Asthma Action at Erie Trial

NCT02481986

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Study Location(s):

1. UIC: Department of Pediatrics
2. UIC: Institute for Health Research and Policy
3. Erie Family Health Centers (*has multiple sites, intervention sites to be determined*)

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LIST OF ABBREVIATIONS

CAB	Community Advisory Board
CBPR	Community Based Participatory Research
CHW	Community Health Worker
DSMB	Data and Safety Monitoring Board
DSMP	Data and Safety Monitoring Plan
HIPAA	Health Insurance Portability and Accountability Act
IHRP	Institute for Health Research and Policy
IRB	Institutional Review Board
MRC	Methodology Research Core
OHRP	Office of Human Research Protections
OPRS	Office for the Protection of Research Subjects
PHI	Protected Health Information
PI	Principal Investigator
RS	Research Specialist

1.0 PROJECT SUMMARY/ABSTRACT

Asthma prevalence and morbidity have been increasing among children over the last three decades despite significant advances in environmental control and asthma care. The annual costs for children with asthma range between $2.0 and $3.2 billion. Asthma morbidity and its associated costs are not borne equally; they are highest for urban, low income, African American and Puerto Rican children. Community health workers (CHWs) have been growing in popularity as a potential intervention to combat these asthma disparities. CHWs are frontline public health workers who serve as liaisons between health and social services and communities to facilitate access to services and improve the quality and cultural competence of service delivery. The evidence on CHW asthma intervention efficacy has been growing but several critical gaps still exist. The Asthma Action at Erie Trial will test the ability of a CHW intervention with three important modifications to achieve asthma control in high-risk children: 1) CHWs will be integrated into both the clinical and the home setting, 2) A system for directly addressing mental health and psychosocial barriers will be provided, and 3) Participants will be provided only materials and equipment for trigger remediation that are supported by the current medical reimbursement system.

A two-arm behavioral randomized controlled trial (N=223) will be conducted in partnership with a federally-qualified health center (FQHC) serving a low income, minority population that is at high-risk for significant asthma morbidity. The intervention arm will receive an integrated CHW home intervention for pediatric asthma education. The comparison arm will received clinic-based certified asthma educator (AE-C) services. Primary Aim 1 is to assess the efficacy of the integrated CHW home asthma intervention, relative to clinic-based AE-C education over 12-months, as demonstrated by asthma control. We hypothesize that the CHW arm will have at least 30% less days with activity limitation than the AE-C arm at 12-months. Specific Aim 2 is to assess maintenance of intervention efficacy, as demonstrated by asthma control at 18 and 24 months after randomization. Specific Aim 3 is to determine the cost-effectiveness at 12-months of CHW and AE-C intervention delivery, and additional costs or savings related to asthma exacerbations at 12- and 24-months. Specific Aim 4 is to assess the efficacy of the integrated CHW home asthma intervention relative to clinic-based AE-C education, as demonstrated by asthma control, among those experiencing depression, stress, and/or a post-traumatic stress disorder. This trial compares the current best practice in asthma self-management education (AE-C services) to an integrated CHW home intervention in which the real-life challenges of patients and the health care system are taken fully into account. This trial will provide clarity as to the expected effect size, cost savings, and resources needed to integrate asthma CHWs into clinical practice.

2.0 BACKGROUND/SCIENTIFIC RATIONALE

Asthma morbidity and its associated costs are not borne equally. African American and Puerto Rican children suffer disproportionately higher asthma prevalence and morbidity.[1] Asthma disparities measured over ten years ago[1] still persist[2] due to an interaction of individual, environmental, health system, and provider factors.[3-4] These disparities are clearly seen in Chicago, which has some of the highest asthma prevalence rates ever reported. A survey of randomly selected Chicago households in 2002, which measured both diagnosed asthma and children with probable asthma, reported potential total asthma rates of 14% in Mexican children, 20% in White children, 25% in Black children, and 34% in Puerto Rican children.[5] Effective interventions to control asthma are needed, especially within minority urban populations where the highest asthma burden exists. Interest is growing around the potential role of community health workers (CHWs) to control pediatric asthma in these high risk populations. However, major gaps remain regarding specific CHW dose and protocols, associated efficacy on clinical outcomes, and integration into the healthcare system before the intervention can be effectively disseminated.[6-9] Using a rigorous design, we will assess the efficacy of a well-developed CHW home asthma intervention that is fully integrated into a clinical setting. At the completion of the study, we will be able to describe the expected clinical outcomes associated with a CHW intervention integrated into clinical care, as well as the anticipated costs relative to the benefits. The results of this study will clarify the necessary resources and realistic expectations of the intervention for clinicians, administrators, and insurers. As healthcare reform progresses, this study will provide essential information about the optimal role of CHWs in routine clinical care for pediatric asthma.

The Community United to Challenge Asthma - Project CURA (Clinical Trials ID NCT01065883 and NCT01061424) was a behavioral randomized controlled trial to test the efficacy of a CHW intervention to improve medication adherence and reduce home triggers among Puerto Rican children and adolescents.[10-12] Fifty-one children in elementary school and 50 children in high school were recruited and randomized to receive either CHW home visits or mailed information. Both interventions lasted four months and covered a standard asthma core curriculum emphasizing physiology, triggers, medications, and physician communication. The interventions also included information on self-management skills. Data were collected at the end of the intervention period and one-year from the start date to assess maintenance. The sample was intentionally poorly controlled at baseline; all met criteria for either uncontrolled and/or persistent asthma over the past year. Only 45% of the Elementary School Cohort and 12% of the High School Cohort had an inhaled corticosteroid at baseline. For those with an inhaled corticosteroid, the combined median adherence was 1.0 doses/day (range 0-3.3), meaning about 25% adherent to standard metered dose inhaler regimens. Homes had an average of six asthma triggers. Prevalence of depression was very high: 59% of caregivers and 68% of teens reported signs of depression. In the Elementary School Cohort (n=51), no differences were seen in outcomes between arms at any time point with one exception: the CHW arm had lower odds of having an ICS (OR=0.2; p=0.02) at 12-months. Every point increase in baseline caregiver depressive symptoms was associated with a lower odds of controlled asthma (OR 0.9; 95% CI = 0.8, 1.0; p=0.02). The only significant treatment arm difference in the High School Cohort (n=50) was in inhaler technique. At 5-months, the CHW arm performed 18.0% (95% CI = 8.0, 28.1; p <0.01) more steps correct than the Mailings arm. At 12-months, the CHW arm performed 14.2% (95% CI = 4.4, 24.1; p <0.01) more steps correct than the Mailings arm.

