Community Health Workers Improve Asthma Outcomes: Processes, Challenges and Lessons Learned

Tyra Bryant-Stephens, MD, Director and Founder of the Community Asthma Prevention Program of Philadelphia

CAPP
Community Asthma Prevention Program

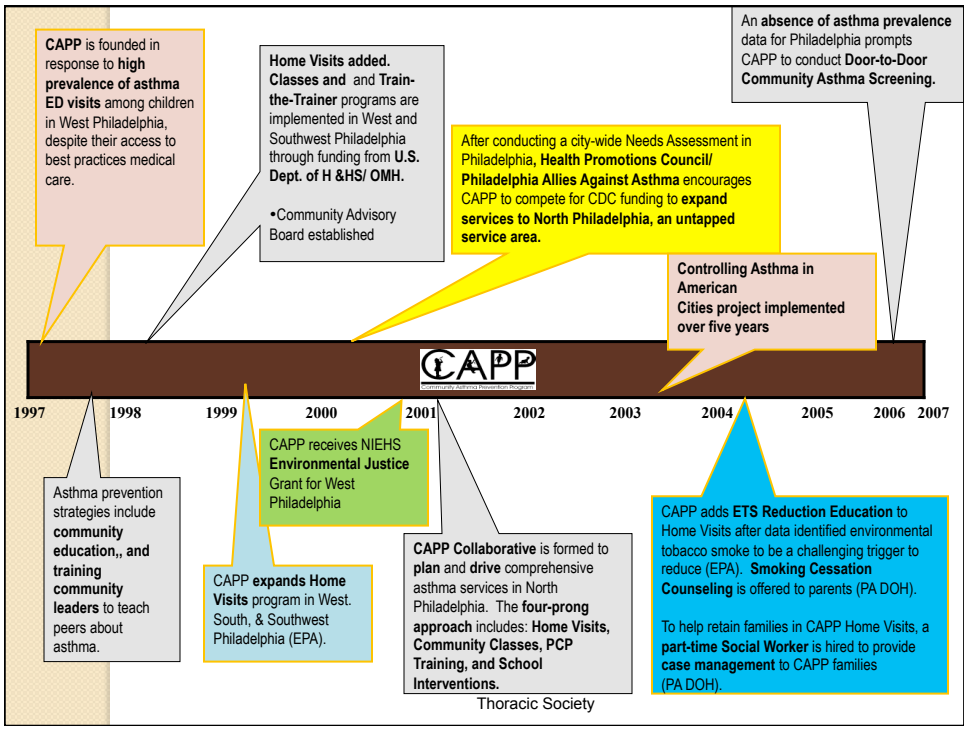
Objectives

- Describe the Community Health Worker's (CHW) Role in Community Asthma Prevention Program research and service projects
- Discuss training and infrastructure support
- Review three CAPP studies and outcomes
- Discuss lesson learned

CAPP

Community Asthma Prevention Program of the Children's Hospital of Philadelphia

- **CAPP founded in 1997**
- **Population Served** A city with 1.4 million people, 28% children, large minority population, and 26% asthma prevalence
- **CBPR approach with Key Partners**: Philadelphia School District, numerous Faith-based Organizations, City Department of Health, Health Promotions Council, Philadelphia Allies Against Asthma, Health Federation, Congreso de los Latinos, Head Start Learning Tree,



CAPP's Asthma Interventions where Community Health Workers are key players

- Community Classes***
- Home Asthma Education and Environmental mitigation***
- Screening for Asthma Prevalence: Door-to-Door and Schools***
- School student asthma classes and Professional training***
- Primary Care Practices: Professional training and quality improvement***

CAPP

CAPP Delivers Asthma Interventions

Trains CHWs recruited from the community:

- To deliver in-home evidence-based asthma education and environmental mitigation
- To review symptom diaries with patients to help better manage asthma
- To promote self-management of environmental exposures by demonstrating medication use, asthma devices, trigger avoidance techniques, reviewing AAPs and connecting families to resources

CAPP

CHW Roles

- Recruitment
- Providing five intervention visits which include education and environmental mitigation then at least monthly visits for one year
- Data Collection
  - Administering surveys for baseline demographics, knowledge, asthma control and asthma quality of life
  - Visual assessments of the home environment

CHW roles-(cont)

- Supporting parents in implementing allergen/irritant avoidance techniques
- Collecting symptom diaries
- Providing feedback to clinical providers
- Provision of direct feedback from caregivers
- Connecting families to resources
- Providing social support

CAPP

Essential Infrastructure Elements

- Training- Core values
- On-going Supervision and re-training
- Staff development- cultural sensitivity, dealing with unexpected encounters
- Development of linkages- to other community members, policy development
- Qualifications
- Sustainable roles

CAPP

Basic Training for CHWs

- Overview of CAPP and specific project
- Basic Asthma Knowledge
- Skill building-asthma devices
- Teaching Techniques
- Mock teaching from Lesson Plans
- Scenarios encountered in the Home
- Protocol for project- consenting as per IRB protocol
- Data collection strategies

CAPP

Ongoing Training for CHWs

- Demonstration of lesson for peer review
- Field observations
- Buddy visits
- Independent visits
- Monthly booster sessions

