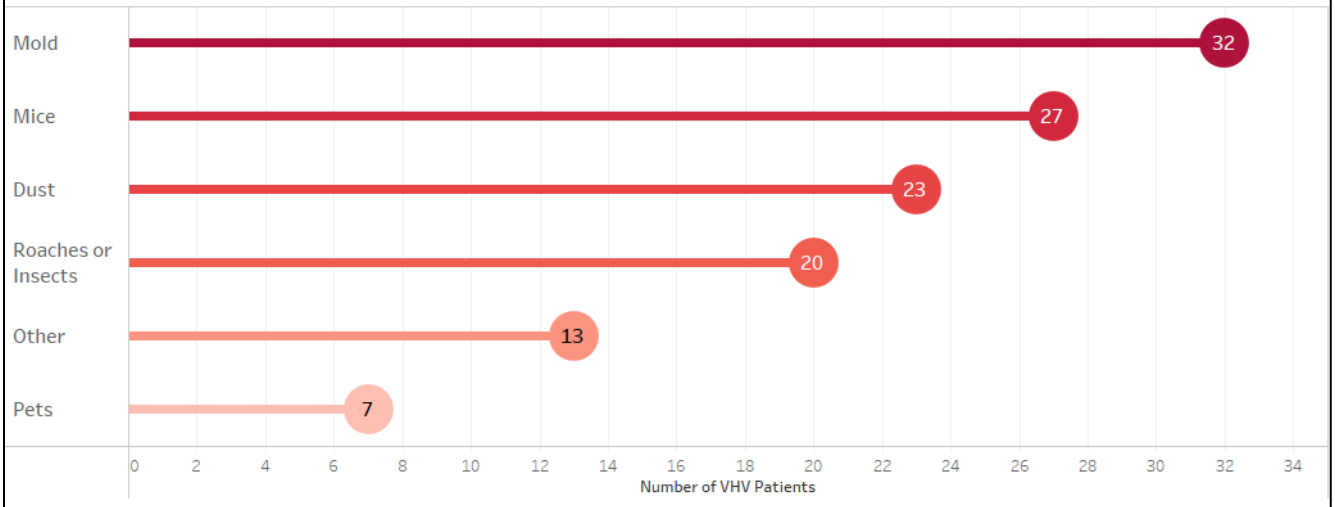
The majority of patients and families involved in this pilot live in apartments (58%) and are renters (84%) (Figure 6). Many more VHV families were dependent on property management companies or landlords to provide proper maintenance and remediation to address health triggers. Unfortunately, building management is often unresponsive to lower-income renters. Only 10% of families in the pilot owned their homes. In contrast, 19% of families referred to the Asthma Home Visiting Program at Yachad in 2019 lived in owner-occupied, single-family housing. Reasons for this difference are not apparent.

Of the 57 patients who completed a VHV, 55 patients reported environmental asthma triggers within their home. The most commonly reported triggers were mold (58.2%), mice (49.1%), dust (41.8%), and cockroaches or insects (36.4%) (Figure 8). On average, patients reported 2.16 asthma triggers per home. Of the 55 homes assessed for a VHV, the pilot team identified remediation needs in 53

homes (Figure 9). The most commonly identified issues were pests (64.1%), HVAC (60.6%), mold (52.8%), and carpeting (47.1%). The environmental asthma triggers reported by families in the pilot largely matched the home remediation needs identified by the pilot housing team. Interestingly, the housing specialists identified the need for dust remediation more often than the families reported dust as a trigger. While less frequent, more extensive remediation needs such as plumbing, roofing, and drainage were identified in a number of homes. The VHV proved to be an effective tool in assessing a home's environmental asthma triggers.

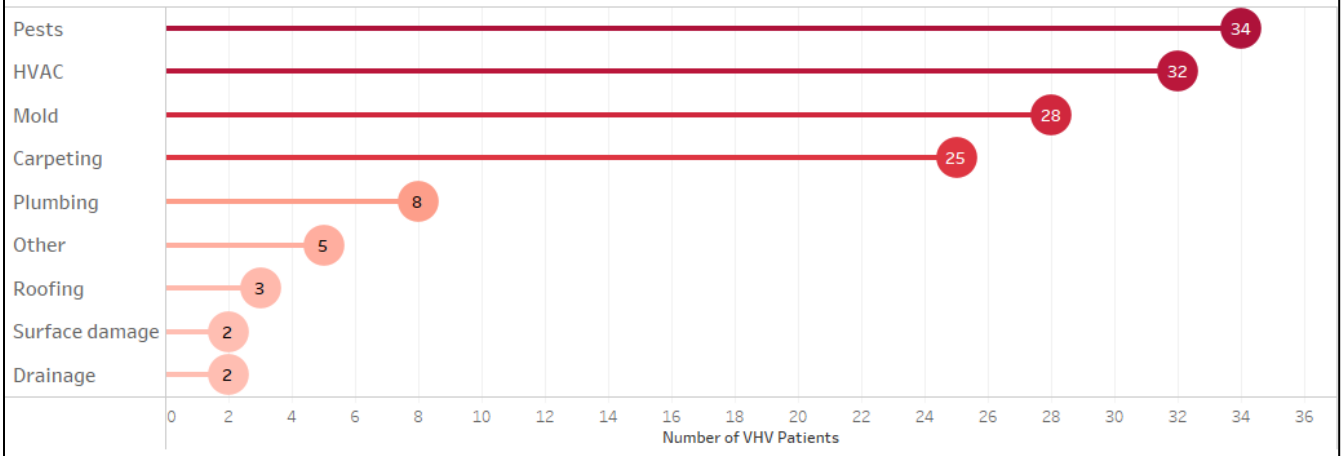
Housing Improvement Outcomes

Figure 8: Reported Environmental Asthma Triggers (Source: VHV Study)



Note: The reported percentages may add up to greater than 100% in cases where participants reported multiple environmental asthma triggers. This chart also excludes any patients who reported no enviromnetal asthma triggers or reported excersise as a trigger.

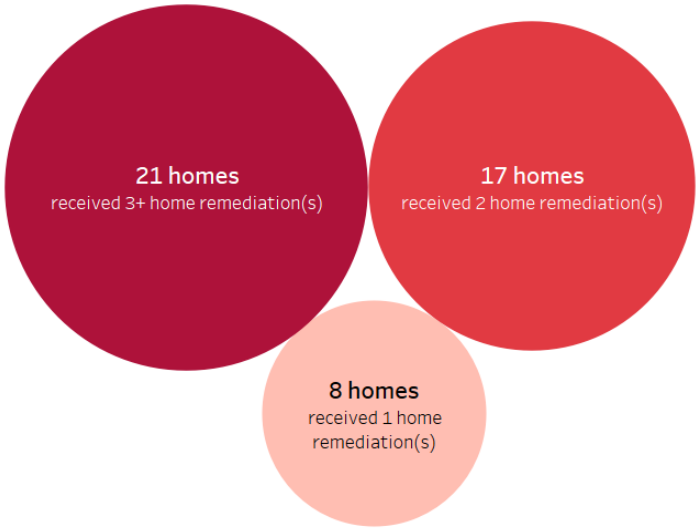
Figure 9: Identified Home Remediation Needs (Source: VHV Study)



Note: The reported percentages may add up to greater than 100% in cases where multiple housing remediation needs were identified within the same property. This chart also excludes data on properties where no housing remediation needs were identified. Additionally, the number of homes assessed for a Virtual Home Visit may be less than the number of patients seen due to instances of sibling patients residing in the same property.

