

BUSINESS CASE

VIAS: ASTHMA INTERACTIVE HOME VISITS

PROGRAMA DE MANEJO Y CONTROL DEL ASMA

DEPARTMENT OF HEALTH



DEPARTAMENTO DE
SALUD



Business Case
VIAS Home Visiting Project

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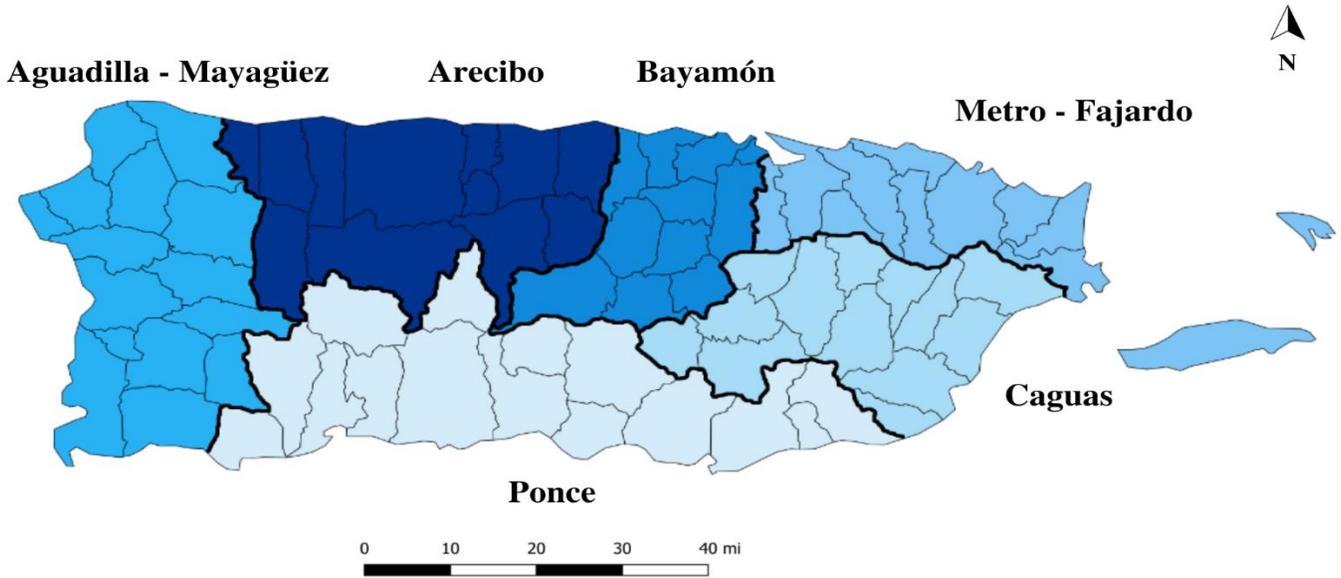
Introduction

Purpose of the Business Needs Statement Document

The burden of asthma in Puerto Rico has been recognized as a public health problem. The prevalence of lifetime asthma and current asthma was higher than in the United States. Puerto Rico's prevalence of lifetime asthma for 2018 was 18.5% whereas in the United States it was 14.5%. The prevalence of current asthma in Puerto Rico was of 11.1% compared to 9.2% in the United States. At the same time, the burden of asthma among children in Puerto Rico is even more alarming when compared to the United States. In Puerto Rico in 2018 the prevalence of lifetime asthma in children was 24.8% and for current asthma it was 14.1%, while in the United States children had a prevalence of lifetime asthma of 11.4% and current asthma of 7.2%.

