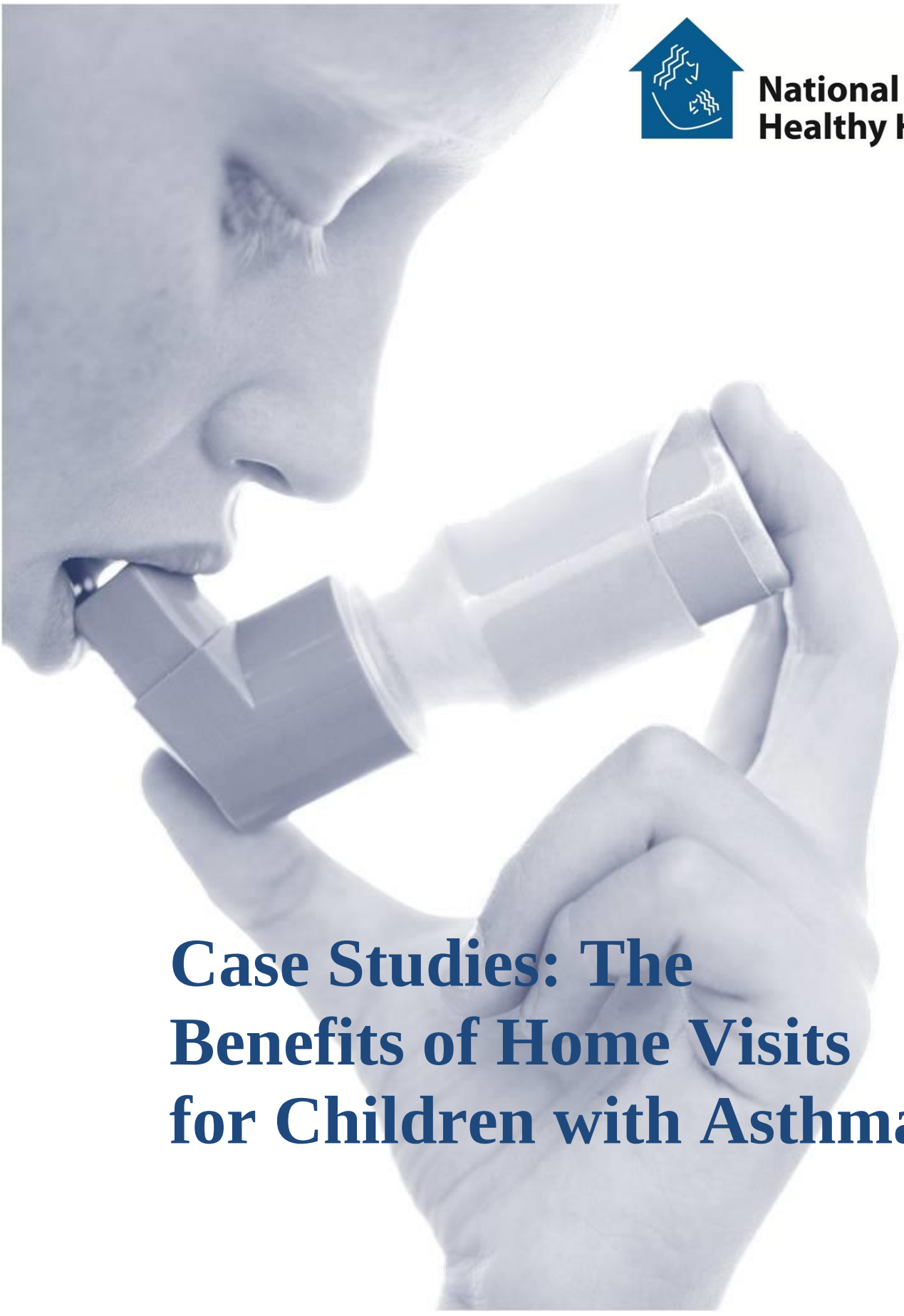

National Center for Healthy Housing

Case Studies: The Benefits of Home Visits for Children with Asthma

Case Studies: The Benefits of Home Visits for Children with Asthma

Portland, OR

Multnomah County Environmental Health Department
Phone: 503.988.3663; e-mail: infocair@multco.us

Effectiveness of Home Visiting Models:

The disproportionate burden in rates of hospitalizations and emergency room visits among low-income populations with asthma has prompted numerous health plans, hospitals, provider organizations, community coalitions, and government agencies to investigate home-based asthma management education and intervention programs. Numerous studies in the research literature have linked asthma exacerbations with indoor housing conditions and exposure to allergens and irritants such as such as dampness, carpets, pests, pets, inadequate ventilation, environmental tobacco smoke, and consumer products including cleaners, fragrances and paints.[i] Rigorous intervention studies, such as the Inner City Asthma Study (ICAS) and the Seattle and King County Healthy Homes Project, have bolstered the evidence on the effectiveness of in-home programs in improving asthma control in children. In addition, a 2011 review suggests that in-home education and environmental interventions are cost-effective approaches to improving the health status of patients, particularly those with more severe asthma.[ii] An examination of the cost effectiveness of the ICAS intervention strengthened this evidence and extended the finding to those with moderate forms of asthma as well.[iii]

Multnomah County Healthy Homes' participants were over 2½ times less likely to use the emergency department after the intervention. Savings of approximately $346,300 annually in hospitalization and emergency room visits is estimated for the 100 children who would be served by the program in each fiscal year. This represents more than a 1-to-1 direct return of the healthy homes' program investment.

The Multnomah County Model:

Mirroring national data, Multnomah County demonstrates a disproportionate burden of asthma.[iv] To address this disparity, the Multnomah Environmental Health Services developed the Healthy Homes asthma program modeled on other successful programs. Funded under a grant from the U.S. Department of Housing and Urban Development, the project served and evaluated three cohorts of families. The program now accepts referrals on a continual basis up to a maximum caseload of 50. Eligible enrollees are children 18 years of age or younger with asthma or persistent wheezing who are Multnomah County residents. The program is committed to supporting health equity, evidenced based practice, quality improvement, and the collection of uniform data that supports evaluation. The program consists of:

- a multidisciplinary team with a nurse case manager
- provision of supplies including vacuum cleaners, green cleaning materials, mattress covers
- multiple housing partners who work to facilitate structural repairs or relocation
- an evaluation component that drives quality practice change and defined outcomes

Financial Return on Investment (ROI): For a full overview of ROI, please see Appendix A on page 9.

- The estimated per-member/per-month cost to Care Oregon is 17.6 cents per month.
- Decreased emergency room visits for children enrolled in the project and their siblings with asthma. Multnomah County Healthy Homes' participants were 2½ times less likely to use the emergency department after the intervention, resulting in a total savings of approximately $346,300 annually in hospitalization and emergency room visits.[v]

Societal Return on Investment:

In addition to direct costs to the healthcare system, health economists estimate an indirect cost of $390 [vi] per day in parents' lost productivity associated with asthma care. It is estimated that, on average, children with asthma lose 2.48 school/preschool/day-care days per year. With the projected intervention, it is expected that the project will save an estimated $976 of parental lost productivity per child, or $97,600. Nationally, asthma mortality displayed as the projected lost future earnings is equivalent to $1,425,950. [vii] The current project would be expected to prevent premature mortality while also producing a societal return on investment.

Baltimore, MD

Baltimore City Bureau of Healthy Homes, Asthma Program
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The Baltimore City Health Department has adopted the Reducing Asthma Disparities (RAD) Program Model (derived from the successful Seattle and King County Asthma Program) that provides an evidence-based six-session home visiting program for persistent asthmatics. The goals of the program were to reduce asthma symptoms, the use of urgent health services, and asthma triggers in addition to improving family knowledge and skill to manage child's asthma, communication between families and providers, and provider knowledge of the home environment.

After an initial interview and room-by-room asthma trigger assessment of the family's home, staff and caregivers developed an individualized plan to reduce/eliminate home asthma triggers and to improve the child's adherence to asthma medication and medial follow-up. The quasi-experimental evaluation plan compared initial and one-year medical histories, visual assessments and emergency department (ED) and hospitalization costs. For the 128 children who completed the program, there were statistically significant (p=0.0001) decreases in asthma symptoms and emergency department visits. Outcomes include:

<table>
<tr><th colspan="2">Reported ED Visits and Hospitalizations</th></tr>
<tr><td>22 fewer hospitalizations**** p=0.023
– # Hospital stays at baseline = 56
– # Hospital stays at follow-up= 34
– Average asthma hospitalization cost: $7,866</td><td>129 fewer ED visits*
– # ED visits at baseline = 310
– # ED visits at follow-up = 181
– Average asthma ED visit cost : $772