CAPP

CHW Certifications

- Healthy Home Specialists
- Smoking Cessation Specialists

CAPP

Core Intervention for most projects

Education	Allergen avoidance/Safety Techniques
Session 1 Pre-test given for asthma knowledge, control and and quality of life **All About Asthma** • What is asthma? • Chronic nature of asthma • Asthma can be controlled	Observe and document common triggers present in child's bedroom and general living areas.
Session 2 **Triggers of Asthma and Prevention Techniques** What are the different things in the environment that may trigger asthma How to avoid these triggers and prevent an asthma attack from starting	Distribute pillow and mattress cover. Assist caregiver in covering mattress Demonstrate how to clean baseboards
Session 3 **Medicines and Asthma Devices** •What medicines are used for asthma •How these medicines work to keep asthma symptoms from starting and how they calm symptoms once they begin •How to use inhalers, spacers, and peak flow meters; the purpose of these devices; and how to take care of them	Discuss cockroach and rodent prevention strategies using integrated pest management techniques Provide IPM
Session 4 **Asthma Action Plan** •Using the right medicine at the right time •How to communicate with the primary provider in using an individualized asthma action plan	Discuss weatherization maintenance techniques
Session 5	Discuss ways to avoid missing school and workdays

Before

After

Changes made from intervention

–Mattress and Pillow Covers Used

–Clothing and toys placed in rubber bins

–Tile replaced worn carpet

Funded through National Institute of Environmental Health Sciences
Bryant-Stephens et al. AJPH 2009

CASE STUDY 1: COMMUNITY PARTNERS FOR ASTHMA PREVENTION

Case Study 1

- Objective; To study whether an asthma environmental and educational intervention designed by partners and delivered by CHWs will improve asthma outcomes in West Philadelphia children
- Eligibility: Children ages 2 to 16 years of age, diagnosed with asthma, and at least one asthma- related IP visit or two ED visits in the prior year were
- Design: Children randomized into two groups (immediate and delayed intervention) in a crossover study. Each group participated in the active phase (intervention) and inactive phase.
- Outcomes included asthma symptoms, albuterol use, emergency department visits, hospitalizations, and trigger reduction.

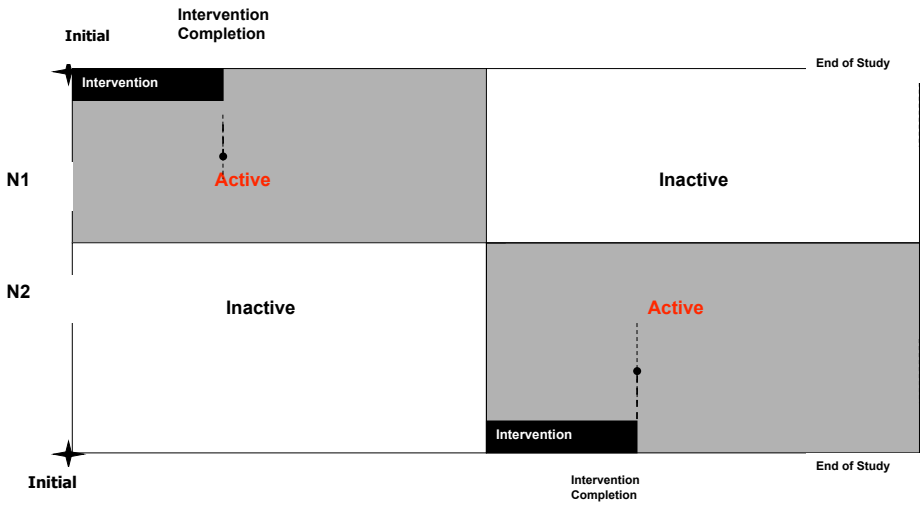
CAPP

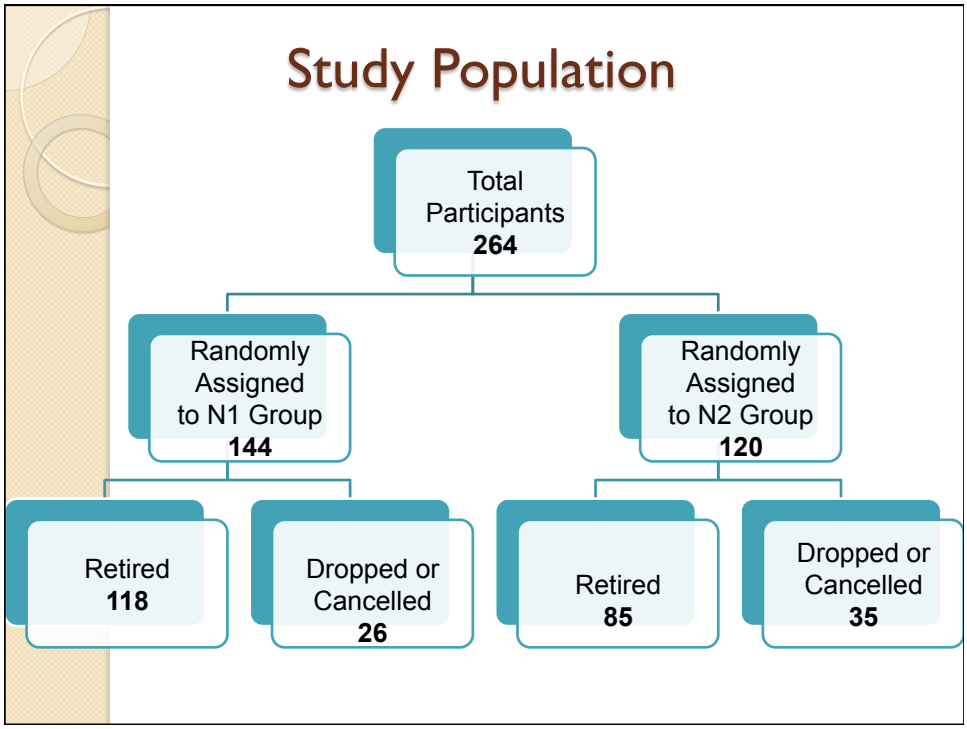
CHW Role

- Randomization
- Enrolling
- Administering questionnaires
- Implementing Intervention
- Collecting bi-weekly to weekly symptom diaries
- Visual assessments at baseline and end
- Presenting cases at monthly team meetings
- Recruitment

