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ORIGINAL ARTICLE

Reducing Home Triggers for Asthma: The Latino Community Health Worker Approach

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This study assessed the ability of a community health worker asthma intervention to change home asthma triggers. A total of 56 children and 47 adults with asthma were enrolled. Home trigger scores for the children averaged 2.8 at the initial home visit and then 2.3, 2.1, and 2.0 at 3, 6, and 12 months. Home trigger scores for the adults showed a similar trend. Every home visit was associated with a 0.32 reduction in home trigger score ($p < 0.01$) for children and a 0.41 reduction ($p < 0.01$) for adults. This intervention shows promise as a way to reduce asthma triggers in urban low-income Latino communities.

Keywords asthma, home triggers, Latino health, community health workers

INTRODUCTION

An objective of Healthy People 2010 was to reduce disparities in asthma deaths, hospitalizations, emergency department use, and disability for all populations (1). Despite this emphasis, asthma mortality continues to increase in urban Latino populations in the United States (2–8). The asthma mortality rate for people living in Chicago from ages 5 to 34 years is 3 to 4 times higher than for the nation, with the most deaths occurring among minorities and people with lower socioeconomic status (9–10). Specifically, the asthma mortality rates for Latinos in Chicago almost doubled in the 1990s, increasing at a greater rate than that of blacks and whites, even after adjusting for population increases (10).

The environmental exposures that occur in homes have been shown to contribute to asthma morbidity and mortality (11). High levels of asthma triggers have been documented repeatedly in the homes of inner-city families with asthma and are known to worsen pulmonary function (12–14). Indoor tobacco smoke, nitric oxide exposure from gas stoves and space heaters, and allergens from pests such as cockroaches are some of the major home asthma triggers (15–18). Reductions in home asthma triggers have been shown to subsequently reduce asthma incidence and severity (19).

Community health workers (CHWs) provide a unique mechanism for reducing home asthma triggers in low-income Latino communities. CHWs are lay people who receive a limited amount of training to educate and assist members of their community in gaining control over their health and lives (20–21). They may be able to overcome barriers to environmental modification by providing culturally competent asthma education and empowering families to make behavior changes. Previous studies have shown that CHW interventions are associated with decreased asthma symptom days and urgent care visits as well as reductions in environmental home triggers for low-income families (22–26). While these data provide good preliminary evidence supportive of the CHW intervention, these studies were not tested specifically in an inner-city Latino community.

We partnered with a community center in Chicago that employed CHWs to provide home asthma education visits for low-income Latino families in their community. This partnership allowed us to use community-based participatory research methodologies and to add culturally appropriate, inexpensive evaluation components to the CHW home visit intervention. Our study objective was to assess whether CHW home visits for asthma education facilitated changes in reported home asthma triggers for children and adults with asthma in an inner-city, low-income Latino community.

METHODS

Study Design

This study originated through a partnership between the principal investigator and Centro Comunitario Juan Diego (CCJD) (27). CCJD is a non-profit community center that runs health promotion programs that focus on asthma education, violence prevention, literacy, human rights, environmental health, human immunodeficiency virus (HIV) education, diabetes education, and community organizing. The center serves a low-income, urban, primarily Mexican-American population on the south side of Chicago. At the time of the study, they employed eleven asthma CHWs who had completed a 15-week basic health promoter training course and Asthma 101 and Asthma for Children (12 hours of coursework) from the American Lung Association. These CHWs were Mexican-American and lived in their service community where they had been performing asthma education for 5 years.

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We designed this exploratory study with an initial cross-sectional analysis and a subsequent longitudinal analysis of asthma outcomes. Participants were a convenience sample, identified by the CHWs, who classified themselves as Latino and had been told by a physician that they or their child had asthma. The CHWs then explained the purpose of the study to these qualified individuals, and interested participants were enrolled in the study.

The intervention was asthma education provided in Spanish by CHWs in a relaxed, non-threatening home environment. Participants all received a home visit for asthma education from a pair of asthma CHWs. At the start of this visit, a survey form was filled out by participants (or read to them if they could not read) and spirometry was measured by the CHWs. Then the CHWs discussed asthma physiology, triggers, myths, and medications using flip charts from the American Lung Association Open Airways Program and a variety of other materials in Spanish from other sources. CHWs demonstrated proper technique with peak flow meters, inhalers, and spacers and then practiced these techniques with participants. Referrals for medical care or applications for the State Children's Health Insurance Program (SCHIP) were completed. Finally another survey was completed at the end of the initial visit. Initial visits lasted approximately 2 hours.