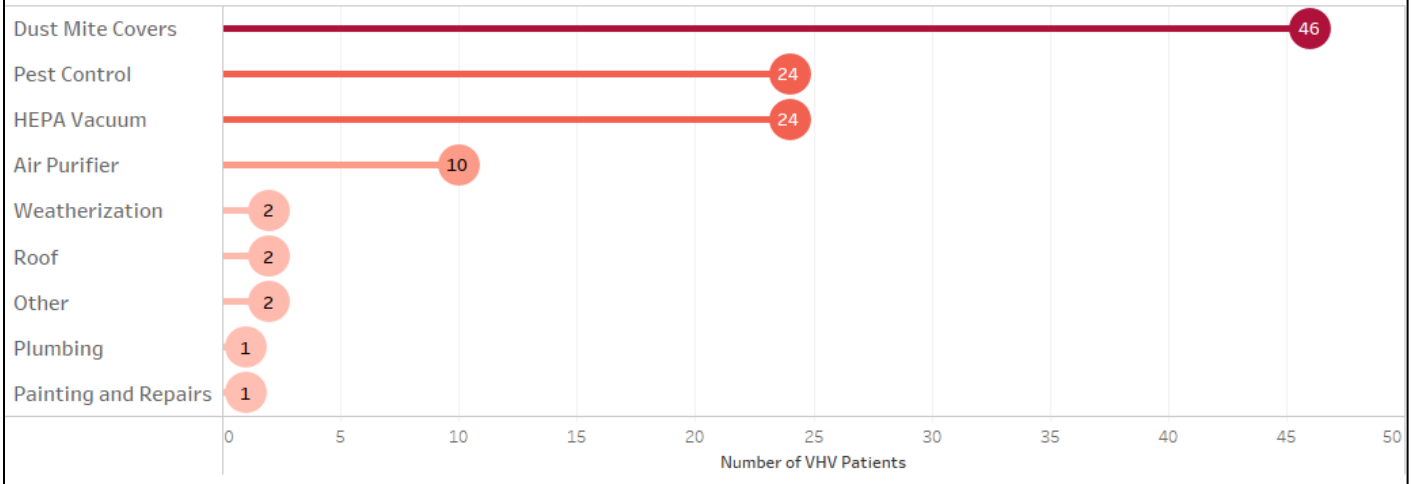
The pilot team provided remediation services to 46 homes. The majority of homes in the pilot (82.6%) received 2 or more remediations to reduce home environmental asthma triggers (Figure 10). Data from the Centers for Disease Control and Prevention (CDC) and National Institutes of Health (NIH) suggest addressing multiple triggers simultaneously is effective in reducing asthma exacerbations in children living in housing with environmental triggers[20]. Pest management is the only single-component intervention supported by evidence-based guidelines[20].

Figure 10: Home Remediation Overview (Source: VHV Study)



Of the 55 homes assessed for a VHV, the pilot team completed home remediations for 46 homes. The most commonly provided home remediation services were dust mite covers (100%), pest control (52.1%), and HEPA vacuums (52.1%) (Figure 11). In total, the pilot program completed over 112 home remediation services. Unfortunately, roof and plumbing remediation to address moisture intrusion, weatherization services to address ventilation, and flooring replacement measures were severely limited due to the COVID-19 pandemic. Health guidelines to limit social contact and exposure impacted the ability to send people into home environments to conduct work other than pest management which was identified by the DC Mayor's Office as an essential service. This made pest management a higher percentage of total remediation costs than expected during the pilot. Ordinarily, costs for more extensive remediation measures would eclipse expenditures for pest management.

Figure 11: Completed Home Remediation Breakdown (Source: VHV Study)



Note: The reported percentages may add up to greater than 100% in cases where multiple home remediations were completed within the same home. This chart excludes data on properties where no home remediations were provided. This chart also excludes data on properties that received non-remediation services such as educational materials and smoking cessation referral services that were provided to 100% and 6.5% of Virtual Home Visit families, respectively.

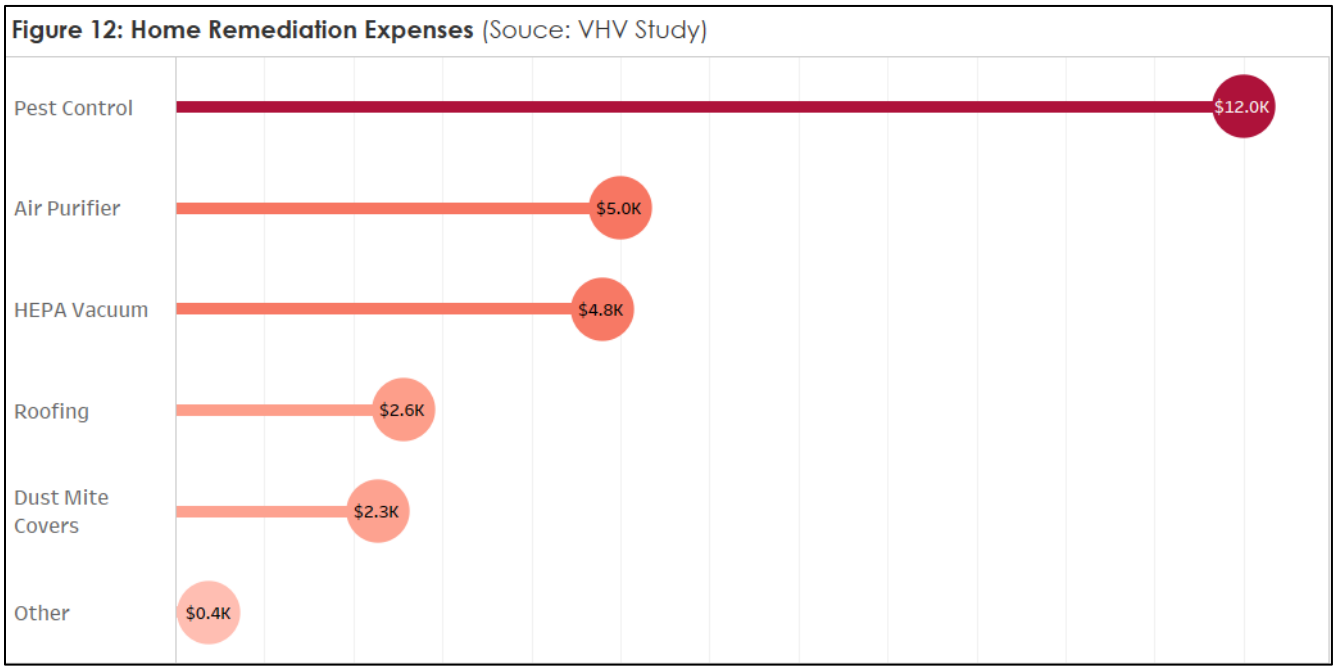
Family Stories and Highlights

Aside from data insights, the project team felt it important to highlight some family anecdotes that highlight the unique impact of Virtual Home Visits on families' housing and health outcomes.