The Community United to Raise Awareness: Asthma and Active Living: CURA 2 (1P50HL105189-01) was a follow-up to Project CURA where the number of CHW visits was

expanded, the inclusion criteria expanded to all race/ethnicities, and content on pediatric obesity added. Similar to the original study, no environmental remediation equipment was provided and there was no clinical partner. Participants were children ages 5-12 with asthma who were overweight or obese. They were offered 12 CHW home visits over one year. Of the 46 participating families, the median number of home visits received was 10; 3 families refused all and 3 families were lost at one-year. Scores of uncontrolled asthma (<20) on the Childhood Asthma Control Test improved significantly pre/post (38% to 14%, $p<0.01$). Improvements were seen in nighttime symptoms (49% to 26%, $p<0.05$), activity limitation (33% to 7%, $p<0.01$), and inhaler technique (steps correct: 60% to 90%, $p<0.01$). Medication adherence and home triggers did not change. Obesity changes did not mediate asthma outcomes.

There is an urgent need for evidence from practical clinical trials where the CHW asthma intervention is integrated into a clinical real-world setting. We need to know: 1) How to formally connect CHWs and medical providers in a way that allows CHWs to keep their community focus but maintains a reimbursable and replicable clinical structure. 2) How to achieve environmental remediation for trigger reduction within the current medical system. 3) How to integrate CHWs with existing resources for the management of psychosocial problems. 4) Cost data on the intervention delivery and outcomes. The proposed study will answer these questions.

3.0 Objectives/Aims

Primary Aim 1: To assess the efficacy of the integrated CHW home asthma intervention, relative to clinic-based AE-C education over 12-months, as demonstrated by asthma control. We hypothesize that the CHW arm will have significantly greater asthma control than the AE-C arm at 12-months as measured by days with activity limitation over the previous 14 days and the Asthma Control Test/childhood Asthma Control Test.

Specific Aim 2: To assess maintenance of intervention efficacy, as demonstrated by asthma control at 18 and 24 months after randomization. We hypothesize that changes in efficacy outcomes will be maintained after cessation of the intervention.

Specific Aim 3: To determine the cost-effectiveness at 12-months of CHW and AE-C intervention delivery, and additional costs or savings related to asthma exacerbations at 12- and 24-months.

Specific Aim 4: To assess the efficacy of the integrated CHW home asthma intervention relative to clinic-based AE-C education, as demonstrated by asthma control, among those experiencing depression, stress, and/or post-traumatic stress disorder (PTSD). We hypothesize that among those living with depression, stress, and/or PTSD, the CHW intervention will be significantly more effective in achieving and maintaining asthma control than the AE-C education intervention.

4.0 Eligibility

The procedures for determining eligibility are described in Section 5.0.

4.1 Inclusion Criteria

- Child is a patient at Erie Family Health Center
- Child is age 5-16 at the start of the study
- Child lives with the index caregiver at least 5 days out of the week

- Child has uncontrolled asthma.[13] This is defined as a score of 1.25 or greater on the Asthma Control Questionnaire,[14-17] a score of less than 20 on the Asthma Control Test/childhood Asthma Control Test,[20-24] or report of oral corticosteroid use at least once in the past year.[13]
- Family has a working telephone

4.2 Exclusion Criteria

Exclusion criteria include family not fluent in English or Spanish, family lives in temporary housing such as a shelter, caregiver does not have permanent custody of child, or child has significant developmental delays or co-morbidities that would limit their ability to participate in the program.

4.3 Excluded or Vulnerable Populations

This study targets vulnerable populations because they suffer disproportionately worse outcomes from asthma. They are also the target population of Erie Family Health Center. Almost all participants will be low income and either African American or Hispanic ethnicity. Many will have Spanish as their primary language.

The study also includes children, by enrolling child/caregiver dyads. Children under the age of 5 are excluded because the diagnosis of chronic asthma in this population is challenging.[13] Children over 16 years of age are excluded because the management of their asthma usually changes from a caregiver/child partnership to mainly child-driven and the role of environmental trigger reduction changes as well since the children spend less time in their parent's home.

5.0 Subject Enrollment

1. There are multiple pathways for enrollment.
   Erie will query the electronic medical record for all patients with a diagnosis of asthma, eliminating those who fall outside of the age range. Potentially eligible families will be sent a letter stating they should call if they do not wish to be considered for this study. A bilingual brochure will also be included with the letter. If families do not respond to the letter within one week, they will be called on the telephone by designated, trained study staff to assess interest in the study. Study staff may be Erie or UIC employees. Families without addresses or whose letters are returned undelivered will be called on the telephone by Erie staff to assess interest in the study. Families who do not answer their telephone will be sent a second letter and their chart flagged for Erie staff to address the study when the family returns to clinic. Potential participants that express interest in the study will be formally screened by UIC research specialists.
2. Erie providers and staff will be instructed to refer potential participants to call the study enrollment number, email the study enrollment team, talk to one of the study staff in clinic, or allow study staff to call them. During high volume times (school physical season, flu vaccine season), charts will also be flagged for Erie providers and staff to address the study directly with families at the time of their visit. Study staff in clinic or on the phone/email will give descriptions of the study and if a potential participant is interested, a formal screen will be initiated by a UIC research specialist.
3. Flyers and signs advertising the study will be created and distributed/posted.

If a family is interested and passes the screener, they will then be scheduled for a home visit. A University of Illinois at Chicago (UIC) research specialist (RS) will go to the home to perform informed consent/assent and to collect the baseline data. At that point, the family is ready for randomization. If recruitment at the Erie primary care centers does not yield

sufficient participants, other sites (school-based centers) will be opened. We will recruit 223 participants (caregiver/child dyads), 111-112 per study arm.

Participants that fail the screener or who chose to not provide informed consent will be thanked for their time. Participants that fail the screener but are interested in the study will be offered the option of being put on a re-contact list. If they agree to be put on this list, their contact information will be saved and research staff can call them again in several months to rescreen them. Personal identifying data from the screening (initial and re-contact lists) will be kept in a secure location until recruitment is ended, at which point it will be destroyed. (We will keep their name during the recruitment period only to prevent contacting people who have screened out.) All staff involved in recruitment will receive careful training about the study and the clinic services to ensure that everyone approached understands that participation is voluntary and services at Erie will continue regardless of study participation, and so that Erie staff understands their primary role is patient care. Recruitment will not impinge on clinical responsibilities or clinic operations. Staff involved in recruitment have their time covered by the study. Providers who refer the study to patients do so when they have time and feel comfortable only.

Randomization will be conducted in a 1:1 ratio using randomly mixed permuted blocks of size 4 and 6 to ensure reasonably equal allocation while reducing predictability of the assignment sequence. Upon completion of the randomization assignment, the data management team will generate a letter to the participant informing him/her of their study status and also notify the Erie Intervention Coordinator who will assign the patient to a CHW if randomized to that arm. Although double blinding in a behavioral randomized clinical trial is impossible, blinding will be maximized by: 1) incomplete disclosure of study goals for participants during consent (see Human Subjects for details), 2) blinding outcomes assessors; 3) incomplete disclosure of research hypotheses for non-investigators staff; and 4) training co-investigators and staff in the concept of equipoise. Intervention investigators and staff will be unblinded to treatment arm because they will need to work with the CHWs and monitor intervention fidelity and data accuracy. Study staff and investigators (with the exception of the Safety Officer) will not have access to interim outcomes data.