CAPP

Crossover Study Design





Baseline Participant Characteristics

Characteristic	N1 (N=144)	N2 (N=120)	Total (N=264)	p
Mean Age of Child	5.87	6.2	6.504	0.44
Gender Male	94	80	174	0.81
Female	50	40	90	
Race/Ethnicity African American	98	79	177	0.70
Latino	0	0	0	
Other	46	41	87	
Caretaker Completed High School	112	97	209	0.54
Caretaker Employed	60	60	120	0.18

Characteristic	Group N1 N=144		Group N2 N=120		*P-Value*
*Child's age, years, mean (SD)	5.9	(3.3)	6.2	(3.6)	.44
+Sex, Male, n (%)	94	65%	80	67%	.81
+Race/Ethnicity, n (%)					
Black Non-Hispanic	136	94%	112	93%	.74
+Caretaker completed high school, n (%)	112	78%	97	81%	.54
+Caretaker employed, n (%)	60	42%	60	50%	.18
+Housing, n (%)					
Single	3	2%	3	3%	
Row house	105	73%	95	79%	.25
Other	1	1%	3	3%	
+Environmental triggers, n (%)					
Home has carpet	70	49%	70	58%	.12
Child's bedroom has carpet	77	53%	72	60%	.29
Mattress in mattress cover	10	7%	9	8%	.86
Pillow in pillow cover	6	4%	2	2%	.30
Smoker resides in house	74	51%	58	48%	.62
Roaches	70	49%	54	45%	.56
Rodents	90	63%	61	51%	.06
Furry Pet	58	40%	49	41%	.93
*ED visits in previous year (avg#/child, SD)	2.26	(2.27)	2.35	(2.44)	.79
*Inpatient hospitalizations in previous year (avg#/child, SD)	0.85	(0.99)	0.95	(0.99)	.46
++Symptoms n (%)	N=110		N=83		
Nighttime wheeze					
None	42	38%	34	41%	.69
1-2 Days/Week	24	22%	19	23%	
2-4 Days/Week	11	10%	11	13%	
Everyday	33	30%	19	23%	
Nighttime Cough					
None	35	32%	24	28%	.39
1-2 Days/Week	12	11%	16	19%	
2-4 Days/Week	21	19%	17	20%	
Everyday	42	38%	27	33%	

Effect of Environmental Intervention on Trigger Improvement*

Outcome	Effect After Intervention vs. Before	
	Odds Ratio (Confidence Interval)	*P-Value*
Roach Elimination/Decrease	2.91 (0.94, 9.06)	**.06**
Rodent Elimination/Decrease	4.8 (1.09, 21.23)	**.04**
Smokers/Smoking Eliminated in Home	3.07 (0.4, 25.79)	.30
Furry Pets Taken Away From Home	1.36 (0.32, 5.81)	.68
Bedroom Carpet Removed and Replaced with Tile	1.29 (0.86, 1.93)	**.21**
Mattress Cover Used	380 (108, 1337)	**<.0001**
Pillow Cover Used	496 (122, 2021)	**<.0001**

*Chi- square and GEE method used

Outcomes

Effect	ED Visits	IP Visits
12 months prior to enrollment as compared to 12 months post-intervention	-0.82 (<0.0001)	-0.7 (<0.0001)
Group N1 vs.N2 *(N 2 did better)*	0.21 (0.04)	0.19 (0.15)
*In general younger age groups had more IP and ED visits than older children. There was a significant difference in children 2-4 having more IP visits than children 5-11or greater than 12.		

Conclusions of Case 1

- CHW's effectively reduced asthma triggers and increased caregiver asthma knowledge which resulted in reduced emergency room visits, hospitalizations and asthma symptoms.
- Relationships formed between caregivers and lay health educators appear to positively impact asthma outcomes for disadvantaged populations.

CAPP

Funded by The Centers for Disease Control and Prevention
Controlling Asthma in American Cities

CASE STUDY 2: CONTROLLING ASTHMA IN AMERICAN CITIES

Case Study 2

- Objective: To study effect of asthma education and environmental mitigation for families in North Philadelphia on asthma outcomes
- Eligibility: On controller medication (later modified) +≥2 ED visits or ≥ 1 IP visit
- CBPR-Pre/post design with 6 month f/u
- Parent chooses:
  - Level 1- Assessment *OR*
  - Level 2- Assessment + Environmental Class *OR*
  - Level 3- Five classes +Environmental Mitigation + six-montl follow-up