Participants were visited again at home 3, 6, and 12 months after the initial visit by a CHW for the purpose of data collection only. At these follow-up visits, participants filled out the follow-up survey form and had their spirometry measured again. Informal education also probably occurred at some of these follow-up visits but was not documented. Participants received a gift certificate for breakfast at a local restaurant at the 3-month visit and a $5 gift certificate for groceries at the 6-month visit.

We hypothesized that the education and assistance provided at the initial visit would lead to improved asthma knowledge and medication knowledge, improved health care utilization, and more empowered participants. These outcomes would then assist participants to improve their medication usage and reduce home asthma triggers, leading to reduced asthma severity.

Survey Instruments

Survey instruments were written first in English and then translated to Spanish by a professional translator. The Spanish versions were reviewed by the CHWs at CCJD where they were modified slightly to improve understanding for the target community. Demographics of the adults and the children's caregivers were obtained at the initial visit. Acculturation was measured using the Marín and Marín Short Language Use Scale (28).

Asthma severity consisted of three categories: severe/moderate, mild persistent, and mild intermittent. Based on the National Guidelines for the Diagnosis and Management of Asthma (29, 30), participants were defined as severe/moderate if they reported asthma symptoms daily, reported nighttime symptoms daily or several times a week, or reported limited physical activity due to asthma symptoms. Mild persistent participants reported asthma symptoms more than once a week but not daily, or nighttime symptoms several times a month. Mild intermittent participants reported asthma symptoms less than once a week or nighttime symptoms less than several times a month. At each visit, participants were asked if they (or their child) had been to the emergency department, urgent care, or hospital in the last 6 months for asthma. They were also asked how often they (or their child) currently use albuterol.

Home asthma triggers were assessed using a series of seven yes/no questions that asked about smokers in the house, pets, cockroaches, air filters, vacuuming, cleaning with chlorine, and aerosol use. The higher the score, the more triggers were reported present. These questions were asked at the start of the initial visit (before the education began) and at each follow-up visit.

Data Analysis

Data were entered into two Excel databases (one for children and one for adults with asthma) by a CHW at CCJD. Analyses were performed using Stata 8 SE (31). Chi-squared analyses (for ordinal data) and one-way analyses of variance (for continuous data) were used to compare demographics of participants lost to follow-up. Exact symmetry tests were performed to assess for changes between the initial visit and follow-up visits for demographics, asthma severity, emergency department/hospital visits, and albuterol usage. Data were converted into longitudinal format to perform linear mixed effects modeling (32). Models controlled for age of the children or adults with asthma, caregiver ages, marital status of adults or caregivers, ethnicity of adults or caregivers, acculturation of adults or caregivers, years adults or caregivers lived in the United States, education level of adults or caregivers, and insurance status of the participants.

Ethics

This study was approved by the Institutional Review Board at the University of Chicago and participants provided written consent.

RESULTS

A total of 103 participants were enrolled in the study; 56 children with asthma (42 caregivers) and 47 adults with asthma. The demographics of these participants are shown in Table 1. About half of the children with asthma were female, compared to 70% of the adults with asthma. The mean child age was 8.5 years; the mean adult age was 41.6 years. Caregivers of children and adults with asthma were primarily Mexican and married, with very low education and acculturation levels. Fifty-seven percent of children had some sort of public health insurance, while 27% had no insurance. Thirty-four percent of adults with asthma had no insurance.

Fifty-seven percent of children with asthma and 45% of adults with asthma completed the study as shown in Table 2. The majority of participants who left the study did so after the first home visit (21% of children with asthma and 23% of adults with asthma). Not wanting to participate anymore (52% of participants lost to follow-up) was the most common reason cited for leaving. The participants lost from the study differed from those who completed the study. Caregivers of the children with asthma who were lost to follow-up were higher educated ($p = 0.02$). Adults with asthma who were lost to follow-up were more likely to be Puerto Rican ($p = 0.05$) and less likely to be single ($p = 0.01$).