6.0 Study Design and Procedures

6.1 Study Locations

Research will be performed at Erie Family Health Center, in homes, and at UIC. Erie is the recruitment site. Erie is also the site where the AE-C intervention will occur. CHWs will be employed by Erie and will work out of Erie, but they will provide home visits as well. For more than fifty-five years, Erie has provided high quality, culturally sensitive, and compassionate health care services to medically underserved populations on Chicago's north and west sides. Today, Erie serves nearly 40,000 patients annually at thirteen sites. Seventy-nine percent of Erie's patients are Hispanic, 54% are best served in Spanish, 68% are female, 49% are under the age of 19, 28% are school-aged children, 31% are uninsured, and 83% come from households with incomes that fall below the federal poverty line. Erie offers a wide range of behavioral health services in addition to medical and dental services. Individual therapy, group therapy, women's support groups, and substance abuse referrals are provided in the languages and settings preferred by patients. As an early adopter of innovative practices, Erie is well positioned to embrace the challenges presented by a changing health care environment. Systems like Erie's Electronic Health Record system, Practice Management System, and advanced open access scheduling contribute to the delivery of coordinated care that is high

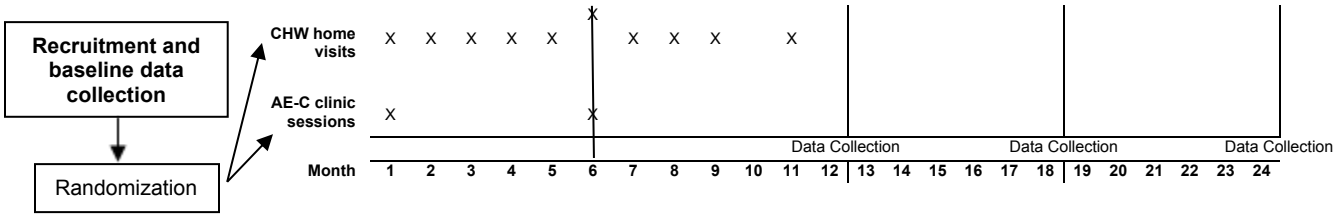
quality, efficient, and affordable. In addition Erie has robust systems, policies and procedures for managing grants and assuring that they meet stated goals and objectives. Erie successfully manages over $11 million in government and private grants by ensuring direct lines of communication between its Board of Directors, President and CEO, program and cost center directors, development, and finance staff.

UIC is the site for data management and analysis. No UIC patients will be involved in the research. Intervention will not occur at UIC.

6.2 Design

This study employs a modified community-based participatory research (CBPR) approach. CBPR involves co-learning about issues of concern, reciprocal transfer of expertise, shared decision-making power, and mutual ownership of research products and processes.[18] The proposed study leverages the resources and interests of each partner. Partners share control of study design, procedures, and outcomes. Erie will convene a Community Advisory Board (CAB), an internal group made up of patients and staff, on an as-needed basis, to advise the project team. In addition, the Chicago Asthma Consortium will function as our external advisory group. The Chicago Asthma Consortium Advisory Board will meet twice yearly. Major decisions on design, implementation, and dissemination will require approval of the CAB.

This study is designed as a behavioral randomized controlled trial. Child/caregiver dyads will be recruited and then randomized to one of two arms: CHW home visits, or education in the clinic from a certified asthma educator (AE-C). Intervention will be delivered in the first year of the study only. Data will be collected at baseline, 6, 12-months (post intervention), 18-months, and 24-months.



6.3. Treatment Arm: Pediatric Asthma CHW Home Intervention

The pediatric asthma CHW home intervention is modeled after that of Krieger et.al.[19] and refined from Project CURA.

6.3.1 Asthma Home Visit Protocol and Topics: Families will be offered 10 home visits over 12 months. At the CHW home visits, CHWs will spend 1-2 hours with the family. CHWs will educate them on the "core curriculum." The topics in the core curriculum are standard topics for asthma educators and are intended to reduce impairment (prevent chronic symptoms, infrequent use of quick relief medications, maintain normal activity levels) and reduce risk (prevent exacerbations, minimize emergency care, prevent reduced lung growth, and minimize adverse therapy effects).[13] The CHWs will approach each visit with the intention to teach one or two of the core curriculum topics. Each visit will begin with several minutes of social discussion for the purpose of relationship building. Behavior change plans from the previous visit will be reviewed and discussed. Behavior change plans are small goals for a specific change over a several-week period. Examples include: "getting a prescription from my doctor" or "writing down

when my child coughs". The main portion of the visit will involve the education session around a core curriculum topic. When a CHW notes a barrier in the delivery of the education, he or she will then incorporate a relevant self-management skill. For example, the CHW may know that the family is not giving a medication as often as prescribed but instead of just saying that, the CHW will have the family track how often the child is receiving their medication (self-monitoring). The family will "self-discover" they do not give the medicine as often as recommended. Then the CHW will have the family problem solve as to why that might be (storage location, parent work schedules, medication fear, etc.). Once they have a list of the problems, the family will create a behavior change plan for one problem they want to solve.

6.3.2 Integrating CHWs in the Clinic: Several of the Erie clinics are quite near each other in the Humboldt Park neighborhood. CHWs will be based out of one of these centrally located clinics but they will have access to all Erie clinics, computers, and staff. Once a participant is assigned to a CHW, the CHW will review the child's health record. The goal will be to review the child's health with the child's clinician. Erie clinicians manage pediatric asthma using a detailed asthma smart form in the electronic medical record (EMR). They have access to spirometry and other support tools through the American Lung Association Enhancing Care for Children with Asthma Program. Whenever possible, the clinician will outline his or her concerns and recommendations for the patient. If the provider is not available to meet with the CHW, the CHW will proceed with the standard home protocol. Then the CHW will meet with the family and determine their concerns and expectations. The CHW will fill out a report of the topics covered, behavior change plans, and potentially relevant issues after each visit. Summaries of these reports, and communications with providers, will be uploaded into the EMR. The clinician and CHW will aim to discuss the participant at least two other times during the year and possibly more, depending on the needs of the family. CHWs will communicate directly with the behavioral health staff and case managers at Erie on an as-needed basis for participants.