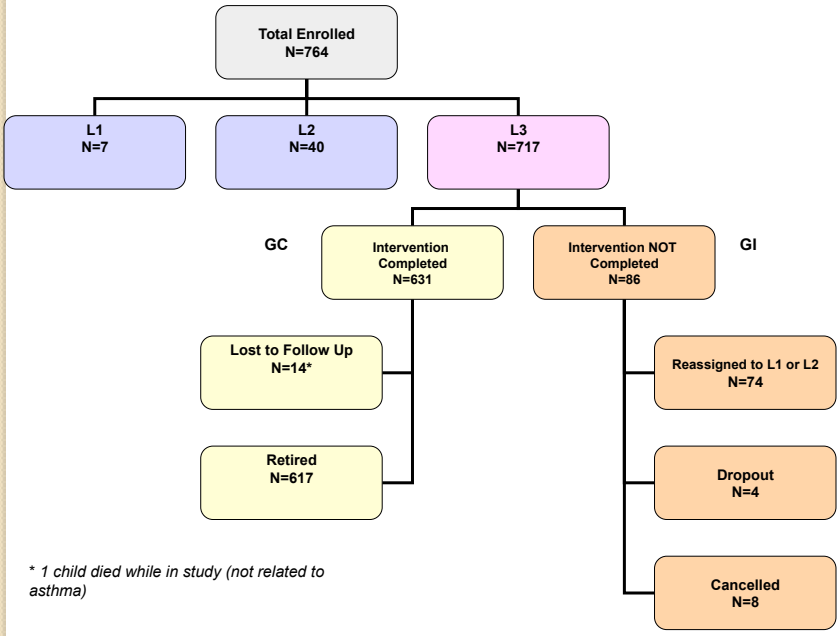
CAPP

CHW Role

- Recruitment
- Establishing CAPP presence in a new area of the city
- Enrolling and administering consent
- Implementing protocol
- Visual assessments of home on monthly bases
- Administering surveys at baseline and follow-up
- Following families for six months with symptom diaries

CAPP

Study Participant Enrollment and Group Status Chart



** 1 child died while in study (not related to asthma)*

Baseline Variable	GI		GC		
Caregiver Characteristics	**N**	**%**	**N**	**%**	**p-value**
Race/Ethnicity					
African American	47	55%	366	58%	0.12
Hispanic	35	41%	242	39%	
Relationship to Child					
Mother	80	93%	578	92%	0.99
Other	6	7%	50	8%	
Age					
18-25 yrs	10	12%	100	16%	
26-35 yrs	40	47%	316	50%	0.27
36-45 yrs	30	35%	157	25%	
Years of Education					
< 8 yrs	3	3%	43	7%	
9-11 yrs	27	31%	126	20%	0.032
12-13 yrs	53	62%	399	64%	
> 14 yrs	3	3%	60	10%	
Employment Status					
Unemployed	45	52%	392	63%	
Manual/ Service Worker	17	20%	116	19%	
Craftsperson/Clerical	7	8%	27	4%	0.2
Skilled White Collar/ Managerial/Professional	11	13%	62	10%	
Student	6	7%	27	4%	

Home Environment Characteristics	**GI-N**	**%**	**GC-N**	**%**	**p-value**
Type of Housing					
Row	75	89%	525	84%	0.56
Apartment	8	10%	74	12%	
Own or Rent Home					
Own	26	37%	205	33%	
Rent	33	46%	413	67%	<0.0001
Other	12	17%	3	0%	
Proximity of Home to Neighborhood Violence					
Both saw violence and felt unsafe in past 6 mo	20	23%	98	16%	
Either saw violence or felt unsafe in past 6 mo	15	17%	50	8%	0.0019
Neither saw violence or felt unsafe in past 6 mo	51	59%	480	76%	

Asthma Control Characteristics	GI-N	%	GC-N	%	p-value
Avg # Albuterol Puffs per Day in Past Week					
None	26	30%	147	23%	
1-2 puffs	19	22%	193	31%	0.33
3-4 puffs	21	24%	153	24%	
>4 puffs	20	23%	137	22%	
Nighttime Cough first 2 wks of intervention					
Mild (< 2 times/wk)	15	50%	320	52%	
Moderate(Btwn 2 and 4 times/wk)	5	17%	90	15%	0.94
Severe (>4 times/wk)	10	33%	195	32	
Nighttime Wheeze first 2 wks of intervention					
Mild (< 2 times/wk)	19	63%	383	63%	
Moderate(Btwn 2 and 4 times/wk)	4	13%	72	12%	0.96
Severe (>4 times/wk)	7	23%	150	25%	
	mean	**std**	**mean**	**std**	**p-value**
# of Asthma Related ED Visits Past Yr	3.64	±3.91	2.38	±2.69	0.002
# of Asthma Related IP Visits Past Yr	1.2	±1.69	1.08	±1.51	0.52

Overall Outcomes

- **Asthma Knowledge (mean improvement 17 points on quiz)
- ** Quality of Life (mean improvement of 10 pts on QOL Questionnaire)
- ** Reduction of Environmental Asthma Triggers
  (an average of 50% reduction of triggers found in home)
- ** Reduction of Nighttime Cough and Wheeze Symptoms
  (an average of about 1 less night of coughing or wheezing per week as reported through symptom diaries kept by participants)
- **Decrease in Number of Asthma Related Emergency Room Visits
  (41% difference in mean number of visits/yr after HV intervention vs baseline)

*** = p<0.0001*

CAPP

Question???

Are there any baseline characteristics that would help local and state health departments determine who would benefit the most from this service?