Change in mean number of ED visits - ↓ 1.0 visit*
Change in mean number of hospitalizations - ↓ 0.22 visit**</td></tr>
<tr><td colspan="2">Cost Savings Analysis
Comparison: 1 year before to 1 year after enrollment
• Costs averted (hospitalizations and ED visits): $272,640 ($2,217/child)
• Home visiting program costs: $170,478 ($1,386/child)
• Potential cost savings for third-party payers: $102,162 ($831/child)</td></tr>
</table>

Philadelphia, PA

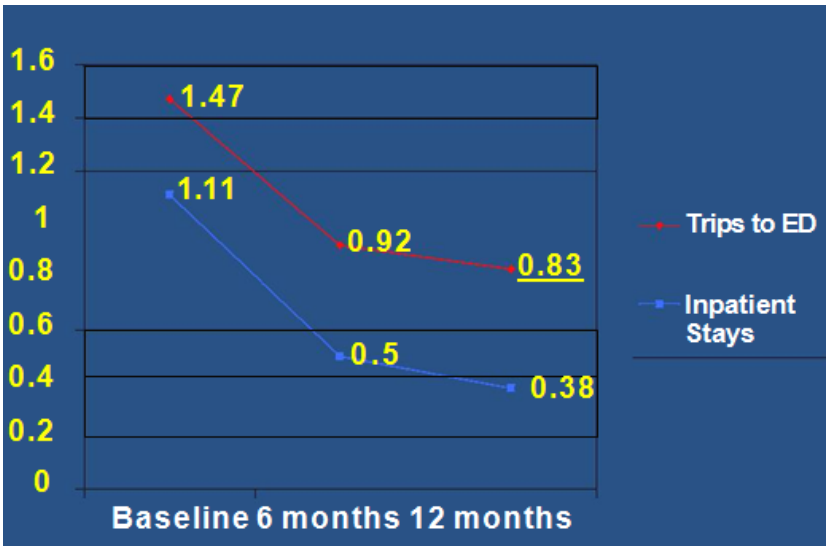
Community Asthma Prevention Program of Philadelphia
Telephone: 215.590.5261; e-mail: capp@email.chop.edu

The Community Asthma Prevention Program (CAPP) was founded in 1997 by Dr. T. Bryant-Stephens in response to high incidence of asthma ED visits to her Philadelphia, PA, practice. The goals of CAPP are to increase asthma knowledge, improve asthma self-management behavior, improve quality of life for children with asthma, equip members of the community to become neighborhood asthma experts, promote asthma-safe home and school/child care environments, and to reduce burden of asthma on disparate populations.

CAPP's community-based interventions include individual home asthma self-management education and home environmental remediation. Some of the home environmental intervention methods include an assessment of child's bedroom and general living areas, in addition to providing general asthma education (including AAP and proper use of devices and medication). The parents are also taught how to make simple environmental interventions in the child's bedroom and general living area. Supplies are given to facilitate interventions and an inspection of rooms at follow-up visits is conducted.

Outcomes include:

Paired Analysis n=208	Baseline	12 months	P-value
ED visits, last 12 months	2.04(±1.43)	1.04(±2.1)	<0.05
Hospitalizations, last 12 months	.90(±2.11)	0.39(±1.0)	<0.05
Missed school for any reason	7.13(±11.47)	6.13 (±7.97)	0.49
Missed school for asthma	5.85 (±10.46)	4.02 (±6.44)	<0.05



Boston, MA

Neighborhood Health Plan
Phone: 617.772.5500; e-mail: memberservices@nhp.org

The prevalence of asthma is higher in Massachusetts than in most states in the U.S. As a result, the Neighborhood Health Plan was formed to promote the health and wellness of the members of Boston. Asthma care managers work together with clients and their healthcare providers to come up with treatment plans that work. A respiratory therapist makes home visits, environmental assessments, and conducts asthma education. The education helps to increase understanding of how to use asthma medication, and helps to identify what inside of the home could be triggering asthma episodes.

In 2005, NHP enhanced their home visit program to include DME products that decrease exposure to environmental triggers, including allergy encasings for bedding, air purifiers and vacuums with a HEPA filters. The program's results boast the lowest hospitalization rate since the asthma program's inception in 1999 (1.9 %), the lowest ER use at 8.8%, and controller/reliever medication ratio of .72.

Seattle, WA

Seattle and King County Public Health Department
Phone: 206.296.4600; e-mail: publichealth@kingcounty.gov

Since 1997, Public Health Seattle and King County has been conducting research on the effectiveness of home visits by community health workers (CHWs) to help children and adults control their asthma.