Asthma is the most common chronic disease among children. In 2014, 17.6% of children, with asthma, in PR experienced at least seven days with symptoms in the past 30 days. For the same period, nearly 11.1% had difficulty sleeping in at least seven days. Additionally, 12.9% of children with asthma experienced moderate or a severe limitation of usual daily activities due to asthma in the past 12 months; including 28.7% who have reported at least six days of missed school or daycare. Children had the highest asthma claims-rates for hospitalizations and Emergency Department visits at 46 and 18 claims per 1,000 persons, respectively. For asthma-related hospitalizations, rates per 1,000 persons ranged from 6.4 in Arecibo to 11.8 in Caguas. According to the reports, 1 out of every 3 visits to emergency departments in the last 12 months were due to asthma. For asthma-related emergency department visits, rates per 1,000 persons ranged from 3.6 in Metro to 9.2 in Caguas (Figure 1). In conclusion, Puerto Rico has a high prevalence of children with asthma, disparities in access to services, and high use of emergency rooms, due to the poor management and control of asthma.

Figure 1. Health Regions of the Department of Health of Puerto Rico.



In 2019, the total costs of services of Medicaid in Puerto Rico for patients with asthma being the principal diagnosis was \$37.5 million dollars. Of this \$37.5 million, the costs for services of asthma as first diagnosis in ages from 0-4 years was \$6.5 million and for ages of 5-9 was of \$7.2 million of dollars. These statistics are alarming and need to be responded to early in life so that the asthma can be controlled. When asthma control is achieved, we can see a reduction in the costs for services of asthma. In many states throughout the United States, home visiting programs are being established to help reduce visits to emergency rooms and hospitalizations from asthma patients. Home visiting programs also educate participants on the home triggers than can aggravate asthma. The effectiveness of home visits by community health workers to children with higher risk of asthma complications is established in literature⁶. After reviewing the effectiveness of other home visiting programs we saw the importance of implementing a similar program in our communities. For this reason, the main

objective of the Puerto Rico Asthma Program with this business case is to provide the evidence needed so that private and public health insurance can implement these type of projects in communities.

With the aim of reducing the impact of asthma in the population of Puerto Rico, the Asthma Program of the Department of Health, in the Division of Prevention and Control of Chronic Diseases of the Assistant Secretary for Health Promotion, developed the VIAS project (Spanish acronym for *Asthma Interactive Home Visits*.) The VIAS Project provides training during home visits on asthma self-management, medication management, identification of asthma triggers, and on asthma control screening. Educational interventions for the family will include general education about asthma, action plans, and appropriate materials for greater understanding of asthma. The VIAS home visiting project has objectives to increase the knowledge and skills on asthma self-management for caregivers of children / adolescents from 4- to 17-year-old who have uncontrolled asthma, and to control environmental exposure to allergens and irritants that can exacerbate asthma in children.

In PR, not all health insurances educate on asthma and even less have home visiting programs that focus on helping the caregiver in reducing asthma triggers, visits to the ER, and hospitalizations. This Business Case looks to address health insurances and demonstrate to them that having a home visiting program can help lower their costs of visits to the emergency room and hospitalizations from asthma. Health insurances also have the potential of impacting a bigger population in PR in comparison with the PR Department of Health. If health insurances join in the efforts of having a home visiting program this could help lower the rate of having an asthma exacerbation and uncontrolled asthma.

Stakeholders

Table 1. Program Collaborators

Asthma Program Staff	
Stakeholder Name: Antonio Cases	Title and Affiliation: MPA, Co-Principal Investigator - PRAP
Contribution to the Business Case: <ul style="list-style-type: none"> ● Provide technical assistance in evaluation. 	Role played in the construction of the Business Case: <ul style="list-style-type: none"> ● Oversee evaluation interventions. ● Promote the dissemination and use of evaluation reports. ● Support the evaluation activities. ● Assist in the development of evaluation reports.
Stakeholder Name: Ibis Montalvo Felix	Title and Affiliation: MPHE, EdD candidate Program Coordinator - PRAP
Contribution to the Business Case: <ul style="list-style-type: none"> ● Promote the participation of stakeholders in the development of the Business Case. 	Role played in the construction of the Business Case: <ul style="list-style-type: none"> ● Lead the evaluation team. ● Conduct VIAS mobilization efforts.