CAPP

Predictors for outcomes based on baseline characteristics

	Short Term Outcomes			Long Term Outcomes			
	QOL Score Improvement Est p-value	Quiz Score Improvement Est p-vlue	Reduction in at least 50% Triggers Est p-value	Reduction in Nighttime Cough Est p-value	Reduction in Nighttime Wheeze Est p-value	Reduction in # ED Visits Est p-value	Reduction in # IP Visits Est p-value
Type of Housing ***Single*** ***Row*** ***Apartment***	*NS*	*NS*	-1.04 0.35 0.69 **0.013**	2.34 -0.83 -1.51 **0.012**	3.62 -1.45 -2.18 **0.0007**	***NS***	*NS*
Home Ownership Status ***Own*** ***Rent***	*NS*	*NS*	-0.20 0.20 **0.073**	*NS*	0.55 -0.55 **0.012**	*NS*	*NS*
Exposure to Violence ***Saw and/or felt unsafe*** ***Neither saw or felt unsafe***	0.35 -0.35 **0.011**	-0.54 0.54 **0.063**	*NS*	*NS*	*NS*	*NS*	-0.35 0.35 **0.026**
Smokers Live in Home ***Yes*** ***No***	---------- *NS* ----------			*NS*	*NS*	*NS*	-0.25 0.25 **0.065**

**Estimated Coefficients are from the logistic model*

Predictors for Asthma Outcomes based on baseline characteristics*

	Short Term Outcomes			Long Term Outcomes			
	QOL Score Improvement Est / p-value	Quiz Score Improve-Ment Est/p-value	Reduction in at least 50% Triggers Est / p-value	Reduction in Nighttime Cough Est /p-value	Reduction in Nighttime Wheeze Est/ p-value	Reduction in # ED Visits Est / p-value	Reduction in # IP Visits Est / p-value
Albuterol Usage	NS	NS	NS	0.16 **0.022**	NS	0.096 **0.030**	NS
Nighttime Cough	---------- NS ----------			-2.07 **<0.0001**	NS	NS	NS
Nighttime Wheeze	---------- NS ----------			0.34 **0.031**	-2.57 **<0.0001**	NS	NS
# ED Visits	NS	NS	-0.085 **0.043**	NS	NS	-1.82 **<0.0001**	NS
# IP Visits	---------- NS ----------			NS	NS	NS	-3.89 **<0.0001**

**Estimated Coefficients are from the logistic model and Shaded areas represent baseline effects of these variables.*

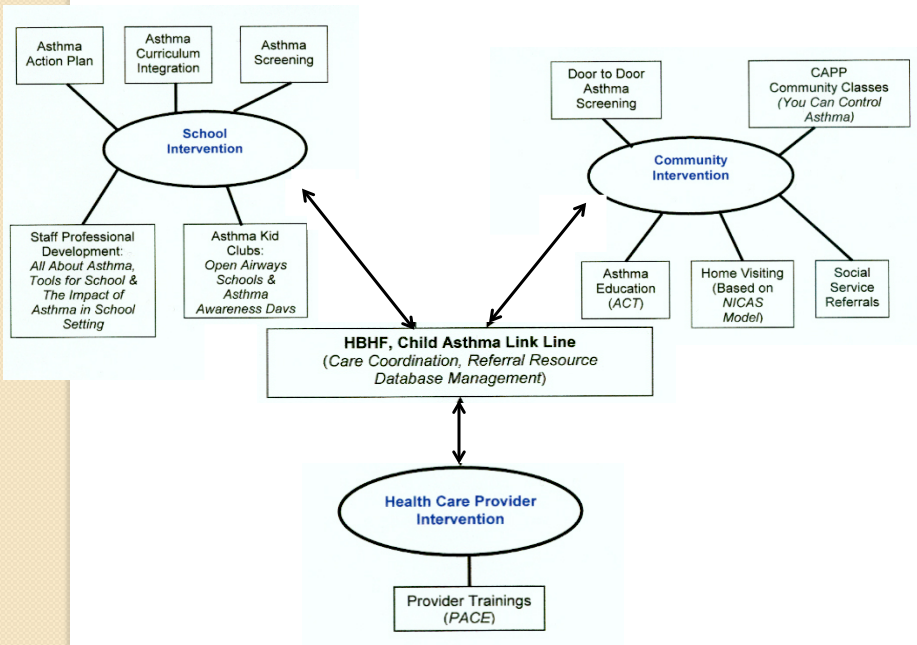
Conclusions for Case Study 2

- CHW's were successful in implementing a home visit program in a new section of the city resulting in improved asthma outcomes

Funded through Merck Childhood Asthma Network

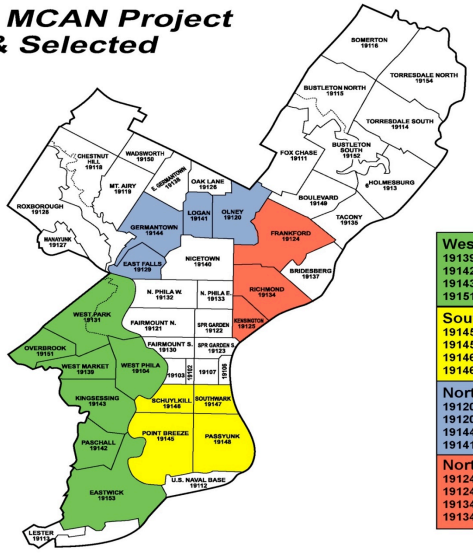
CASE 3: PHILADELPHIA MCAN STUDY

MCAN PROJECT MODEL



Map of Philadelphia + Zip Codes

Philadelphia MCAN Project Target Area & Selected Schools



West - year 1
19139 - Huey - 825 students
19142 - Morton - 822 students
19143 - Bryant - 814 students
19151 - Lamberton - 917 students