- Ms. A purchased their family's home in 2018. Her 18-year-old daughter has asthma and participated in a VHV very early in the program. There are three other children who live in the home, ages 19, 11 and 6. Mr. A is a smoker and was referred for smoking cessation. The roof and gutters were in poor condition. Mold created by leaks from the roof and gutter problems triggered serious asthma symptoms in the 18-year-old girl who was a patient in the IMPACT clinic. Yachad repaired the roof and gutters to address the water intrusion. The family also received pest management services, new HVAC filters, mattress covers and instructions on mold prevention and removal. After this work was completed, the home was free of leaks and pests and the 18-year-old has had fewer asthma attacks.
- The persistent beeping noise during many Virtual Home Visits was a sign of smoke detector batteries failing. The pilot team provided education and replacement batteries so that smoke detectors would work properly.
- The W family was seen close to the end of the pilot period. They have lived in their family home for 28 years. There are two children with asthma, another sibling and many members of the extended family living in an intergenerational home. Chipping and peeling paint and mold in the basement led to the child and her mother to move to an upper level of the home. Flooding occurred when a neighbor's pipe burst, and the water flooded their basement. There is also some roof damage. A comprehensive inspection was performed, and the team is providing a referral to the city's lead reduction program. Roofing repairs will be done prior to the lead work.

Home Assessment and Remediation Expenses

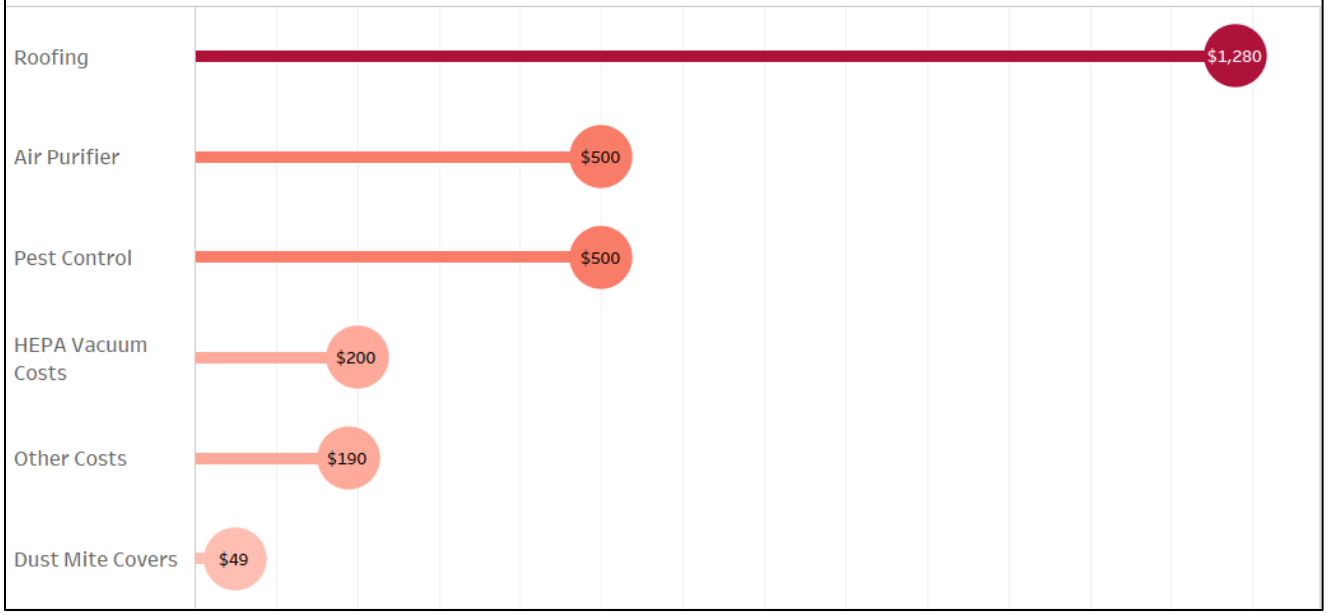
Figure 12: Home Remediation Expenses (Souce: VHV Study)



Yachad spent $74,100 on total expenses related to providing Virtual Home Visits and completing home remediations. An average of $1,300 was spent on each family in the pilot program. Funds were spent on operational expenses and outsourced home repair expenses. Operational expenses included all the home remediation work provided by Yachad's housing construction manager and community health care worker. Under this arm of expenses, Yachad provided inspection and consultation services, harm reduction resources and technical assistance to families, including assistance

to tenants on how to address housing conditions themselves. Outsourced home repair expenses included the labor and materials involved in contracting tradespeople to complete home remediations. Due to the pandemic, the Yachad team spent an increased amount of time ordering, obtaining, and delivering asthma-related supplies to families and less funding was spent outsourcing the home remediation work to independent contractors.
Of the $28,000 that Yachad spent on home remediation, pest control expenses contributed the largest percentage (42.8%) of home remediation expense, followed by air purifiers (17.8%) and HEPA vacuums (17.1%) (Figure 12). Due to COVID-19 it was difficult to provide complete remediation for some of the substandard housing conditions identified during the VHV visits for both single family homes and rental units. Additionally, a majority of the VHVs involved inspecting rental units that required landlord permission for any significant remediation measures beyond pest management. As a result, plumbing repairs, significant mold removal, carpet removal, drywall repair, and other conditions such as non-working kitchen appliances, and HVAC concerns had to be either postponed or were dependent on responsible building management addressing those issues. The pilot team was able to provide more remediation measures to single family homeowners including roof and gutter repairs and some plumbing work.

Figure 13: Average Remediation Cost (Source: VHV Study)



On average, roofing repairs were the costliest home remediation, despite being an infrequently completed remediation measure. Interestingly, the most commonly provided remediation measures, such as dust mite covers, pest control and HEPA vacuums, were relatively low cost on average (Figure 13). Overall, average costs from this pilot program are comparable to average home remediation costs the Yachad program incurs outside this pilot for asthma-related work.

Health Outcomes

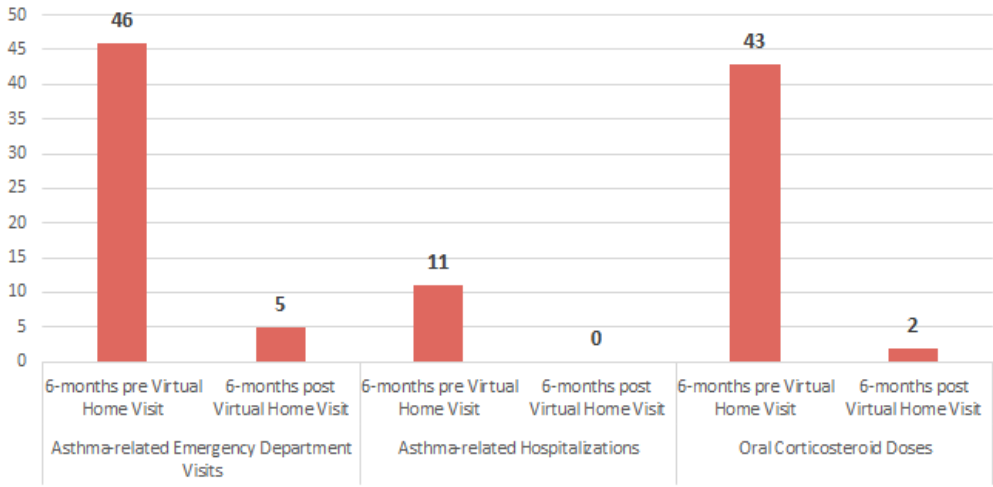
Asthma outcomes as measured by emergency room visits, hospitalizations, and oral corticosteroid use dramatically improved following the VHV. These measures are well-accepted as measures of asthma outcomes.

The Virtual Home Visit pilot demonstrated significantly improved health outcomes. The number of asthma-related emergency hospital visits declined 89.1%, the number of emergency room hospitalizations declined 100%, and the

number of Oral Corticosteroid doses administered to VHV patients declined 95.3% post VHV and remediation. The majority of these outcomes were achieved with relatively low cost remediations such dust mite covers, pest control, and HEPA vacuums.