6.3.3 CHW Training for Asthma

Potential candidates for the CHW positions will be recruited through Erie, community list-serves, and word of mouth. Preference will be given to candidates who have been patients at Erie, are bilingual in English and Spanish, and have personal experience in their families with asthma. A cohort of 12-15 candidates will complete an initial training (Phase 1, see next paragraph) which serves several purposes: 1) The training builds community capacity and skills around asthma, 2) It allows investigators to determine the best candidates for the position, 3) It provides a pool of back-up candidates for the future. Dr. Martin has developed a comprehensive asthma CHW training curriculum (*http://cuhe.rush.edu/Cura%202/Pages/CommunityHealthWorkerTraining.aspx*) which she will conduct in three phases. Phase 1 provides 30 hours of training on asthma basics and self-management. First, the self-management concepts will be taught using popular education methods. Asthma concepts are subsequently taught in a similar fashion and then linked with the self-management concepts. At the end of training, trainees individually conduct a standardized role play and must demonstrate their skills with the asthma medication devices in order to determine competency for future intervention delivery. Phase 2 will provide follow-up training for the three CHWs chosen for the study. This phase will familiarize the CHWs with the study protocol, Erie policies, home visitation strategies, and documentation. Medications and trigger remediation will be reinforced through role plays and practical exercises. CHWs will complete the 12-hour Mental Health First Aid course (*http://www.c4chicago.org/MHFA*). Dr. Weinstein will then provide a follow-up session to discuss anticipated mental health challenges and how to obtain services for their participants. She will also train them in motivational interviewing. They will receive training on the Erie electronic medical record (EMR) system. CHWs will shadow

experienced CHWs on other projects for a minimum of 3 visits and they will shadow Erie clinicians for a minimum of 20 hours. Phase 3 is ongoing continual education. CHWs will attend local educational seminars (*www.chicagoasthma.org*) twice a year.

6.3.4 CHW Supervision

CHWs are not clinicians and they often struggle with many of the same issues as their clients in terms of health problems, children, housing, and poverty. This allows them to intimately understand the challenges their clients face and usually translates into strong bonds between CHWs and clients, but it sometimes transforms into a tremendous burden when clients struggle with serious issues. The CHWs also must deal with the stresses of home visitation (safety, cleanliness, hectic households, and poverty). In order for CHWs to successfully perform their job, they require adequate supervision and support. Supervision is best conducted using a team approach with a group of CHWs in order to facilitate self-discovery and group learning. In this trial, CHWs will report directly to the Erie AE-C for day-to-day supervision and support as needed. Every two weeks, CHWs and the Erie AE-C will also meet with Dr. Martin and/or Dr. Roy for discussion of clinical issues, self-management skills support, and for continuing education. Dr. Weinstein or an Erie mental health provider will meet with CHWs once a month to discuss mental health issues related to participants or the CHW job and to generate strategies for resolution.

6.4 Comparison Arm: Clinic-based AE-C Education

6.4.1 AE-C Training: Most candidates for the AE-C certification have prior experience as an asthma educator and therefore require only a preparatory course to pass the certification exam. Erie leadership will identify the appropriate candidate for this position. This person will then complete a 2-day comprehensive workshop offered in Chicago by the Respiratory Health Association (*www.lungchicago.org/certified-asthma-educator-training/*). If further training is required, an additional online course if available through the American Association of Respiratory Care (*www.aarc.org/education/asthma_* course). Once this person has passed the AE-C certification exam, he/she will complete a subsequent 2-day training with the research investigators to familiarize him/her with the intervention expectations and protocol. The AE-C may start delivery of intervention before obtaining formal AE-C certification as long as they have completed a training course and the study-specific training.

6.4.2 AE-C Intervention Protocol: The AE-C will receive contact information and have access to the clinical chart for participants randomized to the AE-C arm. The AE-C will schedule the participant's family to come in for an educational session in the clinic. At this visit, the AE-C will assess and educate on asthma symptoms, control, triggers, medication technique, adherence, presence of a written asthma plan, and he/she will address caregiver/child concerns. The AE-C will call the family on the telephone in 2-4 weeks to discuss self-monitoring of symptoms and medication and answer any questions. The AE-C will schedule the participant's family again to come in for a similar visit at 6-months. A follow-up telephone call will occur 2-4 weeks later.

6.5 Standard and Research Procedures

The AE-C is considered "best practice" but is not routine care at Erie due to funding. For this study, the AE-C condition is subsidized by the research budget making it a research procedure that will not be offered to intervention arm participants. CHW intervention is a research procedure. Both interventions will be documented in the medical record; support staff regularly document patient encounters in the record, making this standard procedure. The data collection is a research procedure.

6.6 Fidelity and Process Measures: Training: The CHWs will be assessed at the end of the trainings using role plays to determine that they have adequate knowledge and intervention delivery skills. The AE-C will have passed the National Asthma Education Certification Board (NAECB) examination. Delivery: CHWs and the AE-C will complete documentation after every encounter to record curriculum topics covered, resources utilized, and issues encountered after home and clinic visits. These will be reviewed monthly by unblinded staff to ensure fidelity and also to inform the study team on areas of focus and challenge. The data will also be used in final analyses to determine "dose" of intervention and to assess the influence of specific topics/skills on outcomes. Additionally, CHW and AE-C documentation in the EMR will be reviewed quarterly to capture frequency of interactions between clinicians, CHWs and AE-C, behavioral health providers, and case management, and the topics covered. Home visits and clinic visits will be randomly tape recorded and reviewed by unblinded staff to ensure intervention fidelity and accuracy of CHW/AE-C documentation.

6.7. Retention: Participants will be contacted by UIC research staff monthly to verify contact information. We will obtain multiple alternative contacts at the time of enrollment – friends, family, or others likely to keep in touch with the participant and know their whereabouts. We can also search the clinic records for changes in address or telephone number. Incentive payments for data collection aid in retention. The one source that will not be utilized will be the CHWs as this approach could lead to differential ascertainment of outcomes between the arms and introduce bias into the study.

6.8. Outcomes:

6.8.1. General Procedures

Individual outcomes will be collected in the homes by UIC RS. Results will not be returned to participants or their clinicians in order to simulate routine clinical care as much as possible. Emergency plans will be implemented if outcomes are in critical ranges. For example, endorsing a suicide plan will receive immediate intervention and appropriate referrals.

6.8.2. Instruments

The instruments and data domains are in the following table. All instruments have been validated, most with official Spanish validations as well. All instruments will have both English and Spanish translations. Before the study begins, the RSs will receive training sessions which will cover the procedures involved in data collection. The RSs will perform several "test" data collections in both English and Spanish, where they will perform data collection with volunteers. The data collection process and instruments will be reviewed by study staff and then compared to determine intra- and inter-rater reliability. Problems with question accuracy and translations will be fixed.

6.8.3. Salivary Cotinine Protocol:

The salivary cotinine assay will be performed by staff in the UIC Department of Pediatrics laboratory of Dr. Sekhar Reddy and UIC Research Resource Center – Dr. Balaji Ganesh.

Equipment: bioquant ELIZA assay. 360/kit (96 wells), capped test tubes.