South - year 2
19145 - Girard - 625 students
19145 - McDaniel - 532 students
19146 - Alcorn - 796 students
19146 - Smith - 470 students

Northwest - year 3
19120 - Ben Franklin - 1222 students
19120 - Finletter - 1089 students
19144 - Kelly - 673 students
19141 - Prince Hall - 547 students

Northeast - year 4
19124 - Edmunds - 1283 students
19124 - Sullivan - 709 students
19134 - Elkin - 1131 students
19134 - Sheridan - 1011 students

Door to Door Screening

- Objective: To determine asthma prevalence in Philadelphia in low income inner city neighborhoods
- Methods
  - Flyers distributed to each home week prior to screening with specific dates of screening
  - Opt out number given for residents to call who did not wish to be screened (<10/4-block radius)
  - Used validated Brief Pediatric Screen
  - Questions read aloud to avoid literacy issues
  - If positive screen, offered enrollment in Home Visits and/or Link Line

CAPP
Community Asthma Prevention Project

CHW Role

- Implemented screening protocol
- Collected data
- Connected families to resources

CAPP

Brief Pediatric Asthma Screen

1. Has your child ever been diagnosed by a doctor as having asthma?
2. Has your child ever had episodes of wheezing (whistling in the chest) over the past 12 months?
3. In the last 12 months have you heard your child wheeze during or after active play
4. Other than a cold, has your child had a dry cough at night?
5. In the past 12 months has your child been to a doctor, emergency room or hospital for wheezing?

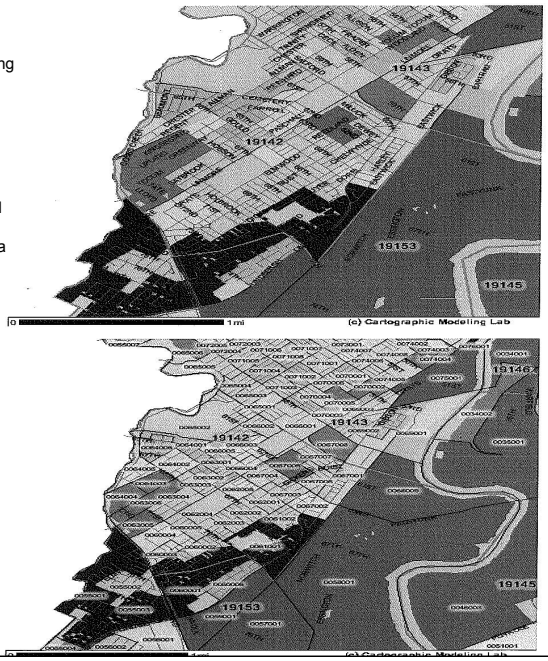
Wolf et al. Chest 1999

CAPP

MCAN Project: Zip Code 19142: 4 Randomly Selected Block Groups

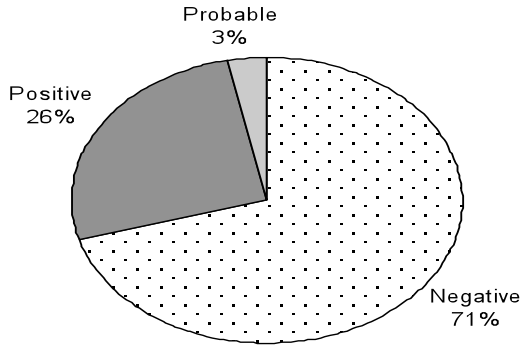
1. CT 62, BG1 (n=890) 2. CT 66, BG2 (n=721) 3. CT 64, BG6 (n=1213) 4. CT 67, BG5 (n=1666)

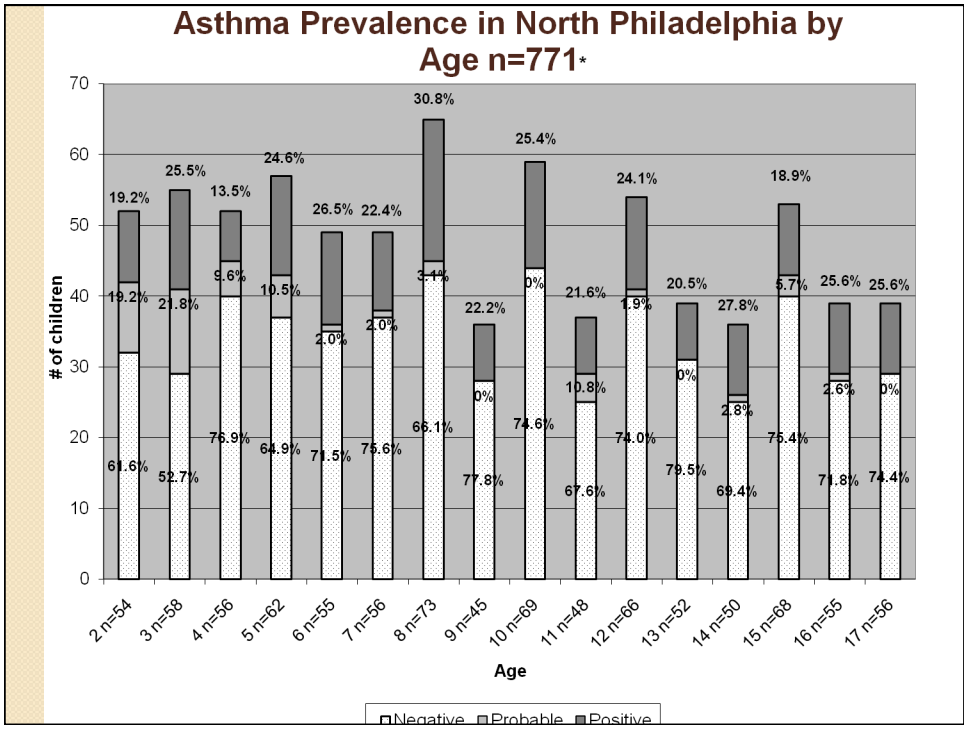
- Randomized Screening
- 4-block radius
- 2006 census data areas with high concentration of children
- Zip codes included all West, Southwest and Northwest Philadelphia zips