However, the COVID-19 pandemic significantly affected asthma rates and healthcare utilization due to asthma. Many institutions, including Children's National Hospital, observed overall decreased healthcare utilization for asthma and other chronic conditions. For example, the spike in ED visits and hospitalizations for asthma typically seen at Children's National Hospital in the fall did not occur in 2020[21]. This is likely due to mitigation measures for COVID-19 which reduced overall exposure to viruses – a known contributor to asthma exacerbations.

Figure 14: Patient Healthcare Utilization, 6 Months Pre- and Post-Virtual Home Visit (Source: VHV Study)



As mentioned previously, the pilot team was unable to adequately address triggers such as mold and plumbing due to stay-at-home measures during the COVID-19 pandemic. This likely decreased the team's ability to impact health outcomes. Additional investigation will provide opportunities to further describe the effect of the VHV program and remediation on asthma outcomes. Further investigation may involve studying the effects of roof and plumbing remediation to address moisture intrusion, weatherization services to address ventilation, and flooring replacement measures once COVID-19 related restrictions are lifted.

Patient Satisfaction Results

Housing and asthma outcomes in this pilot demonstrate the VHV as an effective tool in the evaluation of homes for asthma triggers. Satisfaction surveys conducted 72 hours, 1 month, and 6 months following the VHV, clearly highlight the acceptability of this format by patients and their families (Figure 15). Nearly all families would recommend the VHV to another person (98%) and expressed overall satisfaction (100%). Most families felt the VHV had a positive impact on their child's health (76%).

Figure 15: Patient Satisfaction Survey Results* (Source: VHV Study)

*Specific questions were selected from 3 surveys conducted 72 hours, 1 month and 6 months after patients' Virtual Home Visits. Responses were omitted if the pilot team was not able to contact the family after their VHV.

Question/Response	Post 72 hours	Post 1 month	Post 6 months
Overall, I was satisfied with my experience participating in a Virtual Home Visit.			

Strongly Agree	71%	55%	68%
Agree	29%	43%	32%
Uncertain	0%	2%	0%
Disagree/Strongly Disagree	0%	0%	0%
I would recommend this Virtual Home Visit program to another person.			
Strongly Agree	N/A	46%	49%
Agree	N/A	54%	51%
Uncertain/Disagree/Strongly Disagree	N/A	0%	0%
I believe the services and/or home repairs I received have made an improvement in the health of my child/family.			
Strongly Agree	N/A	N/A	36%
Agree	N/A	N/A	40%
Uncertain	N/A	N/A	24%
Disagree/Strongly Disagree	N/A	N/A	0%
Have you ever used a telehealth (videoconferencing) application before today's Virtual Home Visit?			
Yes	81%	N/A	N/A
No	19%	N/A	N/A

Program Outreach

Figure 16: Pilot Program Outreach Activities (Source: VHV Study)

Date	Event Type	Event	Time	Attendance
4/2/2020	Presentation	RAMP Virtual Asthma Home Visits Webinar	1:00PM-2:00PM	100+
7/15/2020	Meeting	Discussion with Contra Costa Health Plan	12:00PM-1:00PM	6
11/5/2020	Meeting	Discussion with AAFA St. Louis	12:00PM-12:30PM	5
8/11/2020	Meeting	Discussion with Mount Sinai	3:00PM-4:00PM	3

In April of 2020, as the COVID-19 pandemic led to an immediate pause in asthma home visiting programs nationally, the pilot team led a webinar presented by the Regional Asthma Management Prevention Program (RAMP). The session included discussion of the logistics, challenges and lessons learned in implementing a Virtual Home Visit program and reached 100 live attendees and additional viewers who watched the recorded webinar posted on the RAMP website. Several attendees reached out to the pilot team after the webinar, which led to one-on-one meetings with organizations who were seeking additional support in launching programs of their own. This demonstrates both an interest from multi-sector organizations in replicating the Virtual Home Visit model and a need to develop comprehensive standard operation procedures and resources to support organizations as they navigate their implementation of this model.

CONCLUSION AND NEXT STEPS

The pilot's novel approach provided coordinated medical care, housing assessment and remediation, and case management through a VHV. The VHV decreased the amount of time and travel needed to conduct a home visit and allowed for multiple providers to participate from different locations. Importantly, the VHV became the only viable option for home assessments during this period when in-person visits were not permitted. Identifying health and community partners is a crucial first step. The pilot promoted the development of clearer lines of communication among the partners and improved resource allocation. The collaboration also strengthened advocacy efforts with local agencies and funding sources which favorably view joint community projects.

The unique conditions and challenges presented by the COVID-19 pandemic need to be acknowledged when interpreting the outcomes and lessons learned during this pilot. Further investigation will be needed to describe outcomes independent of the effects of the COVID-19 pandemic.

Finally, deteriorating housing stock and unhealthy living conditions are key contributors to gentrification and displacement. In providing access to remediation that improves the healthfulness of housing, a telehealth model can keep owners and renters in quality, affordable housing that exists in their neighborhoods and communities for generations to come. Future housing policy should consider these findings.

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APPENDICIES

Indoor Environmental Trigger Checklist: This checklist was developed by the housing specalists on the project team to guide the home assessment portion of the Virtual Home Visit.

Parent Focus Group Summary Report: This report was developed by the project team in to summarize findings from two parent focus groups that were conducted in 2019 with parents of children with asthma in D.C. to understand their feedback on participating in a Virtual Home Visit.

Remediation Budget Information: This document was developed by Yachad to keep track of standard costs for different types of home remediation measures.

OTHER RESOURCES

Healthy Housing Reference Manual – U.S. Department of Health and Human Services and U.S. Department of Housing and Urban Development

Leading Our Nation to Healthier Homes: The Healthy Homes Strategic Plan – U.S. Department of Housing and Urban Development and Office of Healthy Homes and Lead Hazard Control

REDCap Reference Number				
IDC staff has received patient consent to VHV	Yes	No		
Date and Time of VHV				
Clinician name on VHV				
Housing specialist name on VHV				
Name of house holder (Primary adult resident)				
Home Address				
Contact phone:	Cell	Home	Other	
Does resident rent or own home?	Own	Rent		
How many children total, under 18, reside in the home?				
Are there any children under 6 year's old?				
Primary CNM Patient (Child's name)				
Date of Birth:				
Secondary or other CNM Patient in home(Child's name)				
Date of Birth				
Are there other children or adults in home, with any asthma or respiratory issues? (Not current CNM patients)	Yes	No		

Questions	**Yes**	**No**	**Follow-up?**	**Reviewer's Comments**
1. What do you think is making the child's asthma worse?				
a. Dust				
b. Mice				
c. Mold				
d. Pets				
e. Roaches/Water bugs				
f. Weather				
g. Exercise				
2. Who lives in this household and how many of each?				
a. Parent(s) _____				
b. Grandparent(s) _____				
c. Sibling(s) _____				
d. Other Relatives _____				
3. Does the child sleep in their own bed or with caretaker?				
a. Own bed				
b. Caretaker				
c. Both				
d. Neither				
4. How long have you lived in this building?				
a. Less than 1 year				
b. 1-3 years				
c. 3-5 years				
d. 5-7 years				
e. More than 8 years				
5. Who manages this building?				
b. Private Landlord				
c. DC Public Housing				
d. Owner Occupied				
Smoking				
a. Does anyone in this household smoke cigarettes or marijuana?				
b. If so, are they interested in quitting?				
Educational Materials				
What was left behind with the family?				
a. Educational materials				
b. Mattress and pillow covers				
c. HEPA Vacuums				
d. Referral to Pest Management				
e. Referral for Smoking Cessation				