Procedure:

1. Nothing to drink for 1 hour before
2. Spit into tube (If dry mouth, have them not swallow for a minute and then try.)
4. Need 1 ml

5. Cap tube
6. Transport to UIC within 24 hours
7. Store at -20 degrees Celsius until transport to lab for analysis

OUTCOME ASSESSMENTS

Domain	Questions	# of items	Pre-base line (phone or in person)	0mo Base line	6mo	12mo	18mo (phone or in person)	24mo
Screening	Erie pre-screen							
	UIC screen	21,17,10						
Asthma Control	Activity limitation over 14 days[42-43]	1						
	ACQ[14-17]	6						
	cACT/ACT[20-24]	5-7						
	Oral steroids* [13,20]	1						
	Asthma functional severity scale [25]	6						
Asthma Medicines	Caregiver self-report [10]	5						
	Child self-report [10]	3						
	Observed medicines [10]	2						
	Observed technique [10]	11, 12, 10						
	Adherence [10]	5						
Triggers	Home assessment (self-report + observed)[11,19]	167						
	Salivary cotinine[11,26]	1						
Health Services Utilization	Urgent care visits*	1						
	Emergency dept visits*	1						
	Hospitalizations*	1						
	Missed school*	1						
	Missed work*	1						
Demographics	Height/weight	2						
	Demographics	27						
Psychosocial	Caregiver depression PHQ-9	9						
	Child depression (CDI-2 short or parent PROMIS parent proxy)[27-29]	6 13						
	Perceived Stress Scale 4-item[35-37]	4						
	Caregiver trauma[38-40]	6						
	Child trauma PROPS/CROPS[41]	26						
	Asthma-Related Trauma Event Items	9						
	Social Support PROMIS Scale[29-34]	8						
	CHAOS [44-45]	15						
Implementation	Intervention tracking	19						

6.8.4. Mental Health Protocol:

Part 1: In the home – Research Specialists

A mental health services list will be prepared that explains how to get mental health services at Erie, as well as other local resources. This will be given to all families.

The UIC research specialist (RS) will administer all depression and trauma instruments either via a computer (handing the computer to the participant to complete) or via a paper version with pen/pencil. All instruments will be in the preferred language. They will be instructed to complete the questionnaire on their own but they can ask questions.

The RS will give the caregiver the PHQ-9 and Short Form of the PTSD Checklist - Civilian Version. In addition, if the child is unable to complete the CDI-2 Brief, the research specialist will give the caregiver the PROMIS Parent Proxy questionnaire. The RS will give the child the CDI2 Brief and the CROPS. There is no immediate scoring of these instruments. When the participant finishes completing the PHQ-9, the RS should check to see if they answered 1, 2, or 3 on question 9. If yes, then implement Suicide Protocol.

Suicide Protocol: The RS will tell the participant the following statement: "*I feel that you may need to speak to someone immediately and I am going to make a phone call so that you can speak to a professional about how you are feeling."* The RS will call the National Suicide Prevention Lifeline and ask the participant to talk with them: 1-800-273-TALK (8255). If they are English-speaking, can call locally 630-482-9696. Wait while participant completes call, but try to give privacy. Give hotline card. Give family mental health services list. If further assistance is needed, the RS should do what they feel is appropriate or contact the PI if unsure how to proceed. If participant refuses to talk with the hotline, leave them the mental health services list. Call them back 24 hours later to reinforce that we feel they need to contact this number.

Part 2: After data collection – Research Specialists

The mental health instruments should be scored within 7 days of collection. The following are abnormal scores. If participants score in these ranges, the RS is responsible for trying to call back the participant within 24 hours of noting an elevated score using the below script as a guide. The RS must inform Dr. Weinstein of the scoring and action within 24 hours of noting an elevated score.

- PHQ-9: >=10
- Short Form of the PTSD Checklist - Civilian Version: If score >= 14,
- CDI2: If the scoring puts the child in the Elevated to Very Elevated range

"This is from the Asthma Action at Erie Trial. I was at your house a few days ago. Some of the information we collected tells us that you have [your child has] been feeling somewhat sad and anxious. Everyone fells sad or anxious sometimes but this usually only lasts a short time. We are concerned that your [your child's] feelings of sadness and anxiety are lasting too long and may be interfering in your [his/her] life. Sometimes professional help from a counselor or a doctor can help a person feel happier about life. We recommend that you call one of the people listed on the mental health services list we gave you. The people there can talk to you more about this and get you help if you need it."

For enrolled children in elevated range: All enrolled children are patients at Erie (see inclusion criteria) and therefore qualify for behavioral health services at Erie. If children are already receiving behavioral health services per caregiver report, the caregiver should be advised to talk with their provider about the results of this screen. If children are not already receiving services, the caregiver should be advised to ask at Erie about receiving services.

For caregivers in the elevated range: If caregivers are patients at Erie, they will be advised to seek behavioral health services from Erie. If they are already receiving services, they will be advised to talk with their provider about the results of this screen. If they are not patients at Erie, they will be referred to other providers on the mental health services list.

Part 3: Interventionists – AE-C and CHWs

The AE-C and CHWs will not have access to the mental health screening results and they will not conduct formal mental health screening. If they develop concerns for the children or their caregivers in regards to mental health, they will encourage them to seek services using the mental health services list. If they already receive services, they will encourage them to talk with their provider. If the AE-C or CHW has strong concerns regarding an enrolled child, they will notify the child's primary care provider to refer the child to the Erie Behavioral health program.

6.8.5. Participant and Staff Safety

Working with CHWs poses multiple unique challenges since the CHWs are lay people that interact with participants in their homes. This study proposes the following:

Mandatory reporting: UIC and Erie staff are mandatory reporters of domestic abuse, child abuse and suicidal ideations. If a CHW or RS witness or suspect any of these situations, they will call 911 if they have concerns for the immediate safety of the person involved. If they feel safe leaving without calling 911 but have suspicions of abuse or suicidal ideation, they will bring the concern directly to their supervisor. The supervisor will review the situation, confer with the PI if needed, and determine if the police or Child Protective Services need to be notified. If the supervisor decides the situation requires reporting, the supervisor or PI will perform the reporting and also inform the participant of the decision to do so. This process will be stated in the consent form.

Staff safety: CHWs and RSs will usually visit homes alone but they will always have the option of being accompanied by a "sentry" for safety reasons. If they feel threatened or unsafe, they will not enter the home or they will leave the home. They will then notify the PI or their supervisor and home visits for that participant will be suspended until the home is determined to be safe.

Participant safety: Participants will be informed at the start of the study that if they do not feel comfortable with their RS or CHW, they can refuse them entrance into their home. Participants will be encouraged to notify the RS or project manager if they are uncomfortable with their RS or CHW. If this occurs, they will be offered the option of changing RSs or CHWs, or withdrawing from the study.