Results of Door-To-Door Screening

Figure 1. Asthma Prevalence in West and North Philadelphia n=2023





Lessons Learned

- Advantages of Door-To-Door Screening
  - Ability to reach the unreachable to determine "real" prevalence (important for policies) and to enroll in asthma educational programs (important for individual outcomes).
- Disadvantages of Door-To-Door Screening
  - Labor intensive (needs to be a focused, short-term effort)
  - Safety issues

CAPP

Case Study-Charmane Braxton

Mother of child with asthma

Initial encounter with CAPP as parent in community class

Became Parent Educator in CAPP community classes

Hired as Home Visitor/CHW for CAPP

CAPP

Charmane's Voice

- INITIAL CHALLENGES

1. Gaining the trust of client b/c we are going into their domain(safe haven) and telling them how to take care of their child and home.

2. Getting the client to see us as an asset and not a nuisance or dictator.

CAPP

Charmane's Voice…

SOLUTIONS... First impression is the key!

1. Dress casual b/c this way we blend in with our envirnoment, look like one of them and appear to be friendly, not intimidating.

2. Leave the clipboard in the office, put papers in our CAPP

3. Communicate to the parent that we are there to help, make suggestions which will improve their child's quality of life, reduce stress/fears that the parents may have about asthma and hopefully give them a better understanding of asthma and how to manage it.

4. Be clear, to the point, listen to the parent, allow them to talk freely and ask us questions. This shows genuine interest, makes them feel like they are still in control and have a voice in their child's care.

CAPP

Charmane's Voice… TRAINING-DEALING WITH PROBLEMS WHILE TEACHING

1. ASK questions and get clarity from supervisor
2. Take note of any problems in the home and discuss with team.
3. LISTEN to experienced CHW and learn from their comments/suggestions from mock teaching.
4. KNOW your material(people are more apt to believe you if you know what you are talking about).
5. NEVER leave parents up in the air.
6. NEVER be combative or disrespectful to client.
7. HEAR them out, try to resolve any differences in a professional manner. Or if not, refer them to our supervisor.

CAPP

Challenges

- Infrastructure
- Field supervision
- Data Collection
- Safety challenges
- Monitoring/Documentation of Daily Activities
- Sustainability

CAPP

Lessons Learned

- CHW's are great recruiters for the project
- CHW's can build valued supportive relationships with caregivers
  - Establish boundaries for CHW's and clients
  - Educate CHW's about legal ramifications
- Important to recruit CHW's who have some experience in building relationships with clients

CAPP

Lessons Learned

- Data collection has to be monitored closely
  - Review essential data elements consistently
  - Create script for CHW's when asking questions
  - Have CHW's monitor each other at monthly/ weekly meetings
  - Do random chart checks
  - Create punch list for data entry clerk
- Expectations must always be inspected

CAPP

CHW Retention

- Six home visitors trained over 11 years. Most retained for at least 5 years (range 3-10 years).
- Over 1500 families participated in Home Visit Program
- Average retention for 6 month projects- 86%
- Average retention for 12 month projects-80%
- Average reduction in emergency room visits is 50%
- Average reduction in inpatient visits is 40%

CAPP

Conclusions

- CHWs are effective in providing knowledge to the of what is happening in the "real world"
- With adequate training and supervision, CHWs are effective in conducting rigorous research protocols in the community
- Because they are residents in the same community, CHWs can provide social support and knowledge of community resources
- CHWs efforts are instrumental in improving asthma outcomes
- CHWs can be effective in providing public health professionals with data needed to support disadvantaged families

CAPP

Acknowledgements

CAPP Team

Acknowledgements

- Philadelphia MCAN Team
  - Michael Rosenthal, MD
  - Erin Mccarville,MPH
  - Caroline West, MPH
  - Zalika Shani, MPH
  - Tinesha Banks, MPH
  - Vanessa Briggs

CAPP

CAPP

Objective and Methods

- To study evidence-based home environmental intervention in improving asthma outcomes through
- Eligibility- 1IP or 2 ED
- Methods- families received 5-6 educational visits followed by 2-4 week symptom diary collection for 12 months.
- Prospectively followed for 12 months

CAPP

Home Asthma Education and Environmental Intervention

Demographics of Home Visit Families

n=339 children, n=256 families

	Mean
Age	7.4 years, ± 4.2
Sex	54.0% male
Race	85.8% African American
Ethnicity	8.8% Hispanic