Questions	Yes	No	Follow-up?	Reviewer's Comments
Housing conditions- *NOTE: If appropriate and possible, Photos should be taken at items noted.*				
Pests (Specify rooms or areas pests have been seen.)				
a. Have you ever seen mice in your home?				
b. Have you ever seen cockroaches or water bugs in your home?				
c. When was the last time you saw any pest in yor home?				
d. Have you ever seen other pests in your home?				
PHOTO: Please show me any pest evidence.				
2. If yes, who has taken action?				
a. Building manager has taken action				
b. Family has taken action				
c. No action taken				
What action has been taken?				
a. Pest Management Company was called				
b. Over the counter sprays, traps or poisons				
Was the pest action effective?				
Heating and Air Conditioning				
Do you have any problems heating your home?				
Do you have oil heat?				
Do you have gas heat?				
Do you use any wood or kerosene burning heating in home? (Specify rooms used)				
Are there radiators?				
Do you have air or heat vents?				
When was the last time the furnace filters were changed?				
a. Never				
b. 6 months ago				
c. One year ago				
Do you have access to your furnance filter?				
Do you know the size of your furnace filter? (Specify size for delivery.)				
PHOTO : Please show me the furnace filter if possible.				
Do you have central air conditioning?				
Do you have window A/C units?				
PHOTO: show me the filters on your window air conditioners.				
Moisture, Mold, and Smells				
Do you have rooms or areas where there is Mold/mildew (visible mold or musty smell)?				
Do you have rooms or areas that are hard to keep dry or leak during heavy rains?				
Are you concerned about any Strong or irritating smells?				
Do you have or need a dehumidifier?				
PHOTO: Please show me your dehumidifier, if available.				
Do you have any active water leaks or any moisture concerns in your home? (Note: General size and location area in room)				
Are there smells that come into your unit from other units? If so, where?				
a. Entrance				
PHOTO: *Please show me any moisture concerns.*				
b. Dining room				
PHOTO: *Please show me any moisture concerns.*				
c. Living room				
PHOTO: *Please show me any moisture concerns.*				
d. Kitchen				
PHOTO: *Please show me any moisture concerns.*				
e. Children's bedroom				
PHOTO: *Please show me any moisture concerns.*				
f. Other bedrooms				

Questions	Yes	No	Follow-up?	Reviewer's Comments
PHOTO: *Please show me any moisture concerns.*				
g. Basement				
PHOTO: *Please show me any moisture concerns.*				
h. Other areas not listed				
PHOTO: *Please show me any moisture concerns.*				

Questions	Yes	No	Follow-up?	Reviewer's Comments
Pets and animals				
Are there any pets or other animals living in home? (Specify number and type)				
Does the pet sleep in the child's bedroom?				
Is there any urine or feces from animals anywhere in home?				
Are pets or other animals kept outside?				
PHOTO: *Photo of pet health hazards as needed.*				
Do you have rooms or areas hard to keep free of dust?				
Do any rooms have curtains, drapes or wall hangings that can't be easily cleaned or washed?				
PHOTO: Please show me areas of concern.				
Carpet and flooring				
Do you have wall-to-wall carpet in any rooms?				
Does carpetting need replacing? If so, why?				
PHOTO: Please show me the carpet.				
Do you regularly clean or vacuum carpet?				
Do you have a good, working vacuum cleaner?				
Does your vacuum have the words HEPA written on it?				
PHOTO: Please show me your vacuum cleaner.				
Surface Damage				
Is there any damage to the walls, floors, or ceiling in your home?				
Are there any holes in walls, ceilings or floor surfaces?				
Do you have holes or rooms where you are concerned mice or other pests can enter?				
a. Entrance				
PHOTO: *Please show me any holes or damage.*				
b. Dining room				
PHOTO: *Please show me any holes or damage.*				
c. Living room				
PHOTO: *Please show me any holes or damage.*				
d. Kitchen				
PHOTO: *Please show me any holes or damage.*				
e. Children's bedroom				
PHOTO: *Please show me any holes or damage.*				
f. Other bedrooms				
PHOTO: *Please show me any holes or damage.*				
g. Basement				
PHOTO: *Please show me any holes or damage.*				
h. Other areas not listed				
PHOTO: *Please show me any holes or damage.*				
ADDITIONAL NOTES IF NEEDED				

Children's National

Fannie Mae Innovation Challenge

Parent Focus Groups

Parent Perspectives on Asthma, Telehealth, Home Visits and Housing Repairs

July – August 2019

Executive Summary

This report summarizes focus group findings conducted as a part of the Fannie Mae Innovation Challenge. Key findings are based on two focus group discussions conducted with 20 total parents/caregivers of children diagnosed with asthma living in Washington, D.C. Focus groups explored parent experiences, comfort levels and perspectives on utilizing technology to conduct medical appointments and home visits pertaining to their child's asthma. Two focus groups were conducted with individuals aged 31 to 64. Ninety-five percent of participants self-identify as African-American and 75% reside in Wards 7 & 8 of Washington, D.C; detailed participant demographics can be found in the appendix. Through guided yet open discussion, parents/caregivers expressed honest opinions and feedback to help develop a Virtual Home Visit program, enabling families to meet virtually with a housing specialist and a medical provider using smartphone video technology. As a result, valuable insights were gained into the participants' desires and concerns towards telehealth and home visits, such as convenience, privacy, reliability, and ease of access. These key findings will be incorporated into a Virtual Home Visit program launching in January 2020.

Introduction

Asthma is the most common chronic pediatric disease, affecting at least 6.3 million children annually. In Washington, DC, families in Wards 7 and 8 experience a higher prevalence and severity of pediatric asthma disease burden, in part due to these communities' disproportionate share of older, poorly maintained and constructed housing stock where health-related housing conditions, such as mold and pest infestations, can significantly exacerbate childhood asthma symptoms. Pediatricians recognize the critical importance of an objective in-home housing conditions assessment to identify asthma triggers; however significant barriers include scheduling difficulties, family living circumstances, caregivers' personal issues and trust issues around allowing strangers into the home. The proposed Virtual Home Visit program will allow a pediatrician to schedule a telemedicine visit along with a housing remediation expert instead of an in-person home assessment. As the neediest families experiencing correlated risks are identified, we will work with them, landlords, community organizations and other housing experts to facilitate suitable interventions that can improve the health of their child.

Two parent focus group (PFG) discussions were conducted with parents/caregivers primarily residing in Wards 7 and 8 of Washington, D.C. to gain perspectives and feedback on a Virtual Home Visit program protocol, structure and evaluation metrics. The PFGs were coordinated in collaboration with IMPACT DC and the Child Health Advocacy Institute at Children's National Health System, as well as Breathe Easy, YACHAD, Local Initiatives Support Corporation and Institute for Public Health Innovation.

Objective

PFGs were designed and conducted to collect feedback from parent/caregivers of children with asthma on (1) their accessibility to a smartphone device and connectivity to Wi-Fi, (2) their experience and comfort level utilizing smartphone technology for their child's medical care, (3) their comfort level in using smartphone technology to identifying specific areas of the home, and (4) their positive and negative feelings

towards virtual home visits with a medical provider and housing specialists. Parents also shared challenges and experiences with housing conditions and barriers to addressing the underlying environmental conditions that contribute to their children's health issues.