Asthma Program Staff	
<ul style="list-style-type: none"> ● Assist in the process of reviewing and editing the Business Case. ● Assist in providing the costs for the Business Case 	<ul style="list-style-type: none"> ● Promote the engagement of stakeholders in the Business Case. ● Monitor the writing process of the Business Case. ● Assist in the process of writing the Business Case. ● Help in the recruitment of VIAS participants.
Stakeholder Name: Yaquelin Codias González	Title and Affiliation: RN-BSN; Program Supervisor - PRAP
<p>Contribution to the Business Case:</p> <ul style="list-style-type: none"> ● Promote the participation of stakeholders in the development of the Business Case. ● Assist in the process of reviewing and editing the Business Case. 	<p>Role played in the construction of the Business Case:</p> <ul style="list-style-type: none"> ● Conduct VIAS mobilization efforts. ● Monitor the writing process of the Business Case. ● Assist in the process of writing the Business Case. ● Lead in the recruitment of VIAS participants.
Stakeholder Name: Keila Narváez Sánchez	Title and Affiliation: MS Candidate, Epidemiologist - PRAP
<p>Contribution to the Business Case:</p> <ul style="list-style-type: none"> ● Provide surveillance data and technical assistance. ● Aid the evaluator in conducting the data analysis for the Medicaid database. ● Assist in the process of writing the Business Case. 	<p>Role played in the construction of the Business Case:</p> <ul style="list-style-type: none"> ● Assist in the process of writing the Business Case. ● Gather the Medicaid data for the years 2017, 2018, and 2019. ● Assist in the data analysis, interpretation of evaluation data. ● Participate in meetings with the evaluator to work on the progress of the Business Case.
Stakeholder Name: Manuel Mangual Martínez	Title and Affiliation: MS, Evaluator- PRAP
<p>Contribution to the Business Case:</p> <ul style="list-style-type: none"> ● Lead prioritization activities for the development of the Business Case. ● Provide technical assistance on evaluation. ● Lead the process of writing and reviewing the Business Case. 	<p>Role played in the construction of the Business Case:</p> <ul style="list-style-type: none"> ● Lead the evaluation team. ● Develop and write the Business Case. ● Present the Business Case and evaluation reports for the evaluation planning team. ● Revise the Business Case. ● Update the Business Case. ● Follow up on meetings for the development of the Business Case.
Stakeholder Name: Dr. Heriberto Marín	Title and Affiliation: PhD, Professor in the School of Public Health University of Puerto Rico Medical Sciences Campus
<p>Contribution to the Business Case:</p> <ul style="list-style-type: none"> ● Asses the Asthma Program on economic evaluation. ● Provide technical assistance on evaluation. ● Assist in the process of developing the methodology for the Business Case study. 	<p>Role played in the construction of the Business Case:</p> <ul style="list-style-type: none"> ● Assist the evaluation team. ● Provide technical assistance to the Asthma Program in evaluation and on economic analysis. ● Revise the Business Case.

Asthma Program Staff	
Stakeholder Name: Rose Díaz Garcia	Title and Affiliation: MS, Evaluator Organization: Puerto Rico Department of Health- Epidemiology and Evaluation Unit
Contribution to the Business Case: <ul style="list-style-type: none"> • Provide technical assistance on evaluation. • Assist in the process of writing the Business Case. 	Role played in the construction of the Business Case: <ul style="list-style-type: none"> • Revise the Business Case. • Assist in the process of writing the Business Case. • Support the dissemination process of the Business Case.
Stakeholder Name: Emily Loran Velazquez	Title and Affiliation: MS, Evaluator Organization: Puerto Rico Department of Health-Division of Health Promotion
Contribution to the Business Case: <ul style="list-style-type: none"> • Provide technical assistance on evaluation. • Assist in the process of writing the Business Case. 	Role played in the construction of the Business Case: <ul style="list-style-type: none"> • Revise the Business Case. • Assist in the process of writing the Business Case. • Support the dissemination process of the Business Case.