TABLE 1.—Demographics of children with asthma and their caregivers and adults with asthma.*

Demographic characteristic	Children with asthma ($n = 57$)	Caregivers of children with asthma ($n = 42$)	Adults with asthma ($n = 47$)
Female sex	45%	93%	70%
Age (mean)	8.5 years (range 1–16 years)	34.6 years (range 23–51 years)	41.6 years (range 16–78 years)
Ethnic group			
Mexican		93%	77%
Puerto Rican		2%	17%
Other		2%	4%
Marital status			
Married		74%	51%
Single		14%	23%
Other		5%	26%
Education level			
6 years or less		52%	47%
7 to 12 years		29%	32%
High school graduate or graduate equivalency diploma (GED)		2%	9%
More than high school		7%	13%
Acculturation level (mean)†		1.7	1.9
Years lived in US (mean)		11.5	20
Health insurance			
Public‡	57%		28%
Private	13%		38%
None	27%		34%

*Percentages may not add to 100 in each category due to missing data.
†Acculturation level determined from Marin Marin Language Use Scale where score of 1 is lowest and score of 5 is highest acculturation to United States culture (28).
‡For children: Medicaid, Medicare, or State Children's Health Insurance Program (SCHIP); for adults: Medicaid, Medicare, or Social Security.

Forty-five percent of children with asthma ($n = 56$) were classified initially as having moderate/severe asthma, while 23% had mild persistent and 32% had mild intermittent asthma. Eighteen percent of caregivers reported that their children had been hospitalized or treated in an emergency department or urgent care once in the last 6 months, 7% said two to three times, 2% said four or more times, and 71% said their children had required no hospital or emergency care. Twenty-five percent of caregivers reported their child used albuterol daily, 27% said several times a week, 11% said several times a month, 32% said several times a year, and 5% said never. The majority of adults with asthma were classified initially as having moderate/severe asthma (66%, $n = 47$). Fifteen percent had mild persistent and 19% had mild intermittent asthma. When asked whether they had been hospitalized or cared for in an emergency department or with urgent care for asthma in the last 6 months, 64% said no, 23% said once, and 11% said two to three times. Thirty-six percent of adults reported they used albuterol daily, 19% used it several times a week, 21% used it several times a month, 17% used it several times a year, and 2% never used albuterol. None of these initial variables changed significantly at the 3-, 6-, and 12-month follow-up visits for the children or adults with asthma, and no trends were observed.

TABLE 2.—Study participants lost during the 12-month follow-up period.

	Children with asthma ($n = 57$)	Adults with asthma ($n = 47$)
Received all home visits	32 (57%)*	21 (45%)
Received initial visit only	12 (21%)†	11 (23%)
Did not want to participate anymore	9	6
Moved	3	4
Could not find	0	1
Received initial and 3-month visits	1 (2%)	8 (17%)
Did not want to participate anymore	1	5
Moved	0	2
Could not find	0	1
Received initial, 3-, and 6- month visits	11 (20%)	7 (15%)
Did not want to participate anymore	2	3
Moved	5	2
Could not find	4	0
Died	0	1

*Represents 23 families (55% of total families).
†Represents 7 families (17% of total families).

The home asthma trigger scores are shown in Figure 1. Caregivers of children with asthma reported an average of 2.8 home triggers at the initial visit, 2.3 triggers at 3 months, 2.1 triggers at 6 months, and 2.0 triggers at 12 months. Controlling for child age, child insurance, and caregiver age, marital status, ethnicity, education, acculturation, and years lived in the United States, every home visit was associated with a 0.32 reduction in home trigger score ($p < 0.01$; 95% CI −0.47, −0.17). Other factors that influenced reported home asthma triggers were caregiver age, caregiver education, and child's insurance status. Triggers increased as caregiver age increased (β_1 0.08; $p < 0.01$; 95% CI 0.02, 0.14), and decreased when caregiver education increased (β_1 −0.92; $p = 0.04$; 95% CI −1.81, −0.03) and when children had private insurance compared to public insurance (β_1 −2.50; $p = 0.04$; 95% CI −5.00, −0.15). Adults with asthma reported 3.2 triggers at the initial visit, 2.7 triggers at 3 months,

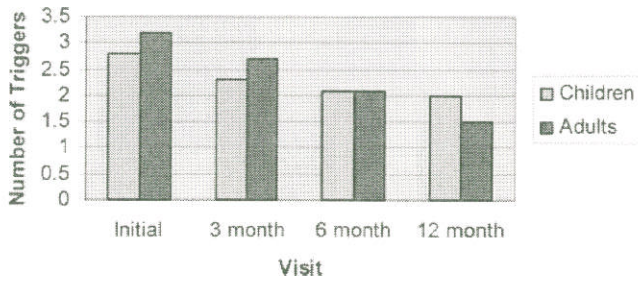

FIGURE 1.—Reported home asthma triggers for children and adults with asthma.