The population in Wards 7 and 8 of Washington, DC includes about 60,000 total households with an average age of 32.6 and 55% female residents. Approximately 31% of persons in Ward 7 and 8 live below the poverty line. The parent focus groups included representation form Wards 7 and 8 in order to elevate the voice of community members most impacted by substandard housing and pediatric asthma.

Methodology

Two focus group discussions were conducted with 20 parents/caregivers to explore their perspectives. The first focus group was held on July 24th from 1:30-2:30pm at United Medical Center (1310 Southern Ave, Conf. Room 2 and 3, Washington D.C., 20032) with 9 participants and the second focus group was held on August 19th from 4:30-5:30pm at Children's National Medical Center (111 Michigan Ave NW, WW Floor 5 East and South Conf. Room, Washington D.C., 20010) with 11 participants. Focus groups were held at these locations to capture voices and attendance from the communities of Wards 7, 8 and 4, where pediatric asthma is most prevalent. Both focus groups were facilitated by Ms. Katharine Richardson form the Local Initiative Support Corporation and Ms. Melissa Baiyewu from the Child Health Advocacy Institute. Focus group questions are listed in the appendix.

Parents/caregiver participants for the first Parent Focus Group on July 24th were identified from a list of families that had been seen at the IMPACT DC Asthma Clinic in the last fiscal year and who had also been referred to the Breathe Easy Home Visiting Program for environmental housing triggers. This identification process helped ensure that participants had children with asthma and potential unhealthy housing conditions or experience with a home visiting program. Families were called until 20 parents/caregivers had confirmed attendance for the focus group with the expectation of a 50% show rate for the event.

Parents/caregiver participants for the second Parent Focus Group on August 19th were identified from IMPACT DC's Parent Advisory Council (PAC). This cohort is comprised of parents/caregivers that have multiple children with asthma who have been seen at the IMPACT DC Asthma Clinic. This group of individuals supports the IMPACT DC program through frequent attendance at focus groups, outreach events and advocacy events throughout the year. Families from the PAC were called until 15 participants confirmed attendance for the event. Because of the Parent Advisory Council's partnership and affiliation with IMPACT DC, fewer participants were recruited with the expectation of a show rate higher than 50% for the event.

Key Findings

Summary:

Across both groups, participants expressed enthusiasm about the concept of a virtual home visit, while recognizing that the technology is just one piece of a broader solution. Parents spoke positively about the potential time-savings, convenience, and cost-savings (e.g. not having to pay for transit or childcare). In addition, almost all parents/caregivers had smart phones and access to data or Wi-Fi, and a few had used

telemedicine previously. However, parents cited concerns about privacy and confidentiality, ensuring follow-up with housing issues (e.g. the need to implement solutions, not just diagnose), and, in some cases, having good service in the home, or noisiness. Some suggestions from parents included: 1) having a place to upload photos of housing conditions, 2) flexibility in scheduling, including hours before and after work, 3) simplicity and accessibility of the app, and 4) ensuring parents outside of the IMPACT DC program could also use the app. In both sessions, the majority of parents had encountered various housing conditions and challenges in getting the conditions addressed. The vast majority of participants were renters, living in public housing, renting from a private landlord, or other subsidized housing. Parents shared many experiences with unresponsive landlords or management companies and expressed the need for a virtual home visit program to not just asses, but also complete housing repairs. Detailed discussion notes including participant quotes can be found below, grouped by focus group session.

Focus Group 1

9 total attendees

Challenges and fears managing child's asthma

- 'When my child gets a cold, it scares me. I have to stay up and tend to her needs making sure she is doing ok'.
- 2 of 8 parents mentioned that their children are very active and find it difficult to keep still which can prove tricky when trying to manage their asthma. 'He's always running around'.

Smartphone Ownership/ Technology (Wi-Fi/internet)

- 6/8 people raised their hands when asked if they own a smartphone
- 6/8 people have access to Wi-Fi/internet

Feelings towards use of a smartphone for conducting a virtual home visit

- 'I think it's innovative; convenient; good, smart'.
- 'Sometimes when people come out, they miss things – but if we use our phone, they see what we see'.
- 'No need for driving'.
- 'I do not have to miss what I'm doing; my kid doesn't have to miss school'.

How comfortable would you be to give a tour of your house with your smartphone?

- 'Very comfortable, I want them to see what's happening'.
- 'It's the same as if someone came to your house, you control what they see'.
- 'I would have no problem showing them'.
- 'I think it would be great to have something that would enable you to take a picture'.

How many of you know where your water heater is?

- All raised hands
- 1 person stated that her water heater is situated outside of her property

How many of you know where your air filter is?

- All raised hands

Would you be comfortable using your smartphone to show mold?

- All stated very comfortable
- 'Especially if it's to do with my child's health. I want them to see the mold'.

Concerns rose about use of smartphone for virtual visit

- Confidentiality
- State of home – if messy or unkempt
- If the person watching the virtual tour is not paying attention to what they are supposed to be doing
- Mandated reporter concerns expressed – fear of being reported to child services/social services for a messy home
- 'They should give us notice before, so we could get the house prepared'.

How do you currently use your smartphone?

- 'Scheduling; appointment reminders; access medical record; use of care app'

What do you think would work well if you had a visit with your child's healthcare provider via video?

- 'No wait period/less waiting'
- 'Convenient'
- 'You do not have to worry about transportation'

What negatives might you might expect from a virtual visit?

- 'Not everything would be easy to diagnose, like a wheeze'.
- 'Confidentiality/privacy is a concern. Who has access to the video?'

If you had to download an app to your phone, how would you feel?

- 'It's necessary if you want the convenience, you gotta do it'.

Housing – any maintenance or repair issues able to fix?

- 1 parent stated that she has had a lot of housing issues. 'It's been 3 years. They haven't fixed anything. One time the [maintenance person] came to do something with the pipes in the walls and it ended up making my child's health worse'
- 'Water damage, concern with black mold. I am having to spray bleach'
- 'They redid my walls but neglected the tub'. I got them to fix the walls because I kept calling the rental company'.
- 'Instead of fixing the problem they paint over the mold. They do patch work instead of addressing the problem, and the mold keeps coming back'.
- 'My kid's room is below the neighbor's bathroom. Management is unresponsive. Last time I had a major problem I moved, if they do not get it together, I will move again'.
- 'Some of us are not in a position to up and move, we need a decent standard of living, we need assistance for better housing'

Housing Repairs – For those who had repairs done - Was there any improvement to child's health once repairs were addressed?

- 'Yes. My child's sneezing and wheezing got better'
- 'My child's health got worse when they came to do something to the pipes in the wall. With every change of season, we have to rush her to the ER because of her asthma. Now that we have the nebulizer its better'.

From your perspective as a parent, what is most important to keep in mind?

- 'Communication'
- 'Responsiveness'
- 'Scheduling, ideally something around the clock, 24/7 – that would allow us to shoot a video'
- 'Privacy'
- 'Being able to set tours when we are not at work'
- 'They do what they say they are going to do'
- 'If you cannot fix the problem then get us out of there. We shouldn't have to stay. We need assistance for better housing'.
- 'Make the app easy to use, not all of us are tech savvy'.

Focus Group 2

11 total attendees

Smartphone Ownership/ Technology (Wi-Fi/internet)

- All raised their hands when asked if they own a smartphone
- All have access to internet using smartphone

Feelings towards use of a smartphone for conducting a virtual home visit

- 'It's a good idea, you can see a lot with a camera'.
- 'There may be a certain type of mold or something growing that the housing specialist would be able to identify. They have a trained eye, we don't'.
- 'Good idea because when you have sick babies it's hard to be outside and it's more risk for them. It's good because we do not have to expose baby outside'.
- 'A lot of people cannot make it out because of traffic or having to see more than one person. Impact helped me so much with my carpet, didn't realize it was the carpet triggering it the whole time'.
- 'Virtual reality really is helpful because it's quick'.