The overall conclusions of these programs (Healthy Homes I, Healthy Homes II and HomeBASE) are home visits by CHWs that address both self-management support and indoor triggers improve asthma outcomes. CHW home visits add 21 more symptom-free days per year in children and 55 days per year in adults. Benefits in quality of life and use of urgent healthcare are modest.

Healthy Homes II looked at two main approaches to improving asthma control. The first approach utilized a "community asthma nurse" who provided patient education, training in self-management, the development of a patient-specific asthma action plan, and case management/review.

The second approach provided all aspects of the community asthma nurse intervention plus in-home outreach, education, and resources (bedding covers, vacuums, cleaning supplies, et cetera) to address environmental triggers (like Healthy Homes-I). Support in self-management, medication use, provider-patient communication, et cetera, were also reinforced. Community health workers (based on the "natural helper" model) provided the in-home outreach. They were educated about asthma, asthma self-management, and the control of environmental asthma triggers.

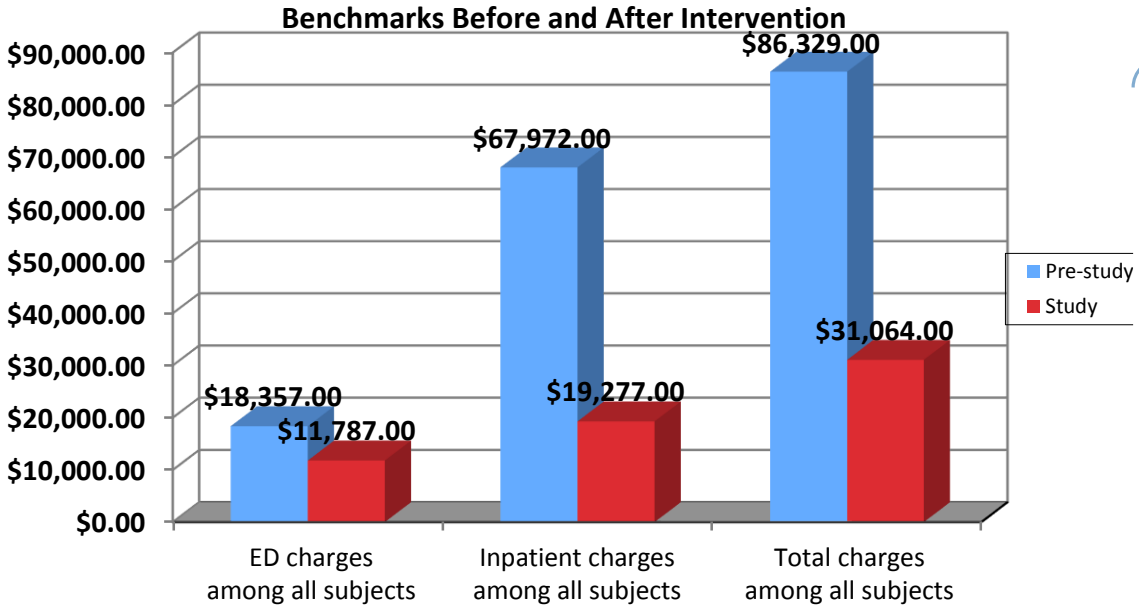
A third approach was funded separately and added structural remediation of housing for conditions that increase exposure to asthma triggers (e.g., poor ventilation, mold-infiltrated surfaces, leaks, holes in walls, carpeting, et cetera).

Michigan

Asthma Network of West Michigan

Telephone: 616.685.1430; e-mail: meyersok@mercyhealth.org

The Asthma Network of West Michigan was established in 1994 as the grassroots asthma coalition serving the West Michigan counties of Kent, Ottawa, and Muskegon. The target population is children with uncontrolled asthma from low-income families in West Michigan. One of the strategies of the Asthma Network includes high-performing collaborations and partnerships. They build on what works by engaging health plans and collaborating with patient-centered medical home models and the largest pediatric practices in West Michigan. Tailored environmental interventions include home-based case management and community outreach. Asthma Network is believed to be the first grassroots asthma coalition in the nation to obtain third-party payer reimbursement for home-based asthma case management services. Health outcomes of the program include significantly reduced facility charges, fewer emergency department visits, fewer hospitalizations, and lower overall costs for asthma.