2.1 triggers at 6 months, and 1.5 triggers at 12 months. Controlling for age, ethnicity, education, insurance, acculturation, and time lived in the United States, every home visit was associated with a 0.41 reduction in home trigger score ($p < 0.01$; 95% CI −0.58, −0.25). Home asthma triggers were also higher as age increased (β_1 0.06; $p < 0.01$; 95% CI 0.03, 0.09) and lower as years lived in the United States increased ($\beta_{1)}$ −0.05; $p = 0.01$; 95% CI −0.09, −0.01).

Individual trigger results are shown in Table 3. The most common triggers reported at the initial home visit were cleaning/vacuuming by or around the person with asthma (45% of adults), use of chlorine and water for cleaning (54% of children, 57% of adults), and use of aerosols by or around person with asthma (70% of adults). Few homes had air filters (32% of children, 30% of adults). Over the 12-month follow-up visits, significant reductions were reported in the children with asthma for cockroaches in the home (β_1 −0.06; $p = 0.05$; 95% CI −0.12, 0.0006) and in adults with asthma for the use of chlorine for cleaning (β_1 −0.13; $p < 0.01$; 95% CI −0.19, −0.07), the use of aerosols by or around person with asthma (β_1 −0.09; $p = 0.01$; 95% CI −0.16, −0.03), and houses lacking air filters (β_1) −0.06; $p = 0.03$; 95% CI −0.11, −0.01). Borderline reductions were noted for smoking inside the home (children: β_1 −0.03; $p = 0.06$; 95% CI −0.07, 0.002), cockroaches in the home (adults: β_1 −0.04; $p = 0.09$; 95% CI −0.08, 0.01), cleaning and vacuuming around the person with asthma (children: β_1 −0.04; $p = 0.08$; 95% CI −0.10, 0.005; adults: β_1 −0.04; $p = 0.08$; 95% CI −0.09, 0.005), and the use of aerosols (children: β_1 −0.06; $p = 0.06$; 95% CI −0.11, 0.002).

Discussion

This study suggests that CHW home visits for asthma education are associated with a reduction in reported home asthma triggers for both children and adults with asthma in this low-income inner-city Latino community. These results are important because while reductions in home asthma triggers have been linked with reduced asthma incidence and severity, no effective strategy has been developed to accomplish these reductions in Latino populations. This is likely because of language barriers, distrust of government programs, and unique health beliefs and practices experienced by Latinos (33). Our study was able to overcome these barriers by partnering with a community center in the target community. This partnership allowed us to gain access to a very difficult-to-reach community, to develop and provide a culturally appropriate intervention, and to better understand the outcomes our study generated.

Our intervention was associated with an important reported behavior change that others have struggled to achieve. Previous studies have shown that many people with asthma do not receive adequate counseling about environmental triggers from their health care providers (34). Low-income families who are able to recognize triggers in their homes often feel helpless to change them due to lack of resources (35). Home nurse visits have been shown to reduce asthma severity and hospitalizations, but they had no impact on environmental triggers (36).

We believe the CHW approach may have facilitated this behavior change of reduced reported home asthma triggers because it worked within the traditional Latino belief system. Current health care in the United States focuses primarily on the individual patient, while traditional Latino culture incorporates several very different concepts including *familismo* (family included in all decisions) and *personalismo* (information is more reliable coming from a trusted source) (37–38). CHWs are from the target community, they speak the same language, and are they culturally similar to their clients; thus they are a trusted source. In addition, CHW home visits allow them to provide their services to the entire family, not just the

TABLE 3.—Individual home asthma triggers at the initial home visit and changes over the 12-month follow-up period.*