Invasion of Privacy

- No concerns arose.

How comfortable would you be to give a tour of your house with your smartphone?

- 'I have nothing to hide, especially if you are trying to help out my child. I don't want to be in front of news people but if it's to do with health I do not mind. If your house is a little junkie just do like grandma says, "excuse the house, we got kids". It's not about me, so I don't mind'.
- 'Very comfortable'.
- 'I'm fine with it, I have nothing to hide'.

How many of you know where your water heater is?

- Yes - 4
- No - 5

How many of you could locate your heating and air conditioning system, particularly air filter?

- All raised hands

Would you be comfortable using your smartphone to show mold?

- All stated very comfortable showing this

Concerns rose about use of smartphone for virtual visit

- 'The noise the babies do. When I'm on my phone they think I am talking to family and they want to be heard so they are really loud when I'm on the phone'.
- 'Wi-Fi signal. Our phones do not always work; we need financial help from you all with accessing good enough Wi-Fi because it is expensive'.
- 'Time. I am always late for everything because of my kids'.

How do you currently use your smartphone?

- 2 parents had used their smartphone for telemedicine visits
- 'I do not use my phone for anything medical. This is my first-time hearing about the virtual reality things so I'm down for it'.
- 'Also my first time hearing of this also, but would love to be part of it because my child is more triggered by nature, and I do not have a car right now. I do not have to take two buses to get what I need with this. Before I leave here can someone show me how to download that app?' – One parent explains how to use telemedicine – Katherine clarifies what this program is about and the difference from the telemedicine program.
- 'I use mine to call for appointments, to make complaints, Children's Law Center – all phone calls and not through an app'.

Katherine asks parents who have used telemedicine for feedback on their experiences:

- Most stated no negatives, one parent mentioned the reception but that the doctor usually would call right back.

If you had to download an app to your phone, how would you feel?

- 'I would have no problem with it'.
- 'No problem. I can take it off if I am not using it and put it back when I need to use it'.
- 'I guess we would just have to make sure we have space in our phone for that'.
- 'Will you all be able to provide a tablet or device for us to be able to use for our children's health related activities? Because where we live, we have problems with the Wi-Fi."

Housing – any maintenance or repair issues such as mold, leaks, and infestations? If so were you able to get them fixed?

- All indicated had problems
- 'Mold in my bathroom, but also outside of the bathroom. No I have not been able to get them fixed. I rent. I have been over to my landlord once a week asking them to get rid of the mold and they do not do it. Someone will come over and wipe down the mold and then paint over it – and the mold came right back. Ever since I have been telling them it's there, but nothing'.
    - **All echo in agreement with this parent**
- **One parent advised others to go to the Children's Law Center because they had helped her and her children move to a new home**
- 'Rats, roaches, lizards, people smoking in the hallways. Because of Children's Law Center they have now cleaned up everything including the carpet and air filters.

- 'I am on the ground floor, there was condensation in my kids closet and wet carpet. It took the landlord 3 weeks to come out and look. My kids have asthma and now I do, I was diagnosed two years ago. There was mold underneath my stove. I told them and they have not come to fix it. Also the AC stopped working. I had to call regulatory affairs because I have 5 kids with asthma and 2 with lung disease. I withheld the rent and then the landlord came and fixed everything'.
- 'My insurance agent helped me with the problems with my home. Rental office sent an email to everyone that I complained about that was smoking and all they did was send an email to everyone that if anyone was found smoking, they would increase the rent by $100'.

From your perspective as a parent, what is most important to keep in mind?

- 'As parents we are stressed with everything we are dealing with. If we do not stay consistent please just call us - a simple phone call goes a long way'.
- 'Be open-minded that not everyone can afford Wi-Fi – so bear that in mind. Also some people live with other people so bear in mind that it may be a violation of their privacy. Also there are some people who do not know their children have asthma'.
- 'I can smell roaches and mice, even in my kids' school. I could smell the mice feces because it's also my trigger. I complained to them about this and took pictures and they did nothing. The school trying to drop my kid's grade because he is at the ER or home because of asthma and that is not right'.

Conclusion

Recurrent themes emerged from focus group discussions:

Access to Smartphone/Internet

A strong majority of parents and caregivers of children with asthma in the Southeast DC community have smartphones and access to internet in the home. However, they are uncertain whether their internet connection is strong enough to maintain clear and consistent connectivity during a virtual home visit. As the virtual home visit protocol and patient recruitment process is development, it will be important to determine what, if any, impact can be made on these barriers and if any external individuals/groups can be engaged to help overcome this barrier. Some possibilities can include: testing the telemedicine platform with multiple cellular providers to understand any general connectivity issues or patterns amongst carriers, or providing iPads to participants who may experience poor connection with Wi-Fi or cellular data in their homes.

Privacy and Confidentiality

Parents and caregivers have concerns about who will have access to the virtual home visit video, where it will be stored, and worries that they may be unexpectedly reported for an unkempt home. To alleviate these concerns, careful thought and consideration should be put into the waiver documents and consenting process for the Virtual Home Visit program, which will help families understand their right to patient privacy, confidentiality and exactly what parties will have access to their virtual visit footage and medical information. Drafted documents will undergo multiple rounds of revision, and can then be reviewed by health literacy professionals at Children's National Health System. The final waiver documents and

consent process can then be presented to a cohort of parents from the IMPACT DC Parent Advisory Council to ensure clarity and comprehensiveness before the start of patient recruitment.

Ease of Access

Parents and caregivers expressed desires for a virtual visit application to be as simple to use as possible with scheduling availability during nights and weekends. Most individuals do not have experience utilizing telehealth previously, but are looking forward to seeing a healthcare provider and housing specialist in one virtual visit where they do not have to take additional transportation or time off from their child's school day. To accommodate these desires, the telehealth platform should be explained and trialed with prospective families prior to the virtual home visit, allowing a parent or caregiver to ask questions and ensure clear understanding of the technology. In addition, efforts should be made to include appointments in the later afternoon and early evening, in hopes that families will not have to take time off school or work for the Virtual Home Visit.

Home Repair Completion

Many parents and caregivers in the Southeast D.C. community experience challenges with substandard and ultimately unhealthy housing conditions such as mold, pests and ventilation. Families have had experiences with home repair in the past through a landlord or home remediation program, some of which was incomplete or inadequate. Therefore, caregivers echoed a sense of wariness and doubtfulness whether a Virtual Home Visit program would truly result in successful home repair completion. To address these concerns, careful thought and consideration should be put into the documents that will explain the virtual home visit program to prospective participants during patient recruitment. The consent process and waiver forms should include language to explain that home repairs are not guaranteed to all participants and the need will be assessed per home and patient. This language should also be reviewed by health literacy professionals at Children's National Health System and presented to a cohort of parents from the IMPACT DC Parent Advisory Council.