Asthma safety: CHWs and RSs will be trained in the danger signs of asthma: using albuterol inhaler more than every four hours, inability to speak, severe cough, and severe wheeze. If they witness a participant with any of these danger signs, they will call 911 or have the participant's family bring them to seek medical attention immediately. CHWs and RSs will always have

immediate access to a supervisor via cell phone when in the field whom can call if they have concerns or questions.

6.8.6. Missing Data

Missing data will be dealt with in the analysis. See Section 9.

6.9 Data Management: See Sections 8 and 11.

6.10 Timeline

	Year 1	Year 2	Year 3	Year 4	Year 5
Instrument/staff preparation					
Recruitment					
CHW initial training					
Baseline data collection					
Active intervention					
6 month partial data collection					
12 month data collection					
Observation period					
18 month data collection					
24 month data collection					
Data analysis					
Manuscript preparation					

7.0 Expected Risks/Benefits

Children and caregivers will be subject to only minimal risks throughout this trial. They may include inconvenience or embarrassment involved in completing questionnaires or demonstrating self-management skills, or permitting the CHW (or research specialist) to conduct home visits for interventions (or for assessments). The caregivers and children will not be required to answer any questions (or conduct any part of the study) that they are reluctant to discuss/conduct. There is also a risk of loss of confidentiality. The CHWs will not provide children or caregivers with any type of medical advice, but will have direct access to health care providers to address any child/caregiver clinical questions or concerns. If the CHW is accidentally contacted with clinical questions, the CHW will connect the child/caregiver with a health care provider familiar with the participant's medical condition immediately. On enrollment, caregivers will be instructed to call their health care provider or seek emergency services in case of worsening symptoms, as opposed to directing questions to the CHW. All participants will be informed in advance that they may withdraw from the study at any time without negatively affecting their medical care or any other benefits they might receive.

We do not know if participants will benefit directly from the research process and we will not indicate there is a benefit to participating. One potential benefit is to the communities served by Erie Family Health Center. Erie is very connected to the communities they serve. They are involved in local schools, events, and organizations. Promotion of research and asthma within Erie translates into promotion of research and asthma in the community at large. The support of this grant and Erie will increase awareness and visibility for research and asthma.

8.0 Data Collection and Management Procedures

Data Coordinating Center

Data management for this project will be provided by the Data Coordinating Center (DCC), which is comprised of staff and investigators from the Methodology Research Core in the Institute for Health Research and Policy at UIC. The DCC also serves as the Design and Analysis Core of the University of Illinois at Chicago Center for Clinical and Translational Science (CCTS) which is supposed by NIH funding through a Clinical and Translational Science Award as well as strong institutional commitment. The DCC has extensive experience in the acquisition, maintenance, and analysis of both large and small clinical trial databases. It is directed by Michael Berbaum who is a co-investigator on this proposal. The DCC faculty and staff are located in same offices as the other UIC investigators. Specific activities of the DCC include: collaborating with the study team to develop a comprehensive, yet efficient, set of case report forms to capture participant data, developing web and direct data capture systems, processing data, implementing and maintaining an effective study database and its associated query system, maintaining a computer environment sophisticated enough to efficiently, effectively, and securely manage the study database, and developing regular reports as to the accuracy and completeness of the study database, participant follow-up, and intervention delivery. The DCC is part of the research team which supports the ready exchange of any needed resources. The DCC will also implement the randomization processes. Access to randomization assignment data will be limited to pertinent DCC staff, intervention staff, and investigators as needed. Outcomes assessors are to remain blind to study arm.

Data acquisition and maintenance

All interviewer administered questionnaire data will be collected on computers (by outcomes assessors and CHWs) with the possible exception of the mental health instruments. The mental health instruments are to be self-administered for privacy; families will be offered the computer but they will be collected on paper case report forms if caregivers and/or children are uncomfortable answering the questions on the computers. Electronic data collected in the field will be on encrypted computers (see below). Paper forms will be transported to the Institute for Health Research and Policy where outcomes assessors will enter them into the computer data collection program and then store the paper forms in a locked storage cabinet.

All data will be kept confidential, and no subject will be identifiable from research records or published data. We will employ procedures used in other studies to maintain anonymity. All identifying information will be removed from the provider self-report data and all data sheets will be coded with ID numbers only. Tracking information will be stored separately from data files, and access to tracking information will be limited to the PI and research staff. The master list of ID code numbers and corresponding names will be kept in a locked file cabinet or in a password protected file on an internal server, with close scrutiny of access maintained by the PI. The master list is used only to coordinate data collection.

Data will be entered using REDCap (Research Electronic Data Capture). REDCap is a secure, web-based application for building and managing online databases for the collection and entry of research data. It is a valuable resource that allows for the creation of web-based databases quickly and securely, with special features like ad-hoc reporting and scheduling. It is fast and flexible with an easy to use design environment to create data capture forms. The program was developed by staff at Vanderbilt University in 2004 in order to help researchers manage data for small/medium sized projects in a systematic manner (metadata defined, secure, audit trails,

etc). The system is continually updated and enhanced by the Project REDCap team at Vanderbilt. REDCap is maintained by the staff in the DCC.

REDCap is designed to minimize data errors. The DCC will develop quality assurance checks that will be implemented at the time data are entered as an assurance of data accuracy. Erroneous and/or inconsistent values will prompt generation of an entry to a query report that will be developed for this study. Query reports will be generated weekly and distributed to study staff for resolution. Once generated, a query will remain part of the weekly report until it is resolved.

The RedCap Survey website and database is hosted by the Institute for Health Research and Policy (IHRP). RedCap is an IRB approved web data collection tool. The REDCap server is behind a firewall, has virus protection, uses Secure Socket Layer authentication to encrypt communication between a user and the server, and has been configured to meet campus HIPPA rules. This means that the Internet connection between a user's browser and REDCap is encrypted, but REDCap is not encrypted on the server on which it resides, nor is any data downloaded and saved to a computer or other storage device encrypted unless a user takes steps to encrypt the stored file using third party software. All data collected through RedCap is stored on a secured MySQL database server. The database server does not have an externally translatable IP address and access to the server is controlled by Microsoft Active Directory. Permission controls and passwords will assure that only authorized personnel will have the ability to access study data. Account creation to the Redcap web server is managed by the Center for Clinical and Translational Sciences, project access is controlled by the project manager. The DCC will work with study staff to ensure accurate transfer of data to the DCC.

Additional data collection procedures are described in Section 6.8. Data instruments are in the table in Section 6.8. Biologic specimens (saliva) will be stored in a freezer at UIC until they are sent to the allergy lab for analysis. After analysis, the samples will be destroyed.

9.0 Data Analysis

All analyses will be performed by the investigators and analysts in the Institute for Health Research and Policy using SAS version 9.4. We will compare key population descriptors in the two treatment groups as patient recruitment progresses (at N=100 and N=150) to ensure that the randomization process is achieving reasonable balance, being careful to protect operational staff from bias. Basic summary statistics will be calculated for outcome variables and covariates. Continuous variables will be assessed for normality using Q-Q plots and compared using 2-sample t-tests. If distributions are sufficiently non-normal, then a suitable transformation or non-parametric test will be used. Categorical variables will be compared using chi-square tests. Significance tests will be two-sided at level $\alpha=0.05$.