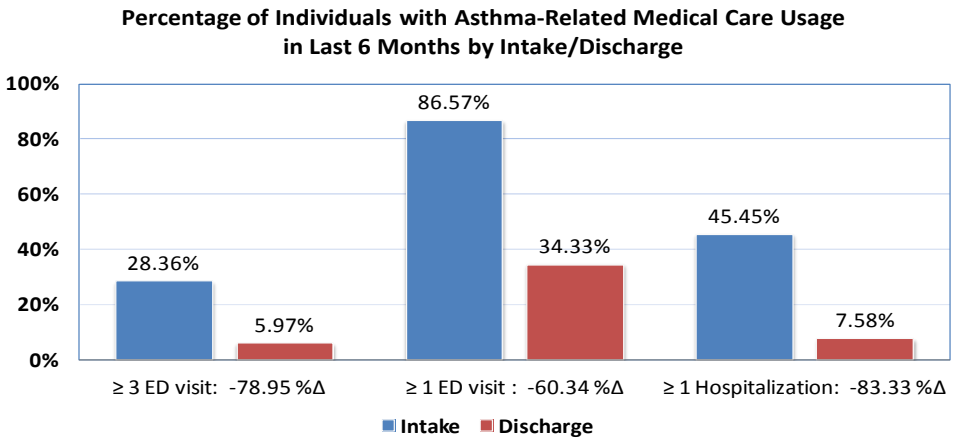


Total hospital charges decreased by **$55,265** from pre-study year to study year for an average reduction of $1625 per subject for the 34 participants enrolled in the first year of the pilot.

"For $400,000, the Asthma Network will improve asthma outcomes for 400 at-risk children with poorly controlled asthma by achieving reductions in ER visits and hospital admissions, through our in-home asthma case management program. We estimate that our work will deliver $640,000 per year in cost savings to the healthcare system through 40% fewer hospital admissions and 25% fewer ER visits."

Karen Meyerson, MSN, RN

Asthma Network of West Michigan – continued



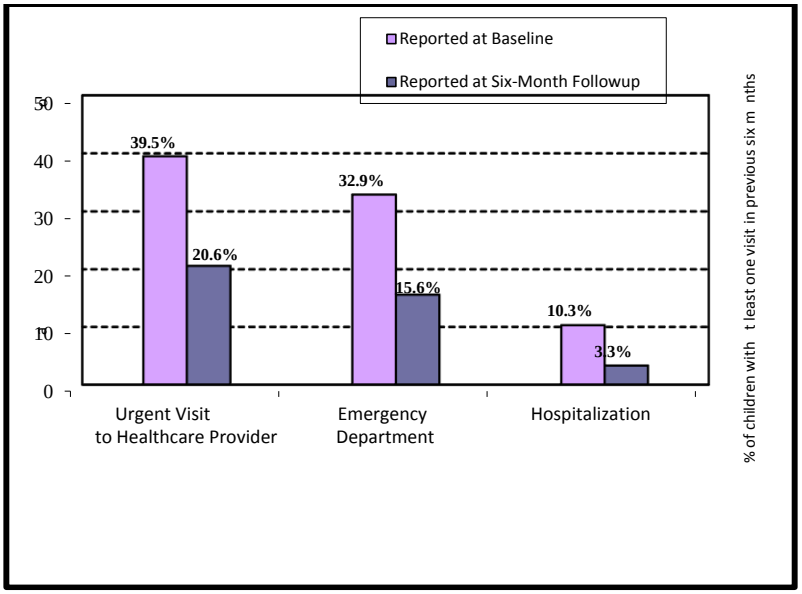
Percentage of participants with asthma inpatient visits by program intake and discharge for participants who were enrolled for at least five months and had at least six visits. There was a -78.95% change between intake and discharge for participants who had at least three ED visits, -60.34% for those who had at least one ED visit, and -83.33% change for those who had at least one hospitalization.

Lansing, MI

Michigan Department of Community Health
Phone: 517.373.3740; e-mail: minicucia@michigan.gov

In Michigan, asthma accounts for almost 10% of all hospitalizations in children. Environmental conditions within the home can exacerbate asthmatic children's symptoms. To improve health outcomes among this group, the Michigan Department of Community Health implemented an in-home environmental public health program – Healthy Homes University – for low-income families in Lansing, Michigan, starting in 2005. Program staff assessed homes for asthma triggers and subsequently provided products and services to reduce exposures to cockroaches, dust mites, mold, tobacco smoke, and other triggers. MDCH also provided asthma education that included identification of asthma triggers and instructions on specific behaviors to reduce exposures. Based on self-reported data collected from 243 caregivers at baseline and six months, the impact of asthma on these children was substantially reduced, and the proportion who sought acute unscheduled healthcare for their asthma decreased by more than 47%. Cost-savings were realized from the reduction in emergency department visits and hospitalizations, as well as a reduction in missed caregiver work days.