Children's National

Appendix

Parent Focus Group Questions

***Icebreaker Question*:**

- Please introduce yourself with your name and how many children you have and the most challenging thing about managing their asthma

Technology/Virtual Home Visit:

- Through a show of hands, how many of you own a smartphone? (Note # of hands)
- Can we see again through a show of hands how many of you have an internet data plan or Wi-Fi at home to access internet on your smartphone?
    - Prompt: How many have a data plan and how many have WiFi? (Note # of hands for each)
- How do you feel about using your smartphone to conduct a virtual home visit, where a housing repair specialist could view different parts of your home through a video and screen?
    - What are some positive or good things you might expect from a virtual home visit?
        - Prompt: More convenient, less invasive
- Would you be comfortable giving a tour of your home using a smartphone?
- If you were asked to use your smartphone to show us around your home, could you locate:
    - Water heater
    - Heating and air condition system – air filters
    - Would you be comfortable walking around your home identifying mold on the walls or ceilings?
- What are some negative things or concerns you might expect from a virtual home visit?
    - Prompt: Problems with phone/video connection, unsure of where/how to locate parts of the home

Technology/Telehealth:

- How do you use your smartphone for your child's medical care?
    - Prompts: Scheduling appointments, viewing medical records, prescription refills, etc.
- Have you ever had a visit with your child's medical provider that was conducted through a smartphone using video technology – like facetime or another app or program on your phone?

If they answer YES:

- What was that experience like for you?
- What were the positive things about that experience?
    - Prompts: Didn't have to take off of work, didn't have to leave my home/worry about transportation to an appointment
- What were the negative things about that experience?
    - Prompts: problems with phone/video connection, didn't feel as personal as in person

If they answer NO:

- From your perspective, what might be some positive or good things you might expect about a video visit with your child's medical provider over the phone?
- What might be some negative or bad things you might expect about a video visit through a smartphone
- If the video visit requires you to download an app or other software to you phone, how would you feel about that?

Housing Remediation:

- Have you had maintenance or repair issues in your home (such as mold, leaks, and infestations)? If so, were you able to get these things fixed? How?
    - If you are a renter, have you been able to work with you landlord to get repairs done in your home?
    - If you have had maintenance/repair issues but have not been able to get them fixed, what have been some of the barriers?
- If you have received home improvements or repairs, did you notice changes in your child's health after improvements were made? Or other changes in their health if improvements were not made?
    - Are there other serious home repairs that still need to be done? Such as?
- Do you have the resources and ability to undertake getting home repairs done on your own?

Exit Question:

- From your perspective as a parent or caregiver, what is most important to keep in mind while creating a virtual home visit program, where a parent or caregiver can use smartphone technology to conduct a virtual visit with a pediatrician and housing expert?

This is a budget break-down for a typical single family home in Ward 6, 7, or 8. A typical home is 2-story with basement or an attached row house with brick or siding/ shingle facing. This is a family residence with an unoccupied basement. Two different scenarios are presented here: A house needing moderate remediation and a house in need of heavy remediation.	**Typical Basic Cost with Moderate Needs** **Moderate needs** will have some or all items listed. No long term water damage or water infiltration. Remediation would consist of typical home repairs of aging housing stock and moderate damage resulting from delayed repairs.	**Additional Remediation Services ("Heavy" house)** **Additional remediation services** are for all items listed plus additional repairs and remediations from long term damage from postponed repairs. **Some repairs may need qualified lead and/or mold remediators to repair** to EPA and housing codes and to	**Soft Costs** Items supplied to maintain allergy-free, healthy home for 1-year post remediation.

Item	Notes	Moderate	Heavy	Optional costs
Moisture and mold	**Mold remediation (Moisture Controls)**			
Plumbing- (leak control)	•Repair of leaking plumbing Typical house may have toilet flange leaks causing rot of flooring in bathroom and under sink leaks causing mold damage to under sink area, as well as bathtub leaks (caulking, drain, faucets) causing leaks to ceiling below.	$500.00	$1,400.00	
Roof and gutter repair	•Repair of roof for existing water damage. •Repair of gutters and downspouts to move water away from structure.	$900.00	$1,700.00	
Exterior ground water infiltration remediation	•General external water entry Exterior drainage remediation if water is infiltrating basement (note landscaping to move water away from house by building up soil level at house foundation and install downspout extensions. Not external water proofing of basement or other areas. Repair or installation of sump pump as needed.	$600.00	$1,800.00	
Cabinetry or hard surfaces (flooring	•Mold remediation of cabinets and hard surfaces. Repair or replacement of cabinets or flooring if mold damaged and mold source.	$200.00	$600.00	
Wall and ceiling repair	•Wall and ceiling drywall repairs for mold damage. Repair of ceiling areas from existing water damage after repairs. NOTE: Lead guidelines should be followed and additional cost may be needed for RRP lead work.	$1,000.00	$2,500.00	

Item	Notes	Moderate	Heavy	Optional costs
Allergy Reduction	**Ambient Air Quality**			

HVAC- whole house and room sized units	•HVAC tune-up and repairs to remove allergens and improve air flow. Improve efficiency of air flow and filtration of house. •Repair or replacement of AC units or filters and cleaning of window units	$200.00	$1,050.00	
Other air quality issues	•Remediation of basement wall mold damage. Repair of external cracks and holes in outer shell. Concrete/masonry repair or siding or trim repair.	$100.00	$1,000.00	
Other air quality issues	•Gas leaks and Nitrogen Dioxide (NO2) remediation. Repair of gas leaks and NO2 remediation if needed Safe removal of oil tank if no longer in use.	$100.00	$1,000.00	
Venting	•Venting- dryers, oven, bath Installation or repair of house ventilation- covers oven venting, bathroom venting, or dryer venting as needed	$300.00	$1,000.00	
Allergy Reduction	•Clutter removal and cleaning Bulk trash services if needed (dumpster). Help with organization of items or isolation of allergen trapping items (clothes, storage, etc.)	$250.00	$750.00	
Allergy Reduction	•Wall and hard surface dust and allergen removal. Cleaning and possible painting of large wall areas to reduce allergens (note Paint used should be low or no VOC, as should all cleaning supplies used in remediation.	$500.00	$1,000.00	
Allergy Reduction	•Carpet removal Carpet removal of wall to wall carpet and padding, cleaning of existing flooring as needed- 300 to 1200 sq. ft.	$500.00	$900.00	
Allergy Reduction	•Floor remediation or replacement (laminate) Installation of hard flooring surface if needed- 300 to 1200 sq. ft.	$600.00	$5,000.00	

Item	Notes	Moderate	Heavy	Optional costs
	Pest Control			
Pest control	•Pest control of rats, cockroaches, other pests as needed. Cost includes Pest exclusion and extermination (multiple visits)	$500.00	$1,500.00	

Item	Notes	Moderate	Heavy	Optional costs
Maintenance	**Maintenance of allergy-free healthy home for one year post remediation** (May be suppplied by other than grantee)			
Maintenance	•Dehumidifier (2) with drain attachment			$700.00
Maintenance	•Allergy proof pillow and mattress covers			$100.00

Maintenance	•HEPA vacuum if indicated to maintain low allergy levels			$250.00
Maintenance	•Room size air purifiers/ electronic filtration			$200.00
Maintenance	•Four HVAC filters- Filter Performance Rating (FPR) 10 (Homeowner replace every 3 months.)			$80.00

	Moderate	Heavy	Optional costs
TOTALS for remediation work only	$6,250.00	$21,200.00	$1,330.00
Administrative cost: Initial inspection, creating work scope, overseeing and managing trades people and volunteer groups, and closing out project.	$2,500.00	$2,500.00	
TOTALS for remediation and administration (without maintenance costs)	**$8,750.00**	**$23,700.00**	
Additional soft or optional cost if needed to maintain home allergy-free for one year post remediation. (if supplied by Grantee)	$1,330.00	$1,330.00	
Total Remediation, Administrative and Maintenance (or soft cost) if supplied by Grantee.	**$10,080.00**	**$25,030.00**	