Methodology

Evaluation Design

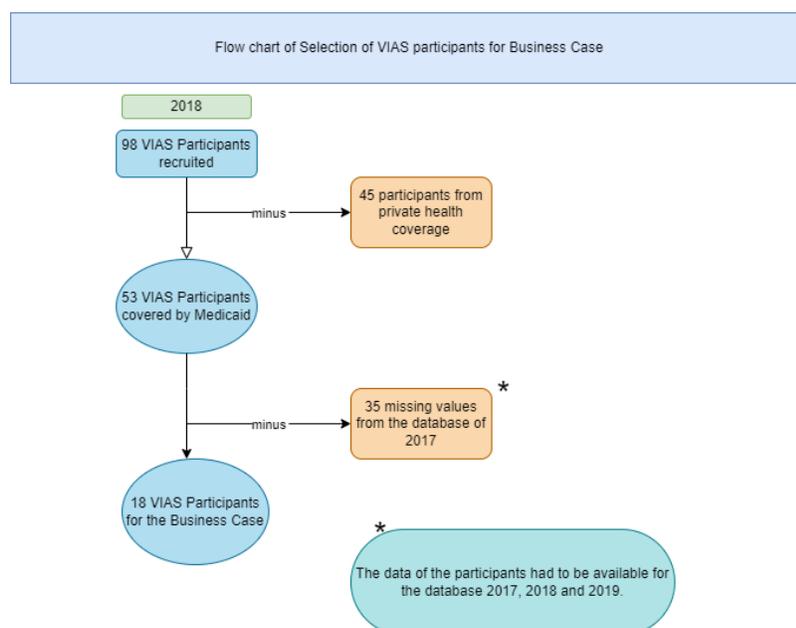
This business case was created by the Asthma Program of the Puerto Rico Department of Health, with the collaboration of experts in business case analysis and Medicaid Puerto Rico. The study analyzed data from March 2017 to December 2019, meaning this a retrospective evaluation. It was decided to do a retrospective evaluation, due to the fact, it was the first time an economic evaluation was being conducted, and because of COVID-19, the number of recent/actual participants was not at its expected rate.

Participants

The eligibility of the participants in the study consisted of the criteria used for enrollment in the VIAS project; being 4 to 17 years of age, living in Puerto Rico inside the regions with highest asthma prevalence, having an asthma diagnostic, having uncontrolled asthma defined as: having 19 or less in the Asthma Control Test, (scores range from 5-25, the higher the better; if the score is 20-25 the asthma is well controlled, 16-19 not well controlled and 5-15 very poorly controlled)⁹ or having at least 2 emergency room visits due to asthma in the last 12 months, or having at least 1 hospitalization due to asthma in the last 12 months, or having used oral corticosteroids in the last 12 months.

For this study, 98 participants were identified that met the criteria's and participated in the VIAS project during the year of 2018. From this sample, 53 of the participants were insured by the public health coverage known as VITAL. The 45 participants that were excluded at this time were

because they were insured by a private health coverage. Being from private health coverage meant there was no way access to the claims needed for the evaluation. The database available for this analysis was from PR-MMIS which provided the information of these 53 participants described from the public health coverage VITAL. Nevertheless, for the study, the sample of 53 participants was reduced to a sample of 18 participants. This significant reduction from the sample was due to the availability of the information for the database 2017, 2018 and 2019 available on the Medicaid database. For the study, the claims of all the participants had to be available on the data of PR-MMIS for the years 2017, 2018 and 2019. For better visualization the continuing flow chart below describes the process of selection for the Business Case.



Evaluation Questions

This business case is focused on demonstrating the costs the participants in treatment for asthma a year before they were enrolled on the VIAS project, during the year they received the VIAS project services, and a year post their participation in VIAS so that it could accurately be evaluated if the VIAS project could stimulate a positive Return of Investment (ROI).