Asthma Tier I Interventions	**Asthma Tier II Interventions**
HEPA vacuum	Beds and/or pillows
Non-scented bleach	Carpet removal
Non-scented cleaning furnace filters	Air conditioning unit
	Floor replacement
Smoking cessation kit	HEPA air filter unit
Mattress/pillow covers	Bathroom vent installation
	HVAC duct cleaning



Cost-Benefit	
Total Program Cost	$1,299,207
Net Benefits – 3 Years	$2,524,193

[i] Institute of Medicine (IOM). Committee on the Assessment of Asthma and Indoor Air, Division of Health Promotion and Disease Prevention, *Clearing the Air: Asthma and Indoor Air Exposures*. Washington, D.C., National Academy Press, 2000. Available at: http://books.nap.edu/books/0309064961/html. (Accessed January 15, 2005).

[ii] Crocker DD, Kinyota S, Dumitru CG et al. Effectiveness of home based, multi-trigger, multi-component interventions with and environmental focus for reducing asthma morbidity: a community guide systematic review, *Am J Prev Med.* 2011; Aug 41(2 suppl 1):S33-47.

[iii] Nurmagambetv TA, Barnett SB, Jacob V et al. Economic values of home based, multi-trigger, multi-component interventions with and environmental focus for reducing asthma morbidity: a community guide systematic review, *Am J Prev Med.* 2011; Aug 41(2 suppl 1):S5-32.

[iv] Oregon supporting data found in the Oregon's Pediatric Asthma Disparities Report. Available online at: http://www.oregon.gov/DHS/ph/asthma/docs/AsthmaGeoDisparities_Pediatric2008.pdf

[v] Oregon Asthma Program. 2010. The Burden of Asthma in Oregon: 2010. Available online at: http://public.health.oregon.gov/DiseasesConditions/ChronicDisease/Asthma/Documents/burden/or_asthma2010.pdf

[vi] Wang LY, Zhong Y, Wheeler L. Direct and indirect costs of asthma in school-age children, *Prev Chronic Dis*. 2005. Available online at : http://www.cdc.gov/pcd/issues/2005/jan/04_0053.htm

[vii] Akinbami L. Asthma Prevalence, Health Care Use and Mortality: United States, 2003-05. 2006. Available online at: http://www.cdc.gov/nchs/products/pubs/pubd/hestats/ashtma03-05/asthma03-05.htm

Appendix A

Multnomah County Environmental Health Department

Program Cost

$328,400 = Personnel $251,600 + Direct Client Assistance $25,500. + ($51,300 in facilities and operations costs)

Personnel: 0.80 Bilingual Asthma Certified Community Health Nurse, 1.0 Bilingual Community Health Worker, 0.30 Program Management, and 0.50 Office Assistant

Per Member Per Month

$328,400 (program cost)/155,000 (Care Oregon members- July 2012)/12 months= 17.6 cents per month

Cost Savings Emergency Department Utilization

1.05 average ER visits per child baseline – 0.4 average ER visits after the intervention = 0.65 visits reduction per child

Projection over 100 children = 100 x 1.05 =105 visits without intervention - 100 x 0.40 = 40 visits with intervention =65 prevented visits

65 visits x $760 (Center for Financing, Access and Cost Trends, Agency for Healthcare Research and Quality: Medical Expenditure Panel Survey, 2009.) = $49,400 (2009 dollars)

Adjusted for Oregon medical inflation rate (8%) for four years = $67,208 (2013 dollars)

Cost Savings Hospitalization

Hospitalization admissions per emergency department referral for children 0-5 with an asthma diagnosis are 38% from Multnomah County discharge data.

(65 visits x 38%) x $8,970 (2010 hospitalization visit cost) = $221,559 (2010 dollars)

Adjusted for medical inflation rate = $279,100 (2013 dollars)

Parental Lost Wages

$285 per day in lost wages in 2003 dollars with applied inflation at 3.2% = $390 per day x 2.5 days lost per asthmatic child = $976 (2013 dollars)