Specific Aim 1*:* To assess the efficacy of the integrated CHW home asthma intervention relative to the AE-C intervention at 12-months post-randomization as demonstrated by asthma control. This study will employ two primary measures of asthma control: number of days with activity limitation over the previous 14 days and the Asthma Control Test/childhood Asthma Control Test (ACT/cACT). The mean total number of days with activity limitation over the previous 14-day period will be assessed at 12-months between the two treatment arms using the two-sample t-test or Mann-Whitney test. If the mean days with activity limitation in the intervention arm is at least 30% lower than that of the AE-C arm and $p < 0.05$, we will conclude that the CHW intervention is more effective. The ACT/cACT will be analyzed using similar methods; a MID of 0.2 will be used to determine intervention efficacy. Linear mixed models will

then be employed to analyze primary outcomes at twelve months. To test the CHW intervention's efficacy on these outcomes, we will first conduct per protocol analyses limited to those patients who received CHW intervention. We will correct potential selection bias by including covariates found to be differentially related to nonadherence. Under the missing at random (MAR) assumption, this ensures unbiased estimates from linear mixed models. Additionally, to test the intervention's effectiveness in clinical practice we will conduct intention-to-treat analyses that include outcomes for all patients randomized. Nonadherent and other subgroups of patients can be expected to exhibit differentially higher rates of missing data. We will therefore examine the sensitivity of inferences to multiple imputation rule using the SAS macros of Little and Yau (1996), including last observation carried forward (LOCF), return to baseline, and continuing on apparent trajectory. The fixed-effects part of the model will be $Days_{ij} = \beta_0 + \beta_1 Time_{ij} + \beta_2 Tx_i + \beta_3(Tx_i * Time_{ij}) + \varepsilon_{ij}$, for subject i at visit j. Candidate covariance structures will be assessed using the data's correlation structure and Akaike's Information Criterion (AIC). A random intercept will be included in the model if it significantly improves the model fit as determined by the likelihood ratio test. Standardized residuals and Cook's distance will be used to assess the influence of outliers and individual observations and residual plots will be used to check the multivariate normal distribution assumption. These analyses will be conducted in SAS PROC MIXED (and PROC GLIMMIX for categorical outcomes), and will be followed by an exploratory variable selection analysis in PROC GLMSELECT. Potentially confounding covariates will be considered for model inclusion using the least absolute shrinkage and selection operator (LASSO) model selection method. This method identifies a significant subgroup of covariates that will form a more parsimonious model. The LASSO method avoids problems typically encountered using stepwise procedures. To accommodate potential age-specific effects, heterogeneity of treatment effects by age will be examined as an exploratory analysis.

Specific Aim 2: To assess maintenance of intervention efficacy, at 18 and 24 months after randomization. The asthma control measures will be compared between the two treatment groups at 18- and 24-months post-randomization as described above for Specific Aim 1. An indicator variable, to be named "Phase", will be added to the models to allow distinction between the time during intervention periods. The model will be: $Y_{it} = \beta_0 + \beta_1 Time_{ij} + \beta_2 Tx_i + \beta_3(Tx_i * Time_{ij}) + \gamma_1 Phase_j * (Time_{ij} - 12) + \gamma_2 Tx_i * Phase_j * (Time_{ij} - 12) + \epsilon_{ij}$. We will conclude that any intervention effect is sustained if the slope for γ_2Time after 12-months continues to be positive in the CHW arm.

Specific Aim 3 compares the costs and cost effectiveness of the interventions. The analysis will be conducted from the societal perspective, including the costs borne by the program, individual participant and family, and healthcare system. 1) Cost and resource use information will be collected for the program, participant, and healthcare utilization. 2) Efficacy will be measured as asthma control as described for Specific Aim 1. 3) Cost effectiveness will be evaluated by combining the mean total cost per participant with change in asthma control. We will calculate the ICER for the CHW home intervention compared to AE-C services, such that $ICER_t = (C_1 - C_0) / (E_{1t} - E_{0t})$, where C is cost and E is effectiveness. Subscript 1 denotes CHW home intervention and subscript 0 denotes usual asthma care. t denotes the time period: 12 months, 18 months and 24 months. 95% confidence intervals for the ICERs will be calculated to evaluate the uncertainty in these results. 4) We will conduct one-way and multi-way sensitivity analyses for the key parameters to evaluate whether the ICERs are sensitive to plausible changes in their values. The sensitivity analysis is a check on the robustness and will determine the key parameters impacting the ICERs.

Specific Aim 4: To assess the efficacy of the integrated CHW home asthma intervention among those experiencing depression, stress, and/or PTSD. Interaction terms between treatment indicators for depression, stress, and PTSD will be examined to test for heterogeneity of treatment effects.

10.0 Quality Control and Quality Assurance

Intervention fidelity procedures are described in Section 6.6. The MRC will develop quality assurance checks that will be implemented at the time data are entered as an assurance of data accuracy. Erroneous and/or inconsistent values will prompt generation of an entry to a query report that will be developed for this study. Query reports will be generated weekly and distributed to study staff for resolution. Once generated, a query will remain part of the weekly report until it is resolved.

11.0 Data and Safety Monitoring

11.1. Data Safety Monitoring Board

A Data Safety Monitoring Board (DSMB) has been created to provide oversight for the proposed trial. We have a 6 member DSMB. At its first meeting, the DSMB elected one of the members to serve as the Chair and another to serve as Executive Secretary. DSMB members and their expertise are as follows:

- *Marissa Feldman, PhD; Medical Psychologist, Ann & Robert H. Lurie Children's Hospital of Chicago (health psychologist)*
- *Saria Awadalla, PhD: University of Illinois at the School of Public Health (Biostatistician)*
- Brad Appelhans, PhD, Associate Professor, Rush University Medical Center *(behavioral intervention researcher and health psychologist)*
- Kameron Matthews, MD, JD; Chief Medical Officer, Mile Square Health Center *(federally-qualified health center administrator)*
- Geisel Collazo, MD, Mile Square Health Center *(community pediatrician)*
- *Cortland Lohff, MD, Medical Director, Public Health and Safety Division, Department of Public Health, City of Chicago, Illinois (local health expert)*

The data management team will report directly to the DSMB chairperson at their request or every 12 months. The DSMB will make an affirmative decision at each meeting whether to continue or terminate the study. Early termination is an option for the DSMB, particularly if there are serious concerns about patient safety or there is evidence of futility or sufficient evidence of efficacy; decisions regarding early termination will be made by the DSMB. No interim analyses of outcomes for efficacy or futility are planned. In general, the DSMB will be provided data grouped by treatment without identified treatment groups (i.e., masked to treatment assignment). If the DSMB requests, for the purpose of competent deliberation, to see the treatment assignments (by group or individual), these will be provided by the lead biostatistician. The investigators will remain masked to the treatment assignments of individual patients unless it is judged that it is in the best interests of an individual patient.