Evaluation Questions	Method	Source of Data
Has the VIAS program improved the asthma control for participants?	Survey	Asthma Control Test (ACT)

Has the VIAS participants shown a reduction in emergency department visits for asthma?	Survey Structured Interview Follow Up Calls Survey	Medicaid Data Recruitment Call Follow-Up Calls
Has the VIAS participants shown a reduction in hospitalizations for asthma?	Survey Follow Up Calls Survey	Medicaid Data Follow-Up Calls
Does the VIAS program expenses exceed the benefits it produces?	Literature Review Data Analysis	Medicaid Data Program Budget

Data Collection and Analysis

In the analysis performed, we compiled the cost for hospitalizations, emergency department visits, and medical office visits of our VIAS participants. These costs were extracted from the PR-MMIS Database. On the other hand, the costs of rent, technology, staff salary, printed materials, and program promotional materials. The cost analysis performed among the participants were from those whose health coverage came from Plan VITAL, who participated in the Asthma Program home visiting program VIAS, and therefore, met the projects' enrollment criteria. The database provided by PR-MMIS contains claims for hospitalizations, emergency department visits, medical office visits and pharmacy. However, pharmaceutical costs were not taken into consideration, because the data on drugs provided by PR-MMIS for our participants were not related to asthma, neither for any procedure done in the Hospital or ER.

The ROI was based on average total preventable asthma costs, per participant, during the control and post periods, (the total preventable asthma costs, per participant, were total asthma-related hospitalization costs, and total asthma-related emergency department visit costs per participant) and the average of the VIAS program costs for the interventions offered (1-3 visits). The program costs were a portion of staff salary based on the duration of the interventions, mileage, program supplies (pillow covers, air chamber, roaches' traps, cleaning products) and promotional materials. Finally, the ROI was calculated as ((total preventable costs control period – total preventable costs post period)/present value of program costs).

$$ROI = \frac{\text{Total preventable costs control period} - \text{Total preventable costs post period}}{\text{Present value of Program Costs}} - 1$$

Three data sources for our analyses; the Puerto Rico Medicaid data base for the years 2017, 2018 and 2019. To do the analyses, we used the primary procedure code from the Medicaid database. The primary procedure code of subsequent Hospital Care and Hospitalization were determined as Hospitalization and Emergency department visits. One of the main reasons of the VIAS project, is to reduce the likelihood of its participants to re-admit on a hospitalization or to an emergency department visit. Using the data for 2017 and 2018 along with the primary code for the VIAS project participants, the corresponding asthma history is visible. The claims for hospitalizations and emergency department visits for years 2017 and 2018 were categorized as our control period. The year 2019 was used to visualize if there was any re admittance to any hospital or emergency department visit. The claims for the year 2019 were considered part of the post period.

For the cohort analysis of our participants, the date of the VIAS first home visit and the VIAS third home visit were utilized. From the VIAS first home visit, in the first year, the past asthma history of the participant was collected. The third home visit, and a year post, collected the participants' present asthma history. Within this cohort we analyzed the participants' costs for hospitalizations and emergency department visits. The Medicaid database provided the detailed billed amount, and that variable was used to establish the cost of hospitalization, the emergency department visit, and the medical office visits. The data analysis was done using Excel version 2010.

The VIAS program cost analysis took into consideration the program costs of the interventions offered (1-3 home visits). The cost of the analysis included a percentage of the salary of the Puerto Rico Asthma Program staff because they were the ones who also implemented the VIAS project. The percentage of staff salary was assigned by the time they assisted the VIAS project (table 2). Program materials used for the three visits were established by the program nurse and the health educator (table 3). Total costs of the program materials, and program incentives for the three visits, were included within the VIAS total costs. Cost of rent was also incorporated into the analysis. Rent was calculated by multiplying the cost per square feet, \$22.00, by the 567 square feet of office space. The cost of rent included utilities such as: security, office cleaning, parking for program staff, electricity and water services were included.