Home Asthma Education and Environmental Intervention Outcomes

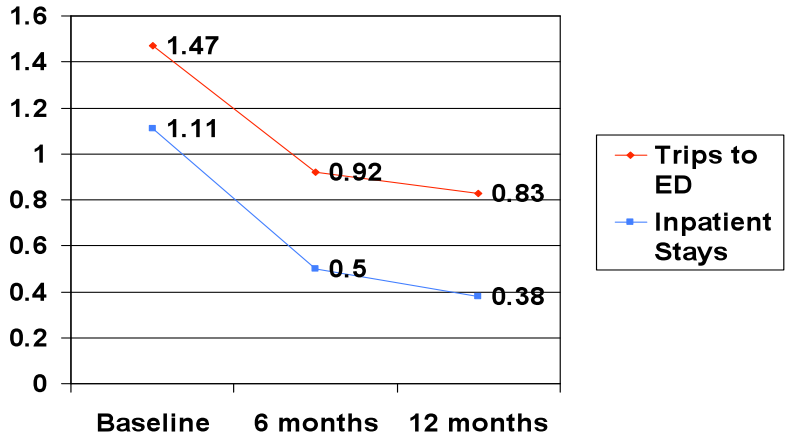
Paired Analysis	Baseline	12 month	p-value
ED visits last 12 months n=47	1.32 (±1.43)	0.83 (±1.24)	0.05
Hospitalizations last 12 months n=47	1.36 (±2.11)	0.38 (±0.74)	0.00
Missed school for any reason n=31	6.48 (±11.19)	8.03 (±9.61)	0.49
Missed school for asthma n=31	6.48 (±11.23)	4.84 (±6.44)	0.42

Home Asthma Education and Environmental Intervention Outcomes

Paired Analysis	Baseline	12 month	p-value
# of days using rescue meds n=47	3.94 (±4.18)	2.17 (±3.86)	0.06
# of days with symptoms n=43	2.67 (±2.97)	1.19 (±2.69)	0.01
# nights with symptoms n=47	2.49 (±3.12)	0.96 (±1.85)	0.005
# of days child slowed down because of asthma n=48	2.94 (±5.20)	0.58 (±1.57)	0.005

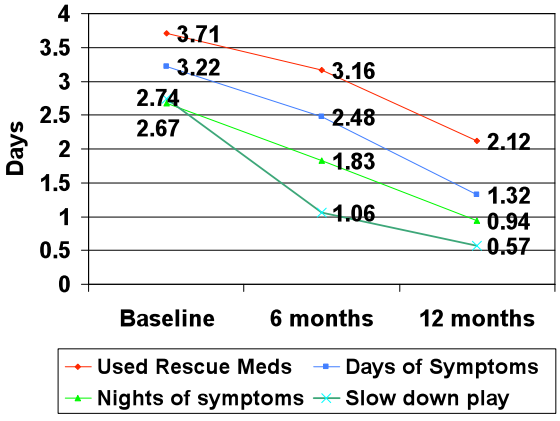
ED and IP outcomes

In Past Year:

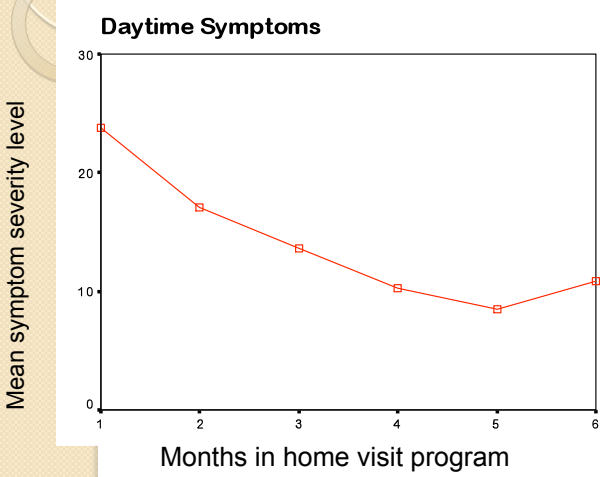


Asthma Control Change Over Time

In Past Two Weeks:



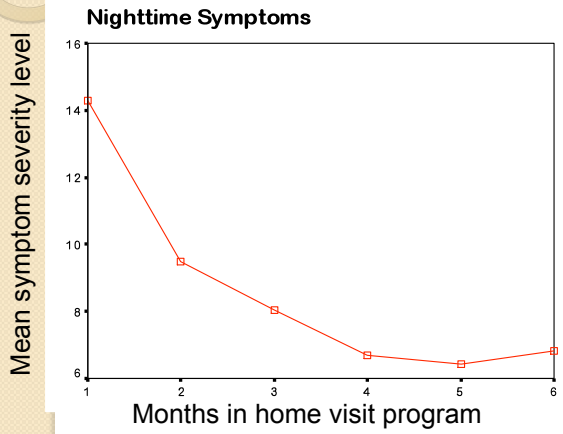
Daytime Symptoms Change Over Time



n=68 children completing 6 months of diaries after introduction of common instrument, **n=816** bi-weekly diaries, August 2007 through December 2008

Repeated Measures Analysis **F=10.96**, **p<. 001**

Nighttime Symptom Change Over Time



n=68 children completing 6 months of diaries after introduction of common instrument, **n=816** bi-weekly diaries, August 2007 through December 2008

Repeated Measures Analysis **F=10.96, p<. 001**

Conclusions for Case 3

- Overall project utilizing CHW's as key personnel was successful in reducing asthma symptoms
- These changes occurred at about six months into the program and were sustained until 1 year post enrollment

CAPP