11.2. Adverse events (AEs) and Unanticipated Problems (UPs)

The Data Coordinating Center (DCC) will work with study staff to monitor any AEs and UPs that occur among participants of the proposed study. The two primary risks are: 1) confidentiality (protection of data, especially sensitive data collected in home); and 2) mental health risk (not

from the intervention, but assessments query for risks of harm to self or others). Confidentiality risks are managed by the procedures described in Data Acquisition and Maintenance Section. Mental health risks are managed as indicated on the Mental Health Protocol (See section 6.8.4).Adverse events will be reported immediately to the Safety Officer (Dr. Mosnaim). When indicated, the Safety Officer will inform the Principal Investigator, IRB, DSMB, Compliance Office, and/or NIH. Action to protect participant safety and privacy will be taken. Serious and non-serious AEs will be reported by the Principal Investigator to the IRB and NHLBI within 14 calendar days of initial receipt of information. UPs that are not serious AEs will be reported by the Principal Investigator to the IRB and NHLBI within 14 calendar days of when the investigator becomes aware of the problem.

11.3. Data Management

Data management for this project will be provided by the Methodology Research Core (MRC) in the Institute for Health Research and Policy at UIC. The MRC also serves as the Design and Analysis Core of the University of Illinois at Chicago Center for Clinical and Translational Science (CCTS) which is supported by NIH funding through a Clinical and Translational Science Award as well as strong institutional commitment. The MRC has extensive experience in the acquisition, maintenance, and analysis of both large and small clinical trial databases. It is directed by Michael Berbaum who is a co-investigator on this proposal. The MRC faculty and staff are located in same offices as the other UIC investigators. Specific activities of the MRC include: collaborating with the study team to develop a comprehensive, yet efficient, set of case report forms to capture participant data, developing web and direct data capture systems, processing data, implementing and maintaining an effective study database and its associated query system, maintaining a computer environment sophisticated enough to efficiently, effectively, and securely manage the study database, and developing regular reports as to the accuracy and completeness of the study database, participant follow-up, and intervention delivery. The MRC is part of the research team which supports the ready exchange of any needed resources. The MRC will also implement the randomization processes. Access to randomization assignment data will be limited to pertinent MRC staff (who have no interaction with participants) and designated study personnel who are responsible for ensuring participant safety.

11.4. Data Storage

See Section 8.0.

11.5 Data Release

A well-documented and appropriately accessible archive of study data is an important resource that will result from this study. The research team recognizes the need to share final data from the study with the larger scientific community. The Asthma Action at Erie Trial recognizes the requirements of data sharing set forth by the NIH. Three years after the end of clinical activity or two years after the main paper of the trial has been published (whichever comes first), data will be publically released. Data sets from the Trial will be stripped of all protected personal health information (PHI) to allow sharing of data without compromising participant confidentiality, privacy, and safety. All identification covered under HIPAA will be removed. All remaining variables not covered under HIPAA will be evaluated in terms of the risk of deductive disclosure of identity, and appropriate measures will be taken to protect confidentiality. The striped data, in partnership with the community clinical partner, will be sent to the NIH Program Officer for public release. In order to ensure responsible usage of study data, user registration will be required in order to access or download data files. Registered users will receive technical assistance with

questions or problems from the Methodology Research Core at the University of Illinois at Chicago's Institute for Health Research and Policy. A data sharing agreement will be required that will describe the conditions and restrictions of their use; limited data access will be made available only to users who successfully complete a rigorous approval process by both the investigators and the community partners. Data sets will be encrypted for transfer to approved investigators.

12.0 Statistical Considerations

Statistical analysis is described in Section 9.0. The sample size for the study was determined to allow assessment of the relative efficacy of the proposed interventions with respect to asthma control. While a strong clinical definition of asthma control has been in place for some time, there is no gold standard for assessing asthma control. The Asthma Control Questionnaire (ACQ) has been validated in diverse, large samples but currently there is an absence of substantive data on this test (data such as variability and reasonable effect sizes within this target population) upon which statistical power and sample size estimates can be based. Therefore we have conducted two calculations to ensure adequate power. Using the ACQ, a sample size of 100 per group (total N=200) had power 0.87 to detect the minimally important difference (MID) of 0.5 established for this test.[14] We performed a separate power calculation using number of days with activity limitation (over the past 14-days) as Zeiger et al.[42] found "activity limitation" to be a strong determinant of the composite asthma control score. In a multi-site inner-city (including Chicago) randomized trial of a home CHW asthma intervention, Morgan et al. reported activity limitations over the previous 14 day period.[43] Based on their data, we hypothesize a mean of 3.9 "activity limitation" days at baseline in both groups (SE 0.22) and, in the AE-C comparison group, a mean at 12 months of 2.84 days (SE 0.10). We anticipate the proposed CHW intervention will be more potent than that tested by Morgan et al. because it involves a higher dose and more physician involvement. Within the proposed CHW home intervention group, we anticipate a mean of 2 "activity limitation" days over a 14-day period at 12 months (SE 0.10), representing a 30% reduction from the AE-C comparison group (and 50% reduction from the baseline mean). Further assuming an attrition rate of 15% and 80% power, the standard two-group t-test for comparing means (at 12 months) requires a sample size of about 111 per group, for a total of 223 participants. Analyses to examine heterogeneity of treatment effects by age, race, or other groups have more limited power but results will be considered suggestive for further research.

13.0 Regulatory Requirements

13.1 Informed Consent

Written informed consent will be obtained by UIC RS from caregivers in the home before randomization. Before signing the consent, the RS will review the entire document and study protocol. They will answer all questions and ensure the caregiver understands the protocol and consent document. The RS will be bilingual in English and Spanish and all documents will be available in both languages. The protocol for informed consent for Spanish-speakers is the same therefore as for English-speakers.

Assent will be obtained from all children capable of reading and understanding the written assent document. The RS will explain the study protocol using the assent document to ensure the child understands what the document says and what the protocol entails. The caregiver will be present during this process.

The RS will complete human subjects training using the online Citi course at UIC. They will practice obtaining informed consent with volunteers/study staff under the observation of the project manager and/or investigators unless mastery of the process is confirmed.

Signed informed consent/assent documents will be stored in locked cabinets in the Institute for Health Research and Policy. The RS, the project manager, and the PI will have access to the documents.

13.2 Subject Confidentiality

Details for study access, data storage, and data release are described in Sections 8.0, 11.3, and 11.5. These procedures will ensure subject confidentiality will be maintained. No Certificates of Confidentiality will be required.

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