Results

The average age of the participants who completed all visits with available data for the study cohort (n=18) was of 9.4 years old, 56% were female and 44% were male. All the participants of the study (100%) had Medicaid as their primary health insurance.

As shown in (Table 4), the total cost for the implementation of the VIAS program was \$74,224.00, the average for hospitalization cost was \$4,404.70 during the control period and \$406.88 during the post period ($P = 0.40$). Whereas the average for emergency department visit was \$269.43 for the control period and \$45.77 for the post period ($P = 0.50$), the average cost for medical office visits during the control period was \$449.75 and \$83.86 for the post period ($P = 0.75$). The number for asthma related hospitalizations for the control period was reduced from 1.67 to 0.11 in the post period ($P = <0.001$), a reduction of 93% between the control period and the post period. While doing the analysis for the number of asthma related visits to the ER during the control period was reduced from 1.44 to 0.44 in the post period ($P = <0.001$) a reduction of 69% between the control period and the post period. Also, there was a reduction on medical office visits from 13.94, during the control period, to 2.94 during the post period, ($P = <0.001$) a reduction of 85%.

The ROI was 0.11 for participant who completed all 3 visits (n=18). In other words, for every dollar invested in the asthma intervention, the payer will save \$0.11 in healthcare costs. For every dollar invested, there is an 11% of return.

Discussion and Implications for Public Health

The economic evaluation, of the VIAS study, demonstrated that the asthma home visiting program not only helps to improve the quality of the home environment of the pediatric patients, reduces or helps control the asthma triggers in the home, but also reduces Medicaid costs for pediatric patients. The Medicaid claims from the control period for our final sample saw significant reductions in comparison to the Medicaid claims for the post period. The cost reductions observed were significant for hospitalizations, emergency department visits, and medical office visits related to asthma. The study also demonstrated a positive ROI which shows that home interventions generate savings on asthma health costs.

The impact of the VIAS home visiting program reflects greatly on the society of Puerto Rican. Most people are not educated on the fact that not every asthma symptom presents a motive to visit an emergency department room or a hospital before reaching out to the primary doctor they visit. While conducting the data analysis, we saw an enormous reduction (69%) on emergency department visits and (93%) on hospitalizations of the 18 participants that the data was available for the years 2017, 2018 and 2019. We also saw with the same sample that they had more office consultations as a primary procedure code than emergency visits and hospitalizations. Seeing these reductions gave us an assurance that the education offered by the VIAS project also impacts the parents or tutor of the participants and presents a better education on asthma condition, and how to manage the participants' condition in a more effective way. With a positive ROI of 1.11 we can establish that asthma home visiting programs do work and can achieve great savings in healthcare costs.

Our study had several limitations which did allow for more precise data for the analysis presented. First, the data of Medicaid for the year 2017 was not complete and the information was not backed up by CMS data. Secondly, 2017 and 2019 data were not available for all 53 participants who were first identified within the Medicaid participants and that participated in the VIAS project in 2018. Also, there were some costs that were included in the analysis that appeared as an unknown primary procedure code but were included as a hospitalization since the charge was given by hospitals and the primary and secondary diagnosis were defined as "asthma acute exacerbation" and "pneumonia" respectively. While analyzing the data this did not give us an assurance that those costs were precisely due to hospitalizations. Other primary procedure code that was not included in the cost's analysis such

as: thoracic x-rays, and after office hours consultations for an asthma diagnostic. Lastly, pharmaceutical claims were also not included in the analysis because the drugs on the database were not used for asthma treatment and none of the participants of the study had pharmaceutical drugs on the claims.

This study let us gain information of how the Puerto Rican society utilizes their health system. Most of the caregivers utilize a hospital or an ER instead of a medical office when their children had an episode of asthma. In the post period we saw the dramatic reduction of the utilization of hospitals, ER and medical offices. This reduction can be attributed to the education in asthma the caregivers and children received through the home visiting program. Education can give participants the empowerment to have control of asthma. We also saw how participants visited more medical offices instead of returning to the hospital or the ER. All this data clearly points to the idea that a home visiting program that offers education, can save thousands of dollars on our health systems. Also, it provides us with information that could lead to the implementation of new public policy. This public policy could include the integration of projects like VIAS within the health insurers companies so that more health education can be offered and by default minimize the cost of hospitalizations and visits to the ER. This type of projects can only be achieved with the help of legislators, health insurers, and the Department of Health.