	Children with asthma ($n = 56$)		Adults with asthma ($n = 47$)	
Home asthma triggers†	Answered yes at initial visit	B_1 for change over 12-month follow-up (95% CI)	Answered yes at initial visit	B_1 for change over 12-month follow-up (95% CI)
1. Does anyone smoke inside your home?	23%	−0.03§ (−0.07, 0.002)	26%	−0.03 (−0.07, 0.01)
2. Do you have any pets? (dogs, cats, birds, gerbils, hamsters)	39%	−0.01 (−0.05, 0.04)	30%	−0.01 (−0.05, 0.03)
3. Are there cockroaches in your house?	32%	−0.06‡ (−0.12, 0.0006)	23%	−0.04§ (−0.08, 0.01)
4. Do you or does anyone in your house clean and vacuum when you (*or your child*) are around?	27%	−0.04§ (−0.10, 0.005)	45%	−0.04§ (−0.09, 0.005)
5. Do you or does anyone in your house clean with a solution of chlorine and water?	54%	−0.05 (−0.12, 0.02)	57%	-0.13‡ (−0.19, −0.07)
6. Do you use aerosols (*around your child*) (such as hairspray, cleaners, perfumes)?	39%	−0.06§ (−0.11, 0.002)	70%	−0.09‡ (−0.16, −0.03)
7. Do you use an air filter in your house?	32%	−0.03 (−0.08, 0.03)	30%	−0.06‡ (−0.11, −0.01)

*Children with asthma model controlled for child age, child insurance, and caregiver age, marital status, ethnicity, education, acculturation, and years lived in the United States. Adults with asthma model controlled for ethnicity, education, insurance, acculturation, and time lived in the United States.

†All questions are incorrect if answered yes except for number 7.

‡$p \leq 0.05$.

§$p < 0.10$.

person with asthma. The education is given in a comfortable environment with sufficient time for questions and explanations. The CHW approach, through education and support, improves personal self-efficacy, which then leads to behavior changes (20–21, 39–41).

While the overall home asthma trigger scores were reduced for both children and adults with asthma, reductions in the individual triggers varied. Caregivers of children with asthma reported a reduction in cockroaches in the home but this decrease was not seen as strongly among the adults with asthma. Perhaps the motivation to eliminate cockroaches is greater when a child's health is involved. Conversely, perhaps admitting cockroaches in the home is more difficult when discussing a child with asthma as compared to an adult with asthma. This explanation likely applies to the similar trend noted in smoking in the home. Eliminating pets proved to be difficult. Methods of cleaning significantly changed. The CHWs explained that families in this community are very concerned with cleanliness and that bleach is thought to be one of the best cleaning solutions. However, the strong odor of bleach may trigger asthma symptoms, (42), as does the dust generated by cleaning and vacuuming. Changing cleaning techniques and eliminating aerosols seemed to be manageable changes for these participants.

Asthma severity was high in this study population as shown by the severity scores and albuterol usage, although emergency department usage was low. Our CHW intervention did not change asthma severity, emergency department/hospital visits, or albuterol usage, although we cannot be sure how to interpret these results in the absence of an appropriate control group. However, other similar studies with CHWs have shown some success in reducing asthma symptoms and urgent care visits. (22, 26). These studies used a higher "dose" of the intervention, meaning more home visits, which may explain our negative asthma severity results.

Because this was an exploratory pilot study, there was no control group or randomization, no blinding, and a small sample size. This limits the interpretation and generalizability of our results, although they do provide estimates of effect size that could prove useful in future studies. The recruitment strategy was subject to selection bias as participants who approached the community center may have already been motivated for change. The home asthma triggers were self-reported and were likely affected by social desirability, although a previous study found good correlation between the self-report of home asthma triggers and the actual measurement of those triggers (43). We speculate that we lost participants at the follow-up visits because we did not have adequate incentives, our questionnaire was long, and the target population is highly mobile. A few of the children with asthma lived in the same households, but similar results were obtained when we repeated the analyses using only one child from each family, suggesting that collinearity did not affect the final results significantly. Finally, this study did not directly assess atopy or measure important home asthma triggers such as dust or mold.

Working with local community groups to provide comprehensive, culturally and linguistically competent asthma care in high-risk populations is a national priority.[1] CHWs have been shown to be useful in asthma data collection and in accessing inner-city, hard-to-reach populations (44–46). This pilot study expands our understanding of the CHW potential to improve asthma by suggesting that in the home, culturally competent asthma education performed by CHWs may be able to reduce home asthma triggers and subsequently the burden of asthma in low-income inner-city Latino communities. Future studies should implement a randomized controlled trial to determine the strength and duration of this effect.

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