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Appendix

Other Tables

List of Resources Program Implementation	Consumed to Implement the Program	Donated / In-kind
Principal Investigator		X
Program Manager	X	
Evaluator	X	
Epidemiologist	X	
Consultants	X	
Nurses	X	
Asthma Educators	X	
Facilities		
Rent		X
Maintenance&Insurance		X
Utilities		X
Printing	X	
Transportation	X	
Mileage Reimbursement	X	
Computers	x	
Materials and Supplies		
Pillow Case	X	
Clorox Wipes	X	
Hand Sanitizer	X	
Spacer		X
Peak Flow meters		X
Backpack	X	
Healthy plate		X
Bottles		X
Lunch box	X	
Pill box		X
Bowl	X	
Shopping bag cancer		X
Shopping bag asthma	X	
Mask nebulizer children		X
Mask nebulizer adults		X
Mask vortex	X	
Coakroaches trap	X	
Mouse trap	X	
Dusty coloring book		X
Asthma Coloring book	X	
Asthma brochures Vias	X	
Asthma brochures rescue Medication	X	

Asthma brochure control medication	X	
Asthma roll banner	X	
Asthma brochure nutrition	X	
Asthma brochure action plan	X	
Asthma brochure program	X	
Asthma brochure triggers	X	
Second hand smoke brochure	X	
Asthma book green	X	
Asthma book blue	X	
Asthma healthy home guideline	X	
Asthma attack 6 paths poster	X	
VIAS poster	X	
Asthma medication bag	X	
Plastic boxes	X	
Nebulizers compressor		X

Table 3. Material used by visit on VIAS project

Materials and Instruments used	Visit Number		
	1	2	3
Pillow Case	X		X
Clorox Wipes			X
Hand sanitizer			X
Spacer	X	X	
Peak Flow meters		X	
Backpack	X		
Healthy plate	X		
Bottles		X	X
Lunch box	X		
Pill box		X	
Bowl	X		
Shopping bag asthma	X		
Mask nebulizer children		X	
Mask vortex		X	
Coakroaches trap			X
Mouse trap			X
Dusty coloring book			X
Asthma Coloring book			X
Asthma brochures Vias		X	
Asthma brochures rescue Medication		X	
Asthma brochure control medication		X	
Asthma medication bag		X	
Plastic boxes		X	
Nebulizers compressor		X	X

Table 4. Insurance Claims for Participants (N=18) Covered by Medicaid Related to Asthma Claims for Hospitalizations and Emergency Visits.

Variable	Total Cost Control Period	Total Cost Post Period	Control Period ^a	Post Period ^b	P-Value ^c
			Mean	Mean	
Participants in Cohort study (n=18)					
Hospitalization	\$79,284.60	\$7,324.00	\$4,404.70	\$406.88	0.40
Emergency Department Visit	\$4,849.74	\$824.00	\$269.43	\$45.77	0.50
Medical Office Visits	\$8,095.62	\$1,509.51	\$449.75	\$83.86	0.75
VIAS Program Implementation Costs	\$74,224.00	-	-	-	-
	Total Number of claims Control Period	Total Number of claims Post Period	Mean claim per participant	Mean claim per participant	
Number of Hospitalizations	30	2	1.67	0.11	<0.001
Number of Emergency Department Visits	26	8	1.44	0.44	<0.001
Number of Medical Office Visits	251	53	13.94	2.94	<0.001

^a Control period was defined as 1 year prior to the first VIAS visit.

^b Post period was defined as 1 year after visit 3.

^c $P < 0.05$ indicates significance.